City of Enumclaw
Comprehensive Water System Plan

Final September 2013

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CERTIFICATE OF ENGINEER

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

Scott Woodbury, P.E.
Assistant City Engineer

Executive Summary

PURPOSE OF THE PLAN

The City of Enumclaw's (City) water system is a major infrastructure, much of which is invisible to the people that receive water from it. The water system requires qualified staff to operate and maintain it, and 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 Enumclaw Comprehensive Water System Plan 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 Plan complies with Washington State Department of Health (DOH) regulations under *WAC 246-290-100*.

SUMMARY OF KEY ELEMENTS

The Comprehensive Water System Plan 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 Plan also includes several ancillary elements, which include a water use efficiency program, a coliform monitoring plan, a cross-connection control plan, a water supply alternative analysis, a wellhead protection program, and an emergency response plan. A summary of the key issues related to these elements is provided in the following sections.

Water Service Area

In 2011, the City provided water service to approximately 5,600 customer accounts both within and outside the City's corporate limits. Pursuant to the Municipal Water Law, the City of Enumclaw has designated retail, future, and wholesale areas within its service area, in addition to related polices, which are described in Chapters 2 and 5 of this plan.

Past Water Usage and Conservation

The City has experienced a trend of decreasing water demands per equivalent residential unit since 1998. This is most likely the result of water conservation practices, adoption of an increasing block residential water rate structure, new buildings with more water efficient plumbing, the replacement of old water mains and repair of system leaks, adverse economic conditions, and significant increases in the City's sewer rates. The City's average equivalent residential unit consumption in 2011 was approximately 223 gallons per day. The average amount of distribution system leakage in the same year was 9.5 percent.

Future Water Demands and Water Supply

Population projections used to predict growth in water demand assume about 3.8% growth per year within the City from 2012 to 2022 in order for the population to reach a target of 15,996

people in the City limits by 2022. After 2022 the inside City growth rate is assumed to drop to 1% per year. The City has sufficient water supply from its existing sources to meet the demand requirements of the system for the planning horizon of year 2033.

Water Source and Quality

The City owns and operates four (4) water supply facilities at three sites to the east of the City: Boise Springs, Watercress Springs, and PC Johnson Wellfield. The City also has an emergency intertie connected to the Tacoma Water pipeline that passes through the City. Water produced at the spring sites and wellfield is chlorinated, while water supplied from the spring sites receives additional treatment for corrosion control. Water quality sampling results for the City's sources indicate that all primary and secondary drinking water standards have been met, except for manganese at the PC Johnson Wellfield which has exceeded the secondary standard. The drinking water regulations are constantly changing and will require additional monitoring and reporting in the future in an effort to ensure the regulations are met.

Operations and Maintenance

The City's operations and maintenance organization is staffed by well-qualified, technically trained personnel. City staff regularly participates in safety and training programs to keep abreast of the latest changes in the water industry and to ensure a smooth and safe operation of the water system. As the water system expands in the future, additional staff will be required to maintain the current level of service.

The City has taken several steps to prepare for emergency situations. Updates of the City's Vulnerability Assessment and Emergency Response Plan have been prepared as part of this plan update. These documents provide information to prepare and assist the City in responding to a number of emergency events. A supplement to the City's Emergency Response Plan was prepared, and is included as part of this Comprehensive Water System Plan.

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 the Department of Health. Key results of the evaluation are summarized below.

- The City has sufficient water supply to meet the demands of forecasted growth through the planning horizon of 2033.
- Treatment for manganese at the PC Johnson Wellfield can be deferred to beyond the planning horizon of 2033 due to continuing trend of decreasing water usage by existing customers.
- The 2.0 MG City Reservoir has reached the end of its useful life and needs to be replaced.

- Areas of the system that do not meet minimum pressure requirements will be included within expanded higher pressure zones.
- The City plans to add the Golf Course Well as a municipal water supply source to provide peaking capacity redundancy, to extend the deferral of manganese treatment at the PC Johnson Wellfield, and to determine the actual long term yield that the aquifer is capable of producing and can be relied on.
- The City plans to implement an automatic meter reading system to streamline the meter reading process and to benefit from advanced leak detection, concurrent reading of all meters, enhanced reporting and customer use information, ability to read a meter from the office for account close out, and other advantages.
- There are over 7 miles of steel or galvanized iron water mains ranging in size from less than 1 inch to 6 inches in diameter that have been identified for replacement due to their small size and tendency to corrode and leak.

Proposed Water System Improvements and Financial Program

The plan identifies over $17 million in water system improvements to be completed through 2033. These include water main, pressure zone and facility improvements as well as miscellaneous improvements.

The financial program considers the "total system" costs of providing water service, both operating and capital, by assessing past financial performance, funding sources, capital financing, projected financial performance, and rate structures. The most critical period financially is through 2016 at which time debt service will decline. Each year, as adopted by City Council, rates are to be adjusted for inflation according to the Consumer Price Index for the Seattle-Tacoma-Bremerton area. No other changes are also proposed to the utility's current rate structure.

The financing program calls for the use of a $3.5 million Drinking Water State Revolving Fund loan and $3.325 million revenue bond issue. State loan payments are on a reimbursement basis only so short term interfund loans may be necessary to temporarily funds incurred costs until reimbursement payments are received. Otherwise the balance of funding needed for the capital improvements identified through 2033 may be funded out of capital reserves rather than debt, with improvements in the Y Bar S local improvement district (LID) being made out of the replacement fund setup for that purpose and funded by the collection of a $40 per month rate surcharge on the LID participants.

With continued sound management and implementation of the recommendations of the financial program, the utility will ensure that it can meet future projected capital and operational requirements.

CHAPTER 1

Introduction

WATER SYSTEM OWNERSHIP AND MANAGEMENT

The City of Enumclaw (City) is a municipal corporation that owns and operates a public water system within its corporate boundaries. Water system data on file at the Department of Health (DOH) for the Enumclaw system is shown below in **Table 1-1**.

Table 1-1
Water System Ownership Information

Information Type	Description
System Type	Group A - Community - Public Water System
System Name	Enumclaw Water Department
County	King
DOH System ID Number	236001
Address	1309 Myrtle Ave, Enumclaw WA 98022
Contact	Scott Woodbury, Certified Operator
Contact Phone Number	253 261-1937

OVERVIEW OF EXISTING SYSTEM

The City provided service to approximately 5,600 customer connections, or 7,337 equivalent residential units (ERU's) at the beginning of 2012, within the City's existing retail service area, which extends beyond the city limits. The city limits comprise an area of approximately 5.3 square miles and the existing water service area is approximately 37.4 square miles. The 2011 estimated population within the city limits was 10,896, while water service was provided to an additional 4,327 people located outside of the city limits but within the existing retail water service area.

The City owns and operates four groundwater supply facilities at three sites to the east of the City: Boise Springs, Watercress Springs, and PC Johnson Wellfield. The City also has an emergency intertie connected to the Tacoma Water pipeline that carries surface water from Tacoma's Green River source through the City. Water produced at the City spring sites and wellfield is chlorinated, while water supplied from the spring sites receives additional treatment for corrosion control. Water from Tacoma is chlorinated and fluoridated. Water storage is provided by five reservoirs that have a total maximum capacity of 4.74 million gallons (MG). In

addition, the City's water system has nine pressure zones with one pressure reducing station, seven booster pump stations, and more than 142 miles of water main. A summary of 2011 water system data for the City's system is shown in **Table 1-2**.

Table 1-2
2011 Water System Data

Description	Data
Water Service Area Population	15,223
Water Service Area	37.4 square miles
Total Connections	5,556
Total ERUs	7,337
Demand per ERU	223 gallons per day
Annual Supply	617,346,388 gallons
Average Day Demand	1,175 gpm
Distribution System Leakage	9.5%
Maximum Day/Average Day Demand Factor	2.10
Peak Hour/Maximum Day Demand Factor	1.80
Number of Pressure Zones	9
Number of Permanent & Seasonal Sources	4
Number Emergency Sources	1
Number of Pump Stations	7
Number of Reservoirs & Total Capacity	5 (4.74 MG)
Number of Pressure Reducing Stations	1
Total Length of Water Main	142 miles

AUTHORIZATION AND PURPOSE

In accordance with WAC 246-290-100, comprehensive water system plans must be updated and submitted to the DOH every six years. The previous comprehensive water system plan for the City was approved by DOH in 2007. The purpose of this updated Comprehensive Water System Plan 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 which resolve existing system deficiencies and accommodate future needs of the system for at least 20 years into the future.
- To prepare an implementation schedule of improvements and financing plan that meets the goals of the financial program.
- To evaluate past water quality and identify water quality improvements.
- To document the City's operations and maintenance program.
- To prepare or update water use efficiency, emergency response, cross connection control, wellhead protection, and water quality monitoring plans.
- To comply with the Municipal Water Law and water system plan requirements of DOH.

SUMMARY OF PLAN CONTENTS

A brief summary of the content of the chapters in the plan is as follows:

- **Executive Summary:** Provides a brief summary of the key elements of this plan.
- **Chapter 1 - Introduction:** Introduces the reader to the City's water system, the objectives of the plan, and the plan organization.
- **Chapter 2 - Water System Description:** Presents the water service area, describes the existing water system, and identifies the adjacent water purveyors.
- **Chapter 3 - Land Use and Population:** Presents related plans, land use, and population characteristics.
- **Chapter 4 - Water Demands:** Identifies existing water demands and projected future demands.
- **Chapter 5 - Policies and Design Criteria:** Presents the City's operational policies and design criteria.
- **Chapter 6 - Water Source and Quality:** Discusses the City's water source and quality monitoring program.
- **Chapter 7 - Water System Analysis:** Discusses the water system analyses and existing system deficiencies.
- **Chapter 8 - Operations and Maintenance:** Discusses the City's operations and maintenance program.
- **Chapter 9 - Water System Improvements:** Presents the proposed water system improvements, their estimated costs, and implementation schedule.

- **Chapter 10 - Financial Program:** Summarizes the financial status of the City water utility and presents a program for funding the water system improvements.
- **Appendices:** Contain additional information and plans that supplement the main chapters of the plan.

DEFINITION OF TERMS

The following terms are used throughout this plan:

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

Cross-Connection: Any physical connection, actual or potential, between a water system and any source of non-potable substance which, therefore, presents the potential for contaminating the public water system.

Demand: The quantity of water required from a water supply source over a period of time necessary to meet the needs of domestic, commercial, industrial, and public uses, and to provide enough water to supply fire fighting, 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:

- **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 one hour time period of a given year. A system's peak hour demand usually occurs during the same day as the maximum day demand.

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

Equivalent Residential Units (ERU's): 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 ERU's by dividing the demand of each of the other customer classes by the demand represented by one ERU.

Fire Flow: The rate of flow of water required during fire fighting, which is usually expressed in terms of gallons per minute (gpm).

Group A System: A public water system that regularly serves 15 or more residential connections or 25 or more people per day for 60 or more days per year.

Group B System: A public water system that serves less than 15 residential connections and less than 25 people per day or 25 or more people per day during fewer than 60 days per year.

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.

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 Service Connection Charge: The installation charge or hook-up fee is a fee 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 cost for installing the service line off of the system's water main to the customer's water meter. The charge also includes the cost of the water meter and meter box.

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, 888 Zone refers to the City's main pressure zone that has reservoirs with an overflow elevation of 888 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.

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.

Tap-in Fee: See Capital Facilities Charge.

LIST OF ABBREVIATIONS

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

Table 1-3
Abbreviations

Abbreviation	Description
ADD	Average Day Demand
AWWA	American Water Works Association
CCR	Consumer Confidence Report
CIP	Capital Improvement Program
City	City of Enumclaw
DBP	Disinfection By-Product
DOH	Department of Health
EPA	Environmental Protection Agency
ERU	Equivalent Residential Unit
fps	feet per second
GMA	Growth Management Act
gpm	gallons per minute
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
OSHA	Occupational Safety & Health Administration
PHD	Peak Hour Demand
psi	pounds per square inch
SDWA	Safe Drinking Water Act
SOC	Synthetic Organic Chemical
SWTR	Surface Water Treatment Rule
THM	Trihalomethane
UGA	Urban Growth Area
USGS	United States Geological Survey
VOC	Volatile Organic Chemical
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety & Health Act

CHAPTER 2

Water System Description

INTRODUCTION

This chapter describes the City of Enumclaw's (City) existing retail and future water service areas, 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 later in **Chapter 7.**

History

In 1879, Frank and Mary Stevenson homesteaded what is now the center of town. Early settlers called this area Stevensonville, but the name later changed to Enumclaw (which means "thundering noise") after Enumclaw Mountain near town. Enumclaw was first platted in 1885, when the railroad decided to come through the area. In 1901 the town of Enumclaw granted the Weyerhaeuser Company a 25-year franchise to operate a water system within the town. In 1913 the City was incorporated. In 1923 the City decided to acquire the water system from Weyerhaeuser, which included the Boise Spring source (property). Since taking over ownership, the City has invested significantly in renovating the system, supplementing storage and supply facilities, and expanding the distribution network and assuming ownership of several small water companies. As of 2012, the City provides water service to approximately 5,600 customer connections.

Geology

The City of Enumclaw is situated on the Osceola Mudflow Plain, a broad, relatively level upland above the deep embayment of the Duwamish Valley. The plain consists of lithified volcanic mudflow (lahar) deposits that have been eroded by the Green and White Rivers and their tributaries. The City of Enumclaw lies on the plain near the hydrologic divide between these two rivers. Bedrock consists of Tertiary-age volcanic and coarse-grained sedimentary rocks, which comprise a few of the isolated hills on the plain near Enumclaw. Several episodes of Pleistocene to Recent glaciation deposited several hundred feet of stratified glacial drift, dense glacial till, and glaciolacustrine silt which were eroded and reworked by succeeding glacial events and during interglacial periods. The complex glacial stratigraphy reflects the historic sequence of glacial ice advance and retreat, and concurrent deposition and erosion of glacial sediment. The most recent (Vashon) glacial event reached its maximum extent of ice approximately 13,000 years ago. Enumclaw lies near the terminus of the glacial ice, where extensive piles of unconsolidated sand and gravel accumulated along the ice margins. Post-glacial streams excavated channels and eroded slopes into the Vashon-age glacial sediment. The 5,000-year-old Osceola Mudflow, a massive volcanic debris flow emanating from Mount Rainier and transported along the White River channel, deposited clay, sand and boulders that filled

channels and depressions in the Enumclaw area, leveling the surrounding topography to depths up to approximately 80 feet thick.

Hydrogeology

Groundwater in the Enumclaw area in sufficient quantities for sustainable withdrawal resides in porous layers of stratified glacial drift and ice-contact sediments underlying the Osceola Mudflow Plain. Groundwater-bearing zones vary regionally in thickness and extent and typically occur 50 to 150 feet below ground surface. Groundwater in these zones are recharged directly by infiltration of precipitation in the Enumclaw area and through deeper, more extensive groundwater flow paths that transmit infiltrated precipitation falling on the foothills to the east of the City. Supply wells completed in these zones yield from less than 100 to several hundred gallons per minute.

Topography

The topography of the City's water service area varies greatly in elevation. The area generally slopes downward to the northwest corner of the service area where the elevation is approximately 520 feet. The highest area served is located along the eastern extents of the system and has an elevation of approximately 1,100 feet.

ADJACENT WATER SYSTEMS

Group A and Group B water systems located in the vicinity of Enumclaw's water service area are shown in **Figure 2-3** and **Figure 2-3a**.

Group A Systems

Marion Water System

The Marion water system is located immediately adjacent to Enumclaw, southwest of the City's service area boundary. The water system serves approximately 254 connections and provides water service to approximately 522 people. Water is supplied to the system by two groundwater wells and an emergency intertie with the City of Buckley. There are currently no plans for an intertie between this system and Enumclaw.

Muckleshoot Water System

The Muckleshoot water system is located immediately adjacent to Enumclaw's westerly water service area boundary. The Muckleshoot Indian Reservation has approximately 3,000 residents. There are currently no plans for an intertie between this system and Enumclaw.

Walzak Water System

The Walzak water system is located north of the City's water service area. The water system has approximately 67 service connections and provides water to approximately 249 people. The Walzak water system has one groundwater well.

Remolif Addition Water System

The Remolif Addition water system is located within the northern portion of the City's water service area. The water system has approximately 25 service connections and provides water to approximately 55 people. The Remolif Addition water system has two groundwater wells with only 1 currently active.

Black Diamond

The City of Black Diamond's water system is located north of the City's water system. The City of Black Diamond serves approximately 851 connections and provides water service to approximately 2,213 people. Water is supplied to the system by three springs. There are currently no plans for an intertie between this system and Enumclaw.

City of Buckley

The City of Buckley's water system is located south of the City's water system. The City of Buckley serves a population of approximately 4,535 through approximately 1,825 connections. Three wells are currently providing water supply to the City. Buckley's South Prairie Creek supply is currently inactive. There are currently no plans for an intertie between this system and Enumclaw.

Group B Systems

Based on data provided by the state Department of Health (DOH) there are many Group B systems located within the City of Enumclaw's service area boundary as shown in **Figure 2-3a**. Data on each system is included in **Table 2-1** on the following page.

WATER SERVICE AREA AGREEMENT

All public water systems located within a Critical Water Supply Service Area (CWSSA) are required to define the external boundary of their water service area. South King County was declared a CWSSA on December 15, 1985. The South King County Coordinated Water System Plan, which was finalized in 1989, defined the City's claimed water service area. This boundary is shown on **Figure 2-4** relative to the City's current service area boundary. The City does not currently have any signed service area agreement in place. However, at such a time that a Group A water purveyor expands their service area to Enumclaw's defined boundary, a written service area agreement will be prepared.

Table 2-1
Water Systems Within Enumclaw's Water Service Area

Map#	PwsSrcId	SystemName	Type	FTPop	Conn	SrcName	Status
1	AB15101	ALDER CREEK WATER SYSTEM	GRPB	8	3	WELL #1	A
2	178,701	ASHLEY HOUSE	GRPB	0	1	WELL #1	A
3	526,201	BACKHAUS WATER SYSTEM	GRPB	5	2	WELL	A
4	5,234,301	BASS LAKE #1	GRPB	21	8	WELL	A
5	6,134,401	BASS LAKE #2	GRPB	22	9	WELL #1	A
6	149,401	BASS LAKE #3	GRPB	5	2	WELL #1	A
7	223,001	BASS LAKE #3	GRPB	24	9	WELL	I
8	461,001	BASS LAKE VIEW TRACTS	GRPB	5	2	WELL # 1	I
9	7,842,001	BAUR/BERNARDONI WATER	GRPB	5	2	WELL #1	A
10	2,853,801	BAXTER, R	GRPB	8	3	WELL	I
11	5,222,401	BERTRAND, J WATER	GRPB	5	2	WELL	A
12	3,221,401	BREMER-STROM	GRPB	5	2	WELL #1	A
13	824,501	BREVIK,D	GRPB	5	2	WELL 01	A
14	2,576,801	BROWN, G	GRPB	15	5	WELL NO 1	A
15	538,801	BRUHN/BOYER WATER SYSTEM	GRPB	5	2	WELL	A
16	2,454,401	CCR WATER SYSTEM	GRPB	23	9	TODNEM WELL	A
17	1,991,301	DOYLE,R	GRPB	9	3	DOYLE R.	A
18	1,528,101	ELMENDORF - BUCKINGHAM	GRPB	5	2	WELL #1	A
19	525,801	ENGEN, E. WATER SYSTEM	GRPB	5	2	WELL	A
20	2,358,001	ENUMCLAW GOLF COURSE	Comm	0	0	WELL #1	I
21	2,360,001	ENUMCLAW WATER DEPARTMENT	Comm	11,970	5,536	BOISE SPRING	A
22	2,360,002	ENUMCLAW WATER DEPARTMENT	Comm	11,970	5,536	WATERCRESS SPRING #1	A
23	2,360,004	ENUMCLAW WATER DEPARTMENT	Comm	11,970	5,536	PCI JOHNSON WELL #1	A
24	2,360,005	ENUMCLAW WATER DEPARTMENT	Comm	11,970	5,536	PCII JOHNSON WELL #2	A
25	2,360,006	ENUMCLAW WATER DEPARTMENT	Comm	11,970	5,536	PCIII JOHNSON WELL #3 (AKA #1	A
26	2,360,007	ENUMCLAW WATER DEPARTMENT	Comm	11,970	5,536	PC JOHNSON WELLS 2 & 3	A
27	2,360,008	ENUMCLAW WATER DEPARTMENT	Comm	11,970	5,536	WATERCRESS SPRING #2 ALK13	A
28	2,360,009	ENUMCLAW WATER DEPARTMENT	Comm	11,970	5,536	ZONE 888/1002 WELL AFT336	A
29	2,470,901	FARRELL-SWEENEY WATER	GRPB	21	7	WELL #1	A
30	1,672,901	FLINT, J	GRPB	20	8	WELL #1	A
31	1,315,101	FORTIN, A	GRPB	8	3	WELL #1	A
32	3,058,301	FOUR HUNDRED EIGHT WATER	GRPB	5	5	WELL #1	A
33	733,101	GARRITY, J.	GRPB	5	2	WELL #1	I
34	2,154,701	GRADDON - KELLER SUPPLY	GRPB	15	6	WELL	A
35	1,048,601	GRADDON / WASICEK COMM. SYSTEM	GRPB	20	8	GRADDON WASICEK WELL	A
36	3,809,601	GUNTER, F. WATER SYSTEM	GRPB	10	4	SPRING #1	A
37	3,290,401	HIGH VIEW ESTATES	GRPB	10	4	WELL 01	I
38	557,901	HUND WATER SYSTEM	GRPB	10	4	WELL #1	A
39	170,401	HUNT MILL	GRPB	12	4	WELL	A
40	5,540,101	J W S	GRPB	8	3	WELL #1	A
41	3,831,401	JOHNSON, GARY	GRPB	5	2	WELL #1	A
42	2,657,501	KLEMPEL	GRPB	5	2	WELL	A
43	1,265,401	LIEBENTRITT, C.	GRPB	5	2	SPRING # 1	A
44	386,801	LOCKEN WATER SYSTEM	GRPB	10	4	WELL	A
45	4,283,501	LORENZ, B.	GRPB	16	4	WELL	A
46	143,801	MARRAPODI	GRPB	8	2	WELL	A
47	107,101	MATHISON (COMM.) WATER SYSTEM	GRPB	5	2	WELL	A
48	2,145,101	MC KIM/HARSTON	GRPB	5	2	WELL #1	A
49	6,447,701	MIMIS	GRPB	5	2	MIMIS	A
50	5,616,501	MORGAN,H	GRPB	5	2	WELL 01	A
51	AA00901	MPD Water System	GRPB	15	6	WELL 1	A
52	259,801	NORMAN WATER SYSTEM	GRPB	6	2	WELL	A
53	550,201	PLATEAU HIGHLANDS	GRPB	10	5	WELL #1	A
54	60,901	PLUMMER-KENNEDY WATER	GRPB	5	2	WELL #1	A
55	6,844,501	POPE,S	GRPB	5	2	WELL 01	I
56	5,923,101	PRENOVOST	GRPB	8	4	WELL #1	A
57	7,021,501	QUALEY,B	GRPB	5	2	WELL 01	A
58	7,174,501	REMOLIF ADDITION	Comm	55	25	WELL #1 ABS603	A
59	7,174,502	REMOLIF ADDITION	Comm	55	25	WELL #2 AKR528	A
60	6,439,401	ROWLEY/GAMBLIN	GRPB	5	2	ROWLEY/GAMBLIN	A
61	216,501	SAVARD WATER SYSTEM	GRPB	9	3	WELL	I
62	6,490,801	SCHILZ WATER SYSTEM	GRPB	8	3	SCHILZ	A
63	2,623,601	SHOAL WATER SYSTEM	GRPB	23	9	WELL	A
64	378,801	SNOEK ESTATE WATER SYSTEM	GRPB	10	4	WELL	A
65	132,101	SNOOPY	GRPB	12	5	WELL	A
66	1,702,701	SUTHERLAND, F.	GRPB	8	3	SPRING #1	A
67	378,901	TINA S WATER SYSTEM	GRPB	6	2	TINA S WELL	A
68	611,901	VALLEY VIEW COMM WATER SUPPLY	GRPB	15	6	WELL #1	A
69	482,201	WHITE RIVER HATCHERY	GRPB	7	3	WELL	I
70	8,433,701	WHITTINGTON WATER SYSTEM	GRPB	5	2	WELL 01	A
71	9,887,501	Y BAR S WATER COMPANY INC	Comm	240	105	WELL # 1	I
72	9,887,502	Y BAR S WATER COMPANY INC	Comm	240	105	WELL # 2	I
73	9,887,503	Y BAR S WATER COMPANY INC	Comm	240	105	WELL #3	I
74	9,887,504	Y BAR S WATER COMPANY INC	Comm	240	105	WELL #4	I
75	9,942,001	YOUNG,D S	GRPB	5	2	WELL	A
		Totals Excluding Enumclaw Water Dept and Inactive Systems		**542**	**216**		

PLANNING/WATER SERVICE AREA

South King County Coordinated Water System Plan

All public water systems located within a Critical Water Supply Service Area (CWSSA) are required to define the external boundary of their water service area. South King County (SKC) was declared a CWSSA on December 15, 1985. The South King County Coordinated Water System Plan (CWSP), which was finalized in 1989, defined the City's general water service area relative to other systems in the area. There has been little change to the City's water service area and/or boundaries since they were established in the SKC CWSP. Figure 2-4 shows the City's service area boundaries. This plan proposes no changes to the City's service area as represented in the SKCWSP.

Municipal Water Law – Service Area Descriptions/Criteria

In 2003, the Municipal Water Supply – Efficiency Requirements Act, Chapter 5, Laws of 2003 (MWL) was passed by the Washington State Legislature. The MWL and related DOH rules (WAC 246-290-100) changed the manner in which municipal water suppliers are to describe their water system service areas within their water system plans. To this end, the DOH rules were crafted to provide definitions of how an "existing service area", "retail service area" and "future service area" are to be described within a water system plan, and to set out the legal obligations associated with such service areas.

Under the MWL and implementing rules, a retail service area means the specific area as defined by the municipal water supplier, where such supplier has a duty to provide service to all new service connections. This area includes a municipal water supplier's existing service area (and connections), and may also include areas where new service is proposed. Water service within a retail service area is presumed to occur by direct connection with the customer's home or business.

The duty to serve existing and potential future connections falling within a retail service area occurs if the following criteria are met:

- Sufficient capacity exists to serve water in a safe and reliable manner;
- Service can be provided in a manner consistent with provisions of adopted land use plan(s) and development regulation(s) that reasonably relate to water service;
- Sufficient water rights exist to provide the service;
- Service can be provided in a timely and reasonable manner.

Existing Water Service Areas

The City is located in south-central King County, Washington, north of the White River. The City's corporate boundary encompasses an area of approximately 5.3 square miles, as shown in **Figure 2-1**. The City's existing water distribution system extends beyond these limits, also shown in the figure. The City's existing water service area is shown in **Figure 2-3**.

The City's water service area is divided into sub-areas of retail service area, future service area, and areas where wholesale water service may be provided as shown in **Figure 2-4**. In general terms, the City's retail service area represents where utility facilities have been constructed and/or may be easily extended to meet customer demands on a direct connection basis over both a six (6) and twenty (20) year planning horizon. The City's future service area represents that area where the City plans to provide future retail water service, but not necessarily during the current 6 (six) or 20 (twenty) year planning horizon. The City's wholesale service area is limited to the Remolif Group A water system.

Except for one map amendment approved in 2008, **Figure 2-4** is unchanged from that approved in the City's 2007 Comprehensive Water System Plan. The amendment changed the map designation of the Y Bar S Water System from wholesale to retail due to City acquisition of the Y Bar S system.

Retail Service Area

The City's existing water system and retail service area reaches as far north as SE 384th Street near Bass Lake, south to the White River and the King County-Pierce County line, and west to 180th Avenue SE. The existing water system also extends approximately one-half mile east of 292nd Avenue SE. The specific boundary of Enumclaw's retail water service area would encompass an area of approximately 28.8 square miles.

In accordance with the MWL, the City has a duty to serve public water supply only within its defined retail service area. Based on the reliability of existing sources and planned projects, the City has determined that it is capable of meeting its duty to serve customers within its retail service area over a 20 year planning horizon (i.e., 2033). No changes or expansions are anticipated to occur involving the City's retail service area over the next six year planning cycle. Please see Chapter 5 for a more detailed discussion of the City's water service policies.

Future Service Area

As noted above, the duty to serve under state law is limited to the City's retail service area and does not extend to the City's defined future water service area. As a municipal water supplier, the City may convert portions of its future service area to retail service area status pursuant to either a specific water system plan amendment or a scheduled water system plan (6 year cycle). Such action, however, assumes the City has adequate supply to meet the associated demands and that the requested service meets other applicable City service policies described in Chapter 5.

At this time, the City's future water service area includes several sub-areas and/or properties where water mains do not currently exist and may not be easily extended and/or where provision

of retail service would be inconsistent with the policies in Chapter 5. These future service areas are shown in **Figure 2-4** and are generally located as follows:

1. Along the corridor of SE 406th Street extended between 216th Avenue SE and 240th Avenue SE
2. Along the corridor of SE 406th Street extended between 248th Avenue SE and 260th Avenue SE
3. Along 268th Avenue SE between SE 401st Street and SE 411th Street
4. In the vicinity of SE 424th Street and 244th Avenue SE
5. Along SE 424th Street between 220th Avenue SE and 224th Avenue SE
6. Along 216th Avenue SE near SE 444th Street.

The boundaries of the sub-areas/properties within Enumclaw's future water service area as shown on **Figure 2-4** encompass approximately 8.5 square miles. No changes or expansions are anticipated to occur involving the City's future service area over the next six year planning cycle.

Wholesale Service Area

For purposes of this Plan, the City proposes to define that area of its water service area specifically containing the Remolif Group A water system as its wholesale water service area. The Remolif water system, which is located near the northerly edge of the City service area, has previously inquired whether the City could provide wholesale water supply but at a time when the City was not in a position to do so. Remolif subsequently drilled a replacement well obviating the need to secure wholesale service. However, the City is now able and willing to provide wholesale supply to Remolif if requested again in the future.

The boundaries of the sub-areas/properties within Enumclaw's wholesale water service area as shown on **Figure 2-4** encompass approximately 0.1 square miles.

SATELLITE SYSTEM MANAGEMENT

A Satellite System Management Agency (SSMA) is defined as a person or entity that is certified by the Department of Health 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. Based on the success of SSMAs, DOH made recommendations to the legislature to include rules for designating entities as qualified SSMAs. In July 1995, Senate Bill 5448 became law that governs approvals of new water systems and sets forth requirements for SSMAs. The goal of the law is to ensure that the people of this 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;
3. Contract services only.

The service can be provided to new systems, existing systems which are no longer viable, or existing systems placed into receivership status by DOH. Due to staffing constraints, the City is not in a position to act as an SSMA and has no plans to secure such a role. As discussed in policies cited in Chapter 5, newly created remote systems may be allowed to operate within the City's claimed service areas subject to the condition that such systems contract with an existing SMA for operational and regulatory compliance. Existing remote systems have been removed from the City's claimed service areas.

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**. General water system facility data is summarized on the Department of Health Water Facilities Inventory (WFI) Form. A copy of this form is contained in **Appendix A**.

Pressure Zones

The City of Enumclaw currently serves customers within an elevation range of approximately 520 feet near the northwestern corner of the water service area to an elevation of approximately 1,100 feet at the former Weyerhaeuser Mill site on SR 410. The wide range of elevations 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. This is achieved in the Enumclaw system by dividing the water system into nine distinct pressure zones, as shown in **Figure 2-1**. The pressure in each pressure zone is regulated by reservoir levels, pressure reducing station settings, pump station settings or a combination of these, as illustrated in the hydraulic profile, **Figure 2-2**.

The pressures in the 888 Zone, the 983 Zone and the 988 Zone are regulated by reservoir levels, as illustrated in the hydraulic profile. Pressures in the 888 Zone, which has a maximum hydraulic elevation of 888 feet, are established by the surface water level in the City and Crews Reservoirs. As the City's largest pressure zone, the 888 Zone encompasses most of the City's water service area and serves customers within an elevation range of approximately 520 feet to 810 feet. Pressures in the 988 Zone, which has a maximum hydraulic elevation of 988 feet, are established by the surface water level in the Stanridge Hill Reservoir. The 988 Zone is located predominately north of SE 400th Street and serves customers within an elevation range of approximately 790 feet to 940 feet. The surface water level in the Fairway Hills Reservoir establishes pressures in the 983 Zone. With a maximum hydraulic elevation of 983 feet, the 983 Zone serves customers within an elevation range of approximately 830 feet to 950 feet. The zone serves the Fairway Hills area west of 288th Avenue SE.

The 995 Zone, 1013 Zone, 1040 Zone, 1175 Zone and the 1245 Zone are zones without storage, or closed zones, which are supplied by booster pump stations. The 995 Zone is supplied by the Highview Booster Pump station and currently serves 17 customers with an elevation range of approximately 750 to 850 feet. The 1013 Zone is supplied by the Corrosion Control Facility Booster Pump Station and currently serves five customers in the vicinity of the City reservoirs. The elevation range within the 1013 Zone is approximately 820 feet to 860 feet. The 1040 Zone is supplied by the Upper New Horizons Booster Pump Station and serves customers along SE 401st Street and SE 402nd Street in the New Horizons area. The zone serves customers within an elevation range of approximately 830 feet to 910 feet. Supplied by the Fairway Hills Upper Booster Pump Station, the 1175 Zone serves customers along 290th Avenue SE within an elevation range of approximately 990 feet to 1,000 feet. The 1245 Zone is supplied by the Weyerhaeuser Booster Pump Station which serves the former Weyerhaeuser Mill site located on SR 410. The elevation range within the zone is approximately 1,000 feet to 1,100 feet.

The 899 Zone is supplied with water by a pressure reducing station that decreases the pressure of water supplied to the services along SE 403rd Street in the New Horizons area. This zone serves customers within an elevation range of approximately 740 feet to 830 feet.

Supply Facilities

Introduction

Water supply to the Enumclaw water system is provided by two spring sources, a groundwater wellfield and an emergency intertie with the City of Tacoma. The City's well and spring sources are located outside of the city limits, within the eastern portion of the water service area and supply water directly to the City's largest pressure zone, the 888 Zone. The City's two spring sources, Watercress Spring and Boise Spring, are Enumclaw's primary sources of water. Additional data on the City's sources is contained in **Appendix B**.

Water Treatment

All water that is produced by the City's wellfield and spring sources is chlorinated to disinfect and kill harmful bacteria that may be present in the water. Chlorination is achieved through a chlorine gas disinfection system located on-site at Watercress Springs and the P.C. Johnson Wellfield. Boise Spring's chlorine gas disinfection is accomplished at the Weyerhaeuser Booster Pump Station site. Chlorine gas is fed from 150-pound cylinders at a rate to achieve an approximate residual of 0.50 mg/l at the sources.

CCF Storage and Day Tanks

Water supply from the spring sources is further treated at the Corrosion Control Facility (CCF) by adjusting the pH to reduce the naturally corrosive properties of the source water. Water is conveyed through dedicated mains from each spring to the CCF site, which is shared with the two City reservoirs and is located near SR 410, north of the Enumclaw Golf Course. The CCF adjusts the pH of the incoming water to approximately 7.8 through the use of flow meters and diaphragm pumps, which inject a 13% concentrated solution of sodium hydroxide (caustic soda). The 13% concentrated solution is injected from two 300-gallon day tanks and is diluted from a 25% concentrated sodium hydroxide solution that is stored in two 3,000 gallon storage tanks within the facility. A small booster pump station is also housed in the facility to increase service pressures and supply treated water to connections that were once served off of the dedicated transmission main from the Boise Spring. A 50 kW stationary engine generator set, located northeast of the CCF, provides backup power supply. The site is fully enclosed and secured with a chain link fence, topped with barbed wire.

A small diaphragm pump is also installed at the Weyerhaeuser Booster Pump Station to inject a 13% concentrated solution of sodium hydroxide into water supplied by the Boise Spring before it leaves the pump station. The injection process is controlled by a signal from a 1-1/2-inch flow meter located on the service line to the former Weyerhaeuser Mill site. A 50-gallon on-site tank is used to store the sodium hydroxide solution, which is transported by City staff from the day tanks at the Corrosion Control Facility, as needed.

The City of Tacoma draws its water from the Green River and/or a series of wells near the water storage reservoir impounded by Howard Hanson Dam. As a surface water source, Tacoma must disinfect its water to a higher level than the City of Enumclaw. Chlorine levels of over 1.5 mg/l at the City of Enumclaw intertie are typical, whereas the chlorine levels maintained at City sources typically average near 0.5 mg/l. Tacoma intends to have a filtration plant on-line in 2014 which will allow chlorine levels to be reduced. Tacoma also adjusts the pH of its water and adds fluoride. Levels of 0.8 to 1.3 mg/L are required in the distribution system of water systems that fluoridate. The City of Enumclaw does not add fluoride to its sources.

Boise Spring

The Boise Spring site, which was originally developed in the early 1900s, is located approximately one-half mile east of the city limits, just south of SR 410 and Boise Creek. Water is conveyed by gravity in a dedicated 10-inch water main from the spring to the Weyerhaeuser Booster Pump Station site. After the water is chlorinated at the booster station site, it continues along the dedicated 10-inch water main to the Corrosion Control Facility and fills the City reservoirs to provide supply directly to the 888 Zone and indirectly to other zones in the system. The spring is metered and is capable of producing the full instantaneous water right flow of 898 gpm.

Boise Spring Chlorination Equipment

The Boise Spring site is accessed by a dirt road with a gated and locked entry from SR 410. The site is situated near the base of a steep slope on City owned property in an undeveloped area that has been partially logged. The property is fully enclosed and secured with a chain link fence topped with barbed wire. Water is collected by horizontal collection pipes that extend from a covered collection vault into the aquifer. The manhole cover on the collection vault was gasketed in the early 1990s and was buried under less than 12 inches of soil to deter unauthorized access into the vault.

The chlorination system for the spring is located north of the Boise Spring site and SR 410, on a site that is shared with the Weyerhaeuser Booster Pump Station. A concrete building, located on the west side of the Weyerhaeuser Booster Pump Station, houses the chlorine gas disinfection system. Backup power supply to the facility is provided by a propane-powered 8.5 kW stationary engine generator set located within a fenced enclosure behind the chlorination building.

Watercress Spring

Watercress Spring was developed for use by the City in 1953 and is located near the intersection of 280th Avenue SE and SE 436th Street in a relatively undeveloped area. Improvements to the spring, which included the addition of a second larger pump, were constructed in 1968. Gas chlorination was added in 1972. In 2008 the original 1953 pump was removed and a replacement well facility was constructed on the

Watercress Well 2 Building

site approximately 60 feet southeast of the original facility. Water is pumped from the spring through a dedicated 16-inch water main to the Corrosion Control Facility and fills the City reservoirs to provide water supply directly to the 888 Zone and indirectly to the other zones in the system. Production from the spring is fully metered and is capable of producing the full instantaneous water right flow of 2,289 gpm.

The Watercress Spring site is accessed from a driveway with an entry that is gated and locked at its entrance off of SE 440th Street (Battersby Ave). The site itself is fully enclosed and secured with a chain link fence topped with barbed wire. The 1968 well pump, Well 1, is a 150 hp vertical turbine and draws water from a concrete, bottomless wet well vault that overflows into an adjacent drainage channel when the pump is not operating. Well 1 is housed in a CMU block building above the east side of the vault while the rest of the vault is covered by a wood frame roof structure with metal siding and roofing. Two small pumps located in the building with Well 1 pump water from the vault to the channel downstream of the vault overflow and to another spring that emanates on the site about 300' north of the well building.

The replacement well facility constructed in 2008 is a CMU block building with a metal roof and includes a pump room with a 200 hp vertical turbine pump and a separate room housing a chlorine gas disinfection system. This chlorination system disinfects water produced from both wells and replaced the original system that was in a separate room of the Well 1 building.

A 350 kW stationary generator provides standby power to both buildings. A 4-inch surge anticipator valve is housed in a small wooden enclosure on the east side of the Well 1 pump station and protects the pumps from pressure surges emanating from the transmission main to the City reservoirs.

P.C. Johnson Wellfield

The P.C. Johnson wellfield site is located at the intersection of SE 424th Street and 284th Avenue SE in a rural area. The well site fully enclosed and secured with a chain link fence. Two wells are located within the wellfield; P.C. Johnson Well 2 and P.C. Johnson Well 3. Wellfield status for the two wells was granted by DOH in 2004. Water pumped from the two production wells provides supply directly to the 888 Zone and indirectly to other zones in the system. Each well is housed in a separate CMU block building. A gas chlorination system is housed in a separate room in the Well 3 building. This chlorination system disinfects water produced from both wells. The wellfield is currently capable of producing the full instantaneous water right of 1,500 gpm with both pumps running simultaneously.

PC Johnson Wellfield Buildings

P.C. Johnson Well 2 was drilled in 1986 and has been rehabilitated multiple times. The 16-inch diameter, 227-foot deep well has a current supply rate of approximately 900 gpm, which is

delivered by a submersible pump with a 100 horsepower motor. Water production from the well is metered through a 10-inch meter.

P.C. Johnson Well 3 was drilled in 1997 to replace the failed P.C. Johnson Well 1. The 16-inch diameter, 229-foot deep well has a current supply rate of approximately 900 gpm, which is delivered by a submersible pump with a 100 horsepower motor. Water production from the well is metered through an 8-inch flow meter. The Well 3 pump building is situated on the south side of the Well 2 building. The Well 3 wellhead is located outside and south of its pump building.

A portable 200 kW emergency diesel generator can provide backup power supply necessary to operate one well at a time.

City of Tacoma Intertie

The City of Tacoma intertie was constructed in 1977 and upgraded in 1999 and 2005. The intertie is located on the west side of SR 410, north of Warner Avenue and adjacent to the City of Tacoma's water department maintenance shop. Water is pumped from Tacoma's 52-inch regional transmission main to provide supply directly to the City's 888 Zone and indirectly to the other zones in the system. The facility was originally constructed to increase pressures in the City's water system, provide supply during emergencies, and to fill reservoirs as needed. With minor piping changes, the intertie may also be utilized to supply water from Enumclaw to the City of Tacoma, as was done in 1987. Currently the intertie is designated as an emergency source to supplement the City's supply during peak demand periods.

City of Tacoma Intertie

The Tacoma intertie consists of a below-grade concrete vault which houses the intertie's mechanical and electrical equipment. The facility has a capacity of approximately 1,000 gpm, which is delivered by two end-suction centrifugal pumps with 100 horsepower motors. The intertie vault has a power receptacle to enable connection of a portable engine generator set for backup power supply. Supply through the intertie is recorded by an 8-inch magnetic meter. Because the City intertie draws water from the Tacoma main upstream of Tacoma's disinfection compliance point, an automated system installed in 2005 ensures that water drawn from the Tacoma main meets minimum disinfection treatment standards prescribed by federal and state regulations. This is accomplished using real-time chlorine residual, pH, temperature, and pipeline flow data from the City of Tacoma received through a virtual private network and calculating the actual contact time achieved at the intertie, which must be greater than the required contact time by a minimum ratio of 1.1 in order for a pump to run. When pumping is permitted to start, the entire stream is diverted through a purge valve to waste until measurements of temperature, chlorine residual, and pH from the station itself, along with the Tacoma pipeline flow data from Tacoma, confirms that adequate contact time is being provided,

at which point the purge valve closes and water is pumped into the Enumclaw system. Pumping is stopped anytime the contact time inactivation ratio falls below the programmed inactivation ratio of 1.1, or a higher, operator adjustable setpoint. Dechlorination of the waste stream is accomplished using vitamin C tablets placed in the flow in permeable mesh sock.

Pump Station Facilities

The City has a total of 7 booster pump stations to serve higher elevations areas in the north and east portions of the City water service area. A summary description of each station follows. Additional data on the City's pump stations are contained in **Appendix B.**

Weyerhaeuser Booster Pump Station

The Weyerhaeuser Booster Pump Station is located on a site that is shared with the Boise Spring chlorination building, approximately one-half mile east of the city limits, just north of SR 410 and Boise Creek. The station, which was constructed in 1993, is used to pump water from the discharge side of the Boise Spring chlorination system to the former Weyerhaeuser mill site in the 1245 Zone.

Weyerhaeuser BPS and Boise Spring Chlorination Building

A concrete building houses the booster pump station's mechanical, electrical and corrosion control equipment. The station has a total capacity of approximately 80 gpm, which is delivered by two in-line pumps with 7.5 horsepower motors. Pump cycling is controlled by bladder tanks located at the truck shop on the former Weyerhaeuser mill site, currently owned by Lisa, Inc. The City has a retail service agreement with Lisa that defines station capacity, maintenance and operation responsibilities, and other terms and conditions of service. Under the agreement Lisa owns and is responsible for maintenance of the bladder tanks.

As described previously in the water treatment section under Supply Facilities, a small diaphragm pump is installed in the booster pump station to inject caustic soda and provide corrosion control by adjusting the pH of the water supplied from the Boise Spring. The booster pump station does not have standby power or a power receptacle to enable connection of a portable generator.

Lower New Horizons Booster Pump Station

Lower New Horizons Booster Pump Station

The Lower New Horizons Booster Pump Station, which was constructed in 1962 and upgraded in 1996, is located near the intersection of 278th Way SE and SE 400th Place within an easement. The station pumps water from the 888 Zone into the 988 Zone to fill the Stanridge Hill Reservoir.

A CMU block building houses the mechanical and electrical equipment for the station, which has a total capacity of approximately 80 gpm that is delivered by two end-suction centrifugal pumps with 3 horsepower motors. The building is equipped with a power receptacle to enable connection of a portable engine generator.

A 3" pressure reducing valve installed between the pump station suction and discharge headers is set to open on low pressure in 888 zone (i.e. fire event) to allow flow from the 988 Zone to flow into 888 Zone. The valve will also allow for back-feeding the long dead end line that supplies the booster station should the water supply from the 888 main zone be interrupted for repairs.

Upper New Horizons Booster Pump Station

Upper New Horizons Booster Pump Station

The Upper New Horizons Booster Pump Station was constructed in 1979 and was upgraded in 1996. The booster pump station is located within an easement near the intersection of 274th Avenue SE and SE 401st Street. The station pumps water from the 988 Zone into the closed 1040 Zone.

A wood building houses the mechanical and electrical equipment for the station, which has a capacity of approximately 40 gpm delivered by an end-suction centrifugal pump powered by a 2 horsepower motor. A 6-inch check valve installed in the booster pump station supplies water to the 1040 Zone from the 988 Zone in the event that pressures are excessively suppressed in the 1040 zone (i.e. fire flow situation). The building is not equipped with a power receptacle to enable connection of a portable engine generator.

Corrosion Control Facility Booster Pump Station

The Corrosion Control Facility Booster Pump Station was constructed in 2002 to increase service pressures and supply treated water to customers who were transferred off of the 10-inch dedicated Boise Spring transmission main. Water is pumped from the 888 Zone into the closed 1013 Zone. The booster pump station is housed within the Corrosion Control Facility, which is located near SR 410 north of the Enumclaw Golf Course.

Corrosion Control Facility Booster

The Corrosion Control Facility Booster Pump Station has a capacity of approximately 80 gpm that is delivered by two in-line pumps with 3 horsepower motors. A 211-gallon bladder tank mounted adjacent to the pumps controls the operation of the booster pump station and prevents excessive pump cycling. A stationary engine generator set, located northeast of the building, provides backup power supply to the booster pump station. The site is fully enclosed and secured with a chain link fence, topped with barbed wire.

Fairway Hills Lower Booster Pump Station

The Fairway Hills Lower Booster Pump Station, which was constructed in 1974, is located near the intersection of 286th Avenue SE and SE 464th Street. The station pumps water from the City's 888 Zone into the 983 Zone to fill the Fairway Hills Reservoir.

Fairway Hills Lower Booster Pump Station

A partially buried CMU block building houses the booster pump station's mechanical and electrical equipment. The station has a capacity of 38 gpm that is delivered by two end-suction centrifugal pumps powered by 5 horsepower motors. The station is also equipped with a 170 gpm end-suction centrifugal fire flow pump that is powered by a 20 horsepower motor. The booster pump station building is equipped with a power receptacle to enable connection of a portable generator.

Fairway Hills Upper Booster Pump Station

The Fairway Hills Upper Booster Pump Station was constructed in 1991 and is located on a site that is shared with the Fairway Hills Reservoir, at the intersection of 290th Avenue SE and SE 464th Street. The booster pump station pumps water from the Fairway Hills Reservoir in the 983 Zone to the closed 1175 Zone.

Fairway Hills Upper Booster Pump Station

A wood building houses the booster pump station's mechanical and electrical equipment. The station has a capacity of approximately 35 gpm and is equipped with one end-suction centrifugal pump that is powered by a 2 horsepower motor and a second end-suction centrifugal pump that is powered by a 1 horsepower motor. The booster pump station building also houses three bladder tanks, which control the operation of the station and prevent excessive pump cycling. The booster pump station building is equipped with a power receptacle to enable connection of a portable engine generator. The site is fully enclosed and secured with a chain link fence, topped with barbed wire.

Highview Booster Pump Station

The Highview Booster Pump Station is located within an easement on the east side of 254th Avenue SE near SE 396th Street. Constructed in 2010 as part of Local Improvement District 08-01, the station supplies water from the 888 Zone to the closed 995 Zone.

Highview Booster Pump Station

A CMU block building houses the mechanical and electrical equipment for the station, which has a total capacity of approximately 120 gpm delivered by three multi-stage centrifugal pumps with 3 horsepower motors powered by variable frequency drives. The lead pump runs continuously, eliminating the need for a bladder tank, with additional pumps started as needed to meet demand. A stationary 20 kW propane generator provides backup power to the facility.

Storage Facilities

The City has five reservoirs in three different zones with a total of 4,740,000 gallons of storage. A summary description of each reservoir follows. Additional data on the reservoirs is contained in **Appendix B**.

1.0 MG City Reservoir

The 1.0 MG City Reservoir is located near SR 410, north of the Enumclaw Golf Course on a site that is shared with the Corrosion Control Facility and the 2.0 MG City Reservoir. The reservoir is operated at the same water surface elevation as the 2.0 MG City Reservoir, and together they provide water storage directly to the 888 Zone and indirectly to the other zones in the system. The 15-foot tall concrete reservoir is a partially buried rectangular structure with a roof dimension of approximately 130-feet square. The storage volume per foot of height varies from approximately 6,330 gallons at the reservoir's base elevation of 875.7 feet to approximately 12,640 gallons at the reservoir's overflow elevation of 887.7 feet. The cast-in place reservoir floor and sloping walls were constructed in 1926 and a precast, prestressed hollow core plank (Span Deck) roof with precast, prestressed girders installed in 1977. The interior of the 1.0 MG City Reservoir was lined to reduce leakage from the reservoir in 2002.

1.0 MG City Reservoir

A 12-inch water main with a 12-inch control valve serves as an inlet and outlet for the reservoir and enters approximately at the base of the facility near its northwesterly corner. An 18-inch water main located at an elevation of 878.7 feet connects the 1.0 MG City Reservoir directly to the 2.0 MG City Reservoir to the north, while a 10-inch water main entering the base of the reservoir near its southeasterly corner serves as a 2nd inlet/outlet pipe to the 888 Zone's distribution system. A 10" water main enters the reservoir through its easterly wall at an elevation of approximately 879.7 feet and can accept flow from the Boise Spring transmission main. Under the system's current operation, this water main is normally closed. The reservoir site is fully enclosed and secured with a chain link fence, topped with barbed wire.

2.0 MG City Reservoir

The 2.0 MG City Reservoir is located on the same site as the 1.0 MG City Reservoir and the Corrosion Control Facility. Similar to the 1.0 MG City Reservoir, the 2.0 MG City Reservoir provides water storage directly to the 888 Zone and indirectly to the other zones in the system. The 17-foot tall, 170-foot diameter precast concrete Pritzker System reservoir provides

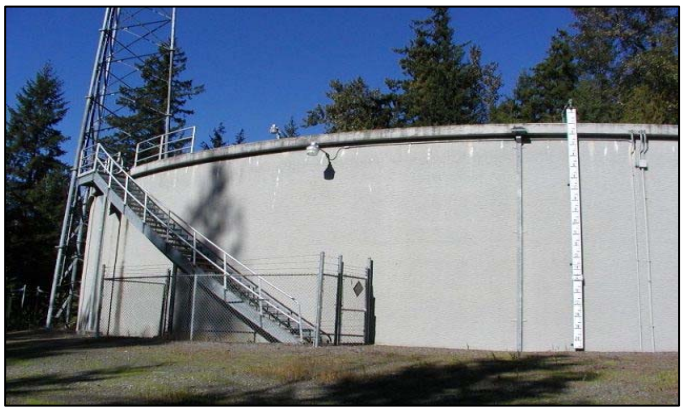
approximately 169,800 gallons of storage per foot height. The reservoir was constructed in 1963 and its roof joints resealed in 1998. The partially buried structure has a base elevation of 875.7 feet and an overflow elevation of 887.7 feet.

2.0 MG City Reservoir

The reservoir is equipped with an exterior level gauge and has a 12-inch water main entering the base of the southeast side of the reservoir to accept flow from the Boise Spring transmission main. An 18-inch water main located at an elevation of 878.7 feet connects the 2.0 MG City Reservoir directly to the 1.0 MG City Reservoir to the south, while a second 12-inch water main entering the base of the reservoir on its southwesterly side serves as a common inlet/outlet to the reservoir.

Crews Reservoir

The 1.5 MG Crews Reservoir is located north of the intersection of SE 424th Street and 274th Avenue SE. The reservoir provides water storage directly to the 888 Zone and indirectly to the other zones in the system. The 114-foot diameter, 22-foot tall cast-in-place, prestressed concrete DYK reservoir was constructed in 1989 and provides approximately 76,350 gallons of storage per foot height. The reservoir's base elevation is approximately 868 feet and the overflow elevation is 888 feet.

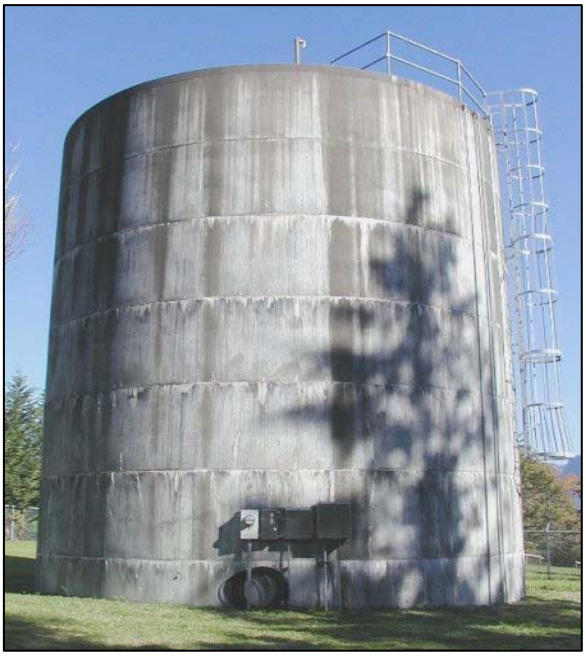


1.5 MG Crews Reservoir

The reservoir is equipped with an exterior level gauge and has a 12-inch water main that serves as its outlet pipe. The reservoir has a 10-inch elevated inlet pipe that discharges water into the reservoir at an elevation of approximately 886 feet and a second 12-inch inlet pipe that discharges water into the reservoir at an elevation of approximately 872 feet. A CMU block building, located adjacent to the reservoir, houses a 12-inch control valve, flow meter, chlorine residual monitor, and a booster pump for tank cleaning. A portion of the western side of the reservoir site is leased for a cellular telephone tower and control building. The reservoir site is fully enclosed and secured with chain link fence, topped with barbed wire.

Stanridge Hill Reservoir

The 0.18 MG Stanridge Hill Reservoir is located approximately one-quarter mile north of the intersection of 278th Way SE and SE 400th Place. The reservoir is supplied by the Lower New Horizons Booster Pump Station and provides water storage directly to the 988 Zone and indirectly to the 1040 and 899 Zones. The 30-foot diameter, 36-foot tall, cast-in-place concrete Mt. Baker Silo reservoir was constructed in 1993 and provides approximately 5,290 gallons of storage per foot height. The reservoir's base elevation is at 954 feet and the overflow elevation is at 988 feet.



Stanridge Hill 0.18 MG Reservoir

The reservoir is equipped with an exterior level gauge and has a 10-inch water main that serves as its outlet pipe. The reservoir has an 8-inch elevated inlet pipe that discharges water into the reservoir at an elevation of approximately 976.5 feet. The reservoir site is fully enclosed and secured with a chain link fence, topped with barbed wire.

Fairway Hills Reservoir

The 0.06 MG Fairway Hills Reservoir is located on a site that is shared with the Fairway Hills Upper Booster Pump Station at the intersection of 290th Avenue SE and SE 464th Street. The reservoir is supplied by the Fairway Hills Lower Booster Pump Station and provides water storage directly to the 983 Zone and indirectly to the 1175 Zone. The partially buried 26-foot diameter, 16-foot tall, cast-in-place, concrete Mt. Baker Silo reservoir was constructed in 1991 and provides approximately 4,000 gallons of storage per foot height. The reservoir's base elevation is at 987 feet and the overflow elevation is at 1,002 feet.

Fairway Hills 0.06 MG Reservoir

The reservoir is equipped with an exterior level gauge and has an 8-inch water main that serves as a common inlet/outlet pipe. The reservoir site is fully enclosed and secured with a chain link fence, topped with barbed wire.

Distribution and Transmission System

The City owns and maintains approximately 142 miles of water main ranging in size from less than 1-inch to 24-inches. A total of approximately 6 miles of private water main are directly connected to the City system. The private mains are primarily comprised of fire sprinkler system lines extending from a backflow device inside the building it serves out to the City main and mobile home park communities that the City provides water to through master meters. City and private mains are shown in **Table 2-2** and **Figure 2-1**. It is the City's policy that ownership of all future water main extensions will be transferred to the City prior to connection to the water system to avoid the addition of any additional privately owned water main.

The water main in the City's system is constructed of asbestos concrete, PVC, HDPE, ductile iron, cast iron and steel. All new water main installations are required to use ductile iron water main in accordance with the City's development and construction standards.

The life expectancy of water main is assumed by the City to be approximately 80 years. Some water main constructed in the 1920s and 1930s is still in service and is primarily located in the downtown Enumclaw area. The majority of this older water main, which has exceeded its general life expectancy, is cast iron.

Table 2-2
Water Main Inventory

Diameter (in)	City-Owned		Privately-Owned	
	Length (ft)	% of Total	Length (ft)	% of Total
2 or smaller	77,589	10.3%	9,699	29.0%
3	404	0.1%	6,636	19.8%
4	29,685	3.9%	4,343	13.0%
5	808	0.1%		
6	220,339	29.3%	12,650	37.8%
8	259,503	34.5%		
10	98,897	13.1%	110	0.3%
12	57,896	7.7%		
14	1,481	0.2%		
16	6,425	0.9%		
18	20	0.0%		
24	130	0.0%		
Total	**753,177**	**100%**	**33,438**	**100%**

Pressure Reducing 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 by reducing the pressure of the water as it flows through the station, thereby maintaining a safe range of pressures in the lower zone. A pressure reducing station is essentially a below-grade vault (typically concrete), which normally contains two pressure reducing valves, sometimes a pressure relief valve, piping, and other appurtenances. The pressure reducing valve hydraulically varies the flow rate through the valve (up to the flow capacity of the valve) to maintain a constant pressure on the downstream side of the valve for water flowing into the lower pressure zone.

Pressure reducing stations can serve multiple purposes. 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, such as a well or reservoir. Pressure reducing stations can also 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 drop in water pressure near the downstream side of the station. A typical application of this function is a pressure reducing station that is only needed to supply additional water to a lower zone during a fire flow situation. The pressure setting of the control valve within the station allows it to remain closed during normal system operation and open only during high demand conditions, like fire flows, to provide the additional supply needed.

The City's water system has two pressure reducing stations, as shown in profile view in **Figure 2-2**. The New Horizons pressure reducing station actively supplies water from the 1040 Zone to the lower 899 Zone through 2-inch and 6-inch valves. If water was supplied from the 1040 Zone directly to the lower zone, high pressure problems would exist. The station's below-grade concrete vault was constructed in 1996 and is located south of the intersection of 273rd Avenue SE and SE 402nd Street. In the event that the pressure reducing station fails, a pressure relief valve near the intersection of SE 403rd Street and 278th Avenue SE opens to relieve excess pressure in the zone.

A 3-inch pressure reducing valve is located within the Lower New Horizons Booster Pump Station and is set to function as a standby supply from the 988 Zone to the 888 Zone as noted in the prior Lower New Horizons Booster Pump Station description.

Additional data on the pressure reducing stations is contained in **Appendix B**.

Water System Interties

Water system interties are physical connections between two adjacent water systems. Interties are normally 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 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 or only during peak demand periods.

The City's water system currently has an intertie with the City of Tacoma as described previously in the Supply Facilities section. Through a 1997 wholesale water supply agreement with Tacoma, theCity has purchased an average day demand capacity of 206,911 gallons and a peak day demand capacity of 611,109 gallons. However, the intertie is designated as an emergency source only until such time as the additional capacity is needed. A copy of the 1997 agreement with Tacoma is contained in **Appendix C**. Both parties have agreed to negotiate an updated agreement, but that effort is still yet to be initiated.

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 efficiently control a system by automatically optimizing facility operations. A telemetry and supervisory control system also provides instant alarm notification to operations personnel in the event of equipment failure, operation problem, flood, fire, or other emergency situations.

The City's telemetry and supervisory control system was updated in 1991 by Stead and Baggerly (S & B). The system consists of a master telemetry unit (MTU) at the public works building and remote telemetry units (RTU) at remote facilities. The RTUs communicate with the MTU using dedicated leased telephone lines or the internet.

Water System Operation and Control

All of the City's water sources provide supply directly into the City's main pressure zone, the 888 Zone. Watercress Spring and the Boise Spring directly fill the two City Reservoirs through dedicated transmission mains. Boise Spring is a continuous supply source to the City Reservoirs, while the operation of Watercress Spring is controlled by the water levels in the Crews and City Reservoirs. The water level in the Crews and City Reservoirs can also be used to control the operation of the P.C. Johnson Wellfield. The City of Tacoma Intertie can provide water directly into the 888 Zone in an emergency to supplement water production from the City's wells and springs. The settings of the supply facilities and the water usage throughout the system dictate the amount of water either flowing into or out of the 888 Zone reservoirs.

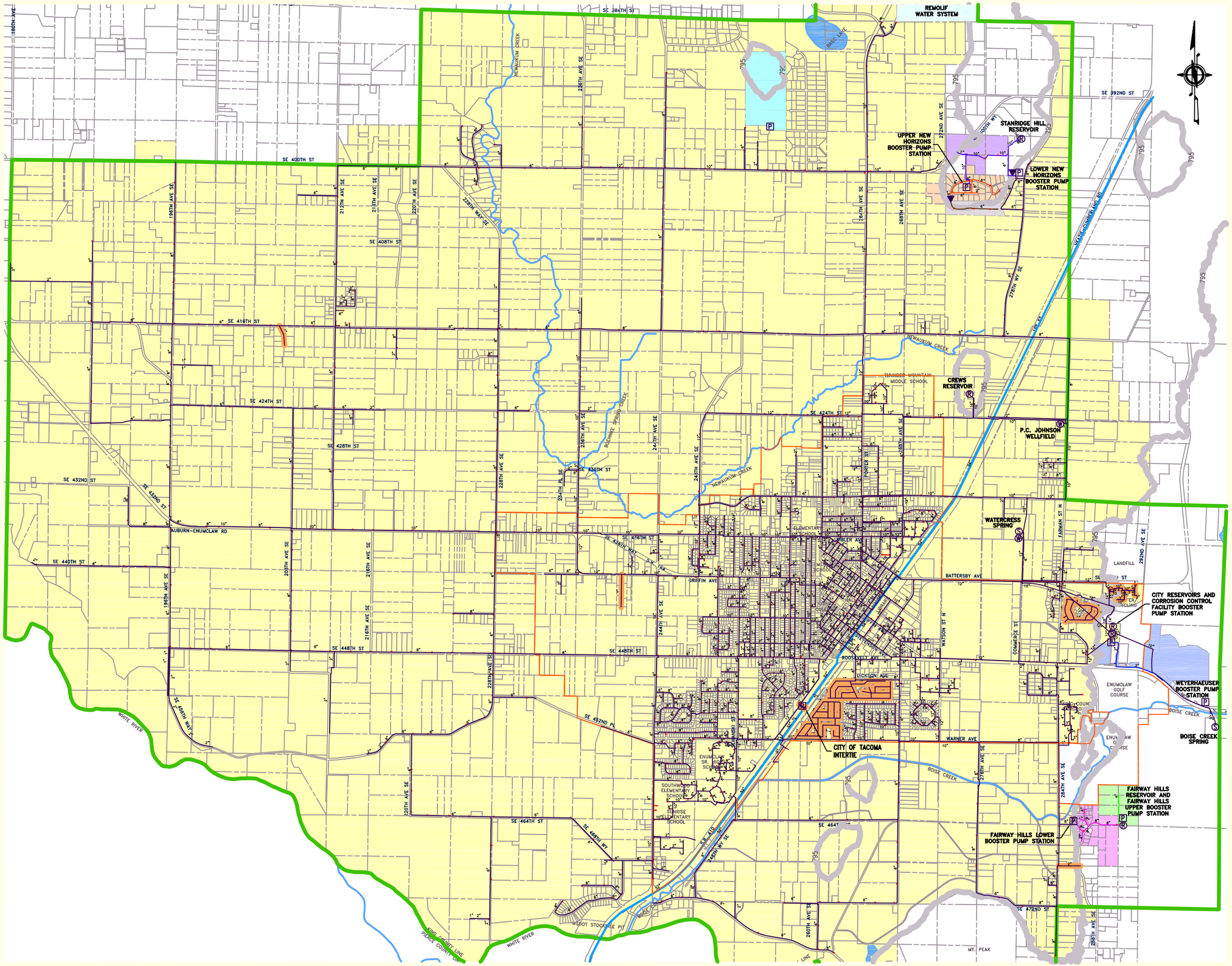
The Lower New Horizons Booster Pump Station draws water from the 888 Zone to fill the Stanridge Hill Reservoir and to meet the demands of the 988 Zone. The Upper New Horizons Booster Pump Station draws water from the Stanridge Hill Reservoir into the closed 1040 Zone (i.e. no storage in the zone). The 899 Zone is supplied by a pressure reducing station with water that originates from the 1040 Zone.

The Lower Fairway Hills Booster Pump Station draws water from the 888 Zone to fill the Fairway Hills Reservoir and meet the demands of the 983 Zone. Water from the Fairway Hills Reservoir is used to supply water to the 1175 Zone through the Upper Fairway Hills Booster Pump Station. The water pressure in the booster pump station's bladder tanks control the

starting and stopping operation of the pumps and maintain pressure in the 1175 Zone when the pumps are not on.

The Corrosion Control Facility Booster Pump Station draws water directly from the City Reservoirs in the 888 Zone into the closed 1013 Zone. Water pressure in the booster pump station's bladder tank controls the starting and stopping operation of the pumps. The 1245 Zone is supplied by the Weyerhaeuser Booster Pump Station and draws water directly from the Boise Spring transmission main. Water pressure in bladder tanks on the former Weyerhaeuser mill site control the starting and stopping operation of the Weyerhaeuser Booster Pump Station pumps.

The Highview Booster Pump Station draws water from the 888 Zone into the closed 995 Zone. Variable frequency drive technology allow the lead pump to run continuously, eliminating the need for a bladder tank, with additional pumps started as needed to meet demand.



LEGEND

- EXISTING URBAN GROWTH AREA
- 1989 COORDINATED WATER SYSTEM PLAN SERVICE AREA
- CITY OF TACOMA TRANSMISSION MAIN
- WATER MAIN
- PRIVATE WATER MAIN
- 888 PRESSURE ZONE
- 899 PRESSURE ZONE
- 988 PRESSURE ZONE
- 983 PRESSURE ZONE
- 995 PRESSURE ZONE
- 1013 PRESSURE ZONE
- 1040 PRESSURE ZONE
- 1175 PRESSURE ZONE
- WELL
- SPRING
- RESERVOIR
- BOOSTER PUMP STATION
- PRESSURE REDUCING STATION

Figure 2-1
Existing Water System

City of Enumclaw Comprehensive Water System Plan

Scale: 1" = 3,000' Date: June 2013

Filename: Fig 2-1.dwg

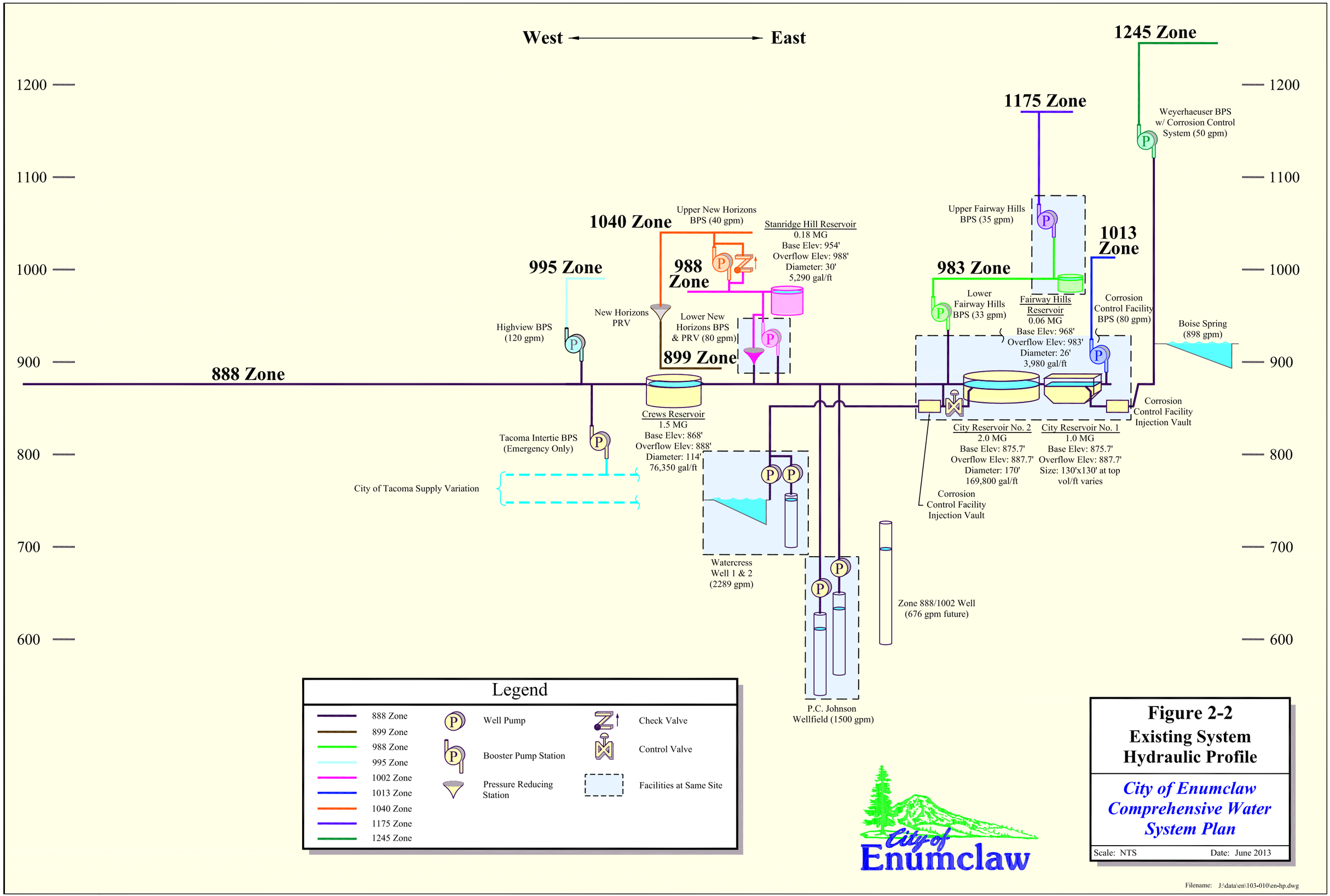


Figure 2-2
Existing System Hydraulic Profile

City of Enumclaw Comprehensive Water System Plan

Scale: NTS Date: June 2013

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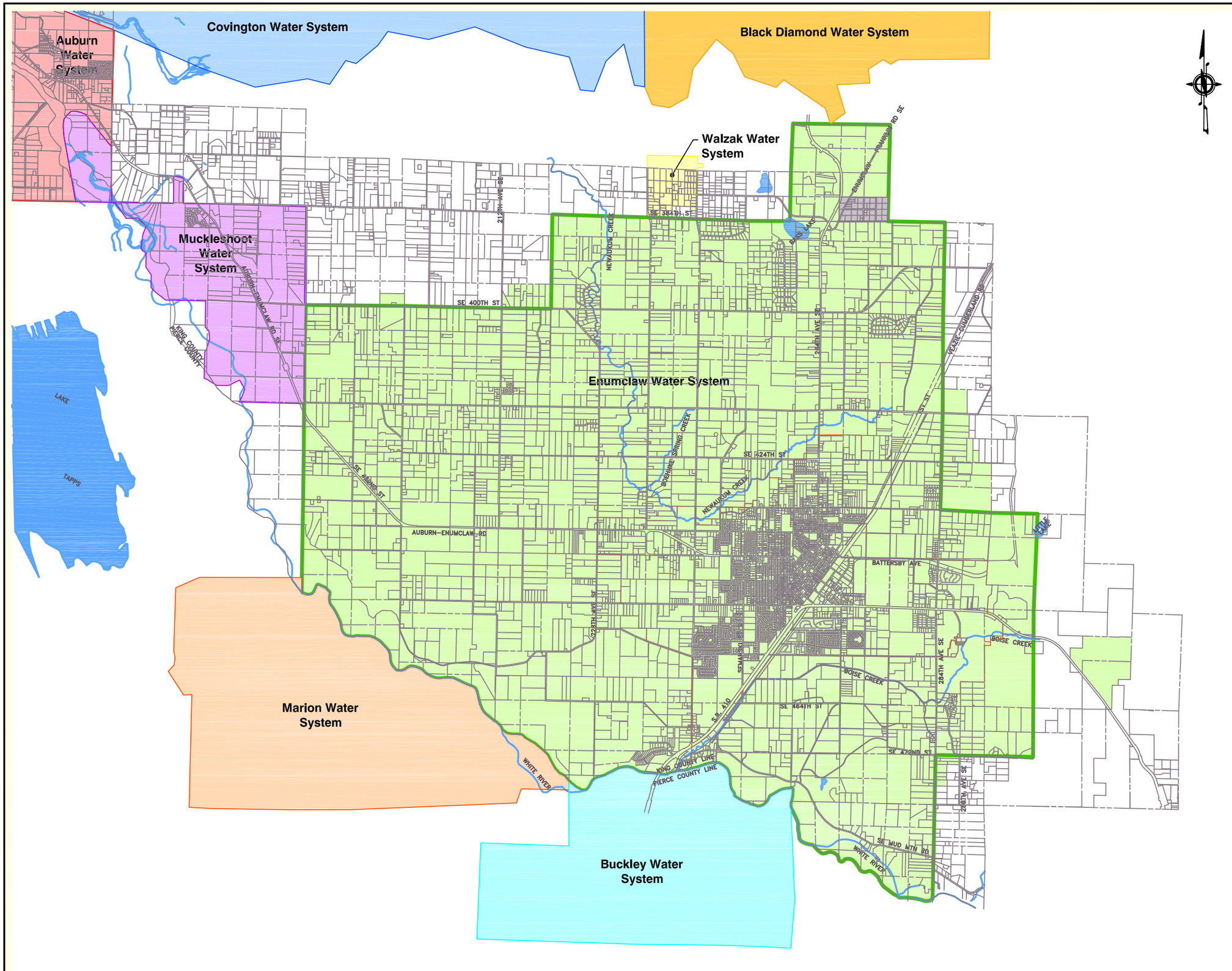


City of Enumclaw

LEGEND

- EXISTING URBAN GROWTH AREA
- 1989 COORDINATED WATER SYSTEM PLAN SERVICE BOUNDARY
- AUBURN WATER SYSTEM
- BLACK DIAMOND WATER SYSTEM
- COVINGTON WATER SYSTEM
- MARION WATER SYSTEM
- MUCKLESHOOT WATER SYSTEM
- REMOLIF WATER SYSTEM
- WALZAK WATER SYSTEM
- BUCKLEY WATER SYSTEM
- ENUMCLAW SERVICE AREA

Figure 2-3
Enumclaw Service Area and Adjacent Systems

City of Enumclaw Comprehensive Water System Plan

Scale: 1" = 5,000' June 2013

Filename: J:\data\en\103-010\enwcpadj.dwg

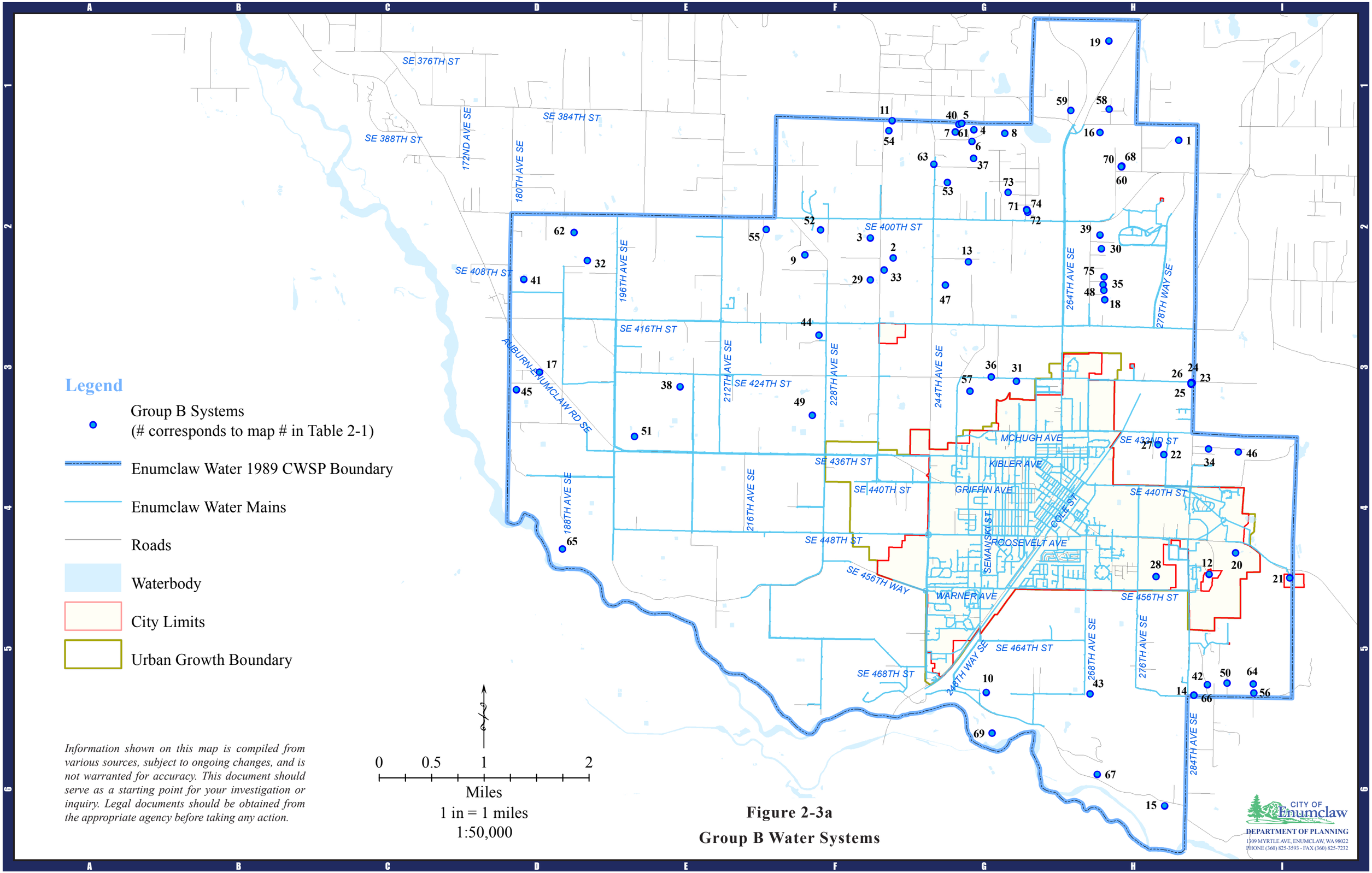
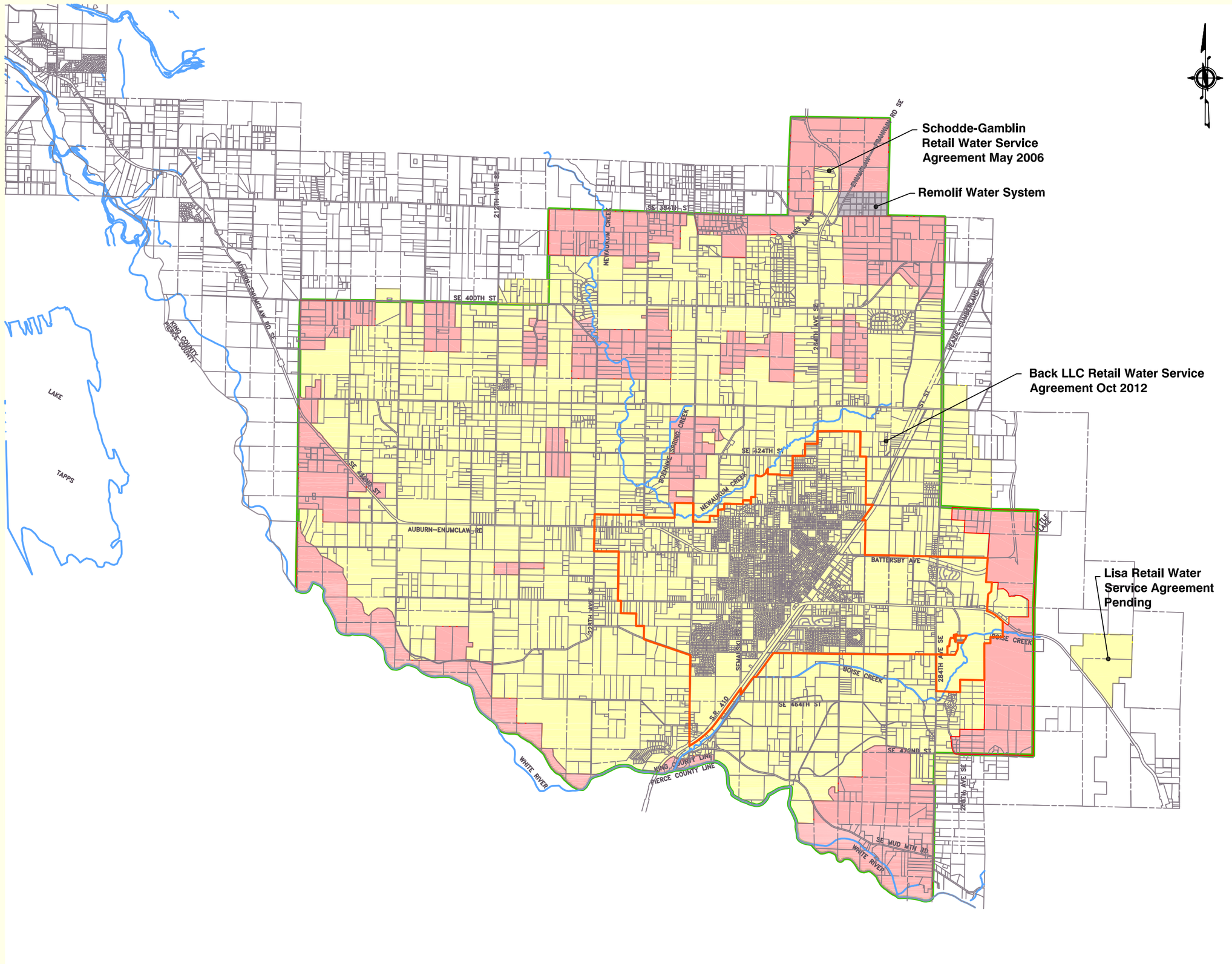


Figure 2-3a

Group B Water Systems



City of Enumclaw

LEGEND

- EXISTING URBAN GROWTH AREA
- 1989 COORDINATED WATER SYSTEM PLAN (CWSP) SERVICE AREA BOUNDARY
- RETAIL SERVICE AREA
- FUTURE SERVICE AREA
- WHOLESALE SERVICE AREA

Figure 2-4
Service Area Map

City of Enumclaw Comprehensive Water System Plan

Scale: 1" = 5,000' NOV. 16, 2012

CHAPTER 3

Land Use and Population

INTRODUCTION

The City of Enumclaw (City) Comprehensive Plan was last updated in 2005. The plan was developed to meet the requirements of the State of Washington Growth Management Act (GMA). The GMA requires, among other things, consistency between land use and utility plans and their implementation. This chapter demonstrates the compatibility of the Comprehensive Water System Plan with other plans, identifies the designated land uses within the service area, and identifies population projections within the Enumclaw planning area.

COMPATIBILITY WITH OTHER PLANS

Introduction

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

- Growth Management Act
- City of Enumclaw Comprehensive Plan
- King County Countywide Planning Policies and Comprehensive Plan
- South King County Coordinated Water System Plan

Growth Management Act

The State of Washington Growth Management Act of 1990 and its 1991 and 1993 amendments defined four goals relevant to this water plan.

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.
4. Critical areas should be designated and protected.

Urban Growth Area

The GMA requires that King County (County) and the City cooperate in designating an Urban Growth Area (UGA). As part of the development of its 1995 Comprehensive Plan, the City designated an UGA that would accommodate the City's projected population growth and provide resource conservation.

Consistency

The GMA requires planning consistency from two perspectives. First, it requires consistency of plans among jurisdictions. This means that plans and policies of Enumclaw and King County must be consistent (RCW 36.70A.100). Second, the GMA requires the implementation of the plan be consistent with the comprehensive plans (RCW 36.70A.120).

The 2003 Municipal Water Law (MWL) and implementing DOH regulations (WAC 246-290-108) also require that water system plans be consistent with applicable local land use plans and regulations. In this regard, DOH requires that a water system's consideration of consistency with local plans and regulations include elements that reasonably relate to water service for new connections, including:

- Land use zoning within the applicable retail service area
- Six year growth projections used in the demand forecast
- Utility Service extension ordinances (if applicable)
- Provisions of water service for new service connections, and
- Other relevant elements related to water supply planning as determined by the department.

Pursuant to WAC 246-298-108, DOH directs water utilities to request local governments with land use jurisdiction over the applicable service area to provide a consistency review which is to be completed within 60 days of receipt of the plan. If the local government review is not completed within 60 days, or the local government does not request a further 60 days to review revisions that address items determined inconsistent, the applicant may complete the consistency review for the local government and request DOH approval of the plan.

Concurrency

Concurrency means that adequate public facilities and services must be provided at the time growth occurs, which is defined as being within a six-year time frame. For example, growth should not occur where schools, roads, and other public facilities are overloaded. Concurrency ensures that public dollars are used efficiently and that quality of life is preserved. 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, new development should be prohibited (RCW 36.70A.100).

Critical Areas

The GMA requires that critical areas be designated and protected. Critical areas include fish and wildlife habitat, flood zones, aquifer recharge areas, streams, creeks, rivers, lakes, wetlands and other surface water, as well as geologic hazard areas such as steep slopes and liquefaction zones. **Appendix E** contains a SEPA checklist that addresses other environmental concerns.

City of Enumclaw Comprehensive Plan

The Land Use Element of the City of Enumclaw's 2005 Comprehensive Plan and subsequent amendments form 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 Comprehensive Plan Land Use Map, which has been reproduced at the end of this chapter, indicates geographically where certain types of uses may be appropriate. The Land Use Map is a blueprint for development of an area, whereas the zoning code provides the regulatory means for implementing such development.

The Land Use Element articulates at a local level many of the same goals and concerns of the GMA. Like the GMA, the Land Use Element seeks to accommodate growth while preserving the City's residential but rural character and protecting environmentally sensitive areas. It seeks to promote a strong local economy and vital commercial, industrial and agricultural districts by focusing economic development within them and establishing development guidelines. The Utilities Element ensures that new development will be adequately serviced without compromising existing levels of service, similar to the principal of concurrency as defined in the GMA.

For that part of the City's retail service area that falls within the incorporated boundaries of Enumclaw, the City has determined that this plan is consistent with the above DOH criteria and applicable City plans and development regulations. See Appendix D for the City of Enumclaw Consistency Determination Form.

Recent Planning Efforts

The City updated its Comprehensive Plan in 2005 and made updates to the Land Use, Transportation and Public Services, and Capital Facilities Chapters in 2012. The City's population projections are based on a target of 15,996 people in 2022. These projections were adopted by the City Council in Resolution 1041 and are used to prepare the water demand forecasts in this Plan for consistency with the Comprehensive Plan.

King County Countywide Planning Policies and Comprehensive Plan

King County's 2012 Countywide Planning Policies and Comprehensive Plan serve as the framework for the comprehensive plans of cities within King County. Consistent with the GMA's goals, they establish UGAs within the County to encourage growth in urban areas and to reduce urban sprawl, and also guide development in rural, unincorporated King County. Similar to the City's Comprehensive Plan, the County's policy goals and Comprehensive Plan seek to reduce urban sprawl, protect rural areas, provide affordable housing, and coordinate protection of environmentally sensitive areas.

For that part of the City's retail service area that falls within the incorporated boundaries of Enumclaw, the City has determined that this plan is consistent with the DOH consistency review criteria described above. The City has further determined that this plan is not inconsistent with

applicable King County plans, policies, and regulations, as well as King County Policies F-101, F-201, F-208, F-210, F-226, F-227, F-2239, CA-5, CA-6, LU-29, LU-30, and LU-37.

South King County Coordinated Water System Plan

The South King County Coordinated Water System Plan (SKCCWSP), dated October 1989, is the result of a study performed by Economic and Engineering Services, Inc. (EES) under the direction of the South King County Water Utility Coordinating Committee (WUCC). A group of representatives from local governments, water purveyors and agencies which are responsible for water supply and public health in King County comprise the WUCC, which was appointed in 1986 by the King County Council.

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

This plan proposes no changes to the City's service area as represented in the SKCWSP.

LAND USE

As a result of four annexations from 2010 to 2012, the city limits currently encompass an area of approximately 3,289 acres. The City's UGA encompasses an additional 695 acres outside of the current city limits. The existing SKCCWSP water service area is significantly larger than the City's UGA with 22,157 total acres. The City's Land Use Map guides development within the UGA. Land use outside the City's UGA is designated by King County. Copies of the City's and County's land use maps are included at the end of this chapter.

The area served by the City is primarily residential, comprised largely of single family residences. . Approximately 52 percent of the land area within the city limits is currently designated for residential use; 5 percent is designated for schools; 5 percent is designated each for commercial; 9 percent for industrial and light industrial use; 15 percent is designated for public facilities; and 1 percent is designated for office use. The remaining 13 percent of land area within the city limits is undesignated right-of-way.

Within the current UGA outside of the city limits a much higher percentage of land use, approximately 88 percent, is designated for residential use. Approximately 2 percent of this land area is designated for public facilities. The remaining 10 percent of the land area within the UGA outside of the city limits is undesignated right-of-way.

Analysis completed as part of the efforts to update the City's Comprehensive Land Use Plan determined that the UGA boundary can accommodate the growth forecasted for the 20-year planning horizon.

POPULATION

Household Trends

Enumclaw's residential community is comprised largely of single-family residences. In 2010, approximately 2,841 housing units, or 61 percent, were single family residential and approximately 1,780 housing units, or 39 percent, were multi-family residential or mobile home dwellings. A slow trend has been occurring within the City towards providing more single family housing units than multi-family or mobile home units and it is expected that this trend will continue. The City has also adopted policies and programs to promote a more diverse housing stock.

The average household size in Enumclaw was 2.39 persons per household in 2010. The average household size in all of King County was 2.40 persons per household in 2010.

Existing and Future Population

King County has experienced steady population growth over the past decade. The population of the County increased more than 11 percent from 2000 to 2010.

The City experienced a rapid growth rate from the 1980s through 1990s, with its highest rate of growth occurring in the early 1990s. During 1990 to 2010, the population within Enumclaw's city limits increased approximately 54 percent. However, from 2000 to 2010 the population decreased by 6 percent. The City's 2007 Comprehensive Water System Plan had projected the population to grow by about 2000 people from 2003 to 2011. Annexations in 2010 to 2012 have nearly brought the City population back to what it was in 2000.

Table 3-1 shows population trends and projections both inside the current city limits and within the water service area. The 2000 and 2010 populations are based on census data within the city limits. Historic populations outside the City are based on the number of residential and agricultural connections times 2.40 people per connection.

Most growth in population is expected to occur within the City with an average of 5 residential equivalent connections per year assumed outside of the City consistent with past trends. The low growth in the unincorporated portion of the service area is not surprising as the large lot size designations of the current King County zoning map limits potential subdivisions of land. There are also extensive land areas where development rights have been acquired by the County Farmland Preservation Program, further limiting potential subdividing.

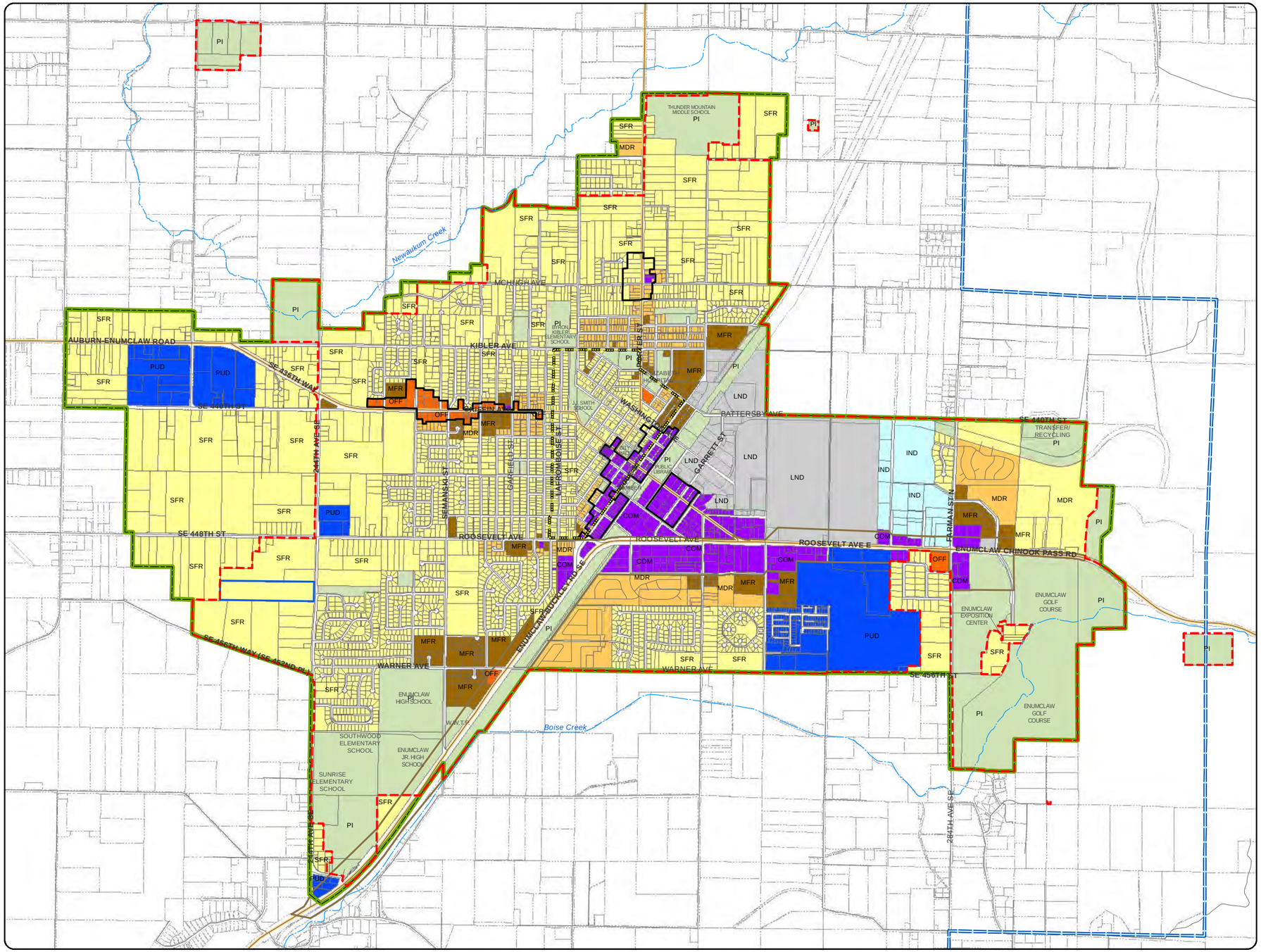
As shown in **Table 3-1**, the City's population is projected to grow from 11,028 people in 2012 to approximately 16,602 people in 2023. By 2023, the total population served within the Enumclaw water service area is shown to increase to approximately 20,989 people.

These population projections, along with the historical per capita water use data presented in **Chapter 4**, form the basis for determining the future water demands of the City's water system. This analysis and the results are presented in **Chapter 4 – Water Demands**.

The projections used assume rapid growth of about 3.8% per year within the City in order to achieve a population of 15,996 people in 2022. These projections exceed the minimum target growth rate of 1.6 percent per year established in collaboration with King County under the growth management process. After 2022 the inside City growth rate is assumed to drop to 1% per year. For planning consistency purposes the higher projections established in the City's Comprehensive Plan must be used in the water demand analysis until the City's Comprehensive Plan is updated to adopt a revised target. An update of the City's Comprehensive Plan is not due until June 2015, and will cover a period of time from 2015-2035.

Table 3-1
Population Trends and Projections

Year	Population	
	City Limits	Water Service Area
Historical		
2000	11,116	15,414
2001	11,074	15,394
2002	11,033	15,358
2003	10,991	15,326
2004	10,950	15,308
2005	10,908	15,283
2006	10,866	15,264
2007	10,825	15,228
2008	10,783	15,198
2009	10,742	15,170
2010	10,700	15,135
2011	10,896	15,223
2012	11,028	15,283
Projected		
2013	11,446	15,713
2014	11,880	16,159
2015	12,330	16,621
2016	12,797	17,101
2017	13,282	17,598
2018	13,786	18,113
2019	14,308	18,647
2020	14,850	19,202
2021	15,413	19,777
2022	15,996	20,371
2023	16,602	20,989
2024	16,768	21,167
2025	16,936	21,347
2026	17,105	21,529
2027	17,276	21,712
2028	17,449	21,896
2029	17,624	22,083
2030	17,800	22,271
2031	17,978	22,461
2032	18,158	22,653
2033	18,339	22,846



CITY OF Enumclaw

Legend

- Creek
- Enumclaw Water Boundary
- City Limits
- Urban Growth Boundary
- Single-Family Residential
- Mixed Density Residential
- Multi-Family Residential
- Planned Unit Development
- Commercial
- Office
- Public/Institutional
- Light Industrial
- Industrial
- King County Parcels
- Airport Overlay
- S.R. 410 Corridor Overlay
- Mixed Use Overlay
- Old Town Overlay

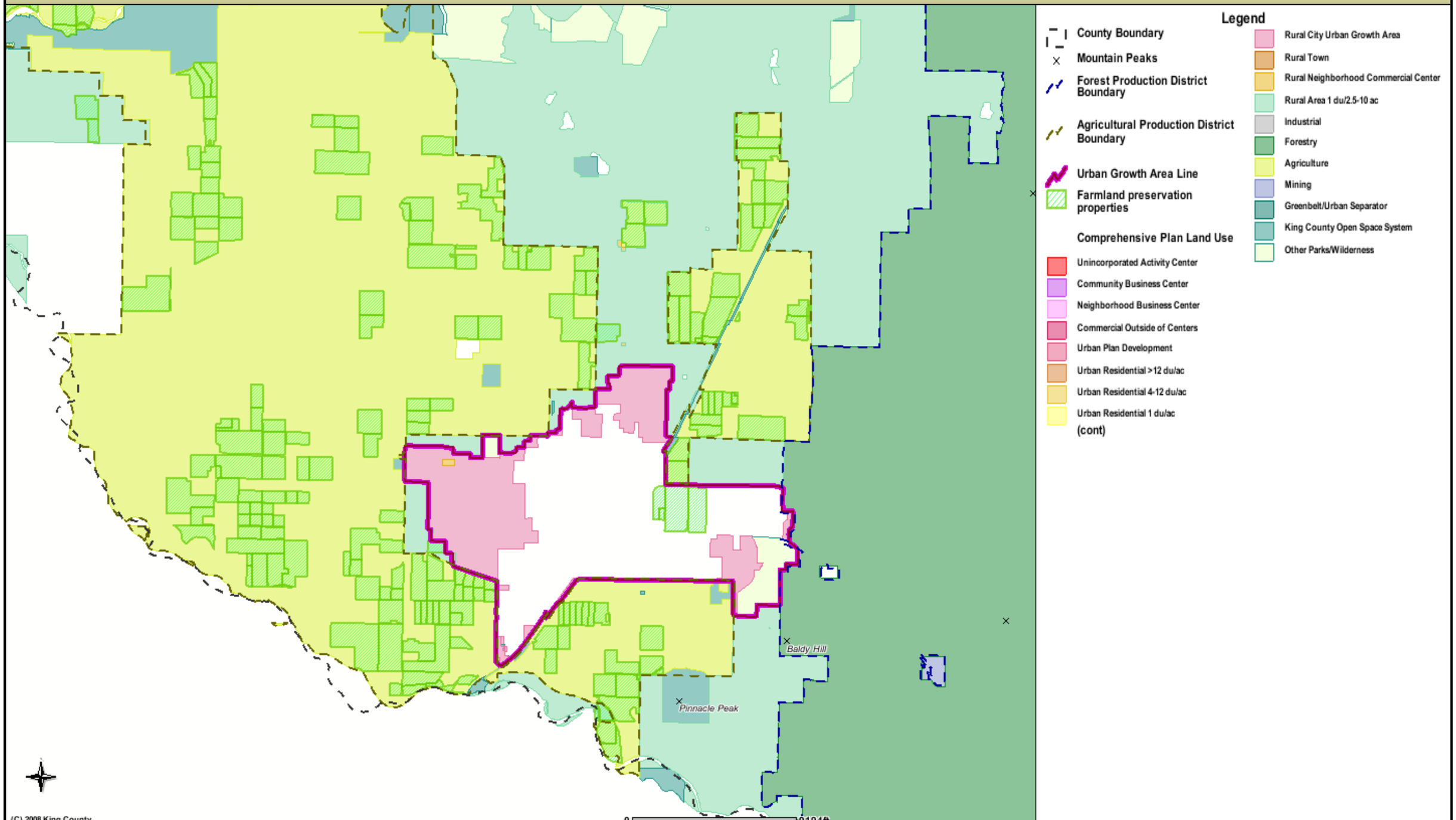
N
W E
S

Feet

0 1,100 2,200 4,400

1 inch = 2,200 feet
1:26,400

iMAP



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King County

CHAPTER 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 provide an adequate quantity of water to its customers in accordance with federal and state laws. A future demand analysis identifies projected demands to determine how much water will be needed to satisfy future growth of the water system and continue to meet federal and state laws.

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, and future demands. A separate analysis of the effects of conservation on demand is included in **Appendix F**.

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 has a tendency to increase the annual demand; whereas, high temperature has a tendency to increase the demand over a short period of time. Population does not solely determine demand because different populations use varying amounts of water. The use varies based on the number of users in each type of customer class, land use density, and irrigation practices. Water conservation efforts will also impact demands and can be used to accommodate a portion of system growth without increasing a system's supply capacity.

Certificate of Water Availability

In accordance with the requirements of the Growth Management Act (GMA), a building permit cannot be issued until water is available. A "Certificate of Water Availability" (CWA) is issued by the City if there is “preliminary” water supply to meet the domestic water service and fire flow requirements of the applicant’s proposed project. The requirement for providing evidence of an adequate water supply was codified in 1990 under Title 19.27.097 of the Revised Code of Washington (RCW) in the Building Code Section. To assist governments with implementing these requirements, the Department of Health has developed a handbook titled *Guidelines for Determining Water Availability for New Buildings*.

CURRENT POPULATION AND SERVICE CONNECTIONS

Residential Population Served

In June 2012, the City provided water service to 5,558 customer accounts, of which 5,024, or 90 percent, of these accounts were residential customers and 534 accounts, or 10 percent, were other customer types. A more detailed discussion of the City's population and household trends is contained in **Chapter 3**.

Water Use Classifications

Water customers are separated into six different classes for demand tracking purposes. These groups are defined as single-family residential, multi-family residential, commercial, city, agriculture, and schools. The demand analysis that follows shows the water use patterns of these user groups.

EXISTING WATER PRODUCTION

Water production, or supply, is the total amount of water supplied to the system, as measured by the meters at each supply source. Water supply is different than water consumption in that water supply is essentially 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). **Table 4-1** summarizes the total amount of water supplied to the Enumclaw system from 2004 through 2012, the estimated population within the City's service area, and the calculated average day demand on a per capita basis for each year.

Table 4-1
Historical Supply and Production Per Capita

Year	Average Population	Annual Supply (gallons)	Average Daily Demand (gpm)	Maximum Day Demand (gpm)	Max/Ave Ratio	Ave Demand Per Capita (gal/day/capita)
2004	15,308	738	1,404	2,892	2.1	132
2005	15,283	694	1,321	2,516	1.9	124
2006	15,264	746	1,419	2,814	2.0	134
2007	15,228	679	1,291	2,722	2.1	122
2008	15,198	653	1,242	2,190	1.8	118
2009	15,170	688	1,310	3,155	2.4	124
2010	15,135	623	1,186	2,489	2.1	113
2011	15,223	617	1,175	2,186	1.9	111
2012	15,283	621	1,181	2,368	2.0	111
Average		673	1,281	2,592	2.0	121
Average 2009 - 2011		643	1,224	2,610	2.1	116

Table 4-2 shows the total annual amount of supply from each of the City's supply facilities from 2004 through 2012. Boise Spring and Watercress sources have supplied an average of more than 97 percent of the water to the system since 2004. This is an increase relative to the average of about 87 percent supplied by these sources for the period of 1994 to 2003.

Table 4-2
Supply by Facility

Year	Total Supply from Each Facility (MG/% total)						
	Boise Spring (S01)	Watercress Well 1 (S02)	Tacoma Intertie (S03)	PCJ Well 2 (S05)	PCJ Well 1/3 (S06)	Watercress Well 2 (S08)	System Total
2004	422	268	0	35	13		738
	57.1%	36.3%	0.0%	4.7%	1.8%		
2005	419	244	0	12	20		694
	60.3%	35.1%	0.0%	1.7%	2.9%		
2006	427	277	0	31	10		746
	57.3%	37.1%	0.0%	4.2%	1.4%		
2007	429	246	0	3	0		679
	63.2%	36.3%	0.0%	0.5%	0.0%		
2008	280	54	0	4	2	312	653
	42.9%	8.3%	0.0%	0.6%	0.3%	47.8%	
2009	154	0	0	10	0	525	688
	22.3%	0.0%	0.0%	1.4%	0.0%	76.3%	
2010	452	0	0	0.3	0.01	170	623
	72.6%	0.1%	0.0%	0.0%	0.0%	27.3%	
2011	451	1	0	0	0	165	617
	73.1%	0.2%	0.0%	0.0%	0.0%	26.7%	
2012	457	0	0	0	0	163	621
	73.7%	0.0%	0.0%	0.0%	0.0%	26.3%	
Total (04-11)	3,491	1,091	0	96	46	1,336	6,060
% of Total	57.6%	18.0%	0.0%	1.6%	0.8%	22.0%	100.0%

EXISTING WATER DEMANDS

Water Consumption

Water consumption, or demand, is the amount of water used by all customers of the system, as measured by the customer's meters. **Table 4-3** shows the historical average number of connections, average annual consumption, and average daily consumption per connection of each customer class since 2004.

Since the early 1990s, the City has experienced several periods of moratoriums that were established based on a lack of water or sewer system capacity. After the last sewer related moratorium was lifted in early 2009 development continued to be slowed by economic recession and restrictions on obtaining credit. As a result the City has experienced slow growth in the number of connections, averaging about 1.2% increase per year from 2004 to 2011 as shown in

Table 4-3. Despite the added connections annual consumption dropped an average of 3.7% per year for the same period. Factors contributing to a decline in consumption include an increase in the number of home foreclosures, a drop of over 400 persons in the City's population from 2000 to 2010 according to census data, customer and supply side conservation efforts, adoption of a residential increasing rate block structure, and significant increases in sewer volumetric rates to finance expansion of the City's wastewater treatment plant.

Table 4-3
Annual Consumption and Service Connections

Year	Customer Class						Totals	% Growth[2]
	Residential	MF Res[1]	Agricultural	City	Commercial	School		
Number of Connections								
2004	4,581		32	24	429	19	5,085	0.7%
2005	4,601		31	25	432	19	5,108	0.5%
2006	4,616		32	29	443	18	5,138	0.6%
2007	4,602	222	73	37	366	20	5,320	3.5%
2008	4,624	223	78	36	372	20	5,353	0.6%
2009	4,752	222	87	41	376	20	5,498	2.7%
2010	4,772	220	93	39	375	19	5,518	0.4%
2011	4,799	227	101	43	367	19	5,556	0.7%
2012	4,800	227	105	41	372	21	5,566	0.2%

[1]Prior to 2007 multi-family connections were included with the commercial class.
[2]Average growth was 1.2% between 2004 and 2011.

Annual Consumption (MG)								
2004	442		52	13	168	11	686	-6.7%
2005	408		49	12	161	9	638	-6.9%
2006	478		51	15	172	9	725	13.6%
2007	369	91	55	15	84	8	622	-14.2%
2008	352	85	57	13	75	7	590	-5.1%
2009	392	96	49	8	73	9	627	6.3%
2010	334	92	46	6	64	8	551	-12.2%
2011	321	84	45	7	63	9	528	-4.1%
2012	329	82	43	7	60	8	529	0.1%

[2]Average growth was -3.7% between 2004 and 2011.

-Table Continues-

Table 4-3
Annual Consumption and Service Connections – Continued

Year	Customer Class					
	Residential	MF Res[1]	Agricultural	City	Commercial	School
Average Daily Consumption Per Connection (gal/day/conn)						
2004	263		4,448	1,435	1,072	1,598
2005	243		4,308	1,335	1,022	1,234
2006	284		4,341	1,429	1,062	1,408
2007	220	1,123	2,048	1,096	632	1,083
2008	208	1,045	2,008	1,014	554	999
2009	226	1,187	1,549	503	534	1,243
2010	192	1,147	1,341	445	469	1,181
2011	183	1,010	1,223	427	467	1,237
2012	188	986	1,133	458	439	1,050
Avg[1]	223	1,083	2,489	905	516	1,226

[1]The average for commercial excludes 2004-2006 when combined with multi-family.

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. The ADD is determined from historical water use patterns of the system and can be used to project future demand within the system. ADD data is typically used to determine standby storage requirements for water systems. Standby storage is the volume of a reservoir used to provide water supply under emergency conditions when supply facilities are out of service. The system's ADD for 2004 through 2012 is shown in **Table 4-1**.

Maximum Day Demand

Maximum Day Demand (MDD) is the maximum amount of water expected to be used throughout the system during a 24-hour time period of a given year. MDD typically occurs on a hot summer day when lawn watering is occurring throughout much of the system. In accordance with WAC 246-290-230 - Distribution Systems, the distribution system shall provide fire flow at a minimum pressure of 20 psi during MDD conditions. Supply facilities are typically designed to supply water at a rate that is equal to or greater than the system's MDD. The average MDD/ADD ratio of 2.1 shown in **Table 4-1** for 2009-2011 will be used in future demand projections. This is the same ratio used in the 2007 Comprehensive Water System Plan (CWSP).

Peak Hour Demand

Peak Hour Demand (PHD) is the maximum amount of water used throughout the system, excluding fire flow, during a one-hour time period of a given year. In accordance with WAC 246-290-230 - Distribution Systems, new public water systems or additions to existing systems shall be designed to provide domestic water at a minimum pressure of 30 psi during peak hour demand conditions. Equalizing storage requirements are typically based on PHD data.

The PHD, like MDD, is typically determined from the combined flow of water into the system from all supply sources and reservoirs. The City's 1983 and 1996 CWSPs used a PHD/MDD demand ratio of 1.33, while the 2007 CWSP used 1.8. Analysis of digital production and reservoir level records around the MDD in 2006 and 2009 found a ratio of 1.79 and 1.62, respectively. Therefore a ratio of 1.8 will continue to be used consistent with the 2007 CWSP.

Demand by Pressure Zone

Table 4-4 shows the average demand of each of the City's nine pressure zones in 2011 based on metered use data if available or the estimated number of connections and . Most of the water system demand is in the 888 Zone, as shown in the table.

Table 4-4
2011 Demands by Pressure Zone

Pressure Zone	2011 Annual Demand (gallons)	Average Daily Demand (gpm)	Percent of Total Demand (%)
1245	109,227	0.2	0.0%
1175	500	0.0	0.0%
1040	3,174,405	6.0	0.6%
1013	406,975	0.8	0.1%
995	1,465,110	2.8	0.3%
988	406,975	0.8	0.1%
983	2,686,035	5.1	0.5%
899	1,465,110	2.8	0.3%
888	518,257,723	986.0	98.2%
Total	527,972,060	1,004.5	100.0%

Largest Water Users

Table 4-5 shows the largest water users of the system in 2011 and their total amount of metered consumption for the year. The total water consumption of these 20 water accounts represented approximately 15 percent of the system's total consumption in 2011.

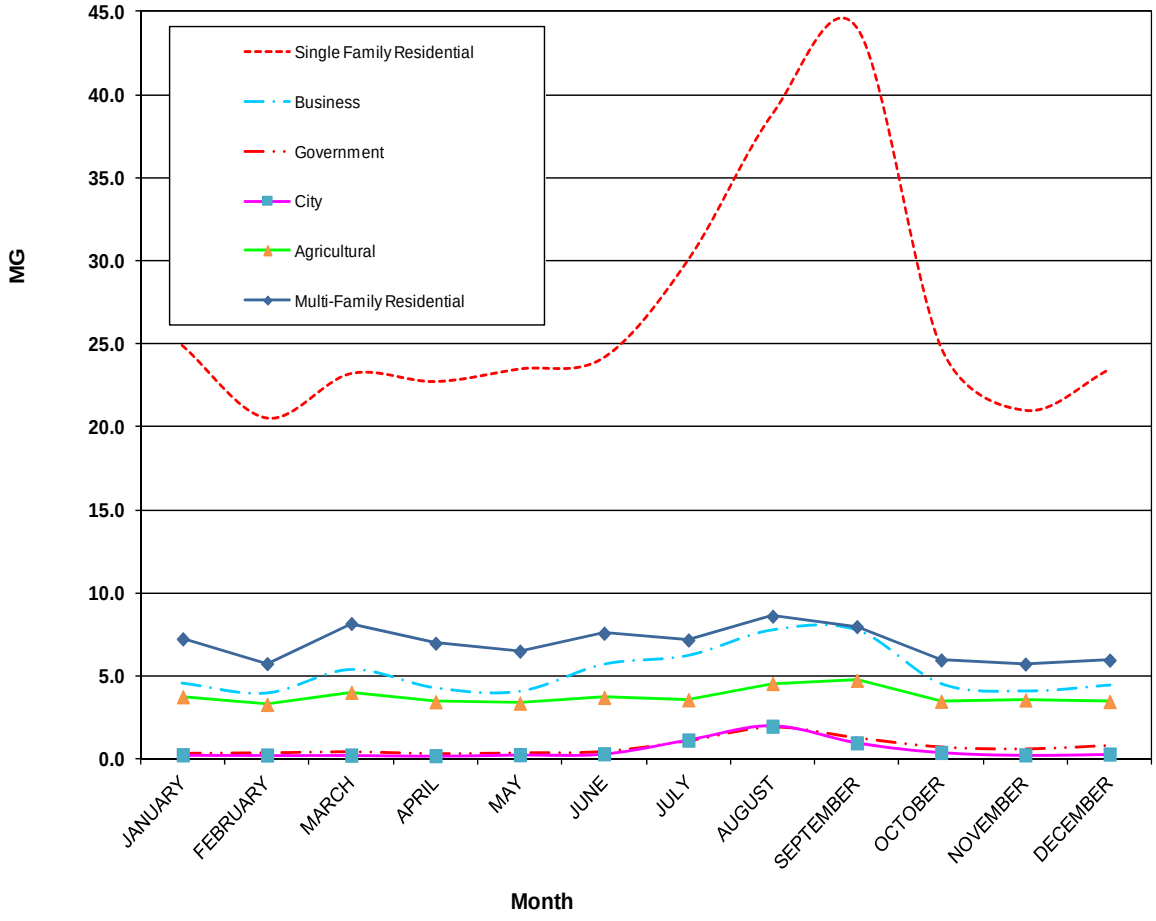
Table 4-5
2011 Largest Water Users

Customer	Annual Consumption (MG)
Mobile Home Park	13.1
Mobile Home Park	12.1
Mobile Home Park	6.8
Mobile Home Park	5.5
Dairy	4.2
Hospital	4.1
Dairy	4.1
Dairy	3.4
Grocery Store	2.9
Mobile Home Park	2.4
Dairy	2.3
Retirement Center	2.3
School	2.2
Dairy	2.2
Dairy	1.9
Memory Care Center	1.7
Dairy	1.7
Nursing Home	1.6
Apartment Complex	1.6
Apartment Complex	1.5
Largest Water Users Total	77.7
Water System Total	528
Percent of Total	15%

Seasonal Variation in Consumption by Customer Class

Figure 4-1 shows seasonal variation in consumption by customer class in 2011. Water usage is significantly higher in the summer for the residential class while the other customer classes show little or relatively small summertime increases.

Figure 4-1
2011 Demand by Month



Equivalent Residential Units (ERUs)

The demand of each customer class can be expressed in terms of ERUs for demand forecasting and planning purposes. One ERU is equivalent to the amount of water used by a single-family residence. The number of ERU's represented by the demand of the other customer classes is determined from the total demand of the customer class and the demand per ERU from the single family residential demand data.

Table 4-6 shows the calculated number of ERU's for each customer class and the ERU total for 2011. An average demand per ERU of 223 gallons per day is used in the table and is based on the average residential daily consumption for 2008-2011. This demand will be used later in this chapter to forecast ERU's in future years based on estimated future demands. This demand per ERU value will also be used to determine the capacity (in terms of ERU's) of the City's existing water system in **Chapter 7**.

Table 4-6
Equivalent Residential Unit (ERU) Calculation for 2011

Customer Class	# of Connections	% of Total	Ave Daily Consumption (gpd)	ERUs[1]	% of Total	Ave ERU per Connection
Residential	4,799	86.4%	880,296	4,799	65.4%	1.0
MF Res	227	4.1%	229,294	1,028	14.0%	4.5
Agricultural	101	1.8%	123,522	554	7.6%	5.5
City	43	0.8%	18,358	82	1.1%	1.9
Commercial	367	6.6%	171,534	769	10.5%	2.1
School	19	0.3%	23,495	105	1.4%	5.5
Total	5,556	100.0%	1,446,499	7,337	100.0%	1.3

[1]1 ERU = 223 gpd based on the average residential daily consumption for 2008-2011 with 10% leakage factor.

Distribution System Leakage

The difference between the amount of water supply and water used is the amount considered as Distribution System Leakage (DSL). In addition of actual leakage from the system, DLS also may include supply or customer metering inaccuracies and illegal water system connections or water use. The City's calculated DSL history since 2004 is shown in **Table 4-7**. The City's DSL is significantly lower than the 49 percent DSL experienced in 1999. The decrease is primarily due to the repair of a leaking reservoir and an extensive water main replacement program in 1997 through 2002.

The City intends to further minimize the amount of DSL in the future with a customer meter replacement program and replacement or repair of leaking mains.

Table 4-7
Distribution System Leakage

Year	Supply (MG)	Metered Use (MG)	Unmetered Use (MG)[1]	Total Use (MG)	DSL (MG)	DSL (%)	3-yr Ave (%)
2004	738	686		686	52	7.1%	8.4%
2005	694	638		638	56	8.1%	7.3%
2006	746	725		725	21	2.8%	6.0%
2007	679	622		622	57	8.3%	6.4%
2008	653	590		590	63	9.6%	6.9%
2009	688	627		627	61	8.8%	8.9%
2010	623	551	17	568	56	8.9%	9.1%
2011	617	528	31	559	59	9.5%	9.1%
2012	621	529	27	556	65	10.5%	9.7%

[1]Did not report or fully account for unmetered use prior to 2010.

Fire Flow Demand

Fire Flow Demand is the amount of water required during fire fighting 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 high rate 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 is useless if the transmission or distribution system can not deliver water at the required rate and pressure necessary to extinguish a fire.

General fire flow goals were established for the 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 fire flow goal for each land use category within the City's service area is shown in **Table 5-2**. The water system analyses presented in **Chapter 7** are based on an evaluation of the water system providing sufficient fire flow in accordance with these general fire flowgoals. Actual fire flow requirements, as determined by the local fire marshal, may differ from those shown in the table based on such factors as proposed use, degree of buildout, use of fire sprinklers, and building size and construction.

FUTURE WATER DEMANDS

Future water demand projections are shown in **Table 4-8**. The growth in ERUs was calculated by applying the same rate of growth as estimated in **Chapter 3** for population with the 2011

ERU estimate from **Table 4-6** as the base year. ADD was determined using the average ERU demand of 223 gpd from **Table 4-6**. Future MDD and PHD were determined using the factors for MDD/ADD and PHD/MDD ratios as shown in the footnotes of **Table 4-8** and discussed previously.

The analysis and evaluation of the existing water system with proposed improvements, as presented in **Chapters 7** and **9**, is based on the 20-year projected demand data without conservation reductions. This ensures that the future system will be sized properly to meet all requirements, whether or not additional water use reductions from conservation are achieved.

Table 4-8
Future Water Demand Projections

Year	Population[1]	ERUs	ADD[2]		MDD[3]		PHD[4]
			(gpd)	(gpm)	(gpd)	(gpm)	(gpm)
2013	15,713	7,573	1,688,811	1,173	3,546,503	2,463	4,433
2014	16,159	7,788	1,736,724	1,206	3,647,121	2,533	4,559
2015	16,621	8,011	1,786,405	1,241	3,751,451	2,605	4,689
2016	17,101	8,242	1,837,920	1,276	3,859,632	2,680	4,825
2017	17,598	8,481	1,891,338	1,313	3,971,810	2,758	4,965
2018	18,113	8,730	1,946,732	1,352	4,088,137	2,839	5,110
2019	18,647	8,987	2,004,177	1,392	4,208,771	2,923	5,261
2023	20,989	10,116	2,255,893	1,567	4,737,375	3,290	5,922
2033	22,846	11,011	2,455,474	1,705	5,156,496	3,581	6,446
Buildout	23,842	11,491	2,562,467	1,779	5,381,180	3,737	6,726

[1]Total for service area. See Chapter 3 for methodology used to estimate future population.
[2]ADD is calculated using the demand per ERU from Table 4.6 of 223/gpd.
[3]MDD is calculated using the average MDD:ADD ratio for years 2009-2011 of 2.1
[4]PHD is calculated using an PHD:MDD ratio of 1.8.

CHAPTER 5

Policies and Design Criteria

INTRODUCTION

The City of Enumclaw operates and plans water service for City residents and businesses according to the design criteria, laws, regulations, and policies that originate from the following seven sources, listed in Table 5-1 in descending order from those with the broadest authority to the most narrow.

Table 5-1
Agency Jurisdiction/Authority

Agency	Jurisdiction/Authority
U.S. Department of Health & Human Services	Federal Regulations
U.S. Environmental Protection Agency	Federal Regulations
Washington State Department of Health	State Laws/Regulations
Washington State Department of Ecology	State Laws/Regulations
King County Council	Land Use Plans/Regulations
Enumclaw City Council	Administrative Policies
American Water Works Association	Design Criteria

These laws, design criteria, plans, and policies guide the City's operation and maintenance of the water system on a daily basis and it's 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 that the City must meet to ensure that the water supply is adequate to meet existing and future water demands of the system. The system's ability to meet these demands is detailed in **Chapter 7**, and the recommended improvements are identified in **Chapter 9**.

The City operates and plans water service for City residents and businesses according to the laws, regulations, and policies that originate from the Department of Health (DOH) and other applicable state and local agencies. These laws, regulations, 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 that the City must meet to ensure that the water supply is adequate to meet existing and future water demands of the system.

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 laws and standards.
- Security of the water supply is of primary importance. The City will take all reasonable measures to protect its system and customers. Security improvements identified in vulnerability assessment reviews shall be given the highest priority.

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.
- The City has a cross-connection control program for eliminating cross-connections. A copy of the City of Enumclaw 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 WAC 246-290-490, and utilize the guidance published in the manual entitled *Cross Connection Control Manual Accepted Procedure and Practice* – Pacific Northwest Section – American Water Works Association (AWWA).

Quantity

- The City will plan for at least twenty years into the future so that future water resource limitations can be handled effectively.
- The City will ensure that the capacity of the system, including supply sources, pump stations and transmission mains, is sufficient to meet the maximum day demand of the system.
- The City will seek to meet its future water supply needs with existing and new sources of supply under the City's ownership to minimize the need for reliance on use of Tacoma water.

Fire Flow

The City will plan to provide the minimum fire flows for future development as set forth in **Table 5-2**:

Table 5-2
General Fire Flow Goals

Land Use Category	Fire Flow Goal (gpm)	Flow Duration (hours)
Rural Residential (lots >35,000 sf & outside city limits)	500 [1]	0.5
Rural Residential (lots <35,000 sf & outside city limits)	1,000	2
Single Family Residential (5 DU/acre)	1,000	2
High Density Residential (7 DU/acre)	1,750	2
Multi-Family Residential (15 DU/acre)	2,500	2
Commecial/Business Park	3,000	3
Industrial	3,000	3
Schools	3,000	3

[1]Lots > 35,000 sf are exempt from fire flow under King County Code.

Actual fire flow requirements, as determined by the local fire marshal, may differ from those shown above based on such factors as proposed use, building size and construction, existing available fire flow, use of fire sprinklers, and degree of buildout. The City reserves the right to not provide rural residential fire flow where such service is determined by the City to be not cost effective and/or impractical based on system capacity limitations.

Water Use Efficiency

- The City will promote the efficient and responsible use of water consistent with DOH MWL Water Use Efficiency standards and requirements.
- The City's water use efficiency program is contained in **Appendix F**.

Regional Participation

- The City will participate in regional supply management and planning activities as staff resources allow.

CUSTOMER SERVICE POLICIES

Water Service and Connection

Retail Service Area

- The City will strive to provide potable water service to the people within the Enumclaw

water service area, provided all policies related to service can be met, consistent with applicable statutes, rules, and guidance provided by the Washington State Department of Health (DOH).

- The City has a duty to serve within its retail water service area subject to criteria cited in WAC 246-290-106. In this regard, all proposed developments within the City's retail water service area shall connect directly to the City's water system.
- For water service applications, the applicant must submit a completed Application for Utilities form, along with the appropriate application fee, to the City's Public Works Department. Once the application and required fees are received, the proposed service will be evaluated to determine fire flow availability, meter size and improvements necessary for adequate water pressure, fire flow, looping or extensions. The adequacy of water system capacity to serve the applicant's property will also be evaluated at this time. Following the approval of the application, the applicant must complete any required improvements and pay the required connection fees to the City's Public Works Department before the new service may be installed. The new water service will be installed by the City's installation crew within three weeks of payment of the connection fees, and within 30 days of installation of the service, the applicant will be billed the actual labor, material, and equipment cost, less the meter deposit amount.
- For water service applications involving projects/properties located outside of the City limits, a King County Certificate of Water Availability must also be obtained by the applicant. Within two weeks of the receipt of the Application for Utilities form, the City will issue a King County Certificate of Water Availability to the applicant that indicates the conditions that must be fulfilled prior to allowing the new water service connection.
- If it has been determined that a property cannot be developed following payment of water service connection charges, the City will process a refund for the connection charges, less the City's labor costs to abandon the service. To obtain a refund, a written request must be made to the City's Public Works Department that includes documentation from King County or other responsible agency that the property cannot be developed (septic denial, wetlands, etc.), legal proof to whom the refund will be sent to, and a statement of agreement that the amount of the refund will be the total of the connection charges paid at the time the connection was purchased, less the cost to abandon the service.
- The City will determine whether adequate water system capacity is available to serve an applicant's property and/or water system that is located in the City's retail service area based on available capacity from water rights, supply, storage, transmission and treatment. This will be accomplished through the ongoing tracking of equivalent residential units served by the City in comparison to the maximum number of equivalent residential units that can be served by the system, as computed in **Chapter 7** of this Plan.
- Water system extensions required to provide water service to proposed developments shall be approved by the Public Works Department and must conform to the City's adopted design criteria, and construction standards and specifications, as shown in the City's *Developer Design Manual* as part of the *City of Enumclaw Water System Construction Standards*, a

copy of which is included in **Appendix H**. All costs of the extension shall be borne by the developer or applicant.

- Applicants for a water service within the City's retail service area are advised that a "timely and reasonable" service response period commences on the date the completed Application for Utilities is received by the City.An applicant with a grievance regarding the response can make an appeal under the provisions of this chapter.
- Water availability will expire at the time indicated on the Certificate of Water Availability issued for the property, unless a written request for an extension is submitted to and approved by the City prior to the expiration date. Typically certificates will expire within one year of issuance.
- Time extensions with regard to water availability may be granted, provided that good faith effort is being made to complete the permit or other activity deemed necessary to connect to the City water system. Written evidence must be provided demonstrating progress is being made. When extensions are denied, a written notice of appeal, together with an appeal filing fee, may be submitted to the city clerk within 14 days for consideration by the City Council.
- Delays resulting from non-technical conditions that affect the City's ability to provide new water service will be the responsibility of the applicant. These conditions include, but are not limited to, environmental assessments, local ordinances and annexation procedures.
- In the event an individual water service applicant or party seeking a developer extension has a grievance regarding the "timely and reasonable" response of the City to his/her application, the applicant is directed to submit in writing to the City Public Works Director, a request for said grievance to be heard before the City Council. Prior to such a hearing, the Public Works Director shall consult with and make a recommendation to the City Council Public Works Committee. The Public Work Committee shall then submit its recommendation to the City Council for its consideration in the course of a Council hearing which the applicant may attend and present his/her position. Once a request for hearing is submitted, a hearing before the City Council shall occur within 60 days. A decision by the Council shall occur no later than twenty-one (21) business days after the hearing.
- If a residence requires a fire sprinkler system and will be served by City water, then a separate meter may be required in addition to the domestic water service meter and a separate water line run from the fire system meter to the structure. Connection fees are not assessed for a fire meter, only time and material costs to install the meter. A backflow device and separate meter will not be required if a flow-through fire system is proposed and is allowed by the City. City approval will be on a case-by-case basis. Meter oversizing up to a 1" meter will be allowed without additional connection charges. Yearly fire service line fees still apply.

- New remote water systems proposed to be formed and operated within the City's designated retail service area shall be allowed subject to the condition that oversight and operation of the new system is contracted to an existing SMA or contract operator (paid by the new water system). The system shall remain part of the City's service area, but the City is under no

obligation to own, operate, or extend retail or SMA services. Any such action may occur strictly at the discretion of the City, or if the operator requests water service and agrees to pay all related connection charges and commodity costs.

- In the event a remote public water system falling within the City's retail service area is placed in receivership by the Washington State Department of Health, King County shall serve as receiver of last resort of such system pursuant to RCW 43.70.195(1).
- Water service may be extended outside of the City limits to properties located within the UGA and which fall within the City's retail water service area, as long as the proposed project/connection is not inconsistent with the City's adopted land use plan, zoning and development regulations.

Future/Wholesale Service Areas

- The provision of water service within the City's future service area is a discretionary act by the City subject to a determination that requests for service can be met pursuant to City retail service policies and consistent with WAC 246-290-108.
- All proposed connections/developments within the City's future water service area shall connect directly to the City's water system unless deemed unfeasible by the City at the time of the request. The City shall specifically evaluate the feasibility of service to applicants in its defined future service area based on the following factors:
    1. Date that a written request for retail service is received.
    2. Determination that adequate water supply exists beyond that required to meet existing and planned connections within the City's defined retail service area.
    3. Compliance with City design, engineering, and operational standards.
    4. Determination that costs relating to the extension of existing and/or construction of new mains, distribution lines, and other related facilities can be fully recovered by the City.
    5. Consistency with DOH retail service area criteria (WAC 246-290-106)
- Water service may be extended outside of the City's UGA and within the City's future water service area (i.e., unincorporated King County) if the proposed project/connection is not inconsistent with applicable provisions of King County's adopted land use plan, zoning, and development regulations. Approval to convert a future service area to retail service area status may be obtained from DOH through either a specific water system plan amendment or a scheduled water system plan update (6 year cycle).
- Prospective water service to areas outside of the City's water service area boundary, as reflected in the South King County CWSP, will be coordinated as appropriate with adjacent water purveyors (if applicable), the South King County Regional Water Association/Water Utility Coordinating Committee (WUCC), King County DNRP, and the Department of Health, and evaluated on a case by case basis by the City Council. Water service to properties located in unincorporated areas shall not be provided in a manner inconsistent with applicable provisions of King County's adopted land use plan, zoning, and related

development regulations.

- Applicants for water service in the City's future service area may bring complaints relating to the "timely and reasonable" provision of such service to King County pursuant to RCW 70.116.060 (3)(b).

- New remote water systems proposed to be formed and operated within the City's claimed (future) service area shall be allowed subject to the condition that oversight and operation of the new system is contracted to an existing SMA or contract operator (paid by the new water system). The system shall remain part of the City's service area, but the City is under no obligation to own, operate, or extend retail or SMA services. Any such action may occur strictly at the discretion of the City, or if the operator requests water service and agrees to pay all related connection charges and commodity costs.

- In the event a remote public water system falling within the City's claimed (future) service area is placed in receivership by the Washington State Department of Health, King County shall serve as receiver of last resort of such system pursuant to RCW 43.70.195(1).
- Wholesale water service may be extended to water systems identified as falling within the City's wholesale water service area, subject to the water system requesting wholesale service agreeing to assign its existing water right(s) to the City as a condition of such service, and so long as the provision of such wholesale supply is not inconsistent with King County's adopted land use plan, zoning, and development regulations.

Annexations

- Areas annexed without existing municipal supply will be served by the City.
- Areas annexed with existing municipal supply must meet City of Enumclaw water standards.
- Areas annexed with existing water right permits, certificates, or claims shall assign such water right(s) to the City for redevelopment as City municipal water supply sources.

Temporary Services

No temporary service is allowed, unless there are plans for permanent water service that meets all City standards.

Emergency Service

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

Planning Boundaries

For planning purposes, the City will use as appropriate, the water service boundaries described in this Plan (e.g., retail, future, and wholesale) and/or established by agreement as a result of the regional coordinated water system plan (*South King County Coordinated Water System Plan).*

Satellite System Management

The City is not prepared at this time to provide and/or contract for satellite system management or ownership services within and/or adjacent to the City's existing retail, future, or wholesale service areas As noted in Customer Policies, new remote water systems proposed to be formed and operated within the City's claimed (future) service area shall be allowed subject to the condition that oversight and operation of the new system is contracted to an existing SMA or contract operator (paid by the new water system). The system shall remain part of the City's service area, but the City is under no obligation to own, operate, or extend retail or SMA services. Existing remote systems, however, have been removed from the City's claimed service areas..

FACILITY POLICIES

This section describes the planning criteria and policies used to establish an acceptable hydraulic performance and a standard of quality for the water system. Additional criteria are contained in the City's *Developer Design Manual* as part of the *City of Enumclaw Water System Construction Standards*, a copy of which is included in **Appendix H** of this Plan.

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.
- All projects within unincorporated King County right-of-way must be designed and constructed in accordance with the King County Road Standards and franchise requirements and must be inspected and approved by King County Utility Inspection.

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 120 psi in the water mains during normal demand conditions, excluding pressure surges. Individual residences are responsible for reducing pressures over 80 psi.
- The City will endeavor to maintain a minimum pressure of 30 psi at customer meters during all demand conditions, excluding a fire or emergency.
- During fire conditions, the minimum pressure at customer meters and throughout the remainder of the system will be 20 psi.

- During a failure of any part of the system, the maximum pressure will not exceed 160 psi.

Velocities

- During normal demand conditions, the velocity of water in a water main should be less than 5 feet per second (fps).
- Unless otherwise allowed by the City during emergency conditions such as a fire, the velocity of water in a water main may exceed 5 fps, but should not exceed 10 fps unless hydraulic transient (water hammer) analysis is conducted.

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).
- Standby storage must be located above the elevation that yields a 20 psi service pressure to the highest service in the zone under peak hour demand conditions.
- Fire flow storage must be located above the elevation that yields a 20 psi service pressure to all services in the zone under maximum day demand conditions.
- 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 to the system during the emergency condition.
- The City will provide sufficient storage for a fire condition equal to the system's maximum fire protection water demand and the required duration.
- The City will have a water level indicator and high-water level and low-water level alarms at the Operations and Maintenance office.
- 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 the storage facilities during fires and peak demands; and
    3. Improve the reliability of supply to the City's water system.

Transmission and Distribution

- New private water mains shall not be allowed within the City's distribution system unless determined otherwise by the City. At the time that existing privately owned water mains are replaced to City standards, the City will consider ownership of the mains.
- Unless deemed impractical, transmission and distribution mains will be looped to improve water quality and increase reliability, fire flow capacity and to decrease head losses.
- Water mains shall be extended to boundaries of projects to provide future service to adjacent

properties and, where practical, shall be located north and east of street centerline and generally five feet from the street centerline, except as required to match existing utilities.

- All mains will comply with the generally recognized design criteria from the City, AWWA and Department of Health guidelines that follow. Design plans for main extensions shall be prepared by a qualified licensed engineer in accordance with state law. All design plans must be reviewed and approved by a designated member of the City's licensed engineering staff. For designs completed by the City the design and review engineer will be different staff.

    1. All new construction will be in accordance with the City's Developer Design Manual, a copy of which is included in the *City of Enumclaw Water System Construction Standards* in **Appendix H** of this Plan.
    2. Distribution system design assumes that adequately-sized service lines will be used. All residential service taps and lines will be one-inch or larger. Service lines will be the same size as the meter or larger, unless otherwise allowed by the City.
    3. The minimum diameter of distribution mains will be six inches in diameter if looped, or eight inches in diameter for dead-end lines. Water lines not required to provide fire flow and dead-end water mains that will not be extended in the future may be reduced to no smaller than 2 inches in diameter beyond the last fire hydrant. All distribution water mains 4 inches and larger will be ductile iron pipe and mains less than 4 inches will be high density polyethylene pipe.
    4. All new distribution mains will be sized by a 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 maximum pipeline velocity of eight feet per second during maximum day demand conditions.
    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 installing services. Unless it is impractical to do so, the location of isolation valves shall be such that that any section of a water main with a potential of twenty or more services can be isolated at a minimum of 300 feet on center. 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. Blowoff 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 blowoff assembly shall have a valve the same size as the main with concrete thrust blocking.

e. Individual pressure reducing or check valves must be installed in all new customer service lines in the City. The International Plumbing Code requires pressure reducing valves on customer service lines if pressures are greater than 80 psi. Pressure reducing valves protect customers from high pressures in case a mainline pressure reducing station fails.

f. Check valves must be installed on meter setters to prevent customer service lines from emptying into the City's distribution system when a nearby water main is empty or when the pressure in the main is less than the pressure in the customer line. The check valves help to protect the water system from possible contamination caused by a cross-connection with the customer's pipes and fixtures.

7. Fire hydrant installations will satisfy the following criteria unless otherwise allowed by the local Fire Marshal:

   a. Within the City, fire hydrants serving detached single family dwellings or duplex dwellings on individual lots will be located not more than 600 feet on center, such that all lots are within 300 feet from a fire hydrant, as measured along the path of vehicular access. Within unincorporated King County, fire hydrants will be located at a maximum of 700 feet on center.

   b. Fire hydrants serving any use other than detached single family dwellings or duplex dwellings on individual lots will be located not more than 450 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 local Fire Marshal.

   c. Hydrants located in dead-end areas or cul-de-sacs shall service an area of no more than 120,000 square feet.

   d. One fire hydrant minimum shall be installed per intersection.

   e. The local Fire Marshal will review all proposed fire hydrant installations to ensure the correct number, location and spacing of fire hydrants for each project.

Supply and Booster Pump Stations

- All existing and future booster pump stations will be modified/constructed to comply with the following minimum standards or as directed by the City:

  1. All structures will be non-combustible with aesthetic exterior treatment as directed by the City;

  2. All buildings will have adequate electrical, heating, cooling, ventilation, insulation, lighting, instrumentation and telemetry, drainage, access, and work spaces as required by the City for efficient and cost effective operation and maintenance;

3. Sites will be fenced to provide screening and 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. To eliminate the need for pressure bladder tanks booster pumps shall be variable frequency drive unless otherwise allowed by the City.
- 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 and located at the Operations and Maintenance office using the City's telemetry and supervisory control system.
- Stations will be monitored with alarms for the following conditions:
    1. Pump start failure;
    2. Power phase failure;
    3. Power outage/generator running;
    4. Communication failure;
    5. Water in structure;
    6. Low suction pressure;
    7. High discharge pressure;
    8. Intrusion;
    9. Smoke detector;
    10. Chlorine gas leak;
    11. Other as required.
- The following indicators shall be provided at the station and at the Operations and Maintenance office:
    1. Real time flow indication and totalizing;
    2. Real time suction and discharge pressure;
    3. Recording of combined supply flow to the system;
    4. Other as required.
- 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 per City standard.
- 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 pressurizing in case of a pressure reducing valve failure and will be sized by hydraulic analysis.

Control

The City's control system must be capable of efficiently operating the water system's components in accordance with this Plan, and in response to reservoir levels, system pressures, abnormal system conditions, electrical power rate structure and water costs. The system must be reliable and kept up to date to avoid disruption of customer water service and maintain efficient use of water supplies.

Maintenance

- Facility and equipment breakdown is given 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 equipment items whose failure will impact the ability to meet other policy standards.
- Equipment 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, 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 descriptions. The City will provide the resources necessary for personnel to obtain the required level of operator certification and to encourage pursuit of advanced certification.
- Maintenance will be performed by the water maintenance staff or other approved sources and

supervised by the Certified Water System Operator.

- Detailed operation and maintenance manuals will be kept of all facilities and equipment, with identical copies stored with the equipment in the field or at the City's maintenance shop. Manuals will be kept current.
- Written records and reports showing operation and maintenance history will be maintained on each facility and item of equipment.

Joint-Use

- All joint-use facilities (with other public water systems) must comply with City of Enumclaw policy and design standards.
- All joint-use facilities will be maintained by the City Water Department.
- 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 utilizing standards established by the AWWA.
- Rates and additional charges established for the City should be:
    1. Cost-based rates which 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;
    3. Adequate and stable source of funds to cover the current and future cash needs of the City.
- Existing customers of the City 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, as well as increase 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, each year an amount should also be set aside and retained for capital expenditures, which will cover some portion of the depreciation of the physical plant. The amount may be transferred from the Operations and Maintenance Fund to the Water Improvement Fund for general purposes or for specific purposes.
- Sufficient reserves will be maintained to cover unanticipated emergencies and fluctuations in cash flow.

Charges

Owners of properties that have not been assessed, charged, or have not 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 system.

1. 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 water system extensions and facilities.
2. Connection Charge: The connection charge will be assessed against any property that has not participated in the development of the water system. Meter charges, or hookup fees, are additional in order to recover the cost of meter and service line installation. Credit for existing meters will be given when upgrading to a larger meter size.
3. Developer Extension Charges: These charges are for the administration, review, and inspection of a developer extension project.

ORGANIZATIONAL POLICIES

Staffing

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

Relationship with Other Departments

- The Finance and Public Works Departments are responsible for customer billing, payment collection, project cost accounting, and fund activity reporting.
- The Human Resources and Public Works Departments are responsible for employee records, union labor negotiations and salary schedules.
- The Police Department and Public Works Departments are responsible for enforcement response to violations of City water ordinances and policies.

- Fire Districts 28 and 44 use water utility facilities for fire protection and establishes fire flow requirements.
- Fire Districts 28 and 44 is responsible for emergency responses to hazardous events at water system facilities.
- The Public Works Department is responsible for hydrant fire flow testing.
- The Building and Public Works Department coordinate on cross-connection control reviews and issues. The Public Works Department will maintain a combined cross-connection control database for backflow devices required by the department for protection of the water system and by the Building Official for fixture backflow devices required by the International Plumbing Code.
- The Public Works Department will coordinate with the King County Department of Development and Environment Services for ensuring that backflow device database is kept current for unincorporated King County and to ensure that protection is commensurate with the degree of hazard.

CHAPTER 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 Enumclaw's 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

Water supply to the City's water system is normally provided from four water sources to the east of the City: Boise Spring, Watercress Spring and Well, and PC Johnson Wellfield. The City also has an emergency intertie with the City of Tacoma. Boise Spring is located approximately one-half mile east of the city limits, just south of SR 410 and Boise Creek, whereas Watercress Spring and Well are located near the intersection of 280th Avenue SE and SE 436th Street. The PC Johnson Wellfield is located at the intersection of SE 424th Street and 284th Avenue SE and is comprised of two individual wells. In general terms, the City's water right sources fall within the Puyallup and Green River basins, but because of their senior priority dates they are not subject to the instream flow rules prescribed for those river basins. Additional information on each of the City's existing sources is presented in **Chapter 2** and contained in **Appendix B**.

Water Treatment

All water that is produced by the City is chlorinated to disinfect and kill harmful bacteria that may be present in the water. Chlorination is achieved through a chlorine gas disinfection system located on site at Watercress Springs and the PC Johnson Wellfield. Boise Spring's chlorine gas disinfection is accomplished at the nearby Weyerhaeuser Booster Pump Station site. Chlorine gas is fed from 150-pound cylinders.

Water supply from the spring sources is further treated to increase the pH to reduce the potential for the water to corrode metal piping. This is accomplished by injection of sodium hydroxide prior to the water entering the distribution system. The City does not add fluoride to their water sources; however, water supplied by Tacoma does contain fluoride. Additional information on each of the City's treatment facilities is presented in **Chapter 2**.

WATER RIGHTS

Overview

A water right is a legal authorization to use a specified amount of ground or surface water for beneficial uses authorized under the Washington State Water Code. The water right is typically 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, claim, or certificate.

The process for obtaining a water right generally involves submitting an application, obtaining a water right permit, and then a water right certificate. A water right permit provides permission to develop a water right by constructing and developing the diversion or withdrawal facilities for the water source. A water right permit remains in effect as long as beneficial use of the authorized quantities is undertaken with reasonable due diligence, consistent with the prescribed development schedule. A water right certificate is issued by Ecology following submittal by the water right holder of a Proof of Appropriation (PA) form which documents the actual beneficial use of the quantities stated on the form, consistent with conditions indicated on the water right permit.

A water right permit is issued by Ecology subject to investigation of the following requirements:

- Water will be put to a recognized beneficial use
- No impairment to existing rights.
- Water is available for appropriation.
- Issuance of the requested water right will not be detrimental to the public interest.

The water right decision process may consider the status of existing basin management plans, stream closures, instream flows, hydraulic continuity (surface water interconnected to groundwater), seawater intrusion, compliance with state water use efficiency rules, 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

The City currently holds twelve (12) water right certificates that authorize a total annual withdrawal (Qa) of 5,218 af/yr, and a total instantaneous withdrawal (Qi) of 5,637 gpm. Within that total number of rights, the City holds nine (9) primary rights, and three (3) supplemental rights. The City's primary sources of water are two spring sources: Boise Spring, and Watercress Springs. A summary of this water rights information is presented in **Table 6-1**. Existing sources currently utilized by the City to provide water supply to the existing system include the PC Johnson Wellfield, Boise Spring, and Watercress Spring and Well. The City's water rights certificates are presumed valid under law and their authorized quantities will

continue to be applied to beneficial use as required to meet existing and projected service area demands.

Boise Spring: S1-22798C

Boise Spring is a certificated, primary surface water right with an authorized instantaneous quantity (Qa) of 2.0 cfs (1.29 mgd) and an annual quantity (Qa) of 1,270 afy. This water right has a priority date of 1977. The right's purpose of use is for "municipal supply", and the designated place of use is "area served by the City of Enumclaw." The source water is captured by an underground collection system of perforated pipes, gravel and concrete vaults/manholes. The Boise Spring right was issued prior to adoption of the Puyallup River Basin Instream Resources Protection Program (IRPP - WAC 173-510-040) which established both closures and minimum flows on that river system, and its exercise is therefore senior in time to said flow regulations. Continued withdrawals from this source are anticipated to meet existing and projected service area demands.

Watercress Spring System

The Watercress Spring System is the City's largest water source and is comprised of two (2) certificated surface water (springs) rights and one (1) certificated groundwater right. These rights are conjunctively managed. The source of this system is Watercress Springs, a tributary to Newaukum Creek. Pursuant to the water right issued for the last permitted source for this system (i.e., G1-09339C), the total primary authorized instantaneous quantity for the rights in this system are 3.29 mgd (2,286 gpm), and the total primary annual quantity (Qa) is 2,480 afy. Continued withdrawals from this source and system are anticipated to meet existing and projected service area demands.

Watercress Surface Water Right (S1-06308C/5576C)

This surface water right has an authorized instantaneous quantity (Qi) of 0.75 cfs (0.48 mgd), and a priority date of 1945. This right authorized the first source developed for the Watercress system. No annual quantity (Qa) is stated on the certificate (pre-1965 certificate). However, the Department of Ecology has calculated an authorized Qa of 540 afy (ROE for PC Johnson 2/G1-24918C - 1986). The water right's purpose of use is stated as "domestic supply", now recognized as "municipal supply purposes" under RCW 90.03.015, and the designated place of use is the area served by the "City of Enumclaw." The source water is collected by either an underground, bottomless vault with pipe penetrations through the walls of the vault and/or a 20-inch well that is approximately 52 feet deep with screens set from 22 feet to 42 feet.

Watercress Surface Water Right (S1-10594C/5579)

This surface water right has an authorized instantaneous quantity (Qi) of 1.0 cfs (.65 mgd), and a priority date of 1951. No annual quantity (Qa) is stated on the certificate (pre-1965 certificate). However, the Department of Ecology has calculated an authorized Qa of 720 (ROE for PC Johnson 2/G-24918C - 1986). The water right's purpose of use is for "municipal purposes", and

the designated place of use is the area served by the "City of Enumclaw." The source water is collected as referenced above for S1-06308C.

Watercress Groundwater Right (G1-09339C/6894-A)

This groundwater right has an authorized instantaneous quantity (Qi) of 1,500 gpm (2.17 mgd), and an annual quantity (Qa) of 1,220 afy. The priority date for this right is 1968. This right was the last source developed for the Watercress system. The water right's purpose of use is for "municipal supply", and the designated place of use is the "area served by the City of Enumclaw." The source water is collected as referenced above for S1-06308C.

PC Johnson Wellfield

The PC Johnson Wellfield is comprised of two (2) certificated groundwater rights; one primary and one supplemental right which are conjunctively managed as a wellfield. This source falls within the Green River basin. Pursuant to the water right issued for the last permitted source for this system (i.e., G1-24918C), the total authorized instantaneous quantity for the rights in this system is 1,500 gpm (2.17 mgd), and the total annual quantity (Qa) is 1,680 afy. Continued withdrawals from this source and system are anticipated to meet existing and projected service area demands.

PC Johnson 1: G1-23600C

This primary groundwater right has an authorized instantaneous quantity (Qi) of 550 gpm (0.79 mgd), and an annual quantity (Qa) of 880 afy. The priority date for this right is 1980. The water right's purpose of use is for "municipal supply", and the designated place of use is the "area served by the City of Enumclaw." This right was the first source developed as part of the PC Johnson wellfield. The source groundwater is withdrawn by a 16-inch well that is approximately 230 feet deep with screens set from 195 feet to 225 feet. A replacement well was drilled in 1997 and is designated as PC Johnson Well 3 by Washington State Department of Health to distinguish it from the well it replaced.

PC Johnson 2: G1-24918C

This groundwater right has an authorized instantaneous quantity (Qi) of 1,500 gpm (2.16 mgd) and an annual quantity (Qa) of 1,680 afy; the Qa being fully supplemental to the City of Enumclaw's existing primary rights. The priority date for this right is 1986. The water right's purpose of use is for "municipal supply", and the designated place of use is the "area served by the City of Enumclaw." This right was the second source developed as part of the PC Johnson wellfield. The source groundwater is withdrawn by a 16-inch well that is approximately 227 feet deep, with screens set from 203 feet to 224 feet.

Enumclaw Golf Course Water Rights

In 2004, King County conveyed three (3) certificated primary water rights to the City of Enumclaw (City), involving two (2) groundwater rights (3 wells), and one surface water right/intake, as part of its legal transfer of the Enumclaw Golf Course. The Enumclaw Golf Course was developed in the 1940's by King County Parks and Recreation for golf course operations. The water rights conveyed by King County to the City, which are in close proximity to Boise Creek, were originally issued to and/or secured by the King County Division of Property and Purchasing for golf course domestic and irrigation purposes. Pursuant to: (1) King County's status as a municipal water supply system under RCW 90.03.15 (Municipal Water Law); and (2) the status of of municipal golf course irrigation as a recognized proprietary and commercial purpose of municipal supply water rights, the water rights developed/acquired by King County are considered "municipal purpose" water rights.

In its 2007 water system plan update, the City documented its intention to treat the former King County water rights as municipal purpose, and to conform their respective place(s) of use to the City's existing retail service area. This conformance occurred by operation of law, in accordance with the Municipal Water Law, and specifically RCW 90.03.386(2), with the approval by Department of Health (DOH) of the 2007 water system plan update.

Golf Course Water Right 1: Certificated Surface Water Right S-5127C

This certificated surface water right has an authorized instantaneous quantity (Qi) of 0.2 cfs (90 gpm) for the purpose of irrigating 30 acres of golf course property and providing domestic supply to related facilities. The priority date for this right is 1940, and it was the first right/source issued to King County and developed to serve the golf course. The period of use for the irrigation activities appears to be seasonal, with no such limitation imposed on domestic uses. No annual quantity was designated (pre-1965 certificate), however, the City has calculated an annual quantity of approximately 60 afy based on a local water duty of 2 acre foot of water for each acre of turf. The original point of diversion for this right was from Chappel Springs, a tributary to Boise Creek and the White River. The point of diversion was changed in 1951 to allow the golf course lessee to withdraw the water from a small (gravel mining) lake in close proximity to the golf course property. The point of withdrawal was subsequently moved downstream in 1985 to a constructed pond on golf course property. Since that time, the water has been pumped from the pond into the golf course irrigation system. The water right's original purpose of was for "domestic supply and irrigation", and the designated place of use reflected the golf course property (i.e., 1st nine holes).

Golf Course Right 2: Certificated Groundwater Right G-2514-A

This certificated groundwater right has an authorized instantaneous quantity (Qi) of 126 gpm, and an annual quantity (Qa) of 80 afy. The priority date for this right is 1952 and the point of withdrawal is a well 70 feet deep. The original purpose of use of the water right, which was granted to Mr. Paul W. Moore, was for irrigation and stock watering activities within 40 acres. The season of use was continuous for stockwatering, and seasonal for irrigation. Records

indicate that shortly after Mr. Moore secured the water right (1954), it was assigned in 1956/57 to King County, along with property cited in the proposed place of use, to serve and expand golf course operations.

Golf Course Right 3: Certificated Groundwater Right G1-20890C

This certificated groundwater right has an authorized instantaneous quantity (Qi) of 550 gpm and an annual quantity (Qa) of 516 afy. The annual quantity is partially additive to the annual quantities (Qa) cited for the two golf course rights above, but limits the total Qa withdrawal to 516 afy, less the Qa amounts certificated in the golf course rights cited above. The priority date for this right, which was secured by King County Division of Property and Purchasing, is 1973. The right authorizes two wells/points of withdrawal (109 feet/60 feet deep), located in the vicinity of Boise Creek. The purpose of use of the water right is for irrigation of the golf course property. The authorized period of use is during the irrigation season. The development of this right allowed King County to complete expansion of the golf course to a full 18 holes.

Cemetery Well: Certificate No. 4239-A

This certificated groundwater right has an authorized instantaneous quantity (Qi) of 97 gpm and an annual quantity (Qa) of 28 afy for the irrigation of 14 acres. The priority date for this right is 1960 and the purpose of use is municipal (irrigation of municipal cemetery). The well depth is approximately 20 feet deep. The season of use is limited to the irrigation season (April – October).

Y Bar S Water Rights: Certificate No. CG1-20398C and CG1-20529C

Each of these certificated groundwater rights have an authorized instantaneous quantity (Qi) of 45 gpm and an annual quantity (Qa) of 18.6 afy for water supply to the former service area of the Y Bar S Water Company. The priority date of each right is 1973 and the purpose of use is year round domestic supply. The wells used to supply water under these rights have either been decommissioned or transferred to underlying property owners as except wells. The water rights have been temporarily donated into the Washington State Trust Water Right Program until December 16, 2019, or upon written notice of termination by the City.

Additional water rights information for each source may be found on the certificates and permits, which are included in **Appendix I**.

Table 6-1
Existing Water Rights

DOH No.	Description	Permit or Certificate Number	Priority Date	Primary or Supplemental Right	Surface or Ground Right	Existing Water Rights			
						Instantaneous		Annual	
						cfs	gpm	acre-ft	gpm
S01	Boise Spring	S1-22798C	02/25/1977	Primary	Surface	2.00	898	1,270	787
S02	Watercress Spring	S1-10594C	02/07/1945	Primary	Surface	0.75	337	543	337
S02	Watercress Spring	S1-6308C	08/09/1951	Primary	Surface	1.00	449	724	449
S02	Watercress Spring	G1-9339C	03/27/1968	Primary	Ground	3.34	1,500	1,220	756
S07	PC Johnson Wellfield[1]	G1-23600C	04/23/1980	Primary	Ground	1.23	550	880	545
S07	PC Johnson Wellfield[2]	G1-24918	10/16/1986	Supplemental	Ground	3.34	1,500	1,680	1,041
-	Golf Course[3]	G1-20890C	09/06/1973	Primary	Ground	1.23	550	516	320
-	Golf Course	S-5127C	09/09/1940	Supplemental	Surface	0.20	90	60	37
-	Golf Course	G-2514A	11/28/1952	Supplemental	Ground	0.28	126	80	50
-	Y Bar S	CG1-20398C	01/05/1973	Primary	Ground	0.10	45	18.6	12
-	Y Bar S	CG1-20529C	04/04/1973	Primary	Ground	0.10	45	18.6	12
-	Cemetery Well	G-4239A	08/17/1960	Primary	Ground	0.22	97	28	17
	Totals					12.56	5,637	5,218	3,235

[1]Maximum instantaneous production from PC Johnson Wellfield limited to the 1,500 gpm of Cert. No. G1-23600C.
[2]Annual portion of water right for Cert. No. G1-24918 is supplemental to Cert. No. G1-23600C and thus excluded from totals.
[3]Annual total of the Golf Course rights cannot exceed the annual right listed for Cert. No. G1-20890C.

Water Rights 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 amounts of the sources with the average day demand of the system. The supply available from the Tacoma intertie, based on the City's 1997 agreement with the City of Tacoma and the purchase of capacity on a pay-as-you-go basis, was also included in the evaluation. As shown in the table, the City has sufficient water rights (both instantaneous and annual amounts) to meet the demands of the existing customers.

Table 6-2
Existing Water Rights Evaluation

Description	Instantaneous Rights/ Maximum Day Demand (gpm)	Annual Rights/ Average Day Demand (acre-feet)	Annual Rights/ Average Day Demand (gpm)
Total Certificated Water Rights	5,637	5,218	3,235
Contracted Supply from Tacoma	424	78	144
Existing (Ave 2009-2011) Demand	2,610	1,974	1,224
Surplus (Deficient) Rights with Tacoma	3,451	3,322	2,155

Table 6-3 summarizes the results of the future water rights evaluation, which compares the water rights of the existing sources with the future 6-year and 20-year demand projections of the system. The results of the future water rights evaluation indicate the City has sufficient annual and instantaneous water rights to meet the projected average day and peak demands of the system through 2033.

Table 6-3
Future Water Rights Evaluation

Description	Instantaneous Rights/ Maximum Day Demand (gpm)	Annual Rights/ Average Day Demand (acre-ft)	Annual Rights/ Average Day Demand (gpm)
Year 2019			
Total Certificated Water Rights	5,637	5,218	3,235
Contracted Supply from Tacoma	424	78	144
Projected Demand	2,923	2,245	1,392
Surplus (or Deficient) Rights	3,138	3,051	1,987
Year 2033			
Total Certificated Water Rights	5,637	5,218	3,235
Available Supply from Tacoma	424	78	144
Projected Demand	3,581	2,750	1,705
Surplus (or Deficient) Rights	2,480	2,546	1,674

Water Supply Planning

Although the City has sufficient paper water rights to supply the water system through 2033 and beyond, facility improvements are planned to more fully utilize the existing water rights as described in **Chapter 7** and **Chapter 9**.

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 the 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 has published drinking water regulations that are contained in Chapter 246-290 of the Washington Administrative Code (WAC).

Drinking water standards have been established to maintain high quality drinking water by limiting the levels of contaminants that can adversely affect public health and are known or are likely to occur in public water systems. Regulated contaminants are grouped into two categories of standards – primary standards and secondary standards. 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. States may, however, 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 water quality does not meet the secondary standards.

Existing Regulations

The Safe Drinking Water Act (SDWA) was enacted in 1974, as a result of public concern about water quality. The SDWA sets standards for 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. EPA regulated approximately 20 contaminants between 1974 and 1986. The 1986 Amendments identified 83 contaminants that EPA was required to regulate by 1989. Implementation of the new regulations has been marginally successful due to the complexity of the regulations and the associated high costs. To rectify the slow implementation of the new 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 & IIb Rules, Phase V Rule, Surface Water Treatment Rule, Total Coliform Rule, and Lead & Copper Rule. All of the City's currently active groundwater sources are affected by these rules. EPA regulates most chemical contaminants through the Phase I, II, IIb, and V Rules.

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). The MCL's are equal to or higher than the MCLG's. However, most MCL's and MCLG's are the same, except for contaminants that are regulated as carcinogens. The health goals (MCLG's) for these 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 (SOC) - Man-made organic substances including herbicides, pesticides, and various industrial chemicals and solvents.
- Volatile Organic Chemicals (VOC) – Chemicals, as liquid, that easily evaporate into air.
- Inorganic Chemicals – 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 EPA's first response to the 1986 Amendments, was published in the Federal Register on July 8, 1987, and became effective on January 9, 1989. This rule provided limits for eight VOCs that may be present in drinking water. VOCs are used by industries in the manufacture 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 are typically encountered at dry cleaners, automotive service stations, and elsewhere in industrial processes.

Phase II & IIb Rules

The Phase II & IIb Rules were published in the Federal Register on January 30, 1991 and July 1, 1991, and became effective on July 30, 1992 and January 1, 1993, respectively. These rules updated and created limits for 38 contaminants (organics and inorganics), of which 27 were newly regulated. Some of the contaminants are frequently applied agricultural chemicals (nitrate), while others are more obscure industrial chemicals.

Phase V Rule

The Phase V Rule was published in the Federal Register on July 17, 1992, and became effective on January 17, 1994. This rule set standards for 23 additional contaminants, of which 18 are organic chemicals (mostly pesticides and herbicides) and 5 are inorganic chemicals (such as cyanide).

Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) was published in the Federal Register on June 29, 1989, and became effective on December 31, 1990. Surface water sources, such as rivers, lakes, and reservoirs (which are open to the atmosphere and subject to surface runoff), and groundwater sources that are under the direct influence of surface water (referred to as GWI sources) are governed by this rule. The SWTR seeks to prevent waterborne diseases caused by microbes, Legionella and Giardia lamblia, that are present in most surface waters. The rule requires disinfection of all surface water sources and GWI sources. All surface water sources and GWI sources must also 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. In October 2000, DOH declared that the Boise Creek and Watercress springs were not GWI sources, but are in hydraulic connection with surface water. This determination dismissed the City from the requirements of the SWTR, however disinfection is required for these sources with a minimum contact time of 6.0 mg/l-min.

Interim Enhanced Surface Water Treatment Rule

EPA proposed the Interim Enhanced Surface Water Treatment Rule (IESWTR) on July 29, 1994. The final rule was published in the Federal Register on December 16, 1998, and became effective on February 16, 1999, concurrent with the Stage 1 Disinfectants/Disinfection By-products Rule. The rule primarily applies to public water systems that serve 10,000 or more people and use surface water sources or GWI sources. The rule also requires primacy agencies (DOH) 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. Water systems affected by this rule needed to comply with it by December 16, 2001.

Long Term 1 Enhanced Surface Water Treatment Rule

This is the follow up rule to the Interim Enhanced Surface Water Treatment Rule, which became effective in December of 1998. The final Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) was published on January 14, 2002 and became effective February 13, 2002. The rule addresses water systems using surface water or groundwater under the direct influence of surface water serving fewer than 10,000 people. The rule extends protections against Cryptosporidium for smaller water systems.

Total Coliform Rule

The Total Coliform Rule was published in the Federal Register on June 29, 1989, and became effective on December 31, 1990. The rule set both health goals (MCLG's) and legal limits (MCL's) for total coliform levels in drinking water, and the type and frequency of testing that is required for water systems. The rule requires more monitoring than under the prior requirements, especially for small systems. In addition, every public water system is required to develop a coliform monitoring plan, subject to approval by DOH.

Coliforms are a group of bacteria that live in the digestive tract of humans and many animals, and are excreted in large numbers with feces. Coliforms can be found in sewage, soils, surface waters, and vegetation. The presence of any coliforms in drinking water indicates a health risk and potential waterborne disease outbreak, which may include gastroenteric infections, dysentery, hepatitis, typhoid fever, cholera, and other infectious diseases.

The rule established the health goal for total coliforms at zero. To comply with the legal limit, systems must not find coliforms in more than five percent of the samples taken each month. For smaller systems like Enumclaw that take fewer than 20 samples per month, one sample that contains coliforms would exceed the legal limit and trigger the follow-up sampling requirements.

Lead & Copper Rule

The Lead and Copper Rule was published in the Federal Register on June 7, 1991, and became effective on December 7, 1992. On January 12, 2000, the EPA published some minor revisions to the rule in the Federal Register, which primarily improved the implementation of the rule. The rule identifies "action levels" for both lead and copper. An action level is different than a MCL in that a 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 the source of lead. Corrosion control is typically accomplished by increasing the pH of the water to make it less corrosive, reducing its ability to breakdown water pipes and absorb lead or copper.

Lead is a common metal found throughout the environment in lead-based paint, air, soil, household dust, food, certain types of pottery, porcelain, pewter, and water. Lead can pose a significant risk to health 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 down normal mental and physical development of growing bodies.

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 can also lead to serious health problems in people with Wilson's disease. Long-term exposure to elevated levels of copper in drinking water could also increase the risk of liver and kidney damage.

Radionuclides Rule

EPA established interim drinking water regulations for radionuclides in 1976, under the Safe Drinking Water Act. MCL's were established for alpha, beta and photon emitters, and radium 226/228. Radionuclides are elements that undergo a process of natural decay and emit radiation in the form of alpha or beta particles and gamma photons. The radiation can cause various kinds of cancers, depending on the type of radionuclide exposure from drinking water. The regulations address both man-made and naturally occurring radionuclides in drinking water.

The 1986 Amendments to the SDWA finalized the regulations for radionuclides by eliminating the term "interim". The Amendments also directed EPA to promulgate (publish as law) health-based maximum contaminant level goals, as well as maximum contaminant levels. EPA failed to meet the statutory schedules for promulgating the radionuclide regulations, which resulted in a lawsuit. In 1991, EPA proposed revisions to the regulations; but a final regulation based on the proposal was never promulgated. The 1996 Amendments to the SDWA directed EPA to revise a portion of the earlier proposed revisions, adopt a schedule, and review and revise the regulations every six years, as appropriate, to maintain or improve public health protection. Subsequent to the 1996 Amendments, a 1996 court order required EPA to either finalize the 1991 proposal for radionuclides or to ratify the existing standards by November, 2000.

The final rule was published in the Federal Register on December 7, 2000 and became effective on December 8, 2003. The rule established an MCLG of zero for the four regulated contaminates and MCL's of 5 pCi/L for combined radium-226 and radium-228, 15 pCi/L for gross alpha (excluding radon and uranium), 4 mrem/year for beta particle and photon radioactivity, and 30 ug/L for uranium.

Wellhead and Watershed Protection Program

All federally defined Group A public water systems that use groundwater as their source are required to develop and implement a wellhead protection program. In addition, purveyors of water systems using surface water or groundwater under the direct influence of surface water (GWI) as their source are also required to develop and implement a watershed control program. The Washington State mandate for Wellhead Protection and Watershed Control Programs are in WAC 246-290-135, which became effective in July of 1994. In Washington State, DOH is the lead agency for the development and administration of the State's Wellhead Protection and Watershed Control Programs.

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. A watershed control program is an effort to identify and inventory any existing contaminant in the surface water and prevent any additional contaminants from entering the water system. All required elements of a local Wellhead Protection and Watershed Control Program must be documented and included in either the Comprehensive Water System Plan (applicable to Enumclaw) or Small Water System Management Program document (not applicable to Enumclaw). Because the City does not have any surface water or GWI sources, they are not required to prepare a watershed control program. A copy of the City's Wellhead Protection Program is contained in **Appendix J** of this plan.

Consumer Confidence Report

The final rule for the Consumer Confidence Report (CCR) was published in the Federal Register on August 19, 1998, and became effective on September 18, 1998. Minor revisions were posted in the Federal Register on May 4, 2000. The Consumer Confidence Report is the centerpiece of the right-to-know provisions of the 1996 Amendments to the Safe Drinking Water Act. All community water systems, like Enumclaw, were required to issue the first report to customers by October 19, 1999. The annual report must be updated and re-issued to all customers by July 1 of each year thereafter.

The CCR is a report on the quality of water that was delivered to the system during the previous 12 months. The reports must contain certain specific elements; but may also contain other information that the purveyor deems appropriate for public education. Some, but not all, of the information that is required in the reports include 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 2012 Consumer Confidence Report is contained in **Appendix K** of this plan.

Stage 1 Disinfectants/Disinfection By-products Rule

Disinfection by-products (DBP's) 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 disinfection by-products themselves may pose health risks. Trihalomethanes is a category of disinfection by-products that has been regulated.

EPA proposed the Stage 1 Disinfectants/Disinfection By-products Rule (D/DBPR) on July 29, 1994. The final rule was published in the Federal Register on December 16, 1998, and became effective on February 16, 1999. The rule applies to the City of Enumclaw and most other water systems, including systems serving fewer than 10,000 people, which add a chemical disinfectant to the drinking water during any part of the treatment process. The rule reduced the MCL for total trihalomethanes, which are a composite measure of four individual trihalomethanes, from the previous interim level of 0.10 mg/L to 0.08 mg/L. The rule established MCL's and requires monitoring of three additional categories of disinfectant by-products (0.06 mg/L for five haloacetic acids, 0.01 mg/L for bromate, and 1.0 mg/L for chlorite). The rule also established

maximum residual disinfectant levels (MRDL's) 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 is met. Compliance with this rule was required by December 16, 2001 for large surface water systems (those serving over 10,000 people) and by December 16, 2003 for smaller surface water systems and all groundwater systems (i.e., City of Enumclaw).

Arsenic

EPA established interim drinking water regulations for arsenic in 1976, under the Safe Drinking Water Act. Arsenic is highly toxic, affects the skin and nervous system, and may cause cancer. The 1996 SDWA Amendments requires EPA to conduct research to assess health risks associated with exposure to low levels of arsenic. The EPA issued a proposed regulation on June 22, 2000, and allowed a 90 day public review period. The final rule, which was published in the Federal Register on January 22, 2001, was to become effective on March 23, 2001, except for certain amendments to several sections of the rule. However, on May 22, 2001, EPA announced that it was delaying the effective date for the rule until February 22, 2002 to allow time to reassess the rule and to afford the public a full opportunity to provide further input. On October 31, 2001 EPA implemented the final rule.

The rule sets the MCLG of arsenic at zero and reduces the MCL from the current standard of 0.05 mg/L to 0.01 mg/L. Systems were required to begin quarterly arsenic sampling starting January 23, 2006. Those systems that exceed the reduced MCL based on an annual average of the quarterly samples were required to coordinate with DOH regarding the implementation of improvements to reduce the level of arsenic within the water system.

Stage 2 Disinfectants/Disinfection By-products Rule

This rule is the second part of the Disinfectants/Disinfection By-products Rule, of which the Stage 1 D/DBPR became effective in February 1999. The Stage 2 Disinfectants/Disinfection By-products Rule (Stage 2 D/DBPR) was published on August 18, 2003 in the Federal Register and there was an original summer of 2004 target date for the final rule. However, the comment period was left open through April 15, 2004 and a public meeting was held January 18, 2005. The final rule was published on January 4, 2006. The EPA released this rule 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 which add a chemical disinfectant to the drinking water during any part of the treatment process. The proposed Stage 2 D/DBPR changes the calculation procedure requirement of the MCL's established in Stage 1 D/DBPR by requiring each sampling location to determine compliance with MCL's based on their individual annual average disinfectant by-product levels (termed the Locational Running Annual Average), rather than utilizing a system-wide annual average. The rule also reduced MCLG's for some disinfection by-products. Additionally, the rule requires systems to document

peak disinfectant by-product levels, and if certain criteria are met to prepare an Initial Distribution System Evaluation (IDSE) report to identify Stage 2 D/DBPR compliance monitoring sites. The schedule by which systems must be in compliance with Stage 2 D/DBPR depends upon size and type of source water, with the compliance deadline for the Enumclaw system being October 1, 2013. The impact on the City in terms of staff time and testing costs will be little different from that required by Stage 1 D/DBPR until such time the City changes the Tacoma intertie source from emergency status to seasonal. The City will then have to comply with the more rigorous reporting and frequent monitoring required of a surface water source.

Long Term 2 Enhanced Surface Water Treatment Rule

Following the publishing of the Interim Enhanced Surface Water Treatment Rule, EPA introduced the Long Term 1 Enhanced Surface Water Treatment Rule to supplement the preceding regulations. The second part of the regulations of the Long Term 1 Enhanced Surface Water Treatment Rule, which became effective in February 2002, was mandated in the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). The proposed LT2ESWTR was published in the Federal Register on August 11, 2003. The final rule was published on January 5, 2006, and applies to all systems which 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. Additional requirements include up to 2.5-log Cryptosporidium treatment in addition to existing requirements under the IESWTR and LT1ESWTR. Filtered systems which demonstrate low levels of risk are not required to provide additional treatment. Unfiltered systems under this proposed rule must achieve at least a 2-log removal of Cryptosporidium if the source water is monitored for Cryptosporidium and its mean level remains below 0.01 oocysts/L. If an unfiltered system elects not to monitor, or the mean level of Cryptosporidium exceeds 0.01 oocysts/L, the LT2ESWTR requires the system to provide a minimum 3-log removal of Cryptosporidium. All unfiltered systems 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, provide at least a 4-log virus removal, or perform state-approved risk mitigation. Lastly, the rule extends the requirement of the disinfection profiles mandated under the LT1ESWTR to the Stage 2 D/DBPR.

Since the City does not use surface or GWI water, this rule will not impact the City. However, in response to the rule the City of Tacoma decided to install filtration on its Green River supply. Operation of the new filtration system is scheduled to begin in late 2014.

Filter Backwash Recycling Rule

The 1996 SDWA Amendments required the EPA to promulgate a regulation governing the recycling of filter backwash water within public water system's treatment processes. Public water systems using surface water or groundwater under the direct influence of surface water,

which utilize filtration processes and recycling, must comply with the rule. The rule aims to reduce risks associated with recycling contaminants removed during filtration. The EPA issued a proposed regulation on June 22, 2000, and allowed a 90 day public review period. The final rule was published in the Federal Register on June 8, 2001 and became effective on August 7, 2001.

The rule requires filter backwash water 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.

Groundwater Rule

EPA published the final Groundwater Rule (GWR) on November 8, 2006, that specifies the use of disinfectants for groundwater systems, as necessary. The date for systems to be compliant with the rule was December 1, 2009. The rule requires periodic groundwater sanitary surveys, hydrogeologic assessments of wells, source water monitoring for at risk wells, correction of sensitive wells and/or eliminating the contamination and/or disinfecting, and monitoring of disinfection treatment. It is likely that the rule will require all public water systems using groundwater to disinfect at each source, unless the system qualifies for a variance or satisfies "natural disinfection" criteria. Natural disinfection criteria considers historical source water contamination, distances to nearest potential source of fecal contamination, groundwater and pathogen travel time, hydrogeologic features, and well construction standards. The City is currently disinfecting at all sources so the final rule has minimal impact on the City. The highly susceptible spring sources have sufficient contact time prior to entering distribution to provide 4-log treatment of viruses. The low susceptible PC Johnson Wellfield source also has sufficient transmission main prior to the first customer to provide 4-log treatment of viruses if at least a 0.6 mg/l chlorine residual were maintained.

The GWR requires triggered source water monitoring within 24 hours of receiving a positive total coliform distribution system sample unless there is DOH approved 4-log treatment and continuous disinfectant residual monitoring at the point of entry to distribution (compliance monitoring). The City currently monitors disinfectant residual at the spring sources only and therefore must use triggered source monitoring to comply with the rule. Under triggered source monitoring at least one sample must be taken from each source that was operating at the time of the positive distribution sample. Source samples are analyzed for fecal coliform and the results reported to DOH. An additional five samples from the same source must be taken within 24 hours if the initial source sample is fecal positive unless DOH requires immediate corrective action, such as providing an alternative source of water until the source of the contamination is identified and eliminated or treatment instituted. If any of the additional samples are fecal coliform positive corrective action is required. Unless the fecal positive source sample is invalidated by DOH, persons served by the water system must be notified of the contamination as soon as practical but no later than 24 hours after the system learns of the violation.

The GWR also requires sanitary surveys of water systems every three to five years to identify conditions that may present a sanitary or public health risk.

Unregulated Contaminant Monitoring

Under the 1996 amendments to the SDWA, EPA must publish a new list of no more than thirty unregulated contaminants every 5 years that may warrant regulation due to their potential health effects and occurrence. ERA requires water systems to sample and test for the unregulated contaminates and uses the resulting data to determine if regulation is warranted. The next round of required sampling will be conducted in 2013 to 2015.

Future Regulations

The 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 regulation that will most likely affect the City of Enumclaw is presented below.

Radon

In July of 1991, EPA proposed a regulation for radon, as well as three other radionuclides. The 1996 SDWA Amendments required 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 EPA by February 4, 2000. Final federal requirements for addressing radon were expected to be implemented in 2003, however they have not been published to date. 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, as well as tap water. The final Radon Rule publication date is unknown at this time. Results of tests conducted at all of the sources in 1998 were all below the proposed 300 pCi/L MCL.

SOURCE WATER QUALITY

This section presents the current water quality standards for groundwater sources and the results of the City's source water quality monitoring efforts.

Source Monitoring Requirements and Waivers

The City of Enumclaw is required to perform water quality monitoring at each of the 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.

In 1994, DOH 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. DOH assigned a high rating to Boise Spring and Watercress Spring and a low rating to the PC Johnson Wellfield, based on the results of the susceptibility assessment survey of each source.

All sources were waived from testing for ethylene dibromide (EDB) and other soil fumigants, dixon, endothall, diquat, insecticides, and glyphosphate through December 2013. Some of the sources received waivers for the same period for VOCs, pesticides, and herbicides. Asbestos sampling was waived for all sources through 2019.

Source Monitoring Results

The City has maintained compliance with source monitoring requirements with no contaminant exceeding regulated maximum contaminant levels. In the latest arsenic, VOC, SOC, and radionuclide tests for each source, no regulated contaminants were detected. Nitrate monitoring has also been performed once per year with the average level for each source for the past 5-years being less than 1.9 mg/l. The results of inorganic chemical monitoring indicate that all primary and secondary standards were met, including levels of manganese at the PC Johnson Wellfield which have exceeded the secondary standard in the past.

TREATMENT AND DISTRIBUTION SYSTEM WATER QUALITY

Monitoring Requirements and Results

The City of Enumclaw is required to perform treatment and distribution system water quality monitoring in accordance with WAC 246-290. The City has been in compliance with all monitoring requirements with the exception of missing disinfection byproduct sampling in 2008. A notice of the violation was published in the 2009 Consumer Confidence Report and the 2008 sampling conducted in 2009 along with the disinfection byproduct sampling scheduled for 2009.

A summary of the results of the treatment and distribution system water quality monitoring within the City's system is presented below.

Disinfectant Residual Concentration and Chlorine Contact Time (CT)

The City must comply with disinfectant residual concentration requirements for treated groundwater in hydraulic connection with surface water at the Watercress and Boise Springs, both being deemed highly susceptible to contamination. Disinfection requirements applicable to the springs are contained in WAC 246-290-451, which states that a disinfectant residual concentration shall be detectable in all active parts of the distribution system and a minimum contact time of 6.0 mg/L-min shall be provided before the first connection to provide 4-log inactivation for viruses. Table 6-4 shows the CT provided for the springs based on the typical targeted chlorination residual at the treatment plant. To verify adequate contact time, chlorine residual is noted daily from each continuous analyzer located at the point of injection and a grab

sample measurement is taken once at week at the point of entry to the distribution system. The P.C. Johnson Well Field is not subject to a minimum contact time requirement and has a typical initial target residual of 0.4 mg/l.

Table 6-4
CT Provided at the Spring Sources

CT Provided	Pipe Length	Pipe Diameter	Pipe Volume	Flow Rate	Water Velocity	Detention Time	Free Chlorine Residual	CT available	Inactivation Ratio
	ft	inches	cf	gpm	ft/s	minutes	mg/l	mg-min/l	
Boise Springs	4080	10	2224	898	3.7	18.5	0.50	9.3	1.5
Watercress	5800	15.23	7337	2289	4.0	24.0	0.55	13.2	2.2
Weyerhaeuser	4520	6	887	50	0.6	132.8	0.50	66.4	11.1

The City's chlorination target is to maintain a residual disinfectant concentration of at least 0.2 mg/L throughout the distribution system. Weekly samples collected and submitted for coliform testing are also tested for disinfectant residual concentration to ensure the disinfectant residual meets the regulatory requirements and achieves the minimum target level. A random location in the distribution system is also tested on a daily basis. The results of the residual disinfectant concentration and CT tests are submitted monthly to DOH in compliance with the regulations.

Because Enumclaw's intertie is upstream of Tacoma's disinfection compliance point, an automated system installed at the City's intertie continuously monitors chlorine, pH, temperature, and disinfectant contact time to ensure that water drawn from the Tacoma main meets minimum disinfection treatment standards prescribed by federal and state regulations.

Coliform Monitoring

Based on the residential population listed in the City's Water Facilities Inventory Form in **Appendix A**, the City is required to collect a minimum of fifteen coliform samples per month from different locations throughout the system. The City's Coliform Monitoring Plan is located in **Appendix L**. The results of coliform tests have all been satisfactory dating back to prior to 2004.

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. This is in addition to the triggered source monitoring requirements discussed in the Groundwater Rule section earlier in this chapter. These repeat samples shall be taken and submitted for analysis within 24-hours after receiving the unsatisfactory result. Actions that must be taken in response to an unsatisfactory result depend upon whether an acute or non-acute MCL violation has occurred as defined by WAC 246-290-310. Public notification requirements are discussed in the Emergency Response Plan in **Appendix M**.

Disinfectants/Disinfection By-products Monitoring

Because the City adds chlorine disinfectant at its sources, monitoring for disinfection byproducts is required. In October 2013 new monitoring requirements take effect under Stage 2 regulations. A copy of the Stage 2 monitoring plan is included in Appendix L.

Lead and Copper Monitoring

Lead and copper monitoring results are shown in Table 6-5. Levels dropped significantly after the Corrosion Control Facility was brought on-line in 2002 to adjust pH in the water supplied by Boise and Watercress Springs. Because 90th percentile concentrations have been less than the federal action level the City qualifies for reduced monitoring frequency of 30 sample sites every three years rather than 60 sites every year.

Table 6-5
Lead & Copper Monitoring Results

	# of samples	90th % Pb	90th % Cu
1992	71	0.01	2.94
Jan-04	61	<0.002	0.37
Aug-04	60	0.003	0.47
Aug-07	37	0.002	0.29
Aug-10	31	0.003	0.48

Sample sites were selected based on the known existence of lead pipes, copper pipes, and copper pipes with lead solder. All samples are “first draw tap samples” taken at a cold water tap in which water has not been drawn from the tap for at least six hours. The locations of future sample sites shall be chosen from the same as set of past sample sites, unless unavoidable conditions prevent sampling at the same locations.

pH Monitoring

The City continuously monitors pH levels of the Watercress and Boise Spring source water treated by the Corrosion Control Facility and at the Weyerhaeuser Booster Pump Station. Grab samples of these sources are tested for pH on a weekly basis and pH is measured at the weekly coliform monitoring sites.

Treatment Plant Monitoring

Amounts of chlorine and caustic soda used and water quantity produced are recorded in a monthly report to DOH. This report is also used to document measured chlorine residuals and pH..

Asbestos

Asbestos monitoring is required if the sources are vulnerable to asbestos contamination or if the distribution system contains more than ten percent of asbestos cement pipe. The City is not required to monitor for asbestos because the spring and well sources are not vulnerable to asbestos contamination and less than ten percent of the City's distribution pipe is constructed of asbestos cement pipe.

CHAPTER 7

Water System Analysis

INTRODUCTION

This chapter presents the analysis of the existing City of Enumclaw water system. Individual water system components were analyzed to determine their ability to meet policies and design criteria under both 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 psi. Pressures within a water system's distribution system are commonly as high as 120 psi, requiring pressure regulators 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 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 nine 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 and zero demands). The upper portion of the table illustrates the minimum and maximum pressures of the existing system and the lower portion of the table illustrates pressures after proposed pressure zone improvements are implemented. While this table presents the results of the evaluation of pressures based on the adequacy of the pressure zones (under static conditions), the hydraulic analysis section later in this chapter presents the results of the evaluation of pressures based on the adequacy of the water mains (under dynamic conditions).

The City is currently providing water at pressures of at least the DOH minimum pressure requirement of 30 psi to all services in each zone except for the 888, 983, and 988 Zones. The low pressure in the 988 Zone occurs in the higher elevations near the Stanridge Reservoir. The areas of the 888 and 983 Zones which experience low pressures are located east of 286th Avenue SE. These low pressure areas will be eliminated in the future when the proposed improvements described in **Chapter 9** are implemented and two zones will be consolidated into a single pressure zone. Pressures in all of the zones before and after completion of the improvements are shown in **Table 7-1**.

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				
1245 Zone	1,100	63	1,080	71
1175 Zone	1,005	74	985	82
1040 Zone	910	56	830	91
1013 Zone	870	62	820	84
995 Zone	770	97	850	63
988 Zone	940	21	790	86
983 Zone	950	14	830	66
899 Zone	820	34	740	69
888 Zone	860	13	519	160
Future System - After Proposed Improvements				
1245 Zone	1,100	63	1,080	71
1175 Zone	1,005	74	940	102
1040 Zone	940	43	830	91
1013 Zone	870	62	820	84
995 Zone	770	97	850	63
983 Zone	910	32	830	66
899 Zone	820	34	740	69
888 Zone	800	39	519	160

Several of the City's pressure zones have areas in excess of 80 psi. The highest pressures in the 888 Zone occur in the areas of the zone which lie to the north and west of the city limits. In the 988 Zone, the highest pressures exist along SE 400th Street whereas the highest pressures in the 1013 Zone occur east of the Enumclaw Golf Course. In the future system the 988 is eliminated by an expanded 1040 Zone. The highest pressures in the 1040 Zone occur in the eastern area of the zone, at the end of the cul-de-sac in SE 401st Street and near the New Horizons PRV. The highest pressures in the 1175 Zone occur along SE 464th St west 290th Ave SE.

Individual services that have pressures greater than 80 psi are required to have pressure regulators to reduce the pressures to acceptable levels per the plumbing code. In the table above, the listed pressures are calculated in the water main and the actual service pressure is lower due to the required pressure regulators. Where improvements recommended in **Chapter 9** increase pressure to services, pressure regulators will be installed on the services, if none currently exist.

SOURCE CAPACITY EVALUATION

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 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 of the system.

The combined capability of existing and proposed City sources to meet both existing and future demand requirements is presented below in **Table 7-2**. The future demand projections are without reductions from conservation efforts so if additional reductions in water use are achieved through water conservation efforts, the total source capacity required in the future will be less than that shown in the table.

Table 7-2
Water Source Capacity Evaluation

Description	Existing 2011	Future Projections 2019	Future Projections 2033
Required Source Capacity (gpm)			
Maximum Day Demand	2,186	2,923	3,581
Available Source Capacity (gpm)[1]			
Boise Spring	700	700	898
Watercress Spring	2,239	2,239	2,239
PC Johnson Wellfield	1,500	1,500	1,500
Tacoma Intertie[2]	0	0	0
Golf Course Well	0	451	451
Totals	4,439	4,890	5,088
Surplus or Deficient Source Capacity (gpm)			
Surplus or Deficient Amount	2,253	1,967	1,507

[1]Future capacity includes planned source improvements.
[2]Assumed to remain emergency source only.

The results of the analysis indicate that the City has source capacity to meet demands for the planning period.

WATER SUPPLY FACILITIES EVALUATION

The evaluation of supply facilities to determine if they have adequate capacity is based on one of two criteria, as follows. If the pressure zone that the facility provides supply into has water

storage, then the amount of supply required is equal to the maximum day demand of the zone. 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 of the zone. The higher supply requirement of the latter criteria is due to the lack of equalizing storage that is typically utilized to provide short-term supply during times of peak system demands.

The 2011 peak hour demand for zones without water storage was determined by multiplying the total system average daily demand in gpm in 2011 from Table 4-1 by the percent of demand per zone in Table 4-4 and then multiplying the result by the product of the MDD/ADD and PHD/MDD ratios. The 2019 and 2033 future PHD projections were determined by the estimating the ERU growth in ADD for each zone by a review of vacant land, applying MDD/PHD factors, and then adding the result to the 2011 PHD. Available supply to meet this PHD is the firm supply of the station.

888 Zone Facilities

Table 7-3 summarizes the supply requirements of the 888 Zone based on existing and projected water demands for the 888 Zone and the transfer amount necessary to meet the demands of the higher zones. **Table 7-3** also summarizes the current amount of water supply available to the 888 Zone based on current production rates of the supply facilities. The 888 Zone supply evaluation assumes that the Golf Course Well will be developed as a City municipal water source by 2019.

Table 7-3
888 Zone Supply Evaluation

Description	Existing 2011	Future Projections 2019	Future Projections 2033
Required Supply (gpm)			
888 Zone Max Day Demand	2,144	2,852	3,495
Transfer to Upper Zones	42	71	86
Total Required Supply	2,186	2,923	3,581
Available Supply (gpm)			
Boise Spring	700	700	898
Watercress Spring	2,239	2,239	2,239
PC Johnson Wellfield	1,500	1,500	1,500
Tacoma Intertie	0	0	0
Golf Course Well	0	451	451
Totals	4,439	4,890	5,088
Surplus or Deficient Supply (gpm)			
Surplus or Deficient Amount	2,253	1,967	1,507

The results of the analysis indicate that supply is sufficient to meet the demands of the 888 Zone for the planning period.

899/1040 Zone Facilities

The Upper New Horizons BPS supplies water to the 1040 Zone, which is a closed zone (i.e., it does not have water storage) and indirectly to the 899 Zone through the New Horizons PRV. During a fire or other high demand emergency event, flows from the Stanridge Hill Reservoir can bypass the station through a check valve and supply the zone at a reduced pressure. Therefore, the Upper New Horizons BPS is not required to supply fire flow demand to the 899/1040 Zones. **Table 7-4** summarizes the existing water supply evaluation, based on supply requirements and current pumping rates.

Table 7-4
899/1040 Zone Supply Evaluation

Description	Existing 2011	Future Projections 2019	Future Projections 2033
Required Supply (gpm)			
899/1040 Zone Peak Hour Demand	34	44	47
Available Supply (gpm)			
Upper New Horizons BPS[1]	40	80	80
Surplus or Deficient Supply (gpm)			
Surplus or Deficient Amount	6	36	33

[1]Future demand includes expansion of 1040 Zone by constructing a new BPS at the Stanridge Hill Reservoir site and removing the existing BPS. Future BPS supply to be confirmed during design.

The results of the analyses indicate that the Upper New Horizons BPS is currently able to provide water at a rate that meets the existing peak hour demand for the zones it serves. Future projections assume expansion of the 1040 Zone and a new BPS at the Stanridge Hill Reservoir site to replace the existing BPS. The proposed improvements to expand the 1040 Zone are addressed in **Chapter 9**.

983 Zone Facilities

The Lower Fairway Hills BPS currently provides water supply to the 983 Zone and indirectly to the 1175 Zone through the Upper Fairway Hills BPS. **Table 7-5** summarizes the current and future supply requirements of the 983 Zone, based on existing and projected water demands for the zone and the transfer amount necessary to meet the existing and future demands of the higher zone, which relies on the Upper Fairway Hills BPS to transfer water from the 983 Zone. **Table 7-5** also summarizes the current amount of water supply available to the 983 Zone based on the current pumping rate of the Lower Fairway Hills BPS. This capacity will be increased with the relocation of the Lower Fairway Hills BPS to a combined facility with the planned Golf Course Well discussed in Chapter 9. This CIP would expand the 983 pressure zone to correct existing pressure deficiencies in the southeast portion of the existing 888 zone.

Table 7-5
983 Zone Supply Evaluation

Description	Existing 2011	Future Projections 2019	Future Projections 2033
Required Supply (gpm)			
983 Zone Max Day Demand	11	27	29
Transfer to Upper Zones[1]	2	4	4
Total Required Supply	13	31	33
Available Supply (gpm)			
Lower Fairway Hills BPS	33	200	200
Surplus or Deficient Supply (gpm)			
Surplus or Deficient Amount	20	169	167

[1]Transfer to upper zones provided by the Upper Fairway Hills BPS.

988 Zone Facilities

The Lower New Horizons BPS currently provides all water supply to the 988 Zone and indirectly to other zones through the Upper New Horizons BPS. **Table 7-6** summarizes the current and future supply requirements of the 988 Zone, based on existing and projected water demands for the zone and the transfer amount necessary to meet the existing and future demands of other zones which rely on the Upper New Horizons BPS to transfer water from the 988 Zone. **Table 7-6** also summarizes the current amount of water supply available to the 988 Zone based on the current pumping rate of the BPS. The results of the analysis indicate that the capacity of the Lower New Horizons BPS is sufficient to meet both the existing and future demands of the 988 Zone.

Table 7-6
988 Zone Supply Evaluation

Description	Existing 2011	Future Projections 2019	Future Projections 2033
Required Supply (gpm)			
988 Zone Max Day Demand[1]	2	0	0
Transfer to Other Zones[2]	19	24	26
Total Required Supply	21	24	26
Available Supply (gpm)			
Lower New Horizons BPS	80	80	80
Surplus or Deficient Supply (gpm)			
Surplus or Deficient Amount	59	56	54

[1]Future demand of 0 due to expansion of 1040 Zone eliminating any connections in the 988 Zone.
[2]Transfer to other zones provided by the Upper New Horizons BPS.

995 Zone Facilities

The Highview BPS currently provides all water supply to the 995 Zone. **Table 7-7** summarizes the current and future supply requirements and the water supply available to the 995 Zone based on the current pumping rate of the BPS. The results of the analysis indicate that the capacity of the Highview BPS is sufficient to meet both the existing and future demands of the zone.

Table 7-7
995 Zone Supply Evaluation

Description	Existing 2011	Future Projections 2019	Future Projections 2033
Required Supply (gpm)[1]			
995 Zone Peak Hour Demand[2]	50	50	50
Available Supply (gpm)			
Highview BPS	120	120	120
Surplus or Deficient Supply (gpm)			
Surplus or Deficient Amount	70	70	70

[1]Fire flow is not required in the 995 Zone.
[2]Max recorded gpm from flow meter records. Largely due to customer lawn irrigation.

1013 Zone Facilities

The Corrosion Control Facility BPS supplies water to the 1013 Zone, which is a closed zone. **Table 7-8** summarizes the existing and future water supply evaluation, based on supply requirements and current pumping rates. Fire suppression will not provided to the 1013 Zone until the area develops. The analysis indicates that the Corrosion Control Facility BPS is sufficient to meet the current demands of the 1013 Zone. Any improvements to the 1013 Zone that may be necessary to meet fire flow requirements for future development shall be the responsibility of the developer.

Table 7-8
1013 Zone Supply Evaluation

Description	Existing	Future Projections	
	2011	2019	2033
Required Supply (gpm)[1]			
1013 Zone Peak Hour Demand	3	4	5
Available Supply (gpm)			
Corrosion Control Facility BPS	80	80	80
Surplus or Deficient Supply (gpm)			
Surplus or Deficient Amount	77	76	75

[1]Fire flow is not currently required for 1013 Zone.

1175 Zone Facilities

The Upper Fairway Hills BPS supplies water to the 1175 Zone, which is a closed zone. **Table 7-9** summarizes the water supply evaluation, based on supply requirements and current pumping rates. Fire suppression is not provided to the 1175 Zone based on the lot sizes greater than 35,000 square feet in unincorporated King County.

Table 7-9
1175 Zone Supply Evaluation

Description	Existing 2011	Future Projections 2019	Future Projections 2033
Required Supply (gpm)[1]			
1175 Zone Peak Hour Demand	3	7	8
Available Supply (gpm)			
Upper Fairway Hills BPS	35	80	80
Surplus or Deficient Supply (gpm)			
Surplus or Deficient Amount	32	73	72

[1]Fire flow is not currently required for the 1175 Zone.

1245 Zone Facilities

The Weyerhaeuser BPS currently provides water supply to the 1245 Zone. **Table 7-10** summarizes the current and estimated future supply requirements of the 1245 Zone, which is based only on the total system demand in the 1245 Zone. Fire suppression is not provided by the City to the former Weyerhaeuser mill because the site has its own fire system which is fed by water from Boise Creek. **Table 7-10** also summarizes the current amount of water supply available to the 1245 Zone based on the current pumping rate of the Weyerhaeuser BPS.

Under a pending retail water service agreement with Lisa Inc, the current owner of the former Weyerhaeuser mill site, the maximum purchased capacity that the City has committed to supply is 20,000 gallons per day. This calculates to an average day demand of 13.9 gpm. Actual demand is well below the maximum allowed and there is current no long range plan for the site that would indicate that future demand for water would exceed that assumed in **Table 7-10**. Any capacity improvements to the BPS that may be necessary to meet additional demand will be the responsibility of the developer.

Table 7-10
1245 Zone Supply Evaluation

Description	Existing 2003	Future Projections 2009	Future Projections 2023
Required Supply (gpm)[1]			
1245 Zone Peak Hour Demand	1	10	25
Available Supply (gpm)			
Weyerhaeuser BPS	50	50	50
Surplus or Deficient Supply (gpm)			
Surplus or Deficient Amount	49	40	25

[1]Separate private system provides fire flow in the 1245 Zone.

Water Supply Facility Deficiencies

Several supply facility capacity and other deficiencies have been identified:

- The Upper Fairway Hills BPS needs to be replaced with a structure complying with the City's BPS policies in Chapter 5, including dedicated emergency power supply.
- The Lower New Horizons BPS needs a dedicated emergency power supply.
- Boise Spring's collection system is aging and will need rehabilitation to ensure the integrity of the system is maintained and to enable the full water right flow to be produced throughout the year.
- The City needs to complete the Golf Course Well to add peaking capacity redundancy to the supply system, to extend the deferral of manganese treatment at the PC Johnson Wellfield and/or use of the Tacoma intertie, and to determine the actual long term yield that the aquifer is capable of producing and can be relied on.
- The propeller source meter for Boise Spring is aging and will need to be replaced with a magnetic meter.
- The PC Johnson Wellfield produces water with high manganese levels that will likely require removal treatment in the future.

Proposed improvements to resolve the supply facility deficiencies are identified in **Chapter 9**.

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 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 below.

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 draw down 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 in the City's reservoirs is 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 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 peak hour demand 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 peak hour demand and the combined capacity of the supply sources.

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, which has multiple supply sources, is based on the standard DOH formula that requires average day demand and supply source capacity data. The amount required is sufficient to supply the system for a 48-hour period when the primary supply facility is out of service and the system is experiencing demands that are close to average day demands.

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 maximum day demand

conditions. The fire flow storage requirements shown in the analyses that follow are based on a maximum fire flow requirement of 3,000 gpm for a 3-hour duration for the 888 Zone.

Dead Storage - Volume of the reservoir that can not 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 or that is otherwise retained in the tank due to outlet piping extending above the floor of the tank. This unusable storage occupies the lower portion of most ground level reservoirs. Water that is stored below an elevation that can not provide a minimum pressure of 20 psi is typically considered dead storage.

Storage Analysis Results

The storage analyses are based on an evaluation of the existing storage facilities providing water to the three operating areas that they serve: 1) 888 Zone, 2) 983 Zone, and 3) 988 Zone. The 888 Zone operating area includes the 888, 1013 and 1245 Zones and is supplied by the Crews and City Reservoirs. The 988 Zone operating area is supplied by the Stanridge Hill Reservoir and provides storage to the 988, 1040 and 899 Zones. The 983 Zone operating area, provides water storage to the 983 and 1175 Zones from the Fairway Hills Reservoir.

Existing Storage Analysis

As shown in **Table 7-11**, the maximum combined storage capacity of the City's reservoirs is 4.74 MG when all the reservoirs are on-line. Because the City has a small number of customer meters in all the reservoir zones that are close to the reservoirs in elevation, much or all of the volume of the reservoirs would be considered dead storage since the DOH 20 psi requirement cannot be met, making the City deficient in storage. However, since the City intends to convert these customers to other pumped zoned as described in Chapter 9 the total storage in **Table 7-11** is only reduced by the dead storage in the lower portions of the reservoirs caused by elevated outlet pipes that are located above the base of the tank to prevent sediment in the tanks from entering the system.

Table 7-11 assumes that the City's 2 MG storage reservoir is on-line and shows a storage surplus of 1.49 MG. However, this reservoir was taken off-line in late 2012 and will not be returned to service due to concerns with its structural integrity. Until this reservoir is replaced the loss of its storage volume is compensated for by the City approving a reduced level of service in a temporary 20% reduction of the DOH recommended standby storage component so that there is no storage deficit. A project to replace this reservoir is included in **Chapter 9**.

Table 7-11
Existing Storage Evaluation

Description	Operating Area			Totals
	888 Zone	983 Zone	988 Zone	
Available/Usable Storage (MG)				
Maximum Storage Capacity	4.500	0.060	0.180	4.740
Dead (Non-usable Storage)	-0.421	-0.002	-0.005	-0.428
Total Available Storage	4.079	0.058	0.175	4.312
Required Storage (MG)				
Operational Storage	0.602	0.008	0.037	0.647
Equalizing Storage	0.000	0.000	0.000	0.000
Standby Storage	1.447	0.017	0.028	1.492
Fire Flow Storage	0.540	0.015	0.015	0.570
Totals	2.589	0.040	0.080	2.709
Surplus or Deficient Storage (MG)				
Surplus or Deficient Amount	1.490	0.018	0.095	1.603

Future Storage Analysis

Future storage requirements of the system were computed for the 2019 and 2033 demand projections. The analyses were performed to determine the adequacy of the City's storage facilities to meet future storage requirements. Both analyses are based on the completion of proposed improvements discussed in detail in **Chapter 9**. The results of the analyses are shown in **Table 7-12** and indicate that adequate storage is available in the operating areas through the planning period.

Table 7-12
Future Storage Projections

Description	2019 Operating Area				2033 Operating Area			
	888 Zone	983 Zone	988 Zone	Totals	888 Zone	983 Zone	988 Zone	Totals
Available/Usable Storage (MG)								
Maximum Storage Capacity	4.500	0.060	0.180	4.740	4.500	0.060	0.180	4.740
Dead (Non-usable Storage)	-0.123	-0.002	-0.005	-0.130	-0.123	-0.002	-0.005	-0.130
Total Available Storage	4.377	0.058	0.175	4.610	4.377	0.058	0.175	4.610
Required Storage (MG)								
Operational Storage	0.602	0.008	0.037	0.647	0.602	0.008	0.037	0.647
Equalizing Storage	0.056	0.000	0.000	0.056	0.064	0.000	0.000	0.064
Standby Storage	1.797	0.018	0.029	1.844	2.202	0.020	0.031	2.253
Fire Flow Storage	0.540	0.015	0.015	0.570	0.540	0.015	0.015	0.570
Totals	2.995	0.041	0.081	3.117	3.408	0.043	0.083	3.534
Surplus or Deficient Storage (MG)								
Surplus or Deficient Amount	1.382	0.017	0.094	1.493	0.969	0.015	0.092	1.076

Storage Facility Deficiencies

The following storage facility deficiencies have been identified:

- Since the City's storage reservoirs were constructed no detailed evaluation of their integrity has been conducted by a professional structural engineer. An evaluation of the 2 MG reservoir was completed in early 2013 and resulted in the recommendation to replace it. The other reservoirs are considered to be sound, but these important and expensive assets need to be maintained to last indefinitely. Therefore a thorough review is needed to identify any deficiencies and the corresponding corrective measures.
- The Crews, Fairway Hills, and Stanridge Hill reservoir sites need dedicated emergency generator systems installed to maintain telemetry function in an extended power outage.
- Various other items including improved drainage at the Crews Reservoir site, removing trees that may pose a risk to the reservoirs, resealing roof joints, and lowering the outlet riser pipe in Crews Reservoir.

Proposed improvements to resolve storage facility deficiencies are identified in **Chapter 9**.

DISTRIBUTION AND TRANSMISSION SYSTEM

This section evaluates the City's existing distribution and transmission system (i.e., water mains) to determine if they are sized and looped adequately 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 water 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 is the state mandated requirements for Group A water systems contained in WAC 246-290-230 Distribution Systems. The pressure analysis criteria states that the distribution system "…shall be designed with the capacity to deliver the design peak hour demand quantity of water at 30 psi under peak hour demand 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 maximum day demand (MDD) plus the required fire flow at a pressure of at least 20 psi at all points throughout the distribution system".

Hydraulic analyses of the existing system were performed under existing peak hour demand conditions to evaluate its current pressure capabilities and to identify existing system deficiencies. The existing system was also analyzed under existing maximum day demand conditions to evaluate the current fire flow capabilities and to identify additional existing system deficiencies. Additional hydraulic analyses were then performed with the same hydraulic model, but under future maximum day demand conditions and with proposed improvements to demonstrate that the identified improvements will eliminate the deficiencies and meet the requirements far into the future.

Hydraulic Model

Description

The City uses the EPANet v2.0 program from the US Environmental Protection Agency for hydraulic water system modeling. All water mains in the City's water system greater than 4 inches in diameter, including dead-end mains, are included in the model.

Demand Data

The hydraulic model of the existing and future systems uses demand data from **Chapter 4** distributed throughout the junction nodes of the model.

Facilities

The hydraulic model of the existing system for the pressure analysis contains all active existing system facilities with settings that correspond to peak hour demand events. All sources of supply were operating at their normal supply rates. Each BPS was modeled with its booster

pumps operating consistent with current operational practice. The reservoir levels were modeled to reflect full utilization of operational and equalizing storage. The New Horizons PRV was modeled as being in service and at its normal set point.

The hydraulic model of the existing system for the fire flow analyses contains all active existing system facilities with settings that correspond to maximum day demand events. All sources of supply were operating at their normal supply rates. Reservoir levels were modeled to reflect full utilization of operational, equalizing and fire flow storage. The New Horizons PRV was modeled as being in service and at its normal set point.

The hydraulic model of the proposed system in the year 2033 contains all active existing system facilities and proposed system improvements that are identified in **Chapter 9**. All existing sources were operating at their normal supply rates. The reservoir levels were modeled to reflect full utilization of operational and equalizing storage during the pressure analysis. During the fire flow analysis, the reservoir levels were modeled to reflect full utilization of operational, equalizing and fire flow storage. Fire flow storage requirements for the proposed system are similar to the existing system requirements. The New Horizons PRV was modeled as being in service and at its normal set point.

Calibration

Hydraulic model calibration is achieved by adjusting roughness coefficients, demands, and other parameters in the model so the resulting pressures and flows from the hydraulic analyses reasonably correlate to the pressures and flows from actual field tests under similar demand and operating conditions. An update of the model calibration has been performed using recent field flow and pressure data which was collected and compared to analyses results from the existing hydraulic model. A summary of the model calibration is included in **Appendix N**.

Hydraulic Analysis Results

Several 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 pressures throughout the system under existing peak hour demand conditions. To satisfy the minimum pressure requirements, the pressure at all water service locations must be at least 30 psi during these demand conditions. The same areas shown in **Table 7-1** that had low pressure under static conditions in the existing system had slightly lower pressures under peak hour demand conditions. These low pressure conditions will be corrected by projects identified in **Chapter 9** that expand higher pressure zones to include the existing low pressure areas within the higher pressure zones. The pumps at the Lower New Horizons were also indicated as not being able to deliver flow because of head conditions exceeding what the pumps are able to deliver. This is not considered a deficiency since the pumps would still be able to deliver flow during the night and the 988 Zone that it pumps into has nearly four times the required standby storage. There are no pipes that exceed 8 fps velocity under future peak hour demand conditions

Per Section 8.1.7 of the DOH Water System Design Manual water systems should not have pressures more than 100 psi unless it can be justified. Although there are areas with pressures greater than 100 psi in the main 888 Zone the pipe material is capable of withstanding the higher pressure and adding main line pressure reducing stations would reduce the redundancy afforded by a the bi-directional flow capability of a looped pipe network and possibly reduce fire flows.

Analyses were also performed in the zones where fire flow is required under existing and future demand conditions to determine the capability of the water system under maximum day demand conditions to provide the fire flow goals identified in **Chapter 5**. The future condition analysis included the proposed improvements identified in **Chapter 9**. More information on the analysis is contained in **Appendix N**.

There are several areas, such as dead end lines around the periphery of the water system and the New Horizons, Glacier Vista, and Fairway Hills subdivisions, where there are lot sizes less than 35,000 square feet, but only 500 gpm fire flow is available when current King County code would require 1000 gpm. This is because either the areas were originally approved at the lower level of fire flow or were served by separate, private water systems with minimal or no fire flow that the City subsequently acquired and concluded that providing a higher level of fire flow was cost prohibitive. These and other areas in the system where the local fire authority accepted fire flows lower than the general goals identified in **Chapter 5** are not considered for improvement in **Chapter 9**. Existing water mains that the fire flow analyses did identify as undersized according to actual fire flow requirements instead of the general goals are presented in **Table 7-13**. The results of the future analyses with improvements indicate that all such fire flow deficiencies are resolved with the proposed improvements identified in **Chapter 9**.

Table 7-13
Fire Flow Analysis Summary

Description	Approximate Location	Exist. Zone	Node Number	Available Fire Flow (gpm) Existing	Available Fire Flow (gpm) Future (~2033)	Goal (gpm)
Single Family Res	~SE 428th St & 257th Pl SE	888	35	305	1,430	1,000
Single Family Res	Wilson Ave & James St	888	671	390	2,450[2]	1,750
Expo Cntr Stadium	1492 Roosevelt Ave E	888	738	1,055[1]	1,400[2]	1,000

[1]Velocity in supply line under existing conditions exceeds 10 fps. Flow is less than 1,000 gpm at 10 fps velocity.

[2]Pressure at flow shown exceeds 20 psi residual. Flow based on 10 fps max velocity.

Distribution and Transmission System Deficiencies

This section presents a summary of the distribution and transmission system deficiencies that were identified from the results of the hydraulic analyses of the existing water system and also includes deficiencies not related to the capacity of the mains.

- Low pressure areas in the 888, 983, and 988 Zones need corrected as well as fire flow deficiencies identified in **Table 7-13**.

- There are undeveloped areas east and south of the City reservoir site that are too high in elevation to be served by the City's main pressure zone. These areas will require construction of a new booster pump station with high flow pumping equipment to supply the required fire flow.
- The northern and western portions of the 888 Zone have pressures exceeding 100 psi. Although maintaining the higher pressures can be justified due to the type of pipe material and the redundancy benefits of a looped system, further study should be given to whether it is possible to install main line pressure reducing stations in a way that achieves lower pressures while minimizing reductions in redundancy and/or fire flows.
- There are over 7 miles of steel or galvanized iron water mains ranging in size from less than 1 inch to 6 inches in diameter that have been identified for replacement due to their small size and tendency to corrode and leak. Most of the mains are inside the City limits.
- Areas of the system have water mains that are nearly 80 years old. No main replacements are currently planned based solely on age, but future planning needs to look proactively at replacing older mains in a scheduled program as funding allows rather than reactively based on failures.

Proposed improvements to address these deficiencies are presented in **Chapter 9**.

PRESSURE REDUCING STATIONS

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

Evaluation and Deficiencies

The City has one operational pressure reducing station in its system. The New Horizons PRV is less than twenty years old and is without deficiencies at this time.

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's system includes telemetry units at most facilities. Existing remote telemetry units are linked to the master telemetry unit with dedicated leased telephone lines or through internet virtual private networks. The City is continually upgrading the telemetry system and replacing existing equipment before it becomes outdated or obsolete. Proposed improvements to the City's telemetry and supervisory control system are contained in **Chapter 9**.

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 equivalent residential units (ERUs) it can serve. Once determined, 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 **Table 4-9** of **Chapter 4**, 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, treatment, supply, storage and transmission facilities (i.e. facility with the least capacity). The supply capacity analysis was based on the limiting capacity of the supply facilities and the system's maximum day demand per ERU. Likewise, the treatment capacity analysis was based on the limiting capacity of the treatment facilities and the system's maximum day demand per ERU. The storage capacity analysis was based on the total useable capacity of the storage facilities and the minimum standby storage requirement of 200 gal per ERU. The transmission capacity analysis was based on the total capacity of the transmission system for the supply sources and the system's maximum day demand per ERU. 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 demand per ERU. 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. The ERU-based demand data was derived from the average day demand of the system and demand peaking factors presented in **Chapter 4**.

Capacity Analysis Results

A summary of the results of the existing system capacity analysis is shown in **Table 7-14**. The results indicate that the existing water system has surplus capacity and that the most limiting factor is supply, assuming that the existing 2 MG reservoir is replaced as discussed previously.

A summary of the results of the year 2019 projected system capacity analysis is shown in **Table 7-15**. The results indicate that supply is still the system's limiting factor, but that the water system still has surplus capacity.

Table 7-14
Existing System Capacity Analysis

Demands Per ERU Basis	
Average Day Demand Per ERU (gal/day)	223
Maximum Day Demand Per ERU (gal/day)	468
Peak Hour Demand Per ERU (gal/day)	843
Treatment	
Limiting Treatment Capacity (gal/day)	11,388,483
Maximum Day Demand Per ERU (gal/day)	468
Maximum Supply Capacity (ERU's)	24,319
Supply	
Limiting Supply Rate - Source Capacities (gal/day)	6,392,160
Maximum Day Demand Per ERU (gal/day)	468
Maximum Supply Capacity (ERU's)	13,650
Storage Capacity	
Existing Standby Storage (gal)	3,095,000
Storage Requirement Per ERU (gal)	200
Maximum Storage Capacity (ERU's)	15,475
Transmission Capacity	
Limiting Transmission Capacity (gal/day)	10,575,200
Maximum Day Demand Per ERU (gal/day)	468
Maximum Transmission Capacity (ERU's)	22,582
Annual Water Rights Capacity	
Annual Water Right Capacity (gal/day)	4,658,400
Average Day Demand Per ERU (gal/day)	223
Maximum Annual Water Right Capacity (ERU's)	20,890
Instantaneous Water Rights Capacity	
Instantaneous Water Right Capacity (gal/day)	8,117,280
Maximum Day Demand Per ERU (gal/day)	468
Maximum Instantaneous Capacity (ERU's)	17,334
Maximum System Capacity	
Based on Limiting Facility - Supply	13,650
Unused Available System Capacity	
Maximum System Capacity (ERU's)	13,650
Existing (2011) ERU's	7,337
Surplus Capacity (ERU's)	6,313

Table 7-15
Future 2019 System Capacity Analysis

Demands Per ERU Basis	
Average Day Demand Per ERU (gal/day)	223
Maximum Day Demand Per ERU (gal/day)	468
Peak Hour Demand Per ERU (gal/day)	843
Treatment	
Limiting Treatment Capacity (gal/day)	11,388,483
Maximum Day Demand Per ERU (gal/day)	468
Maximum Supply Capacity (ERU's)	29,440
Supply	
Limiting Supply Rate - Source Capacities (gal/day)	7,041,120
Maximum Day Demand Per ERU (gal/day)	468
Maximum Supply Capacity (ERU's)	15,035
Storage Capacity	
Future Standby Storage Capacity (gal)	3,337,000
Standby Storage Requirement Per ERU (gal)	200
Maximum Storage Capacity (ERU's)	16,685
Transmission Capacity	
Limiting Transmission Capacity (gal/day)	10,575,200
Maximum Day Demand Per ERU (gal/day)	468
Maximum Transmission Capacity (ERU's)	22,582
Annual Water Rights Capacity	
Annual Water Right Capacity (gal/day)	4,658,400
Average Day Demand Per ERU (gal/day)	223
Maximum Annual Water Right Capacity (ERU's)	20,890
Instantaneous Water Rights Capacity	
Instantaneous Water Right Capacity (gal/day)	8,117,280
Maximum Day Demand Per ERU (gal/day)	468
Maximum Instantaneous Capacity (ERU's)	17,334
Maximum System Capacity	
Based on Limiting Facility - Supply	15,035
Unused Available System Capacity	
Maximum System Capacity (ERU's)	15,035
Projected (2019) ERU's	8,987
Unused Available System Capacity (ERU's)	6,048

CHAPTER 8

Operations and Maintenance

INTRODUCTION

The City's water operations and maintenance program consists of the following three elements.

1. Normal Operations
2. Emergency Operations
3. Preventive Maintenance

NORMAL OPERATIONS

City Personnel

The current water department staff consists of several maintenance personnel that function under the Certified Water System Operator/Assistant City Engineer. The water system tasks that are performed by the operations staff include inspection, testing, installation and repair of system facilities, routine operation and preventive maintenance, water quality sampling, regulatory compliance monitoring, record keeping, administrative tasks, general clerical work, and corrective or breakdown maintenance required in response to emergencies.

Washington State Law (WAC 246-292) requires that the City's water system is operated by one or more certified operators. In addition, specialty certification is required for backflow device testing. **Table 8-1** shows the current certifications of the City's water department staff.

Table 8-1
Personnel Certifications

Name	Position	Certification
Chris Searcy, P.E.	Public Works Director	
Scott Woodbury, P.E.	Cert Operator / Asst City Engr	WDM4, CCS
Warren Weiland	Lead Water Worker	WDS, CCS
Darren Breault	Water Worker	WDM2, BAT, CCS
Kyle Rohner	Water Worker	WDS
Kyte Ramberg	Water Worker	WDS

WDM - Water Distribution Manager; WDS - Water Distribution Specialist
BAT - Backflow Assembly Tester; CCS - Cross Connection Control Specialist

It is City's 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.

Personnel Responsibilities

In the 2012 budget, staff totaling 7.2 full time equivalents (FTEs) are charged directly to the water department. The key responsibilities of these staff that have a portion or all of their time dedicated to water department functions are summarized below.

Public Works Director (0.2 FTE) – performs complex supervisory, administrative and professional work in planning, budgeting, organizing, directing and supervising all divisions of the Public Works Department, including the water department.

Certified Water System Operator / Assistant City Engineer (1 FTE) – serves as Certified Water System Operator and supervises the operations and maintenance staff; responsible for ensuring technical competence and compliance with all current codes and criteria; coordinates and directs outside consultants and contractors on assigned projects and studies to ensure performance complies with contracts and city, state and federal specifications and regulations; prepares and administers construction and other contracts; reviews and approves all invoices and monitors budget status.

Senior CADD Technician (0.3 FTE) – maintains the CADD water system inventory map and other map exhibits and prepares construction plans and details as assigned.

Lead Water Worker (1 FTE) – provides lead direction to water department personnel and performs advanced duties and operates specialized equipment to complete the regular, emergency and recurring maintenance and operation needs of the department; performs heavy manual labor and operates heavy equipment; orders supplies and equipment and maintains the parts inventory system.

Water Worker (2 FTE) – performs regular, emergency and recurring maintenance and operation and installation work for the water department. Operates a wide range of tools and heavy equipment and performs heavy manual labor.

Meter Reader (2 FTE) – reads customer meters on a monthly basis; assists other department personnel as time allows.

Maintenance Rover (0.2 FTE) – assist other department personnel as needed, primarily in seasonal maintenance tasks.

Adminstrative (0.43 FTE) – perform file management, reporting, invoice processing, correspondence, and other clerical work in support of the department.

Available Equipment

The City has several types of equipment available for daily routine operation and maintenance of the water system. The equipment is stored at the City's maintenance shop. If additional equipment is required for specific projects, the City will rent or contract with a local contractor for the services needed. An inventory of supplies in sufficient quantities for normal system operation and maintenance and short-term emergencies is also stored at the maintenance shop. A list of major equipment and chemicals used in the normal operation of the water system is shown in **Table 8-2**.

Table 8-2
Equipment List

Water Department Equipment	Equipment Shared w/ Other Departments
CL2 H2O Neutralizer	40 kw Generator w/ Trailer
Ford Tapping Machine	Asphalt Roller
Homelite 2" & 3" Trash Pumps	Backhoe
Honda 2" Trash Pump	Bucket Truck
Honda 2 kw and 5 kw Generators	Portable Air Compressor
Hydraulic Drive	Pressure Washer
John Deere 345 Tractor	1992 Step Van
Metro Tech 810 Pipe Locator (3)	1994 Chev S10 PU (2)
Mikasa Compactor Tamper	1999 Freightliner w/ Dump FL80
Mower Trailer	1999 Chev C1 PU
Mueller Tapping Machine B-100	2001 Chev Silvarado
Rigid Model 690 Pipe Threader w/ Diehead	Miscellaneous small tools, etc.
Stihl Cut off Saws (3)	
Transmate Tapping Machine -Tapmate	**Chemical Inventory**
Valve Actuator Transmate	Chlorine (150 lb cylinders)
1974 AMC Jeep	Sodium Hydroxide (25%)
1990 Chev 3/4 Ton PU	
1991 International 4700 Dump Truck	**Communications Equipment**
1994 Chev 3/4 Ton PU	Two-Way Radios in All Vehicles
2000 Chev K25 PU	Cell Phones
2000 New Holland 555 Backhoe	
2009 Freightliner MWV/IC Step Van	
2012 Ford F250 w/ Lift Gate	
2012 Ford F250 w/ Service Body	
Miscellaneous small tools, etc.	

The Water Department utilizes several different types of communications equipment to ensure a reliable and redundant means of communication within the department. All vehicles are equipped with mobile two-way radios that are capable of communicating with similar base radios at the City's maintenance shop and with other departments. In addition, most Water Department personnel carry cell phones.

Routine Operations

Routine operations involve the analysis, formulation and implementation of procedures to ensure that the facilities are functioning efficiently and meeting pressure and water quality requirements and other demands of the system. The City's maintenance procedures are good, with repairs being made promptly, assuring customers receive high quality water service with limited interruptions.

Continuity of Service

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

Routine Water Quality Sampling

The Washington State Department of Health (DOH) has adopted regulations that specify minimum monitoring requirements for water systems. The sampling requirements depend on the population served, source type, and treatment provided. The City currently performs a total of 15 samples as required each month. A further discussion of the water quality monitoring program is contained in **Chapter 6**.

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. Backflow prevention devices are required at service connections where a potential for contamination exists. A copy of the City's Cross Connection Control Program is included in the **Appendix G**.

Recordkeeping and Reporting

DOH has enacted regulations for recordkeeping and reporting that may be found in *WAC 246-290-480* and *WAC 246-290-485*. The regulations identify recordkeeping and reporting procedures for operations and water quality testing.

Recordkeeping

WAC 246-290 requires retention of critical records dealing with facilities and water quality issues, including those summarized following:

- 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: 10 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
- Daily records of chlorine residual and water treatment plant performance: 3 years

The City's recordkeeping procedure is as follows:

1. Source meter and other facility and system status data are recorded each working day and retained at City's maintenance shop. Select data is entered into spreadsheets for analysis and trending.
2. Reports of water treatment plant performance are completed monthly.

Reporting

WAC 246-290 includes many requirements for reporting, including those summarized following

1. The City must report the following to DOH:
   - As soon as possible, but no later than within 24 hours after the violation is known: Violations assigned to Tier 1 in *WAC 246-290-71001*.
   - Within 48 hours: A failure to comply with any national primary drinking water standards or monitoring requirements
   - Within one business day: A backflow incident, per *WAC 246-290-490* (8)f.
2. The City must submit to DOH all applicable reports required by *WAC 246-290*, such as treatment plant, cross connection control, consumer confidence, and water use efficiency reports. Monthly reports are due by the tenth day of the following month, unless otherwise specified.
3. Source meter readings must be made available to DOH on request.
4. Records regarding the status of monitoring waivers must be submitted during each monitoring cycle.
5. Water facilities inventory and report form must be submitted to DOH within 30 days of any change in name, category, ownership, or responsibility for management of the water system or addition of source or storage facilities.
6. The City must notify DOH of the presence of:
   - Coliform in a sample within 10 days of notification by the testing laboratory.
   - 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.

Other Reports

Several other reports are required for other state agencies, including the Department of Revenue, Department of Labor and Industries, Department of Ecology, and the Employment Security Department. All of these reports are completed according to their instructions. Reports include:

- SARA Title III (Emergency and Hazardous Chemical Inventory Community Right-to-Know).
- Statement of Intent and Affidavit of Payment of Prevailing Wages and Notice of Completion of Public Works Contract.
- Boise Spring annual meter data.

Operations and Maintenance Records

Facilities Operations and Maintenance Manuals

Operations and maintenance manuals are available for staff reference. These manuals are kept on file at the City's maintenance shop, administration office, and at remote facilities. The City intends to maintain its policies of requiring complete operation and maintenance manuals for all new equipment and facilities.

Mapping and As-Built Drawing Records

Maintenance of drawings is essential to maintenance crews, city planners, developers and anyone else needing to know how the water system is laid out throughout the City. Enumclaw maintains a comprehensive mapping and record keeping system of the City's water system. This mapping is comprised of physical maps, historical data books and computer generated maps in AutoCAD format. Mapping of the system is a continuous process of incorporating new data from surveys, sketches and digital pictures. The drawing records are stored in the engineering office and are maintained by the Public Works Department staff.

Operation and Maintenance Records

Records are stored at the maintenance shop and administration office include the following items:

- Hydrant repairs
- Pump motor tests
- Well sounding and static water levels
- Water production
- Material inventory
- Water main flushing
- Bacteriological and other water quality test reports
- Chlorination levels

- Meter records
- Customer complaints
- Backflow and cross-connections

Safety Procedures and Equipment

Safety is the concern and responsibility of all water operations and maintenance staff. To maintain the highest level of safety, the City has taken steps toward educating its staff and providing resources to ensure a safe working environment. All water workers with operation and maintenance responsibilities must be certified by DOH and maintain that certification through continuing education. Safety training classes in first aid, CPR, traffic safety and flagging, asbestos cement pipe, trenching, equipment operation, lockout and tagout procedures, chemical handling, confined space entry and equipment calibration are required.

The following identifies procedures to be followed for operations and maintenance tasks that involve the most common potential work place hazards in the City's water system.

Use of Chlorine or Chlorine Products

Handle with care, provide adequate ventilation, wear safety glasses, and rubber gloves. Two staff members must be present during replacement of empty chlorine bottles. Following the exchange a check is made for leaks with ammonia fumes.

Working in Confined Spaces

Follow state requirements for confined space entry.

Working in Trenches

Obtain proper training and follow all safety procedures for working in trenches.

Working Around Heavy Equipment

Obtain proper training and follow all safety procedures.

Working in Traffic Areas

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

Working on or Around Water Reservoirs

Follow proper safety procedures for working on tall structures.

Working in or Around Pump Stations

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

Working on Asbestos Cement (AC) Water Main

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

Working on Pressurized Water Main

Obtain proper training and follow all safety procedures for working with pressurized water mains.

The following includes a list of safety and first aid equipment available to Water Department staff to carry out safety procedures for operations and maintenance tasks.

- First Aid kits in each department vehicle and workshop.
- Fire extinguishers in all facilities.
- Eye wash stations at Corrosion Control Facility and Weyerhaeuser Booster Pump Station.
- Showers at Corrosion Control Facility.
- Trench shoring equipment.
- Air tester for confined spaces.
- Traffic safety equipment.
- Guards on moving parts.
- Radios and cell phones.

Environmental Awareness Practices

Protecting the environment is a high priority of the City. The operations and maintenance staff have been made aware of the City's commitment to protecting the environment through education and field training. The City recognizes that it can play a major role in protecting the environment.

Chinook salmon and bull trout were listed as a threatened species under the federal Endangered Species Act (ESA) in 1999. The City has established practices to operate, maintain, repair, improve, and expand the water system in a manner that does not adversely affect the environment. For example, the City does not allow chlorinated water to enter surface water bodies or storm drainage systems that discharge to surface water bodies.

EMERGENCY OPERATIONS

Capabilities

The City is well equipped to accommodate short-term system failures and abnormalities. Its capabilities are as follows.

Multiple Supply Capability

The City could lose the operation of one of its sources without adversely impacting its ability to meet normal demands of its customers. The City currently has a wellfield and two spring sources that could be used to provide customers with water in an emergency. Additionally, the City also has an intertie with the City of Tacoma that may be utilized in an emergency.

Multiple Reservoirs

Water storage is provided by five active reservoirs that are located at four different sites. The duplication of reservoirs, coupled with the water system's ability to transfer water between zones through a series of booster pump stations with at least two pumps each, provides 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 fire flow) and minimize impacts to the system in the event that 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 to make repairs to alleviate the emergency condition.

Emergency Telephone

Key or "on-call" personnel can be reached by the City's emergency dispatch center.

On-Call Personnel

On-call staff is equipped with a cell phone and can respond to emergency calls within 30 minutes. A list of emergency telephone numbers is available to each on-call employee. New employees are not placed on-call until they are familiar with the water system and maintenance procedures.

Material Readiness

Critical repair parts, tools and equipment are on-hand and kept in fully operational condition. As repair parts are used, they are re-ordered. Inventory is kept current and is adequate for most common emergencies that can reasonably be anticipated. The City has 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 Program

An Emergency Response Plan has been prepared as part of this Comprehensive Water System Plan and is included in **Appendix M**. The Emergency Response Plan contains a contingency operation plan for responding to emergency events, a list of water personnel responsible for making decisions in emergency situations, and other elements.

Public Notification

WAC 246-290-320 includes follow-up actions that must be taken in the event of water quality emergencies. The public notification (PN) requirements of *WAC 246-290-320* refer to Part 7, Subpart A of *WAC 246-290* and the Environmental Protection Agency's (EPA's) PN Rule, which is codified in the Code of Federal Regulations 40 CFR 141.201 through 208. PNs must provide specific health effects language provided by EPA.

The EPA PN Rule categorizes has three tiers or categories of notification. Tier 1 includes situations or violations that pose an acute health risk, such as a fecal coliform positive sample or a nitrate MCL violation. Waterborne pathogens and any other water system situation determined by DOH to pose an acute health risk are also included in Tier 1. Tier 1 requires DOH consultation and public notification as soon as practical, but within 24 hours of learning of the violation.

Tier 2 includes situations or violations that do not pose an immediate health risk but still require prompt public notification. Tier 2 includes most MCL violations, except acute bacteriological and nitrate MCL violations, and requires DOH consultation within 48 hours and public notification as soon as practical but within 30 days of learning of the violation.

Tier 3 includes situations or violations that have the lowest health risk. Tier 3 includes most monitoring violations and the detection of unregulated contaminants. Tier 3 requires DOH consultation within 48 hours and public notification as soon as practical but within 1 year of learning of the violation. These notifications can be combined with the water system's annual consumer confidence report.

The Emergency Response Plan included in **Appendix M** contains a list of television and radio resources that can be provided with public notification new releases during an emergency situation.

PREVENTIVE MAINTENANCE

Maintenance schedules that meet or exceed manufacturer's recommendations have been established for all critical components in the water system. The following schedule is used as a minimum goal for preventive maintenance.

Storage Facilities

Daily	Visual and audio inspections. Check site, meters, pressure gauges, reservoir levels, site and tank condition, and chlorine residual.
Weekly	Check security and inspect facilities for proper operation.
Annually	Check interior condition, vents, hatches, etc. Clean if required.
As Needed	Perform repairs to maintain sanitary conditions

Distribution System

Water Mains	
Annually or As Needed	Leak survey.
Annually or As Needed	Flush.
Wells and Springs	
Daily	Visual and audio inspections. Log and record volume delivered, hours run and current supply rate; check well level, meters and pressure gauges; check packing and oil level; check chlorine booster pumps, leak detector and scales; check for excessive heat and vibration of pump motors.
Weekly	Check security and clean well house.
Annually	Check all valves and screens; check control valve settings.
As Needed	Maintain electrical and mechanical equipment; paint structures and piping; calibration of equipment.
Corrosion Control Facilities	
Daily	Visual and audio inspections. Check pumps, tank levels, scales, and meters; record pH and water usage; insert pump strokes; check for leaks.
Weekly	Clean building interior.
As Needed	Maintain electrical and mechanical equipment; paint structures and piping; equipment calibration.
Booster Pump Stations and Intertie	
Daily	Log and record volume delivered, hours run and current supply rate; visual and audio inspection; check meters and pressure gauges; check packing and oil level; check for excessive heat and vibration of pump motors.

Weekly	Check security and clean building interior.
Annually	Change oil. Take inventory of parts, pumps and motors.
As Needed	Check flow meter; maintain electrical and mechanical equipment; paint structures and piping.
Engine Generator Sets	
As Needed	Replace fluids and filters in accordance with manufacturer's recommendations (or more frequently depending on amount of use). Perform tune-up; replace parts as necessary.
Pressure Reducing Stations	
Annually	Flush and check all valves and screens; check pressure settings; refurbish every five years, or as necessary.
Isolation Valves	
As Time Allows	Operate full open/closed; uncover where buried; clean out valve boxes and repair as necessary; repair and/or install valve marker posts as necessary.
Hydrants	
As Time Allows	Check for leakage and visual damage; operate and flush; check drain rate; lubricate as necessary; measure and record pressure; paint as necessary; check nozzle and cap threads, clean and lubricate per manufacturer’s recommendations; replace lost and damaged gaskets; check and operate auxiliary valve in accordance with the valve maintenance schedule; leave in open position; inspect drain system to ensure proper drainage and protection from freezing weather.
Meters	
As Time Allows	Replace meters as staffing and budget allows. Meter problems are addressed when staff become aware of them.
Air and Vacuum Release Valve Assemblies	
As Needed	Flush and inspect; repair as needed.
Blowoff Assemblies	
As Needed	Flush and inspect; repair as needed.
Backflow Prevention Devices	
Annually	Test, inspect and record status; repair as needed.
Telemetry and Control System	

Bi-monthly	Backup program and data.
Monthly	Visually inspect cabinets and panels for damage, dust and debris.
Semi-Annually	Inspect inside of cabinets and panels for damage, dust and debris; vacuum clean all modules; test alarm indicator units; clean and flush all pressure sensitive devices; visually inspect all meters to coordinate remote stations.
Daily	Check master and RTUs for proper operation; repair as necessary.

Tools and Equipment

Rolling Stock	
As Needed	Check all fluid levels and brakes.
As Needed	Replace fluids and filters in accordance with manufacturer's recommendations (or more frequently depending on type of use); preventive maintenance per manufacturer's recommendation.
Tools	
As Needed	Clean after each use; lubricate and maintain as necessary; inspect for damage and wear before each use; perform preventive maintenance per manufacturer's recommendation.

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 perform these on-going maintenance and operations schedules provide the basis for determining adequate staffing levels.

In the 2012 budget there were approximately 7.2 full-time staff equivalents (FTEs) that directly support the City's Water Department as discussed in the previous personnel responsibilities section. In June 2012 the City Council approved filling a Water Worker position that had been vacant since 2002, increasing direct support staff to 8.2 FTEs. Maintenance and meter reading account for 6 of the FTEs.

The estimated hours of work required to achieve the operational and maintenance goals of the water system is shown in **Table 8-3**. The upper section of the table identifies the staffing time requirements for preventive maintenance tasks and the lower section identifies the staffing time requirements for operations tasks. Current staffing levels fall short of that estimated to be needed to achieve the level of service as outlined. As the water system expands in the future, the need for additional staff will become even greater in order to maintain level of service. Budget constraints and level of service goals will be continually monitored so that informed decision can be made regarding staffing levels.

Table 8-3
Estimated Staffing Requirements

Description	Total Units In System	Frequency (Times/Year)	Time/Unit (Hours)	Time/Year (Hours)
Preventive Maintenance				
Hydrants	933	1	1	933
Isolation Valves	1,253	1	0.5	627
Air/Vacuum Valves	18	1	1	18
Blowoff Assemblies	107	1	1	107
Meters	5,600	0.05	2	560
Leak Survey Water Mains	142 miles	1	0.5	71
Flushing Water Mains	142 miles	0.1	2	28
Booster Pump Station	7	52	2	728
Pressure Reducing Stations	1	1	6	6
Interties	1	12	2	24
Sources	5	52	2	520
Reservoirs	5	52	2	520
Corrosion Control Facility	2	52	2	208
Telemetry and Control System	1	260	0.5	130
Operations				
Complaint Response	1	24	2	48
Facility check/reads	1	260	1.5	390
Meter Reading	5,600	12	0.05	3,360
Groundskeeping	13	26	4	1,352
Inventory	1	12	8	96
Meter Repair/Replace	100	1	4	400
Main Breaks	4	1	8	32
Locating	1	260	0.5	130
Hydrant Repairs	5	1	8	40
Service Connections	20	1	8	160
Main Connections	2	1	24	48
Water Quality Sampling	5	52	0.5	130
Admin/reporting/records	1	260	0.5	130
Total Requirements				
Total Hours Required				10,796
Total Full Time Staff Require	**(based on 1,540 hours per year per person)**			**7.0**
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

OPERATIONS AND MAINTENANCE IMPROVEMENTS

Recommended operations and maintenance improvements include the following:

- Water department staff spends a considerable amount of time reading customer water meters every month and will spend more time as the population of the City grows. An automatic meter reading system would streamline the meter reading process and have added benefits including advanced leak detection, concurrent reading of all meters, enhanced reporting and customer use information, ability to read a meter from the office for account close out, and other advantages.
- More time is needed for periodic pump performance testing, reservoir drawdown testing, generator exercising, and hydrant and valve exercising. Unfreezing the water worker position in 2012 will result in an increase in the City's level of service in these areas.
- Some of the City's water mains are located outside of paved areas. A program to regularly clear trees or other vegetation from over the mains is needed.
- The inventory map detail books need to be updated and field checked for accuracy.

CHAPTER 9

Water System Improvements

INTRODUCTION

This chapter presents proposed improvements to the City of Enumclaw (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 improvement as shown in **Table 9-2**. The improvements are organized and presented in this chapter according to the following categories.

- Water System Improvements Since Last Water System Plan
- Water Main Improvements
- Pressure Zone Improvements
- Facility Improvements
- Miscellaneous Improvements
- Other Future Improvements

The remainder of this chapter presents a brief description of each group of improvements, the basis for the cost estimates, the criteria for prioritizing, and the implementation schedule. Figure 9-2 shows the location of the CIP projects.

DESCRIPTION OF IMPROVEMENTS

This section provides a general description of each group of improvements and an overview of the deficiencies that they will resolve. Many of the improvements are necessary to resolve existing system deficiencies. A hydraulic profile of the water system with the proposed improvements is shown in **Figure 9-1**.

Water System Improvements Since Last Water System Plan

The water system has undergone several changes since the City last updated its Comprehensive Water System Plan, with several of the recommended projects from the last plan being completed. However, many projects could not be completed as scheduled due to the economic recession making it necessary to defer incurring new debt. Improvements in addition to those identified in the last plan have also been constructed. **Table 9-1** lists the CIP projects that have been completed since the last comprehensive plan. In addition to these projects, developers have also extended or relocated water mains in several areas.

Table 9-1
Improvements Completed Since Last Water System Plan

Project Description	Date
Improve Tacoma Pipeline 1 Intertie Connection	2006
Water Main Replacements (~2000')	2006/2007
Watercress Improvement Project (200 hp Replacement Well)	2008
Design Golf Course Well Project and Install New 16" Well	2009
Update Wellhead Protection Plan	2009
Acquire and Improve Y Bar S Water System	2009/2010
Replace Watercress 150 hp Well Pump Motor Starter	2010
Water Main Replacement Project (~600')	2011
Various Main Relocations, Extensions, and Replacements	2007-2012

Water Main Improvements

Most of the water main improvements listed in **Table 9-2** are replacements of existing distribution water main and are grouped in the "Annual Water Main Replacement Program" project (CIP WM1). The other water main improvements are identified as individual projects (CIP WM2 – WM5) because they will not be funded out of the annual replacement program budget. Water main improvements in addition to those identified in this Plan will likely be installed as part of development projects that will infill areas already served by the existing distribution system. These projects are not identified in this Plan and will be evaluated on a case-by-case basis as the development occurs. Any water main improvements identified to meet minimum service standards for future development shall be the responsibility of the developer.

CIP WM1: Annual Water Main Replacement Program

Deficiency: Most of the water main improvements are for replacing steel or galvanized iron ranging in size from less than 1 inch to 6 inches in diameter that have been identified for replacement due to their small size and tendency to corrode and leak. Other main replacements resolve existing system fire flow deficiencies caused by undersized water mains. Water main segments identified for replacement are listed in Table 9-3 and are illustrated in Figure 9-2.

Improvement: Replace existing water main with new ductile iron water main or high density polyethylene pipe in accordance with the City's construction standards. The selection of specific projects will be accomplished annually during the City's budget development process.

CIP WM2: Boise Spring Transmission Main Replacement

Deficiency: Portions of the existing Boise Spring transmission main, which conveys water from the spring to the City Reservoirs is constructed of asbestos cement (AC) pipe installed in 1938. The segment of the main under Boise Creek is steel encased in concrete that was apparently

installed in 1934. There is need for an isolation valve to be installed between the creek and the Weyerhaeuser booster pump station (BPS) that can be closed if the creek segment were washed out, allowing the Weyerhaeuser BPS to remain in service. Lastly, portions of the AC pipe is at risk of damage because of it shallow depth.

Improvement: Install new ductile iron water main along SR 410 from the Boise Spring to where the existing water main transitions to cast iron. A separate, early action item would be to install the isolation valve described above.

CIP WM3: Complete Loop Between Farman St and Alpine Pl

Deficiency: There is no water main connecting the water mains in Roosevelt and Battersby Avenue west of the City reservoir site until Garrett Street close to City center.

Improvement: Connect the dead end main on Farman St at the south line of the Crystalaire MHP to the dead end line in the south end of Alpine Pl. An easement across private property would be required. An isolation valve on the new main would be closed during peak demand to allow the throttling valve on the Watercress side of the City reservoir site to force water out to Crews Reservoir to keep it full. The valve would be open during rest of year, eliminating the dead end lines and creating an alternate path for water exiting the north side of the City reservoirs to reach the southern portion of the water system and vise versa.

CIP WM4: City Reservoir South Transmission Main Replacement

Deficiency: The 1938 CI 12" main from the City reservoir site to Mt. View Drive has not had any leaks or other known problems, but will likely need to be relocated when private property that it crosses develops.

Improvement: The cost and the timing for relocation of this main is the responsibility of the developer.

CIP WM5: Y Bar S Main Replacements

Deficiency: The basic premise of the City acquiring the private Y Bar S water system in 2009 was that all costs would be recovered from the customers of Y Bar S and be revenue neutral for existing City customers. This included replacement of the existing mains within the Y Bar S system financed through a rate surcharge to the customers of Y Bar S, with the surcharge revenue set aside in a separate fund.

Improvement: Replace existing water main with new ductile iron water main or high density polyethylene pipe in accordance with the City's construction standards. The selection of specific projects will be accomplished annually during the City's budget development process with costs paid out of the Y Bar S replacement fund.

Pressure Zone Improvements

The following pressure zone improvements will improve various low pressure problem areas throughout the water system. A brief description of the existing deficiency that the improvement will resolve and a description of the improvement itself are provided below.

CIP PZ1: Zone 983 South Expansion

Deficiency: A portion of the 888 Zone in the higher elevations near the southeast corner of the system contains low pressures that do not meet the minimum pressure requirements.

Improvement: The Lower Fairway Hills BPS would be demolished and a new BPS located in the same facility as the new golf course well (CIP F1) to provide water to an expanded 983 Zone. The scope of the project includes a new altitude valve for the Fairway Hills Reservoir and a new pressure reducing station between the expanded 983 zone and the 888 zone at the 284th Avenue SE/SE 472nd Street intersection.

CIP PZ2: Zone 983 North Expansion

Deficiency: A small area of land between the City's Expo Center and golf course is too high in elevation to be served by the 888 Zone. This area includes the Golf Course Club House and adjacent properties and would allow elimination of two private booster pumps and transfer of a residence to City water that is currently using a well located under the edge of the 18th Green.

Improvement: A water main would be constructed from the new BPS located in the same facility as the new golf course well (CIP F1) to provide City water service and fire protection to the subject area. A special assessment or latecomer agreement could be established to potentially recover that portion of the cost attributable to future development.

CIP PZ3: Zone 1040 Expansion

Deficiency: Properties in the upper portion of the 988 Zone in the vicinity of the Stanridge Hill Reservoir cannot be further developed due to low pressures that do not meet minimum pressure requirements. There is one existing customer in the 988 Zone that has deficient pressure at the City's water meter.

Improvement: A new BPS would be constructed on the Stanridge Hill Reservoir site to create an expanded 1040 Zone. The actual capacity and configuration of the pump station would be determined during the preliminary design phase of the project. A new 6-inch ductile iron water main would be constructed from the reservoir south, parallel to the existing 10-inch main to the tee at approximately SE 399th Street to complete a 6-inch dedicated transmission main fill line from the Lower New Horizons Pump Station to the reservoir. The 10-inch main parallel to the new 6-inch main would function as the discharge of the BPS. The existing hydrant located approximately 330 feet west of the tee would be removed as it is too close in elevation to the reservoir to be able to meet the required 20 psi residual pressure. A check valve would be installed at the Stanridge Hill site to supply water to the 1040 Zone directly from the Stanridge Hill Reservoir in the event that pressures are excessively suppressed and more flow is required

than the BPS can provide (i.e. fire flow event). The new BPS would allow the existing Upper New Horizons BPS to be demolished.

This project is assumed to be developer initiated and funded with a portion of the cost reimbursable to the developer through a latecomer agreement or other mechanism. Should City funds become available for completing the project independent of the developer, then costs would be similarly reimbursed to the City using a latecomer or separate surcharge.

CIP PZ4: Zone 1175 Expansion

Deficiency: A portion of the 983 Zone in the higher elevations in the vicinity of the Fairway Hills Reservoir contains low pressures that do not meet the minimum pressure requirements.

Improvement: Convert a portion of the existing 983 Zone to the 1175 Zone by constructing a 2-inch water main along SE 464th Street from the discharge side of the Upper Fairway Hills BPS to 288th Place SE. Transfer all water services along this alignment and in 288th Place SE from the existing 8-inch 983 Zone water main to the new 2-inch 1175 Zone water main. Remove the existing hydrant at the intersection of SE 464th Street and 290th Avenue SE because its proximity to the reservoir does not enable it to meet the required 20 psi residual pressure.

Facility Improvements

The following water system facility improvements were identified from the results of the water system analyses that are discussed in **Chapter 7**.

CIP F1: Zone 888/983 Well (Golf Course Well)

Deficiency: Since the Tacoma intertie was first installed in 1977, it was intended to be used only in an emergency, with day-to-day use deferred as long as possible because of the high cost of purchasing water from the City of Tacoma. This has continued to be the City policy on operation of the intertie. The City needs to complete the Golf Course Well to add peaking capacity redundancy to the supply system, to extend the deferral of manganese treatment at the PC Johnson Wellfield and/or use of the Tacoma intertie, and to determine the actual long term yield that the aquifer is capable of producing and can be relied on.

Improvement: This improvement includes the construction of a new well pump for the existing 16-inch diameter replacement wellhead drilled in 2007, which will provide not only irrigation supply to the Back 9 and Front 9 sections of the golf course, as did the original well it would replace, but also treated potable supply to the City's water system. A new concrete masonry unit (CMU) well station building will house the new well pump, water treatment facilities, and a BPS. The BPS would provide supply directly from the 888 to 983 Pressure Zone separate of the treated water supply from the well pump and allow expansion of the 983 Zone to correct existing pressure deficiencies. Construction of a new BPS would also eliminate the need for the Lower Fairway Hills BPS to fill the Fairway Hills Reservoir. With the construction of a new well pump and CMU building the existing golf course well building would be demolished and the well

decommissioned along with another nearby inactive well. Gas chlorination will be used to treat the groundwater for potable use. Additional improvements include installation of a permanent on-site backup generator set, reduced pressure backflow assembly on the irrigation discharge, surge relief valve, electrical and telemetry, and a fence enclosure to safeguard the new site.

The cost incurred to complete those elements of work related to the golf course irrigation would be paid for by the Water Utility in lieu of cash payments to the golf course for the transfer of a portion of the golf course water rights to the City's Water Utility for potable use.

CIP F2: Boise Spring Rehabilitation

Deficiency: Boise Spring's collection system is aging and will need rehabilitation to ensure the integrity of the system is maintained and to enable the full water right flow to be produced throughout the year.

Improvement: The scope and cost of improvements will be first confirmed through a preliminary design study with the recommended improvements constructed later.

CIP F3: City 1 MG, Crews, Fairway Hills, and Stanridge Reservoir Improvements

Deficiency: Water storage reservoirs are some of the most important and expensive assets of a water system and need to be maintained to last indefinitely. Since the City's water storage reservoirs were constructed no detailed evaluation of their integrity has been conducted by a professional structural engineer. A thorough review is needed to identify any deficiencies and the corresponding corrective measures.

Improvement: Corrective measures identified by the evaluation will be implemented with priority to safety and sanitary improvements, including resealing of interior or roof joints as needed.

CIP F4: City Reservoir Improvements

Deficiency: A structural evaluation report of the 2 MG City Reservoir was completed by the consultant MSA in early 2013. The report recommends that the 50-year old reservoir be replaced because of the potential risk of catastrophic failure and the advantages of a replacement reservoir over rehabilitating the existing reservoir. The existing reservoir leaks at an estimated rate of 160,000 gallons per day.

Improvement: Replace the 2 MG reservoir with a new concrete reservoir. The optimal size, location, and configuration would be determined during preliminary design. Other elements of the project would include:

1) piping revisions as needed for the new reservoir.
2) replacing the PLC at the City's Corrosion Control Facility (CCF) on the same site that handles the reservoir level data and other SCADA data so that the CCF can be integrated with the master PLC and computer at the City shops. The master computer installed in 2005 at the City shops would be replaced and its software upgraded to current versions and a newer, more detail alarm program installed.

3) revising the CCF's NaOH injection system to slow scaling associated with the injection of NaOH, including extending the Watercress source transmission main about 200 feet to the new 2 MG reservoir for better overfeed protection. A small booster pump would be added to the Watercress pH sample line to decrease travel time.
4) grubbing existing tree stumps, and minor regrading of less than 2 acres of the undeveloped eastern portion of the site to facilitate mowing and blackberry control.
5) fencing revisions as needed.
6) replacing the existing Boise Spring propeller source meter with a new magnetic type meter.

CIP F5: Upper Fairway Hills BPS Rehabilitation

Deficiency: The Upper Fairway Hills BPS needs to be replaced with a structure complying with the City's BPS policies in Chapter 5, including dedicated emergency power supply.

Improvement: This improvement entails construction of a concrete building for the Upper Fairway Hills BPS, new booster pumps, upgrade of the mechanical and electrical equipment, and installation of a generator for back-up power.

CIP F6: Emergency generator at Lower New Horizons BPS

Deficiency: The Lower New Horizons BPS needs a dedicated emergency power supply.

Improvement: Install an emergency generator to provide electricity to the station in the event of a power outage.

CIP F7: PC Johnson Automatic Transmission Main Control Valve

Deficiency: Currently when the PC Johnson Wellfield is to be operated, staff manually closes an isolation valve at the PC Johnson site to convert the line between the site and Crews Reservoir to a dedicated transmission main. This routes all PC Johnson water through Crews Reservoir and does provide some small level of manganese removal prior to the water entering distribution.

Improvement: A new valve controllable by the telemetry system would be installed to close on well startup and reopen on well shutdown. Most of the water produced by the wellfield would then be routed through the reservoir, but the transmission main would be returned to function as part of the distribution system when the wellfield is not operating.

CIP F8: PC Johnson Wellfield Manganese Removal (pre-design)

Deficiency: The PC Johnson Wellfield produces water with high manganese levels that will likely require removal treatment in the future. High manganese levels cause red or black staining of fixtures and laundry.

Improvement: Conduct a preliminary design study to better define the scope of improvements necessary to provide treatment for the wellfield and the related costs.

Miscellaneous Improvements

The following miscellaneous improvements are for operational efficiencies and items not covered in the other improvement categories.

CIP M1: Automatic Meter Reading System

Deficiency: Water department staff spends a considerable amount of time reading customer water meters every month and will spend more time as the population of the City grows. An automatic meter reading system would streamline the meter reading process and have added benefits including advanced leak detection, concurrent reading of all meters, enhanced reporting and customer use information, ability to read a meter from the office for account close out, and other advantages.

Improvement: Convert the existing manual water meter reading system to an automatic meter reading system.

CIP M2: Comprehensive Water System Plan Update

Deficiency: WAC 246-290-100 requires that the City's Comprehensive Water System Plan be updated every six years and submitted to the Department of Health for review and approval.

Improvement: The City will update and submit its Comprehensive Water System Plan every six years to comply with state requirements.

CIP M3: Minor Improvements & Telemetry Upgrades

Deficiency: The City's existing telemetry and supervisory control system is aging and has limited capabilities compared to new technology. Periodically minor needs arise that requires a small capital improvement project to address.

Improvement: Upgrade existing telemetry facilities on an on-going basis to enable better control and analysis of the system, such as adding pressure transducers and flow meters at the smaller booster pump stations, recording pump hours, and automating calculation of demands by pressure zone. Complete minor system improvements as the need arises.

Other Future Improvements

The following projects are considered potential candidates for inclusion in a future CIP:

- Replace Watercress Well 1 with a new well similar to Watercress Well 2.
- Install an additional well facility at the PC Johnson Wellfield and downsize the PC Johnson Well 3 pump/motor for redundancy purposes, more efficient wellfield production, and to more closely match the yield limitation of Well 3.

- Construct manganese removal treatment for the PC Johnson Wellfield.
- Create lower pressure zone(s) in west and north end of service area.
- Implement a rural area isolation valve densification project.
- Install a CL2 analyzer at the PC Johnson Wellfield.
- Install larger pumps at the Lower New Horizons BPS to fill the Stanridge Hill Reservoir more quickly.
- Replace or rehabilitate the interior liner in the 1 MG City Reservoir.
- Perform well cleaning and rehabilitation for PC Johnson Wells 2 and 3.
- Establish an emergency radio station with deployable notice boards for use in informing customers and the community of emergencies in a timely and efficient manner.
- Study opportunities for artificial aquifer recharge or aquifer storage recovery.
- Proactively replace older mains in a scheduled program as funding allows.

ESTIMATING COSTS OF IMPROVEMENTS

Detailed construction cost estimates have been prepared for projects that are "shovel ready" and need little design work to be able to go out for bids. Prior detailed cost estimates were obtained for implementing an automatic meter reading system and these are used in Table 9-2 with an inflationary adjustment. Water main improvement costs for 2013-2019 are based on what is deemed to be feasible using utility reserves. Costs beyond 2019 are preliminary and should be achievable without incurring new debt. It is expected that additional projects could also be supported from utility reserves for the period beyond 2019, but will not be added to the CIP until the next plan update.

PRIORITIZING IMPROVEMENTS

Priority of the water main improvements listed under WM1 is primarily based on leak repair history and need for coordination with other projects, with additional consideration given to the size of the benefit area of the improvement, existing fire flow requirement, and age of the main. The basis for prioritizing other improvements includes compliance with regulations, severity of the existing deficiency, safety concerns, and maintenance, capacity, and redundancy requirements.

SCHEDULE OF IMPROVEMENTS

The implementation schedule of proposed improvements shown in Table 9-2 is based on the priority criteria above and projected financial resources. The specific schedule of water mains to be replaced under the annual program would be determined during the annual budget process.

This provides the City with the flexibility to coordinate these projects with road or other projects within the same area.

The projects shown in **Table 9-2** will be used as a guide to assist in planning for future projects and establishing rates. A number of factors can affect the actual timing of the projects shown. Therefore, the City will re-evaluate the list of projects on an annual basis, recognizing that the process is dynamic and that modifications will be required.

Future Project Cost Adjustments

All cost estimates shown in the tables are presented in year 2013 dollars. Therefore, costs will need to be adjusted to account for the effects of inflation and changing construction market conditions at the actual time of project implementation.

No.	Description	20-Year Schedule of Improvements Planned Year of Project and Estimated Cost in 2013 $$									
		2013	2014	2015	2016	2017	2018	2019	Total 13-19	2020-25	2026-33
	Water Main Improvements										
WM1	Annual Water Main Replacement		$100K				$120K		$220K	$3,000K	$3,200K
WM2	Boise Spring Transmission Main Replacement			$10K					$10K		$570K
WM3	Complete Loop Between Farman St and Alpine Pl								$0K	$63K	
WM4	City Reservoir South Transmission Main Replacement				$100K				$100K		
WM5	Y Bar S Main Replacements								$0K	$600K	$600K
	Pressure Zone Improvements										
PZ1	Zone 983 South Expansion					$340K			$340K		
PZ2	Zone 983 North Expansion					$500K	$420K		$920K		
PZ3	Zone 1040 Expansion			$300K					$300K		
PZ4	Zone 1175 Expansion					$50K			$50K		
	Facility Improvements										
F1	Zone 888/983 Well					$1,440K			$1,440K		
F2	Boise Spring Rehabilitation								$0K	$20K	$300K
F3	City 1 MG, Crews, Fairway Hills, and Stanridge Reservoir Impr.			$20K	$30K				$50K		
F4	City Reservoir Improvements	$67K	$618K	$2,815K					$3,500K		
F5	Upper Fairway Hills BPS Rehabilitation					$180K			$180K	$180K	
F6	Emergency generator at Lower New Horizons BPS							$20K	$20K		
F7	PC Johnson Automatic Transmission Main Control Valve							$10K	$10K		
F8	PC Johnson Wellfield Manganese Removal (pre-design)								$0K	$50K	
	Miscellaneous Improvements										
M1	Automatic Meter Reading System							$450K	$450K	$750K	
M2	Comprehensive Water System Plan Update						$40K		$40K	$10K	$10K
M3	Minor Improvements & Telemetry Upgrades	$28K			$20K	$20K	$20K	$20K	$108K	$30K	$40K
Total Estimated Project Costs		**$95K**	**$718K**	**$3,145K**	**$150K**	**$2,530K**	**$600K**	**$500K**	**$7,738K**	**$4,703K**	**$4,720K**
Outside Rev (Loan, Developer, CFC in Lieu, Grant, LID, Other)		**$67K**	**$618K**	**$3,115K**	**$100K**	**$2,510K**	**$420K**		**$6,830K**	**$600K**	**$600K**
Water Utility Fund Revenue		**$28K**	**$100K**	**$30K**	**$50K**	**$20K**	**$180K**	**$500K**	**$908K**	**$4,103K**	**$4,120K**

Table 9-3
Water Main Replacement List

Segment Location	From	To	Length	Map Pg	Size	Material	Notes
Davis Ave	Porter St	Cole St	1330	C4	2"	Galv.	
Hillcrest Ave	Kibler Ave	Fell St	760	C4	2"	Galv.	Abandon 6" across park at James and 2" on Kibler from Hillcrest to Division
Alley btw James/Division	Hillcrest Ave	Washington Ave	480	C4	3/4"	Galv	1" that branches off this alley line can be
Alley btw Park/James	Hillcrest Ave	Washington Ave	500	C4	2"	Galv.	
Park St	Marshall Ave	Washington Ave	330	C4	2"	Galv.	Incl. 6" steel in Washington at Park
Alley btw Park/Fell	Washington Ave	Hillcrest Ave	510	C4	2"	Galv.	
Alley btw Marion/Porter	Monroe Ave	Initial Ave	900	D4	1" & 2"	Galv	
Marshall Ave	Division St	Fell St	320	C4	3/4"	galv.	
Alley btw Park/Fell	Washington Ave	Marshall Ave	250	C4	2"	Galv.	
Hillcrest Ave	Fell St	Porter St	430	C4	2"	Galv.	Connect on east to 8" line at NW corner of Hillcrest/Porter. Abandon 4" crossing to park. 8" line north of NW corner of Hillcrest/Porter intersection to be abandoned. Cap 2" xing Porter at
Alley btw Franklin/Fell	Marshall Ave	Washington Ave	300	C4	3/4" & 2"	Galv.	
Porter St	Hillcrest Ave	Washington Ave	860	C4	1" & 2"	Galv.	
Fell St	Myrtle Ave		120	D4	4" & 6"	St	Repl 6" xing Myrtle and 4" xing Fell
Franklin St	Myrtle Ave	Marshall Ave	330	D4	1"	Galv.	
Marshall Ave	Marion St	Fell St	560	D4	1" & 2"	Galv.	Incl xing of Marshall at alley btw Franklin and
Marion St	Griffin Ave	Washington Ave	890	D4	6"	Steel/W.I.	
Alley btw Marion/Porter	Myrtle Ave	Washington Ave	630	D4	1" & 1-1/2	Galv.	
Myrtle Ave	Marion St	Alley W of Wells S	440	D4	2"	Galv.	
Griffin Ave	Fell St	Franklin St	260	D4	1"	Galv.	
Griffin Ave	Marion St	East for 160'	160	D4	1-1/4"	Galv.	
Franklin St	Griffin Ave	Stevenson Ave	850	D4	1-1/2" & 2	Galv.	Initial Ave to Griffin Ave segment to be 2" so as to not have to cross Griffin with large diameter line.
Initial Ave	Marion St	Franklin St	280	D4	1"	Galv.	
Jefferson St	Jensen St	Wells St	200	C4	1"		
Alley btw Cole/Wells	Marshall Ave	Washington Ave	320	D4	3/4" & 2"	Galv.	
Alley btw Cole/Railroad	Washington Ave	Battersby Ave	600	D4	2"	Galv.	
Alley btw Cole/Railroad	Marshall Ave	Griffin Ave	570	D4	2"	Galv	
Alley btw Porter/Wells	Monroe Ave	Lincoln Ave	400	D4	2"	Galv.	
Alley btw Cole/Wells	Roosevelt Ave	Lincoln Ave	290	D4	2"	Galv.	
3rd St	Griffin Ave	South for 250'	250	D4	2"	Galv. / PE	
Lincoln Ave	Wells St	Lafromboise St	590	D5	2" & 6"	Steel/galv.	Include replacement of 6" steel crossing of Lincoln at Laframboise. 5/2011 Leak at 2032 Lincoln. Incl removing 8" valve at Wells and disconnecting 2"
Neilson Ave	Porter St	Lafromboise St	300	D5	2"	Galv.	
Wilson Ave	Porter St	Frederickson St	270	C4	2"	Galv.	
Alley btw Porter/Frederickson	Kibler Ave	Lowell Ave	300	C4	1"	Galv.	
James Street	Kibler Ave	Lowell Ave	275	C4	2" & 4"	Galv./I.P./St	Abandon Wilson to Lowell
Pioneer St	Roosevelt Ave	Lincoln Ave	320	D5	3/4"	Galv.	
Alley btw Pioneer/Harding	Roosevelt Ave	Stevenson Ave	1600	D5	1" & 2"	Galv.	
Alley btw Pioneer/Lafromboise	Griffin Ave	Lincoln Ave	2340	D5	2"	Galv.	Incl line on north side Griffin west of alley for 140'
Alley btw Harding/Garfield	Griffin Ave	Stevenson Ave	1150	D5	2"	Galv.	Incl. portion on Harding and alley s of & parallel Griffin. Abandon portion on Harding where already a
Alley btw Loraine/Garfield	Roosevelt Ave	Initial Ave	2140	D5	2" & 2"	Galv./W.I.	
Alley btw Loraine/Florence	Elmont Ave	Lincoln Ave	650	D5	2"	Galv.	
Lincoln Ave	Harding St	McKinley St	1300	D5	2"	Galv.	
Alley btw McKinley/Florence	Elmont Ave	Lincoln Ave	840	D5	2"	Galv.	
Alley btw McKinley/Semanski	Roosevelt Ave	Lincoln Ave	480	D5	2"	Galv./W.I.	
Fredrickson	Kibler Ave	Wilson Ave	250	C4	2"	Galv.	
Kibler Ave	Division St	Hillcrest Ave	265	C4	2"	Galv.	
Myrtine St	613 Myrtine	717 Myrtine	380	E5			

Table 9-3
Water Main Replacement List (continued)

Segment Location	From	To	Length	Map Pg	Size	Material	Notes
284th Ave SE	SE 440th St	SE 436th St	400	C2	2"	Galv.	Also includes abandoning 650' of 2" where parallels 8" CIP south to 284th
Marshall Ave	E of Cole St	Alley E of Cole St	80	D4	2"		
Alley btw Griffin/Kibler	Harding St	E of Harding St	230	C5	2"	Galv	
Pioneer St	Kibler Ave	S of Kibler Ave	390	C5	2"	Galv.	
Alley btw Wells/Porter	Stevenson Ave	N of Stevenson	100	D4	2"	Galv.	Serves only house on corner of Stevenson/Porter. House purchased by Mutual of Enumclaw. Abandon at main in Stevenson if Mutual demolishes house to put in parking.
SE 436th St	284th Ave SE	E of 284th Ave	950	C1	2"		
283rd Pl SE	SE 440th St	N of 440th St	250	C2	2"		
Roosevelt Ave E (SR410)	Commerce St	300' east & west	280	E2	2"	Galv.	This 2" line serves only Holdner farm and two lots adjoining Holdner to the east and fronting SR410. These 3 services should be transferred to the existing 12" main on the north side of SR410 (1 double service and 1 single) and the 2" line abandoned. The 2" line is rusting and approx. 12"
Alley btw Chinook/Davis	Bailey	Cole	300	C4	1"?	Galv?	Abandon line in alley by connecting 4 customers on north side of alley to 8" main in Chinook. Setters on Chinook already exist.
Cole St	Washington Ave	North for 270'	170	D4	1"	Galv	
SE 429th St	Porter St	West for 360'	360	B4	2"	Galv	
Lowell Pl	Harding St	E to end of 2" mai	370	C5	2"	Galv	
Initial Pl	End of cul-de-sac	End of 2"	80	D5	2"	Galv	
Jensen St	Battersby Ave	S to end of main	150	C4	1"?	Galv?	
A Ct	Melody Ln	Cul-de-sac	210	E5	2"	Galv	
B Ct	Charwila	Cul-de-sac	220	E5	2"	Galv	
D Ct	Harmony Ln	Cul-de-sac	150	E5	2"	Galv	
Scandia Ct	Harmony Ln	Cul-de-sac	150	E5	2"	Galv	
270th Ave SE	SE 416th St	N to end of main	420	Z3	2"	Galv	
218th Ave SE	S of SE 416th St	End at ~419th St	400	A10	2"	Galv	
SE 430th St	W of 284th Ave	End at ~281st Ave	210	B2	2"	Galv	
SE 428th Pl	282rd Ave	End of 2"	320	B2	2"	Galv	Includes line in cul-de-sac of 282nd Ave
283rd Ave SE	SE 428th St	Cul-de-sac	180	B2	2"	Galv	
Louise Ct	McKinley St	Cul-de-sac	170	D5	2"	Galv	
Edel Ct	McKinley St	Cul-de-sac	170	D5	2"	Galv	
234th Pl SE	SE 440th St	S to end of main	650	D8	2"	Galv	
SE 462nd Pl	287th Ave SE	E to end of 2" mai	120	F1	2"	Galv	
287th Ave SE	46221 287th Ave	46229 287th Ave	150	F1	1"	Galv	
283rd Ave SE	SE 470th St	N to end of main	290	G2	2"	Galv	
SE 468th St	SE 468th Way	W to end of main	220	G7	1"	Galv	
244th Ave SE	SE Mud Mt Rd	W to end of main	430	H7	2"	Galv	
SE 402nd St	274th Ave SE	E to end of 2" mai	220	Y3	2"	Galv	
213th Ave SE	SE 414th St	Cul-de-sac	280	Z10	2"	Galv	
SE 412th St	214th Ave SE	Cul-de-sac	270	Z10	2"	Galv	
188th Ave	SE 429th St	SR164	120	B-13	1"?	Galv?	Replace small line in private property with new main in R/W of 188th Ave. Connect taps for 4 services on west side of 188th to new main. Install blowoff on end of new main. Relocate hydrant at SE 429th/188th since hit twice.
Harding St	McHugh Ave	North to end main	1410	B-5	2"/4"	Galv/CI	Flow at fire hydrants is deficient
Chinook btw Cinkovich & Bailey	Chinook	North onto park	0	C4	3"	Galv?	Abandon line at main
Farrelly St	Griffin Ave	N to end of main	0	C6	2"	Galv	Abandon line at main after transferring services to 8"
Kibler Ave	Cinkovich		0	C4	1"	Galv	Abandon line at 10" main
Rainier Ave	Cedar St	E to end of main	290	D3	1"	Galv	Abandon line at 10" main

38730 Feet
7.3 Miles

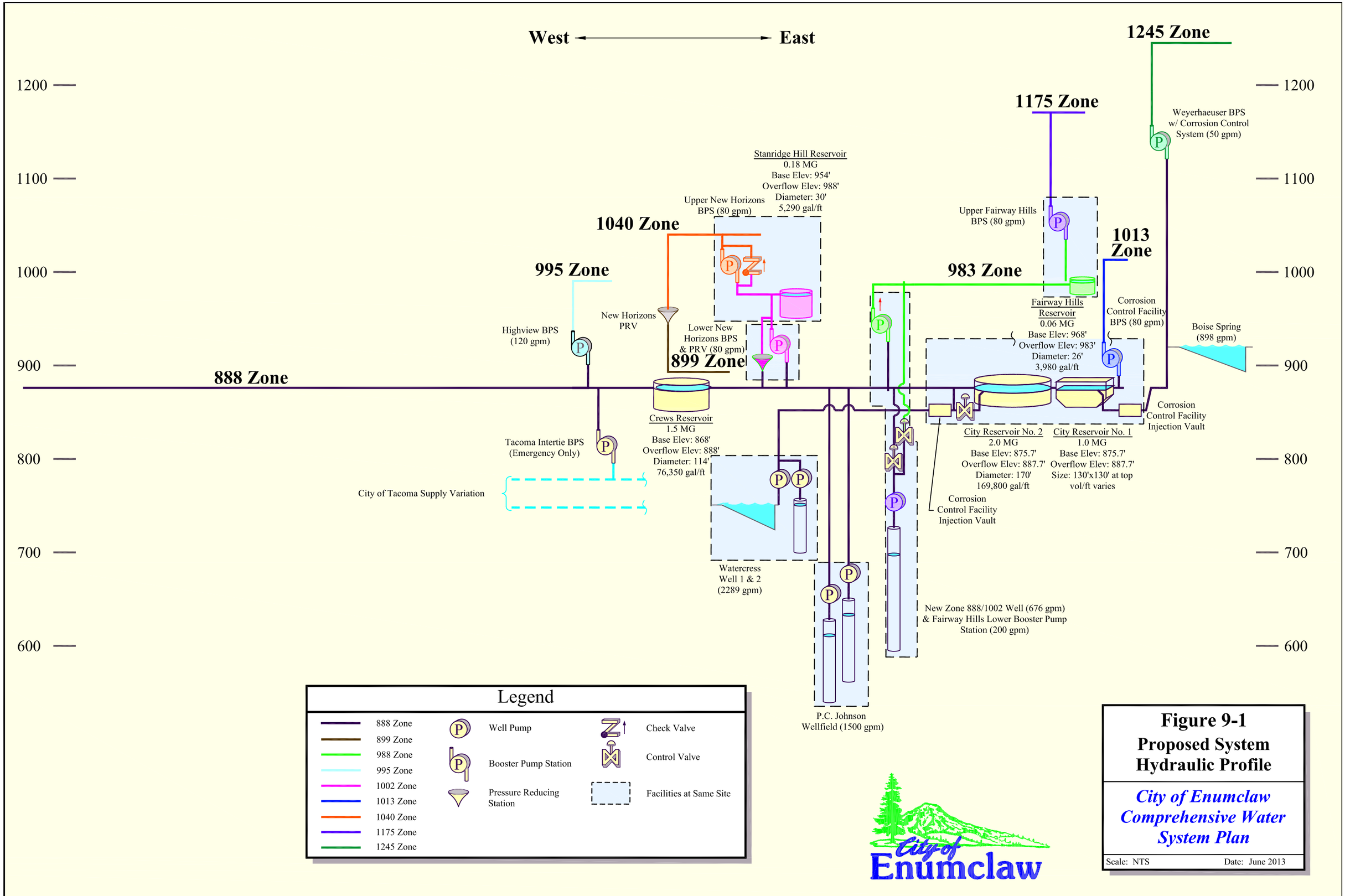
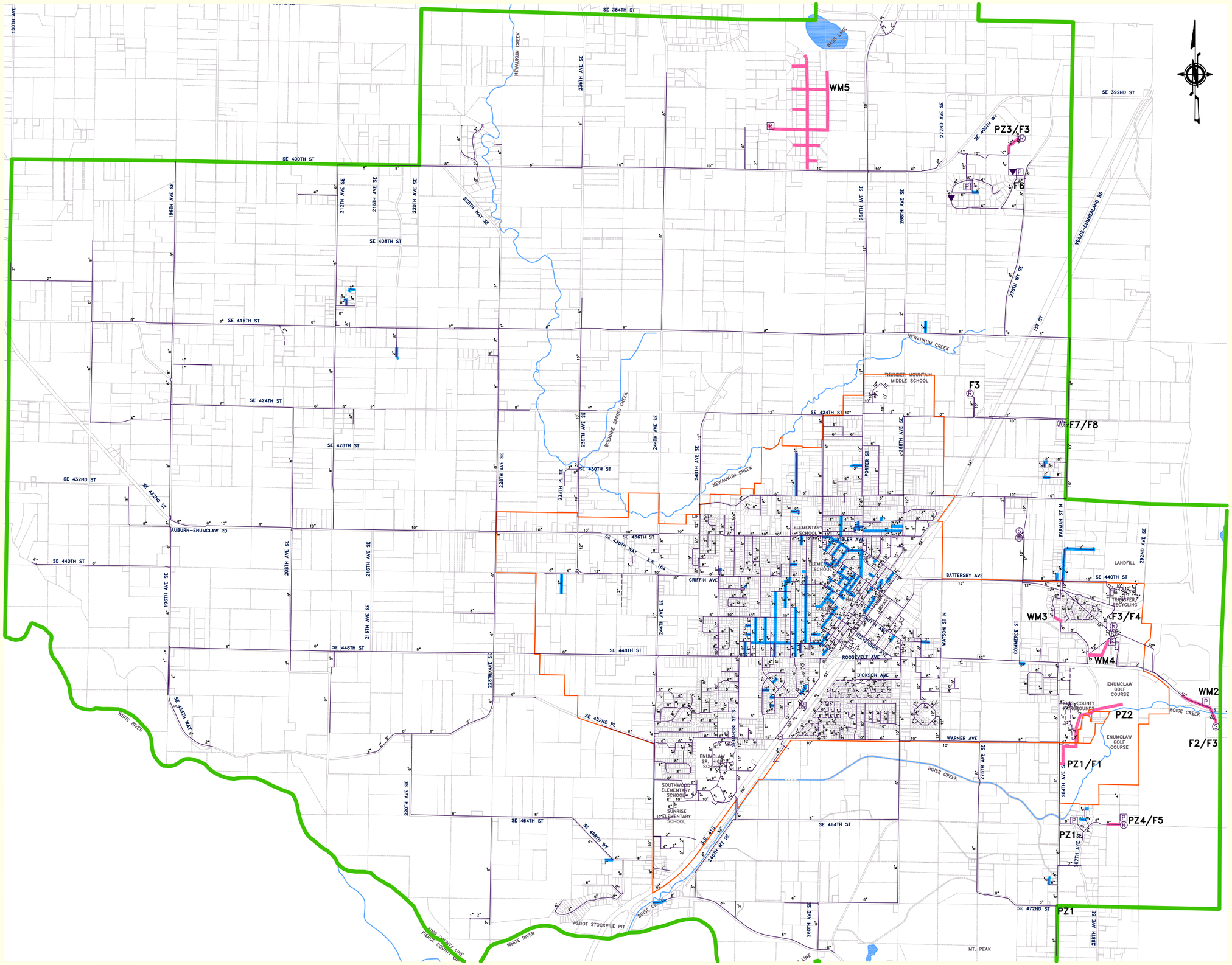


Figure 9-1
Proposed System Hydraulic Profile

City of Enumclaw Comprehensive Water System Plan

Scale: NTS Date: June 2013



LEGEND

- EXISTING URBAN GROWTH AREA
- 1989 COORDINATED WATER SYSTEM PLAN SERVICE AREA
- WATER MAIN
- PRIVATE WATER MAIN
- WM1 PROJECTS
- OTHER CIP WATER MAIN PROJECTS
- WELL
- SPRING
- RESERVOIR
- BOOSTER PUMP STATION
- PRESSURE REDUCING STATION

Figure 9-2
Water System Improvements

City of Enumclaw Comprehensive Water System Plan

Scale: 1" = 3,000' Date: June 2013

Filename: Fig 2-1.dwg

CHAPTER 10

Financial Program

INTRODUCTION

The purpose of the financial program is to demonstrate that the City has and will have the financial ability to maintain and operate the utility on an ongoing basis, plus have the capacity to construct the improvements identified in **Chapter 9**.

WATER RATES AND CHARGES

The utility's rate and charge structure is integral to the viability of the financial program. The current rate structure was developed through a cost-of-service study completed in 2005 and adopted by the City Council through ordinance, becoming effective in 2007. The rates include an increasing block structure in an effort to encourage water conservation. In 2008, 2010, 2011, 2012, and 2013 the City raised the water rates 3.5%, 10%, 3.5%, 3%, and 2.3%, respectively. On January 1 of each year rates are to be adjusted for inflation according to the Consumer Price Index (CPI) for the Seattle-Tacoma-Bremerton area. However, under no circumstances will rates and charges decrease as a result of the annual adjustment without specific action by the City Council.

Customers are billed monthly using a combination of a fixed charge according to meter size and a consumptive charge based on the volume of water consumed. The fixed charge shown in **Table 10-1** is intended to recover costs associated with providing service to customers regardless the level of water used, such as billing, meter reading, and administrative support.

Table 10-1
2012 Meter Monthly Base Charge

Base Monthly Charge	Inside City	Outside City
5/8" x 3/4"	$13.44	$20.17
1"	18.08	27.12
1 1/2"	25.80	38.71
2"	35.09	52.66
3"	60.13	90.19
4"	88.01	132.00

The monthly volume charge shown in **Table 10-2** recovers costs associated with the production, treatment, storage, and delivery of the water used.

Table 10-2
2012 Meter Monthly Volume Charge

	Inside City Volume Charges *per hundred cubic feet (CCF)*				***Outside City Volume Charges*** *per hundred cubic feet (CCF)*			
Customer Class	Block 1 (0 – 8 CCF)	Block 2 (8 – 20 CCF)	Block 3 (<20 CCF)	All Use	Block 1 (0 – 8 CCF)	Block 2 (8 – 20 CCF)	Block 3 (<20 CCF)	All Use
Single Family Residential	$ 1.91	$ 2.52	$ 3.15		$ 2.86	$ 3.79	$ 4.70	
Low Income	$ 1.34	$ 2.52	$3.15		$ 2.00	$ 3.79	$ 4.70	
Multi-Family Residential				$ 1.88				$ 2.82
Commercial				$ 2.16				$ 3.26
Agriculture				$ 1.42				$ 2.12

The City also imposes a connection charge on new customers requesting service based on meter size or projected water consumption in equivalent residential units (ERUs), whichever is greater. The inside City charge for one ERU is $3,110 while the outside City charge is $10,457.

Any building using city water for an automatic sprinkler system for fire protection is assessed annually for the service by size of the supply line as shown in **Table 10-3**.

Table 10-3
2012 Fire Sprinkler System Charge

Supply Line Size	Inside City Limits	Outside City Limits
2-inch or less	$29.32	$66.49
3-inch	$53.51	$114.71
4-inch	$80.83	$169.07
6-inch	$155.97	$319.92
8-inch or more	$247.05	$500.94

Other charges adopted by resolution of the City Council include charges for tampering, late payment, meter setting and new service and main installation, inspection, design plan review, testing, meter removal/reinstallation, backflow device permit and inspection, and for issuing a certificate of water availability. Charges are also assessed for filling water trucks or using a hydrant for a temporary construction service.

EXISTING LONG-TERM DEBT

Table 10-4 shows the water department's existing long-term outstanding debt obligations.

Table 10-4
Existing Long-Term Debt

Year	2005 Revenue Bond $6,970,000			1998 PWTF Loan $7,000,000		
	Principal	Interest	Total	Principal	Interest	Total
2012	$ 572,880	$ 147,648	$ 720,528	$ 376,787	$ 26,375	$ 403,162
2013	$ 596,750	$ 127,597	$ 724,347	$ 376,787	$ 22,607	$ 399,394
2014	$ 620,620	$ 105,219	$ 725,839	$ 376,787	$ 18,839	$ 395,626
2015	$ 644,490	$ 80,394	$ 724,884	$ 376,787	$ 15,071	$ 391,858
2016	$ 668,360	$ 54,615	$ 722,975	$ 376,787	$ 11,304	$ 388,091
2017	$ 697,004	$ 27,880	$ 724,884	$ 376,787	$ 7,536	$ 384,323
2018				$ 376,787	$ 3,768	$ 380,555

EXISTING REVENUES AND EXPENSES

The City currently maintains accounting of unrestricted and restricted cash reserves for the water utility. Restricted reserves include funds set aside as part of revenue bond covenants and cannot be used for purposes other than final payment on outstanding revenue debt obligations. Unrestricted reserves include cash and cash investments available for operating and capital activities. Capital reserves include transfers from the operating account in excess of recommended target balances, interest earnings on capital account balances and revenues from new customer connection charges.

Historical revenues and expenses for 2007-2012 are summarized in **Table 10-5** at the end of this chapter.

PROJECTED REVENUES AND EXPENSES

Rate revenue needed in a given year must meet that year's expected financial obligations. At least two separate conditions must be satisfied for each year of the analysis period in order for rates to be sufficient: 1) periodic cash needs must be met, and 2) the minimum revenue bond debt service coverage requirement must be realized.

The cash flow test identifies cash requirements for the utility in the year addressed. Those requirements can include cash operating and maintenance expenses, debt service, directly funded capital outlays, capital transfers, and any projected additions to reserves. Total cash needs must be compared to projected utility revenues and any rates adjusted to make up for any projected shortfall.

The coverage test is based on the bond covenants for revenue bonds, which require that a specific test of revenue sufficiency be met. This requirement states that revenues must be sufficient to meet operating expenses plus a factor, set at a minimum of 1.25 for the City, times annual debt service on all revenue bond debt issued. The coverage factor adds some protection for bondholders against the risk of poor financial performance in any given year. The excess cash flow derived from the added coverage can be used to fund capital costs.

Forecast assumptions used in the projections are as follows.

- Revenue is calculated to increase at a slower pace than used in the demand forecast in **Chapter 4**, with the demand forecast being based on meeting the population target under growth management. Generally future revenue growth is based on a total of 25 new connections inside the City and 3 outside. Future annual inflationary rate increases are conservatively assumed to be 0 percent.
- Operation and maintenance expenses are escalated at 2 percent for general cost inflation, benefit cost at 5 percent, and interfund services support at 3 percent inflation.
- In 2017 the City issues $3.325 million in revenue bonds.
- Growth in miscellaneous revenue and charges ranging from 2 to 2.5 percent.
- No significant projects for replacing water mains within the area of the Y Bar S local improvement district (LID) are completed in the 6-year capital improvement program. It is assumed that the Y Bar S water main replacement fund setup for that purpose and funded by the collection of a $40 per month rate surcharge on participants of the LID will continue to build reserves.

Table 10-6 at the end of this chapter shows projected revenues and expenses for 2013-2019.

FUNDING SOURCES

The City may fund the water capital improvement (CIP) program from a variety of sources. In general, these sources can be summarized as: 1) governmental grant and loan programs; 2) publicly issued debt (tax-exempt or taxable); and 3) cash resources and revenues. These alternative sources are described below.

Government Programs

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 even the very low-interest loans makes the effort of applying worthwhile. State programs identified as potential funding sources for the utility improvements set forth in this Comprehensive Water System Plan are discussed in the following sections.

Public Works Trust Fund - The Public Works Trust Fund (PWTF) is a commonly used, low-cost revolving-loan fund established by the 1985 State Legislature to provide financial assistance to local governments for public works projects. Eligible projects now include repair, replacement, rehabilitation, reconstruction or improvement of eligible public works systems.

PWTF loans are typically available at variable loan terms and interest rates with the lower interest rates generally given to applicants who pay a larger share of the total project costs. The

applicant must be a local government, such as a City, County or special-purpose utility district, and have an approved long-term program for financing its public works needs. Generally, local governments must compete for PWTF dollars since more funds are requested each year than are available. The Public Works Board evaluates each application and transmits a prioritized list of projects to the legislature. The legislature then indicates its approval by passing an appropriation from the Public Works Assistance Account to cover the cost of the approved loans. Once the Governor has signed the appropriations bill into law, the local governments receiving the loans are offered a formal loan agreement with the appropriate interest rate and term, as determined by the Public Works Board.

Community Economic Revitalization Board - This program provides grants and loans to fund public facilities that result in specific private-sector development. Eligible projects include water, sewer, roads and bridges.

Community Development Block Grant (CDBG) Program - A federal government program administered that provides grants and loans for infrastructure improvements, including water projects, for business development that create or retain jobs for low-and moderate-income residents.

Drinking Water State Revolving Fund (DWSRF) – Managed by both the Washington State Department of Health and Washington State Public Works Board, the program provided federal pass-though low interest loan funding for public and private water systems to protect public health and upgrade their systems.

Public Debt

Revenue Bonds – Revenue bonds are commonly used to fund utility capital improvements. The debt is secured by the revenues of the issuing utility and the debt obligation does not extend to the City's other revenue sources. With this limited commitment, revenue bonds typically 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 ordinance 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. In some cases, poor credit might make issuing bonds problematic. In the case of the City of Enumclaw, strong historical financial performance bodes well for continued reliance on this form of financing capital projects. For the most part, tax-exempt bonds may be issued by a governmental agency for its capital projects with the exception of funding needs that serve private sector or non-governmental interests such as mutual water companies and homeowners associations (which are classified as 501c corporations). Generally speaking, if more than 10 percent of a capital project provides direct benefit and service to the private sector (e.g. a business or mutual water company receiving wholesale water), the associated revenue bonds will likely be taxable. It is important that each agency perform due diligence in this regard where there is a question of private versus public benefit.

General Obligation Bonds – General obligation bonds may be used to finance almost any project of general benefit to a city. The bonds are repaid by tax assessments levied against all privately owned properties within the city. This type of funding is typically reserved for projects normally funded out of a city's general fund, such as roads, facilities, firefighting equipment, and parks.

Summary

Of these programs, the state low interest loans are the most attractive for the City and will continue to be applied for to meet financing needs. Other than the 2013 DWSRF loan and proposed 2017 bond issue, the 6-year capital financing strategy assumes no other outside funding assistance for City funded projects.

CONCLUSION

With continued sound management and implementation of the recommendations of the financial program, the utility will ensure that it can meet future projected capital and operational requirements.

Table 10-5
Historical Revenue and Expense Summary

	2007	2008	2009	2010	2011	2012
Revenues						
Beginning Fund Balance	**$ 2,680,652**	**$ 1,630,513**	**$ 688,374**	**$ 276,002**	**$ 352,409**	**$ 909,441**
Operating Revenues						
Metered Consumption Charges	$ 2,434,674	$ 2,483,426	$ 2,652,337	$ 2,642,554	$ 2,652,944	$ 2,764,096
Miscellaneous Charges	$ 77,595	$ 116,750	$ 96,372	$ 97,019	$ 102,995	$ 94,063
Charges for Services	$ 2,512,269	$ 2,600,176	$ 2,748,709	$ 2,739,574	$ 2,755,939	$ 2,858,159
Miscellaneous Revenues	$ 80,331	$ 41,555	$ 29,992	$ 22,994	$ 24,758	$ 33,583
Operating Revenues Subtotal	**$ 2,592,600**	**$ 2,641,731**	**$ 2,778,701**	**$ 2,762,568**	**$ 2,780,697**	**$ 2,891,742**
Contributed Capital	$ 170,367	$ 110,490	$ 122,296	$ 120,968	$ 91,986	$ 70,989
Y Bar S WM Replacement Acct			$ 37,080	$ 50,470	$ 615,606	$ 50,010
Loan/Grant Revenue		$ 677,000	$ 667,514	$ 73,025	$ 300,000	$ -
Non-Revenue Receipts	$ -	$ -	$ 275,284	$ 127,733	$ 219,752	$ -
TOTAL REVENUES (w/o BFB)	***$ 2,762,967***	***$ 3,429,221***	***$ 3,880,875***	***$ 3,134,764***	***$ 4,008,041***	***$ 3,012,741***
TOTAL RESOURCES	***$ 5,443,619***	***$ 5,059,734***	***$ 4,569,249***	***$ 3,410,766***	***$ 4,360,450***	***$ 3,922,182***
Expenditures						
O&M Expenditures						
Salaries	$ 392,939	$ 429,313	$ 437,099	$ 409,165	$ 426,694	$ 429,464
Benefits	$ 135,611	$ 173,747	$ 173,585	$ 169,193	$ 186,697	$ 192,623
Supplies	$ 88,976	$ 81,662	$ 103,894	$ 76,805	$ 79,036	$ 96,894
Services/Charges	$ 169,027	$ 187,716	$ 169,649	$ 151,498	$ 138,964	$ 124,356
Intergovernmental/Taxes	$ 13,233	$ 8,656	$ 12,346	$ 12,960	$ 11,554	$ 7,687
State Public Utility Tax	$ 132,531	$ 114,662	$ 135,318	$ 137,356	$ 148,632	$ 142,559
City Utility Tax	$ 196,316	$ 199,727	$ 219,297	$ 219,160	$ 219,821	$ 228,649
Interfund Services	$ 409,199	$ 384,075	$ 398,908	$ 434,179	$ 345,241	$ 398,899
Total O & M Expenditures	**$ 1,537,832**	**$ 1,579,558**	**$ 1,650,096**	**$ 1,610,316**	**$ 1,556,639**	**$ 1,621,131**
Debt Service - 2005 Rev Bond	$ 1,153,642	$ 1,146,698	$ 590,326	$ 725,679	$ 720,815	$ 720,815
Debt Service - 1997 PWTF			$ 414,466	$ 410,698	$ 406,930	$ 403,162
Debt Service - Y Bar S DWSRF			$ 13,607	$ 43,980	$ 49,040	$ -
Debt Service - Interfund 3 Yr Loan			$ -	$ 23,230	$ 254,941	$ 7,500
Total O&M Expenditures + Debt	**$ 2,691,474**	**$ 2,726,256**	**$ 2,668,495**	**$ 2,813,902**	**$ 2,988,365**	**$ 2,752,608**
Capital Project Expenditures	$ 1,111,370	$ 1,096,434	$ 920,881	$ 259,382	$ 675,338	$ 20,830
Interfund Transfer to Bond Fund			$ 704,637	$ -	$ (203,466)	$ -
TOTAL EXPENDITURES	***$ 3,802,844***	***$ 3,822,690***	***$ 4,294,013***	***$ 3,073,284***	***$ 3,460,237***	***$ 2,773,438***
Available reserves	$ 1,640,775	$ 1,237,044	$ (47,960)	$ (7,720)	$ 238,141	$ 427,248
Designated O&M reserve			$ 268,737	$ 257,651	$ 249,062	$ 259,381
Restricted reserve for Y Bar S			$ 37,080	$ 87,550	$ 196,186	$ 246,196
Restricted for Debt					$ 201,581	$ 199,698
Restricted for Construction-Min.1% FA			$ 17,379	$ -	$ 15,243	$ 16,222
ENDING FUND BALANCE			**$ 275,236**	**$ 337,481**	**$ 900,213**	**$ 1,148,744**

Table 10-6
Projected Revenue and Expense Summary

	2013 YEE	2014 Est	2015 Est	2016 Est	2017 Est	2018 Est	2019 Est
Revenues							
Beginning Fund Balance	**$ 1,148,746**	**$ 1,111,344**	**$ 1,217,784**	**$ 1,327,100**	**$ 1,197,996**	**$ 1,548,153**	**$ 1,157,177**
Operating Revenues							
Metered Consumption Charges	$ 2,874,000	$ 2,845,300	$ 2,847,600	$ 2,851,100	$ 2,855,700	$ 2,860,300	$ 2,864,900
Miscellaneous Charges	$ 96,000	$ 98,900	$ 100,900	$ 102,900	$ 105,000	$ 107,100	$ 109,200
Charges for Services	$ 2,970,000	$ 2,944,200	$ 2,948,500	$ 2,954,000	$ 2,960,700	$ 2,967,400	$ 2,974,100
Miscellaneous Revenues	$ 23,100	$ 24,100	$ 24,700	$ 25,300	$ 25,900	$ 26,500	$ 27,200
Operating Revenues Subtotal	**$ 2,993,100**	**$ 2,968,300**	**$ 2,973,200**	**$ 2,979,300**	**$ 2,986,600**	**$ 2,993,900**	**$ 3,001,300**
Contributed Capital	$ 21,790	$ 29,117	$ 70,234	$ 99,351	$ 121,121	$ 121,121	$ 121,121
Y Bar S WM Replacement Acct	$ 50,030	$ 50,880	$ 50,880	$ 50,880	$ 50,880	$ 50,880	$ 50,880
Loan/Grant Revenue	$ 67,000	$ 985,000	$ 2,815,000	$ -	$ 3,325,000	$ -	$ -
Non-Revenue Receipts	$ 49,040	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL REVENUES (w/o BFB)	***$ 3,180,960***	***$ 4,033,297***	***$ 5,909,314***	***$ 3,129,531***	***$ 6,483,601***	***$ 3,165,901***	***$ 3,173,301***
TOTAL RESOURCES	***$ 4,329,706***	***$ 5,144,641***	***$ 7,127,098***	***$ 4,456,631***	***$ 7,681,597***	***$ 4,714,054***	***$ 4,330,478***
Expenditures							
O&M Expenditures							
Salaries	$ 454,921	$ 464,019	$ 473,300	$ 482,766	$ 492,421	$ 502,270	$ 512,315
Benefits	$ 244,572	$ 256,801	$ 269,641	$ 283,123	$ 297,279	$ 312,143	$ 327,750
Supplies	$ 98,300	$ 100,266	$ 102,271	$ 104,317	$ 106,403	$ 108,531	$ 110,702
Services/Charges	$ 130,200	$ 143,804	$ 135,460	$ 138,169	$ 140,933	$ 143,751	$ 146,626
Intergovernmental/Taxes	$ 10,600	$ 10,812	$ 11,028	$ 11,249	$ 11,474	$ 11,703	$ 11,937
State Public Utility Tax	$ 145,500	$ 148,415	$ 148,660	$ 148,965	$ 149,330	$ 149,695	$ 150,065
City Utility Tax	$ 236,000	$ 237,464	$ 237,856	$ 238,344	$ 238,928	$ 239,512	$ 240,104
Interfund Services	$ 405,240	$ 413,192	$ 425,587	$ 438,355	$ 451,506	$ 465,051	$ 479,002
Total O & M Expenditures	**$ 1,725,333**	**$ 1,774,773**	**$ 1,803,804**	**$ 1,845,287**	**$ 1,888,273**	**$ 1,932,656**	**$ 1,978,502**
Debt Service - 2005 Rev Bond	$ 991,134	$ 725,839	$ 724,885	$ 722,975	$ 274,884	$ -	$ -
Debt Service - 1997 PWTF	$ 399,395	$ 395,627	$ 391,859	$ 388,091	$ 384,323	$ 380,555	$ -
Debt Service - Y Bar S DWSRF	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Service - 2013 DWSRF		$ 5,118	$ 26,951	$ 244,782	$ 216,667	$ 214,167	$ 211,667
Debt Service - 2017 Rev Bond				$ -	$ 534,922	$ 429,500	$ 430,313
Debt Service - Interfund 3 Yr Loan	$ 7,500	$ 307,500	$ 7,500	$ 7,500	$ 304,375	$ -	$ -
Total O&M Expenditures + Debt	**$ 3,123,362**	**$ 3,208,857**	**$ 2,954,999**	**$ 3,208,635**	**$ 3,603,444**	**$ 2,956,878**	**$ 2,620,481**
Capital Project Expenditures	$ 28,000	$ 100,000	$ 30,000	$ 50,000	$ 2,530,000	$ 600,000	$ 500,000
Capital Exp - New 2 MG Res	$ 67,000	$ 618,000	$ 2,815,000				
Interfund Transfer to Bond Fund	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL EXPENDITURES	***$ 3,218,362***	***$ 3,926,857***	***$ 5,799,999***	***$ 3,258,635***	***$ 6,133,444***	***$ 3,556,878***	***$ 3,120,481***
Available reserves	$ 308,030	$ 338,843	$ 316,322	$ 121,614	$ 399,522	$ 124,467	$ 102,697
Designated O&M reserve	$ 276,053	$ 283,964	$ 288,609	$ 295,246	$ 302,124	$ 309,225	$ 316,560
Restricted reserve for Y Bar S	$ 296,226	$ 348,826	$ 399,706	$ 450,586	$ 501,466	$ 552,346	$ 603,226
Restricted for Debt	$ 197,814	$ 195,930	$ 255,241	$ 246,328	$ 243,819	$ 52,917	$ 52,292
Restricted for Construction-Min.1% FA	$ 33,222	$ 50,222	$ 67,222	$ 84,222	$ 101,222	$ 118,222	$ 135,222
ENDING FUND BALANCE	**$ 1,111,344**	**$ 1,217,784**	**$ 1,327,100**	**$ 1,197,996**	**$ 1,548,153**	**$ 1,157,177**	**$ 1,209,997**

APPENDIX A

WATER FACILITIES INVENTORY, DOH CWSP SUBMITTAL FORM, KING COUNTY SUBMITTAL FORM

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

WATER FACILITIES INVENTORY (WFI) FORM

Quarter: 1
Updated: 08/17/2012
Printed: 10/12/2012
WFI Printed For: Annual
Submission Reason: Pop/Connect Update

ONE FORM PER SYSTEM

RETURN TO: Northwest Regional Office, 20425 72nd Ave S STE 310, Kent, WA, 98032

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
23600 1	ENUMCLAW WATER DEPARTMENT	KING	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS	7. OWNER NAME & MAILING ADDRESS	8. Owner Number 001780
SCOTT WOODBURY [ASSIST. CITY ENG.] 1309 MYRTLE AVE ENUMCLAW, WA 98022	ENUMCLAW WATER DEPARTMENT, CITY OF CHRIS SEARCY TITLE: PUBLIC WORKS DIREC 1309 MYRTLE AVE ENUMCLAW, WA 98022	
STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP	STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS CITY STATE ZIP	

9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION	
Primary Contact Daytime Phone:	(360) 615-5728	Owner Daytime Phone:	(360) 825-3593
Primary Contact Mobile/Cell Phone:	(253) 261-1937	Owner Mobile/Cell Phone:	(253) 261-1938
Primary Contact Evening Phone:	(253) 261-1937	Owner Evening Phone:	(360) 825-3505
Fax: (360) 825-7232	E-mail: swoodbury@ci.enumclaw.wa.us	Fax: (360) 825-7232	E-mail: csearcy@ci.enumclaw.wa.us

WAC 246-290-420(9) requires that water systems provide 24-hour contact information for emergencies.

11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)

- ☒ 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	☒ Hospital/Clinic	☒ Residential
☒ Commercial / Business	☒ Industrial	☒ School
☒ Day Care	☒ Licensed Residential Facility	☐ Temporary Farm Worker
☒ Food Service/Food Permit	☒ Lodging	☒ Other (church, fire station, etc.):
☒ 1,000 or more person event for 2 or more days per year	☒ Recreational / RV Park	

13. WATER SYSTEM OWNERSHIP (mark only one)				14. STORAGE CAPACITY (gallons)
☐ Association	☐ County	☐ Investor	☐ Special District	
☒ City / Town	☐ Federal	☐ Private	☐ State	4,730,000

--- SEE NEXT PAGE FOR A COMPLETE LIST OF SOURCES ---

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
23600 1	ENUMCLAW WATER DEPARTMENT	KING	A	Comm

15	16	17	18										19			20	21						22	23	24			
	SOURCE NAME	INTERTIE	SOURCE CATEGORY										USE				TREATMENT						DEPTH		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	Boise Spring					X							X			Y		X				X		898	SE NW	29	20N	07E
S02	Watercress Spring #1					X							X			Y		X				X		1735	NW NW	19	20N	07E
S03	86800N/TACOMA	86800 N													X	Y	X							1000	SE NE	26	20N	06E
S05	PCII JOHNSON WELL #2				X									X		Y		X					229	1200	NE SW	18	20N	07E
S06	PCIII JOHNSON WELL #3 (AKA #1R)				X									X		Y		X					225	800	NE SW	18	20N	07E
S07	PC JOHNSON WELLS 2 & 3			X										X		Y		X					229	1500	NE SW	18	20N	07E
S08	Watercress Spring #2 ALK139		X										X			Y		X				X	20	2289	NW NW	19	20N	07E
S09	Pre-Active 04/28/2008 Zone 888/1002 Well	A	X											X		Y		X					80	676	NW SE	30	20N	07E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
23600 1	ENUMCLAW WATER DEPARTMENT	KING	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)	0	6598	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or *more* per year)	5356		
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	227		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *more than* 180 days/year	1242		
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.	1511	1511	
28. TOTAL SERVICE CONNECTIONS		8109	

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or *more* days per year? 15283

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?	140	140	140	140	140	140	140	140	140	140	140	140
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?												
B. How many days per month are they present?												

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	15	15	15	15	15	15	15	15	15	15	15	15

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: Scott Woodbury DATE: 10/18/12

PRINT NAME: Scott Woodbury TITLE: Asst City Engr./Cert Water System Oper.

Water System Plan Submittal Form

This form must be completed and submitted along with the Water System Plan (WSP). It will expedite review and approval of your WSP. **All water systems should contact their regional planner before developing any planning document for submittal.**

Enumclaw Water Department 1. Water System Name	23600 1 PWS ID# or Owner ID#	City of Enumclaw System Owner Name
Scott Woodbury Contact Name for Utility	360-615-5728 Phone Number	Assistant City Engineer Title
1309 Myrtle Ave Contact Address	Enumclaw City	WA 98022 State Zip
Scott Woodbury 2. Project Engineer	360-615-5728 Phone Number	Assistant City Engineer Title
1309 Myrtle Ave Project Engineer Address	Enumclaw City	WA 98022 State Zip
3. Billing Contact Name (required if not the same as #1)	360-615-5728 Billing Phone Number	360-825-7232 Billing Fax Number
1309 Myrtle Ave Billing Address	Enumclaw City	WA 98022 State Zip

4.	How many services are presently connected to the system?	8109 per latest WFI	
5.	Is the system expanding? (seeking to extend service area or increase number of approved connections)	☒ Yes	☐ No
6.	If number of services is expected to increase, how many new connections are proposed in the next six years?	1414 ERU	
7.	If the system is private-for-profit, is it regulated by the State Utilities and Transportation Commission?	☐ Yes	☐ No
8.	Is the system located in a Critical Water Supply Service Area (i.e., have a Coordinated Water System Plan)?	☒ Yes	☐ No
9.	Is the system a customer of a wholesale water purveyor?	☐ Yes	☒ No
10.	Will the system be pursuing additional water rights from the State Department of Ecology in the next twenty years?	☐ Yes	☒ No
11.	Is the system proposing a new intertie?	☐ Yes	☒ No
12.	Do you have projects currently under review by the Department of Health?	☐ Yes	☒ No
13.	Are you requesting distribution main project report and construction document submittal exception, and if so, does the WSP contain standard construction specifications for distribution mains?	☒ Yes	☐ No
14.	Are you requesting distribution related project report and construction document submittal exception, and if so, does the WSP contain distribution facilities design and construction standards, including internal engineering review procedures?	☒ Yes	☐ No
15.	The purveyor is responsible for sending a copy of the WSP to adjacent utilities for review or a letter notifying them that a copy of the WSP is available for their review and where the review copy is located. Has this been completed?	☒ Yes	☐ No
16.	The purveyor is responsible for sending a copy of the WSP to all local governments within the service area. (County and City Planning Departments, etc). Has this been completed?	☒ Yes	☐ No
17.	Are you proposing a change in the place of use of your water right?	☐ Yes	☒ No

If answer to questions 7,8, 11, 15and/or 16 is "yes," list who you sent the WSP to: FD28, FD44; Cities of Tacoma, Buckley, and Black Diamond; King County, Adjacent Purveyors Walzak, Remolif, Muckleshoot Indian Tribe, and Marion Water. Others notified in SEPA distribution.

Is this plan: ☒ an Initial Submittal ☐ a Revised Submittal

Please enclose the following number of copies of the WSP:

3 copies for Northwest and Southwest Regional Offices **OR 2** copies for Eastern Regional Office (We will send one copy to Ecology)
1 additional copy if you answered "yes" to question 7. 3 Total copies attached

Please return completed form to the Office of Drinking Water regional office checked below.

☒ **Northwest Drinking Water Operations** **Department of Health** **20425 72nd Avenue South, Suite 310** **Kent, WA 98032-2358** **(253) 395-6750**	☐ **Southwest Drinking Water Operations** **Department of Health** **PO Box 47823** **Olympia, WA 98504-7823** **(360) 236-3030**	☐ **Eastern Drinking Water Operations** **Department of Health** **16201 East Indiana Avenue Suite 1500** **Spokane Valley, WA 99216** **(509) 329-2100**

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD, call (800) 833-6388.

CITY OF Enumclaw

March 13, 2013

King County UTRC Chair
201 S Jackson St, Suite 500
KSC-NR-0512
Seattle, WA 98104-3855

RE: Submittal of City of Enumclaw Draft 2013 Comprehensive Water System Plan

To Whom It May Concern:

Attached are three printed copies of the City of Enumclaw Draft 2013 Comprehensive Water System Plan (CWSP) for review along with an electronic version on CD.

Copies of the City resolution adopting the 2013 CWSP and a completed state Department of Health Local Government Consistency Review Checklist are included in Appendix D. A copy of the SEPA checklist is included in Appendix E.

Please send confirmation of receipt of this submittal either by US mail to the address below or by e-mail to swoodbury@ci.enumclaw.wa.us.

If you have any questions, please contact me at 360-615-5728.

Sincerely,

Scott Woodbury

Scott Woodbury, P.E.
Assistant City Engineer

1309 Myrtle Avenue, Enumclaw, Washington 98022 • (360) 825-3593 • FAX (360) 825-7232

APPENDIX B

WATER SYSTEM FACILITIES DATA

City of Enumclaw
Comprehensive Water System Plan
Well Facilities Data

Well Data

Name	Pressure Zone	Year Const.	Current Pumping Rate (gpm)	Max. Well Capacity (gpm)	Max Inst Water Right (gpm)	Casing Size (inches)	Well Depth (feet)	Well Screen Depth (feet)	Pump Intake Depth (feet)	Static Water Depth (feet)	Pumping Water Depth (feet)	Ground Elv (feet)
PC Johnson 2	888	1986	900	Note 1	Note 2	16	227.2	203.6 to 224	200	39-47	127	747.44
PC Johnson 3	888	1997	760	Note 1	Note 2	16	229	195 to 225	171	39-47	136	747.71
Watercress Springs Well 1	888	1953/1968	2000	Note 5	2289	N/A	9	25'x60' bottomless vault	8	2	5	738.69
Watercress Springs Well 2	888	2008	2289	2289	2289	20	52	22 to 42	47	5	7	741.93
Zone 888/1002 Well	888 / 1002	2007	N/A	Note 4	676	16 to 20	136	80 to 131	N/A	40	N/A	780

Note 1 - The recommended operating scheme is both wells together for the full water right of 1500 gpm, but this represents significant throttling so typically only one well is operated at a time.
Note 2 - Maximum rate for the wellfield is 1500 gpm.
Note 3 - Depth to Level Probe 191.8' for PC2 and 173.3'+/- for PC3.
Note 4 - Well test pumped at initial construction at 776 gpm with only about 4 feet of drawdown at 24 hrs.
Note 5 - Since transmission main installed in 2002, additional friction head prevents full water right production.

Well Pump Data

Name / Year Installed	Pump Manufacturer	Pump Model	Pump Type	Design Capacity (gpm)	Design Head (feet)	Motor Mfgr	Motor Size (HP)	Control Valve Size & Model	Have Standby Power	Have E.G. Set Receptacle
PC Johnson 2 / 2006	Flowserve	8EHM	Submersible	900	340	Flowserve	100	10" CLA-VAL 81-02-21E	Note 1	Yes
PC Johnson 3 / 1997	Goulds	9RCLC	Submersible	820	410	Franklin Electric	100	8" 100-G CLA-VAL 850C13ABC	Note 1	Yes
Watercress Springs Well 1 / 200	Fairbanks Morse Pomona	6927 12" XHC	Vert Turbine	2300	190	Fairbanks Morse	150	10" CLA-VAL 10-60P	Yes	No
Watercress Springs Well 2 / 196	Peerless	14MD	Vert Turbine	1900	285	US Motors	200	None (VFD w/o purge)	Yes	No

Note 1 - A portable 200 kW generator is stored at the site and can plugged into only one well at a time. Under emergency power, PC3 can be run with CL2 input and PC2 cannot.

Well Pump Curve Data

Name	Point 1		Point 2		Point 3		Pump Serial Number	Pump Impeller Diameter
	Flow (gpm)	Head (feet)	Flow (gpm)	Head (feet)	Flow (gpm)	Head (feet)		
PC Johnson 2	600	400	900	340	1100	260	0606SN063141-1	5.96
PC Johnson 3	0	550	500	496	820	410	FR389797	6.38
Watercress Springs Well 1	1500	226	1900	210	2300	190	F2N21167	8.56
Watercress Springs Well 2	0	410	1900	285	3000	120		8.81 x 10.62

Control Data

Name	Control Facility	Supplied Pressure Zone	Supply To Zone Priority	Well Have Telemetry
PC Johnson 2	Typ. Crews Res, but can be City Res or both	888	Seasonal	Yes
PC Johnson 3	Typ. Crews Res, but can be City Res or both	888	Seasonal	Yes
Watercress Springs Well 1	Typ. City Res, but can be Crews Res or both	888	Permanent	Yes
Watercress Springs Well 2	Typ. City Res, but can be Crews Res or both	888	Permanent	Yes

City of Enumclaw
Comprehensive Water System Plan
Pump Station Facilities Data
Does not include CL2 booster pumps or Watercress bypass pumps

Pump Station Data

Name	Suction Pressure Zone	Discharge Pressure Zone	Year Const.	Ground Elev & Above or Below Grade	Maximum Capacity (gpm)	Meter Size & Model	Have Standby Power	Have E.G. Set Receptacle	Have Surge Protection
Tacoma Intertie	Tacoma Pipe #1	888	(4)	735/Below	1000	8" Siemans	No	Yes	No
Lower New Horizons	888	988	1962/1996	762/Above	80 (1)	N/A	No	Yes	No
Upper New Horizons	988	1040	1979/1996	910/Above	40	N/A	No	No	No
Lower Fairway Hills	888	1002	1974	780/Above	38 (2)	N/A	No	Yes	No
Upper Fairway Hills	1002	1175	1991	987/Above	35 (1)	N/A	No	Yes	No
Weyerhaeuser BPS	Boise Spring Transmission Main	1245	1993	875.5/Above	80 (1)	Neptune 1-1/2"	No	No	No
CCF BPS	888	1013	2002	876/Above	80 (1)	N/A	Yes	No	Yes
Highview BPS	888	995	2010	740/Above	100 (3)	2" Siemans	Yes	No	Yes

(1) Max capacity based on both pumps operating.
(2) Based on operating both 5 hp pumps.
(3) Max capacity based on two of the three pumps operating.
(4) Orginal station was constructed in 1977 and upgraded in 1999 and 2005.

Pump Data

Name / Year Installed	Pump Manufacturer	Pump Model	Pump Type	Current Pump Rate (gpm)	Design Capacity (gpm)	Design Head (feet)	Motor Mfgr	Motor Size (HP)	Control Valve Size & Model
Tacoma Intertie #1/2 / 1999	Cornell	4HH-100-4	End Suction	1000	800	236	Cornell	100 (VFD)	N/A
LNH #1 / 2011	Weinman	4AE-30512	End Suction	46	60	110	Baldor	3 (3450 RPM)	N/A
LNH #2 / 1996	Weinman	5832	End Suction	46	30	150	Marathon Electric	3 (3460 RPM)	N/A
Upper New Horizons / 1996	Weinman		End Suction	Not tested	40	52	Marathon Electric	2 (1740 RPM)	N/A
LFH #1/2 / 1974	Burks Pumps	Cat 350G6-1-1/2-SP	End Suction	38	(1)	(1)	Marathon Electric	5 (3460 RPM)	3" CLA-VAL
LFH Fire Pump / 1974	Berkeley Pump Co	B3TPMS	End Suction	170	(1)	(1)	Gould Century	20 (3500 RPM)	Same as #1/2
UFH #1 / 1991	Flint & Walling	CPJ10B0003	End Suction	20	(1)	(1)	Flint & Walling	1 (3450 RPM)	N/A
UFH #2 / 1991	Flint & Walling	CJ101B201	End Suction	35	(1)	(1)	Flint & Walling	2 (3450 RPM)	N/A
Weyerhaeuser #1/2 / 1993	Grundfos	A9334	Vert Stage	20-40	42	354	Baldor	7.5 (3450 RPM)	N/A
CCF BPS #1/2 / 2002	G&L (Goulds)	2SVB	Vert Stage	40	40	100	Baldor	3	1.5" Watts ACV 1115
Highview BPS / 2010	Berkeley Pump Co	BVM8-40	Vert Stage	0-65	120	110	Baldor	3 (VFD)	N/A

(1) Do not have pump or system design information.

Pump Curve Data

Name	Point 1		Point 2		Point 3		Pump Serial Number	Pump Impeller Diameter
	Flow (gpm)	Head (feet)	Flow (gpm)	Head (feet)	Flow (gpm)	Head (feet)		
Tacoma Intertie #1/2	0	250	800	236	1200	212	111428/111429	15.22
Lower New Horizons #1	0	150	30	140	70	110	(2)	5.9
Lower New Horizons #2	0	158	30	150	90	95	(2)	6.125
Upper New Horizons	0	54	40	52	103	36	(2)	7.33 (1)
Lower Fairway Hills #1/2					(2)	(2)	896759(#1) 896760 (#2)	(2)
Lower Fairway Hills Fire Pump					(2)	(2)	7481692	6.25
Upper Fairway Hills #1					(2)	(2)	(2)	(2)
Upper Fairway Hills #2					(2)	(2)	(2)	(2)
Weyerhaeuser BPS #1/2					42	354	(2)	(2)
CCF BPS #1/2	0	310	20	244	40	100	5613260-P1 & P2	Standard
Highview BPS	0	205	40	180	60	135	2407933-10	4.02

(1) Pump installed is different from that specified. No information found on supplied pump so specified pump curve data shown.
(2) Do not have information on pump.

Pump Control Data

Name	Control Facility	Supply To Zone Priority	Pump Operation Priority	Station Have Telemetry
Tacoma Intertie #1/2	City or Crews Reservoir	Emergency	Emergency	Yes
Lower New Horizons #1/2	Stanridge Hill Reservoir Level	Permanent	Permanent	Yes
Upper New Horizons	Continuously Running	Permanent	Permanent	No
Lower Fairway Hills	Fairway Hills Reservoir	Permanent	Permanent	Yes
Upper Fairway Hills	Pressure on Discharge Header (55-75 psi pump 1, 50 psi pump 2 on)	Permanent	Permanent	Yes
Weyerhaeuser BPS #1/2	Pressure on Discharge Header (110 psi lead on, 105 psi lag on, 160 psi lead/lag off)(1)	Permanent	Permanent	No
CCF BPS #1/2	Pressure on Discharge Header (40/54 psi lead on/off, 35/52 psi lag on/off)	Permanent	Permanent	Yes
Highview BPS	Pressure on Discharge Header (107 psi VFD)	Permanent	Permanent	Yes

City of Enumclaw
Comprehensive Water System Plan
Storage Facilities Data

Reservoir Data

Reservoir Name	Pressure Zone	Year Const.	Material	Capacity (gallons)	Overall Height (feet)	Diameter (feet)	Water Base Elv (feet)	Overflow Elv (feet)	Ground Elv (feet)	Seismic Restraint (Y or N)
Fairway Hills	1002	1991	Conc	60,000	16	26	987.0	15	990+	Y
Stanridge Hill	988	1993	Conc	180,000	36	30	954.0	34	956+/-	Y
1 MG City Reservoir	888	1926 (1)	Conc	1,000,000	15.3	130x130 at top	875.7	12	892	N
2 MG City Reservoir	888	1963	Conc	2,000,000	16.7	170	875.7	12	880+	N
Crews Reservoir	888	1989	Conc	1,500,000	22	114	868.0	20	870-872	Y

(1) Conc roof installed in 1977.

Storage Data

Reservoir Name	Max Water Height (feet)	Volume Per Foot (gallons)	Fill/Draw Pipe Dia.
Fairway Hills	15.0	4,000	See Drawing
Stanridge Hill	34.0	5,300	See Drawing
1 MG City Reservoir	12.0	Varies	See Drawing
2 MG City Reservoir	12.0	169,800	See Drawing
Crews Reservoir	20.0	76,350	See Drawing

Level Control Data

Reservoir Name	Controlled Supply Facility	Reservoir Have Telemetry
Fairway Hills	Lower Fairway Hills BPS	Yes
Stanridge Hill	Lower New Horizons BPS	Yes
1 MG City Reservoir (1)	Watercress, PC Johnson, Tacoma	Yes
2 MG City Reservoir (1)	Same as 1 MG Reservoir	Yes
Crews Reservoir	Same as 1 MG Reservoir	Yes

City of Enumclaw
Comprehensive Water System Plan
PRV, Relief Valve, and System Control Valve Data
See also separate CV Summary

Station Data

PRV Station Name	Upper Pressure Zone	Lower Pressure Zone	Year Const.	Ground Elv (feet)	Normal Pressure Inlet (psi)	Normal Pressure Outlet (psi)	Station Operation Status
New Horizons	1040	899	1996	833	86	30	Active
Lower New Horizons	988	888	2011	762	95	30	See note 1

(1) Valve to open on low pressure in 888 zone (i.e. fire event) to allow flow from Stanridge Res 988 Zone to flow into 888 Zone.

PRV Set Point Data

PRV Station Name	Description	Valve Size (inches)	Valve Mfgr	Valve Model	Valve Elv (feet)	Valve Set Point (psi)	Valve Set Point (feet H.E.)
New Horizons	Small PRV	2	CLA-VAL	90G-01AB	830	30	899
	Large PRV	6	CLA-VAL	90G-01AS	830	25	888
Lower New Horizons	PRV	3	CLA-VAL	90A-01AS	765	30	818

Relief Valve Set Point Data

Station Name	Description	Valve Size (inches)	Valve Mfgr	Valve Model	Valve Elv (feet)	Valve Set Point (psi)	Valve Set Point (feet H.E.)

City of Enumclaw
Comprehensive Water System Plan
Check Valve and Zone Valve Data

Check Valves

Location	Low Pressure Zone	High Pressure Zone	Hydraulic Model Pipe No.	Year Const.	Valve Size	Valve Type
Upper New Horizons Pump House (1)	988	1040	1010	1996	6	Single Check
Stanridge Hill Reservoir (2)	988	988	725	1993	10	Single Check
Stanridge Hill Reservoir (2)	988	988	726	1993	8	Single Check
Watercress Creek Bridge at 424th St (3)	888	888	N/A	2011	2	Single Check
Y Bar S (4)	888	888	922	2009	4	Single Check

(1) If demand is too great for the 2 HP Upper New Horizons pump, then the check valve will allow direct flow from 988 zone into the 1040 zone (fire flow scenerio).

(2) 8" check valve is on the fill line and 10" on the tank outlet line.

(3) Intended to keep 10" from flowing into the 2" so the 2" line is not a dead end, but the 10" can function as a dedicated transmission main to Crews Res

(4) Intended as interim measure when private Y Bar S system connected to City system in 2009 until Y Bar S reservoir demolished (2010). Can be removed.

Zone Valves

Location	Low Pressure Zone	High Pressure Zone	Hydraulic Model Pipe No.	Valve Size
Watercress Spring (1)	888	888	293	12"
Upper New Horizons (2)	988	1040	-	6"
Highview Booster Pump Station (3)	888	995	-	4"
Majestic Mountain Mobile Home Park (4)	888	888	-	8"

(1) If opened Watercress could pump directly into the 888 zone, bypassing the transmission main to City Reservoir.

(2) Located at the intersection of 274th Ave SE and SE 401st St.

(3) Located at the Highview station located at intersection of 254th Ave SE and SE 396th St.

(4) Located at Warner Ave & Birch St. Opened only for a fire event in the moblie home park.

City of Enumclaw
Comprehensive Water System Plan
Interties with Adjacent Water Systems

Station Data

Name	Location	City's Zone	Adjacent System Zone	Flow Direction	Pumped or Gravity	Year Const.	Ground Elv (feet)	Normal Pressure City (psi)	Normal Pressure Adjacent (psi)	Intertie Type
Tacoma Intertie	Near 560 State Rte 410	888	Pipeline #1	To City	Pumped	1999	735	58	Varies	Emerg.

Note: For more information see Pump Stations data sheet.

City of Enumclaw
Comprehensive Water System Plan
Control Valve (CV) Summary

Location	Manufacturer	Size	Cat/Model	Stock/Serial #	Code	Control	Last Maint.
PC2 Discharge Check	CLA-VAL	10"	81-02-21E	10-81-02	ON		
PC2 Deep Well Valve	CLA-VAL	4"	4-100-20	100-20-59A			
PC2 Pressure Relief Valve	CLA-VAL	6"	6-661-02	661-02-42K	ON		
PC3 Discharge Check/Pressure Sustaining Valve	CLA-VAL	8"	100-G	850C13ABC	98		
PC3 Deep Well Valve	CLA-VAL	4"	4-61-02	61-02-348F	PS		
PC3 Pressure Relief Valve	CLA-VAL	4"	4-50-01B	50-01-66F	PS		
Watercress 150hp Pump Control Discharge Check	CLA-VAL	10"	10-60P	69506-04	MG	120v solenoid w/ MO Model CSM11-A2-2	
Watercress Stream Bypass PRV	CLA-VAL	2"	90-01ABS	90-01-194A	AI	3/8" CRD 71943-04H 2-30 psi	
Watercress Stream Bypass Solenoid	CLA-VAL	2"	136-01A	136-01-8J	AI		
Watercress Sample Line PRV	Watts	1/2"	N55BM1	06301		25-75 psi	
Watercress Surge Valve	CLA-VAL	4"	52-03	52-03-52K	UQ		
Lower Fairway Hills Pump Station Pressure Relief	CLA-VAL	3"	3-56?	73113-08	PD		
CCF Pressure Sustaining Valve	Watts	1.5"	ACV 1115	1115-3 / 9002-3			
New Horizons Pressure Reducing Valve	CLA-VAL	2"	90G-01AB (2-90 01AB)	90-01-81A	OQ		
New Horizons Pressure Reducing Valve	CLA-VAL	6"	90G-01AS (6-90 01AB)	90-01-56C	OQ		
New Horizons Pressure Relief Valve	CLA-VAL	3"	3-51-01	5101	XG		
City Reservoir Throtting Valve	GA Industries	12"	X-3730-DPM	901324 Rev 1	535734		08 2010
Crews Reservoir Throttling Valve	GA Industries	12"	X-3730-DPM	901324 Rev 1	535734		Don't use
Lower New Horizons PRV	CLA-VAL	3"	90A-01AS				New 2011
Weyerhaeuser BPS Pressure Sustaining Valve	CLA-VAL	2"	50-01/650-01			1/2" CRL 20-200 psi	New 2012

Water System Generators

	Highview	CCF	Watercress	PC Johnson	Boise
Address	39520 254th Ave SE	1835 Roosevelt Ave E	28002 SE 440th St	42415 284th Ave SE	31000 Chinook Pass Hwy
Elevation	750	876	742	747	876
Generator					
Year	2009	2002	1995	1999	1998
kW	20	50	350	200	8.5
Make	Onan-Cummins	Onan-Cummins	Onan-Cummins	Onan-Cummins	Gillette Sentry-Pro
Model	20GGMA	50DGCA	350DFCC	200DGFC - 150	SP85LP
Serial #	L090075922	F020383314	J950590026	H990974879	VL16-215
Fuel	Propane	Diesel	Diesel	Diesel	Propane
Tank Size (gal)	80	140	550	185	240
Engine					
HP			535		
Make	Cummins	Cummins	Cummins	Cummins	Briggs & Stratton
Model	GM3.0L	4BT3.9-G4	NTA855-G3	6CTAA8.3	303447
Serial #	3POL48100	46220998			
Run Time at Full Load					
gal/h	3.27	4.2	24.4	14.5	1.7
Hours	17	33	23	13	97
Days	0.7	1.4	0.9	0.5	4.0
Run Time at 1/4 Load					
gal/h	1.68	1.1	8	4.8	0.9
Hours	33	89	69	39	272
Days	1.4	3.7	2.9	1.6	11.3

Note:

1. Consumption at 1/4 load for 50 and 200 kW sets from 1/24/12 e-mail from Richard Dickson of Cummins NW.
2. Consumption for full and 1/4 load for 8.5 kW set from 1/25/12 e-mail from Gillette Generators.

Fill Tracking

Date	09/26/2012	01/24/2012	11/20/2011	10/23/2012	02/08/2012
Gallons	43%	88.5	58	18.3	94.4
Total Hrs / Net Hrs	118.1	358.8	276.6	445.4	
Gal/hr					
Date	10/24/2012	10/23/2012	10/23/2012		
Gallons	49.8	3	92.1		
Total Hrs / Net Hrs	120.1	360.2	289		
Gal/hr		2.1	7.4		
Date					
Gallons					
Total Hrs / Net Hrs					
Gal/hr					
Date					
Gallons					
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Gal/hr					
Date					
Gallons					
Total Hrs / Net Hrs					
Gal/hr					
Date					
Gallons					
Total Hrs / Net Hrs					
Gal/hr					

APPENDIX C

AGREEMENTS

WATER SERVICE AGREEMENT

WHEREAS, the City of Tacoma, Department of Public Utilities, Water Division ("**Tacoma**") has received a request for wholesale water service from the City of Enumclaw ("**Enumclaw**"),

WHEREAS, Tacoma's Public Utility Board recently approved up to a total of five (5) million gallons per day (mgd) of additional water supply for wholesale purposes,

WHEREAS, Enumclaw has a water supply deficit and has a declared building moratorium,

WHEREAS, Tacoma is revising its System Development Charge fee structure and agrees to hold additional water requests in reserve until the study is complete.

NOW, THEREFORE, BE IT RESOLVED, that Tacoma has agreed to provide additional water supply to Enumclaw as provided below:

1. Upon payment to Tacoma of the calculated System Development Charge (SDC) of $548,153 for Enumclaw's existing water supply deficit of 0.33 MGD, Tacoma will commit the water for Enumclaw's immediate use.

2. Enumclaw shall pay Tacoma the current SDC amount for any new customers that are connected to Enumclaw's water system before Tacoma's current SDC study and implementation is completed. This provision is in accordance with Policy #1 of Tacoma's Wholesale Service Policies/Principles dated June 13, 1997.

3. Enumclaw's additional request for water reservation for 1,400 single family equivalents (minus those in Item 2 above) will be held in reserve by Tacoma until the current SDC study is completed. When the study is completed this Agreement will be amended to provide the provisions for additional water supply.

4. The Conditions of Water Delivery which cover issues dealing with water quality and pressure are as stated in the letter to Enumclaw from Tacoma dated May 7, 1997.

5. Tacoma plans to develop new water sources that will allow it to provide more than five (5) mgd total additional supply to its wholesale customers. However, until these new source are assured, Tacoma cannot commit permanent water supply beyond the combined total of five (5) mgd for all wholesale customers.

Dated and signed this 21st day of October, 1997 by the duly authorized officers.

City of Tacoma

Kenneth J. Merry
Water Superintendent

Legal Approval

City of Enumclaw

Mayor

9-29-97
enumagmt.doc

Tacoma Public Utilities

Mark Crisson
Director

3628 South 35th Street
P.O. Box 11007
Tacoma, WA 98411-0007

Divisions
Light
Water
Belt Line

RECEIVED
MAY 0 8 1997
CITY OF ENUMCLAW

May 7, 1997

Mr. Mark Bauer
Public Works Director
City of Enumclaw
1309 Myrtle Avenue
Ecumclaw, WA 98022

Dear Mr. Bauer:

From our communications in recent months, we understand that Enumclaw needs wholesale water supply from Tacoma to meet an existing deficit and to provide for new customers. We have addressed below how we can provide water for both water supply needs.

As you know, in January our Public Utility Board authorized us to offer an additional 5 million gallons per day (MGD) to help satisfy the needs of our wholesale customers. Therefore, we do have water available to cover your water supply deficit and a limited amount, until we develop a new large resource project, to satisfy new customer needs.

1. Water Supply to Meet the Existing Deficit: From the information provided to us, we understand you have a current summer supply deficit of about 0.75 MGD. The 0.75 MGD (annual daily average = 0.2 MGD +/- assuming 0.75 MGD over three months) can be provided to your system upon payment of our current System Development Charge (SDC). The SDC analysis uses customer information in our 1991 SDC report and is calculated as follows:

Based on 1995 Numbers

SDC = *Commodity-* ~~56,055~~ ~~40,300~~ 200,000 gpd / 662 gal/ERU = 302 ERU
330,000 - ~~56,055~~ ~~40,300~~ 302 ERU x $256.95 = $77,599

Peak- (750,000 - 200,000) gpd / 384 gal/ERU = 1,432 ERU
1,432 ERU x $735.79 = $1,053,651

Total SDC = $1,131,250

330,000 x 61 / 365 = 55,150 Ave. / 662 = 83 ERU's x 256.95 = $21,327.00
~~660,000~~
330,000 - 55,150 / 384 = 716 ERU's x 735.79 = $526,826.00
Deficit $548,153.00

The 662 and 384 gallons per ERU (equivalent residential unit) are the average day and added peak day component, respectively, for our average customer. The $256.95 (commodity or base use) and $735.79 (peak use) costs are the cost components from our SDC report that add up to our $990 SDC amount for our typical residential customer.

2. Water Supply for New Customers: As with the SDC for the deficit, the commitment to a portion of the 5 MGD is secured upon payment to us of our prevailing SDC. Enumclaw would collect our SDC from its new customers or from customers requesting an additional amount of water (such as an industrial user) and the total SDCs collected would be forwarded to us quarterly. Our current SDC amount would be collected for new water services with up to 2" meters. For new services with 3" meter and larger, and for increases in water requested from existing larger customers, the SDC will not be determined until later this year when a study to update the SDC amounts is completed.

We anticipate that all of the SDC amounts will be higher after the study is done and expect it to be substantially higher for meters 3" and larger. Recent evaluations have indicated current SDC amounts do not adequately collect costs for water use through larger meter sizes.

3. Conditions of Water Delivery: We will provide water under the limitations of our water transmission system and Enumclaw would have responsibility for managing any special water quality or supply needs. It is important to identify three water supply conditions upon which service would be provided.

a) As you are aware, our source of supply to Enumclaw would come directly from the Green River. With the surface water source there are requirements from the Safe Drinking Water Act that deal with disinfectant contact time (CT), and lead and copper concentrations at the consumers tap. The CT requirement may not be fully met in our transmission system at Enumclaw under some operating conditions i.e. winter operations.

b) Additionally, the lead and copper rule requirements may need to be dealt with in your water system because the surface water is moderately corrosive. If you need more information on these water quality requirements in relation to our water supply system, please contact Al Medak our Water Quality Manager (253-502-8210).

c) As mentioned before, our transmission main (Pipeline No. 1) through Enumclaw is not always flowing at full capacity. The effect of this is that there is no water pressure because the water level is below the top of pipe. Any connections on Pipeline No. 1 may not be fully submerged if the connection is at the springline (middle) of the pipe, such as with your existing emergency water service. This low flow condition exists now in the non-summer months and will exist most of the year if our proposed Second Supply Project is constructed. If you need more information on options to assure a submerged pump suction, please contact Dave Sherman our Water Supply Manager (253-502-8213).

Please contact Craig Gibson, Project Manager, at 253-502-8204 or myself if you have questions or wish to meet.

Sincerely,

Craig Gibson

for Kennneth J. Merry
Superintendent
Water Division

cc: Water Division Managers

WATER SERVICE AREA AGREEMENT

THE CITY OF ENUMCLAW and the Remolif Addition WATER COMPANY, hereby and for the following reasons have entered into this Water Service Area Agreement under the following terms and conditions:

WHEREAS, The Remolif Addition Water Company is the owner of a water system serving domestic water to the area generally north of SE 384th Street and east of the Enumclaw-Black Diamond Highway, and

WHEREAS, The nearest area provided water from the City's sources is part of the Krain Water Works service area, and

WHEREAS, The City of Enumclaw has no authority to serve customers from Krain Water Works water lines making it unlikely that City water service will be extended into the Company's area,

NOW, THEREFORE, The City and the Water Company do hereby agree as follows:

1. The City agrees to notify the company of any proposed improvements to the City water system which might benefit the Company or which might be detrimental to the Company.

2. The City agrees that it shall not install water lines or serve customers within the area served by the Company unless a Notice of Intent to do so is given to the Company sixty (60) days prior to taking such action.

IN WITNESS WHEREOF, the parties hereto have executed this Water Service Area Agreement as of the 10th day of November, 1977.

CITY OF ENUMCLAW

BY [signature]
Mayor

CORRECT ATTEST:

Margaret E. High
City Clerk

Remolif Addition WATER COMPANY

BY [signature]
President

BY Karen McKim
Secretary

STATE OF WASHINGTON)
) SS.
COUNTY OF KING)

On this 10th day of November, 1977, before me, the undersigned, a Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared FRED C. FARMAN and MARGARET E. HIGH, to me known to be the Mayor and City Clerk, respectively, of the City of Enumclaw, the corporation that executed the foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned and on oath stated that they are authorized to execute the said instrument and that the seal affixed is the corporate seal of said corporation.

WITNESS my hand and official seal hereto affixed the day and year first above written.

NOTARY PUBLIC in and for the State of Washington, residing at Enumclaw.

STATE OF WASHINGTON)
) SS.
COUNTY OF KING)

On this 28TH day of OCTOBER, 1977, before me, the undersigned, a Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared R. V. BANGERT and KAREN McKIM, to me known to be the President and Secretary, respectively, of REMOLIF ADDITION Water Company, the corporation that executed the foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes herein mentioned, and on oath stated that they are authorized to execute the said instrument and that the seal affixed is the corporate seal of said corporation.

WITNESS my hand and official seal hereto affixed the day and year first above written.

Martin L. Strom
NOTARY PUBLIC in and for the State of Washington, residing at Enumclaw.

RETAIL WATER SERVICE AGREEMENT

BETWEEN CITY OF ENUMCLAW

AND

Schodde-Gamblin Homeowners Association

This retail water agreement ("Agreement") is made by and between the City of Enumclaw, a municipal corporation (hereafter "Enumclaw"), and Schodde-Gamblin Homeowners Association (hereafter "Schodde-Gamblin"). Enumclaw and Schodde-Gamblin collectively shall be referred to as the "Parties" or either Enumclaw or Schodde-Gamblin may be referred to as "Party" when appropriate.

A. RECITALS:

WHEREAS, Enumclaw has evaluated its retail projections in its demand forecast and has determined that adequate water resources are available to serve those projected demands; and

WHEREAS, the Parties are responsible for operating and maintaining their respective water systems in accordance with federal, state and local laws and regulations; and

WHEREAS, the Parties further recognize that water resources are finite and valuable, and the prudent use and management of these resources requires cooperation; and

WHEREAS, Schodde-Gamblin has requested and Enumclaw has agreed to provide a retail water supply to Schodde-Gamblin, and Enumclaw is able and willing to provide the requested quantity of water on the terms and conditions as herein provided, now therefore;

for and in consideration of the mutual covenants, conditions and payments to be made as set forth herein, the Parties hereto agree as follows:

B. DEFINITIONS:

The meaning of certain words or terms, when used in this Agreement, is as follows:

1. "Retail Service Connection" means a physical connection between water mains of the two Parties to this Agreement, at a specifically identified point or points, where water may be transferred from one Party's system to the transmission or distribution facilities of the other Party.

2. "Isolation Valve" means a positive shut off valve that shall be installed at the point in each water system that is used to accept or deliver water through the Retail Service Connection. Each Party has sole responsibility for operating their Isolation Valve.

3. "Retail Service Connection Capacity" means the maximum flow capacity for water to be delivered through a Retail Service Connection as agreed upon by the Parties to this Agreement. Retail service connection facilities shall be designed so as to be capable of conveying no less than the agreed upon Retail Service Connection Capacity.

4. "Emergency" means an unforeseen event that causes damage or disrupts normal operations and requires immediate action to protect public health and safety including exclusively when water system repairs are necessary due to a water system failure or when there is a water supply shortfall.

5. "Enumclaw Municipal Code (EMC)" means the City of Enumclaw's municipal code.

6. The City of Enumclaw water system includes:
   a. two spring sources and a wellfield, all with chlorine disinfection, and an emergency connection with the City of Tacoma;
   b. 4.5 million gallons of storage in three main zone reservoirs;
   c. corrosion control treatment for the spring sources;
   d. over 135 miles of water transmission and distribution mains.

   Detailed information on the water quality, treatment, and operation of the City system is contained in the City of Enumclaw Comprehensive Water System Plan.

7. The Schodde-Gamblin water system is within the City of Enumclaw service area and includes: privately owned water lines and booster pump station, separated from the City's water meter by a 4" double check valve assembly. The pump station includes two Goulds 3SVB six-stage 7.5 HP pumps, with ability to add a third pump.

8. The service area of Schodde-Gamblin is as described following: Lots 1, 2, 3, and 4 of King County Short Plat #L00S0012 recorded under file #20030421900004.

C. <u>CONDITIONS</u>:

The responsibilities of the parties to this contract are set forth below:

1. <u>General.</u> Enumclaw agrees to furnish the Retail Service Connection Capacity to Schodde-Gamblin of a quality that will satisfy all applicable local, state, and

federal requirements and in accordance with the City's Comprehensive Water System Plan and the terms and conditions of this Agreement.

2. Service Area. The City of Enumclaw and Schodde-Gamblin agree that the boundary of the Schodde-Gamblin system is as described in Section B of this agreement and that the system is entirely within the Enumclaw retail water service area.

3. Water Quantity Reserved. Enumclaw commits to and agrees to install a 2" meter, for the projected use of the Schodde-Gamblin water system. The quantity so reserved is based on a total number of no more than 5 Equivalent Resident Units (ERUs) served by Schodde-Gamblin as of the date of this agreement.

4. System Development Charge (SDC). Based upon the water supply request information provided to Enumclaw by Schodde-Gamblin, and in accordance with the charges specified in City Resolution No. 1044 and future amendments, Schodde-Gamblin shall pay to Enumclaw the determined System Development Charge (SDC) for the initial Retail Service Connection Capacity and any additional connections to the Schodde-Gamblin system added after execution of this agreement. The 5 contracted Equivalent Resident Unit amount may be adjusted upwards based on additional SDC payment(s).

5. Retail Water Rates. Enumclaw will supply Schodde-Gamblin with retail water at the outside City water service rate as identified in the EMC. In the absence of a specific retail customer class, Enumclaw will charge Schodde-Gamblin at the multi-family residential customer class rate. The water rates are periodically adjusted and shall be applicable as set forth in the rate schedule as adopted by the Enumclaw City Council.

6. Reliability. Enumclaw agrees to supply retail water pursuant to this Agreement with the same degree of reliability and surety of supply as water provided by Enumclaw to its existing customers.

7. Connection(s). The cost for design and construction of the new Retail Service Connection at the point of connection shown in Exhibit "A", including pipe, valves, meter(s), Washington State approved backflow device(s), and appurtenances and vaults, shall be the responsibility of Schodde-Gamblin. The connection shall meet the requirements of the City of Enumclaw and the State Health Department, Office of Drinking Water. No future Retail Service Connections shall be permissible without a subsequent and separate written agreement between the Parties, which agreement may supplement this Agreement. Neither Party shall be obligated to agree to or execute any agreement or permit with the other Party to construct additional water Retail Service Connection(s).

8. Ownership, Capital and Maintenance Costs. Schodde-Gamblin agrees that the City of Enumclaw owns the retail water meter and all equipment and piping upstream of the meter. Maintenance and operation costs for this equipment are the responsibility of the City of Enumclaw. Any material and installation (capital) costs related to the original equipment, including upgrades or replacement and renewal are Schodde-Gamblin's responsibility. Schodde-Gamblin is responsible for installation, operation, and maintenance of the Schodde-Gamblin system.

9. Transferability. The rights and obligations of this Agreement are transferable to heirs, successors and assignees of the Parties.

10. Resale. Water provided under this Agreement may only be resold to the customers of Schodde-Gamblin as allowed under law.

11. Conservation and Curtailment. As a requirement of retail service Schodde-Gamblin commits to a water conservation program that is substantially equivalent to Enumclaw's programs and consistent with applicable state law and regulations. In the event that a major water shortage occurs and Schodde-Gamblin fails to abide by the conservation and/or curtailment requirements as publicly announced by Enumclaw, then Enumclaw may terminate water supplied under this Agreement until such time as Schodde-Gamblin agrees to abide by such requirements or apply appropriate financial penalties to be determined by the Enumclaw City Council.

12. Emergency. Schodde-Gamblin acknowledges that during an emergency situation or a planned outage Enumclaw may temporarily be unable to meet all or part of its retail service commitment. If Enumclaw has a planned outage, Enumclaw commits to give Schodde-Gamblin a minimum of seven (7) days advance notice in writing. Enumclaw and Schodde-Gamblin will work together to identify mutually acceptable dates for planned outages.

13. Indemnification. The City of Enumclaw shall not be liable to Schodde-Gamblin customers for the failure of Schodde-Gamblin system to supply and deliver water provided under this Agreement at any time or for any reason. Each Party agrees to indemnify the other and hold it harmless from and against any loss, cost, damage, or expense of any kind and nature, including reasonable attorney's fees arising out of injury to person or damage to property in any manner caused by the negligence or omission of the Party in the performance of its roles and responsibilities in connection with this Agreement.

14. Agreement not a Joint Venture. This Agreement is intended to be and is a contract for the purchase and sale of wholesale water, and no provision hereof shall be construed to make the Parties partners or engaged in a joint venture. Neither Party is the agent of the other nor shall either Party be held liable for the acts of the other on a theory of agency or any other representative capacity.

15. Dispute Resolution. In the event of a disagreement over any aspect of this Agreement, except as herein further provided, it is agreed that any dispute shall be submitted to binding arbitration pursuant to Chapter 7.04 RCW. The Parties shall agree upon who will arbitrate the dispute, and upon failure to reach agreement within a reasonable period of time, the presiding judge of the King County Superior Court may be asked to appoint an arbitrator from one of the recognized dispute resolution services. The Party that substantially prevails in the arbitration proceeding shall be awarded its reasonable attorney fees and costs. If neither Party substantially prevails in the arbitration proceeding, the Parties shall each bear their respective costs and divide the mutual costs associated with the arbitration equally.

16. Notice. All notices, requests, demands and other communications hereunder shall be in writing and shall be deemed given if personally delivered or mailed, certified mail, return receipt requested, or sent by overnight carrier to the following addresses:

If to Enumclaw:
Chris Searcy
Public Works Director
City of Enumclaw
1309 Myrtle Ave
Enumclaw, WA 98022
Phone: 360-825-3593 Ext. 5721
Fax: 360-825-7232

If to Schodde-Gamblin:
Schodde-Gamblin
PO Box 622
Enumclaw, WA 98022
Phone: 360-825-1049
Fax: 360-825-7915

Billings for payments due the City by Schodde-Gamblin shall be served by regular mail to the address above.

17. Invalidity. If any term of this Agreement is found to be void or invalid, such invalidity shall not affect the remaining terms of this Agreement, which shall continue in full force and effect. The parties shall agree that if any provisions are deemed not enforceable, they shall be deemed modified to the extent necessary to make them enforceable. To the extent that there is any inconsistency between the provisions of this agreement, any exhibit incorporated as part of this agreement, or subsequent amendments and other rules and regulations of the City, the provisions of this agreement shall control.

18. Counterparts. This Agreement may be executed in any number of counterpart copies, each of which shall be deemed an original, but all of which together shall constitute a single instrument.

19. Records Inspection. Each Party shall maintain and make available for inspection at reasonable times all records pertaining to each Party's water system. These records shall be maintained for a minimum 3-year period.

20. Monitoring and Reporting. Schodde-Gamblin shall keep records of total water supplied to its system and water consumed. The difference between water supplied and consumed shall be computed monthly. If the difference is more than 10% of water supplied Schodde-Gamblin shall conduct leak survey(s) to identify where leakage is occurring and implement a regular program to reduce the leakage within a timeframe mutually agreed upon by the Parties.

21. Improvement and Operation of Schodde-Gamblin System. Schodde-Gamblin shall be responsible for improvements in the Schodde-Gamblin system that may be needed because of differences between the City and Schodde-Gamblin system pressures. Schodde-Gamblin shall be responsible for obtaining any required county and state approvals of the Schodde-Gamblin system improvements. The City is not responsible for ensuring the adequacy of the Schodde-Gamblin water system or that all necessary easements and approvals have been obtained. Fire flow to Schodde-Gamblin system will not be provided. Residential fire sprinkler systems will not be allowed to be connected to the Schodde-Gamblin water system. All services in the Schodde-Gamblin system shall be metered and read on a monthly basis. Enumclaw will not be liable for failure of any booster pump used in Schodde-Gamblin system if the City water supply loses pressure for any reason. The pump station design should include a protective system to ensure the pump is not damaged because of lack of water. Schodde-Gamblin shall be solely responsible for flushing water mains within its system. Flushing allowances will be provided by the City only when the City's Water Maintenance Supervisor determines that flushing is required to maintain or improved water quality.

22. Payment. The City shall bill Schodde-Gamblin on a monthly basis for all charges due under the agreement. Schodde-Gamblin shall pay such charges within the period of time specified by the EMC. Any amounts disputed by Schodde-Gamblin shall be paid under protest within the prescribed time period. All late payments, and any refund of an amount in dispute that was paid under protest, shall accrue interest as specified in the EMC.

23. Uncontrollable Forces or Changes. Uncontrollable forces or State or Federal Law changes may occur during the time this Agreement is in place. Neither of the parties hereto shall be considered to be in default in respect to any obligations hereunder if prevented from fulfilling such obligations by reason or uncontrollable forces or material changes in state or federal law or enforcement thereof. Parties rendered unable to fulfill any obligation hereunder by reason of an uncontrollable force or material change in state or federal law shall exercise due diligence to deal with such uncontrollable force with all reasonable dispatch and to take actions consistent with the purpose of this agreement.

24. Independent Relationship. This Agreement describes the entire relationship of the parties with regard to the subject matter herein concerned. Except as maybe explicitly provided otherwise herein, the parties are independent agencies and shall not be deemed to be partners, joint ventures, principals, or agents or each other for any purpose whatsoever. Each party shall have and maintain sole and complete control over all or its employees, agents and operations. Except as may otherwise be explicitly provided herein, or in separated agreement, each and all of the obligations, responsibilities, and liabilities of the parties under and in connection with this Agreement are several, and not joint, and no separate legal or administrative entity will be created to fulfill the purposes of this Agreement.

25. Term. This Agreement shall remain in effect so long as the City of Enumclaw remains in the business of providing water and so long as Schodde-Gamblin meets the terms and conditions of this Agreement. Either party can request amendment or renegotiation of this agreement, but no more frequently than every five years.

26. Authority to Bind. Each of the Parties to this Agreement certifies that the person signing this Agreement has authority to bind the respective governing bodies to all of the terms and conditions of the Agreement herein. No change, amendment or modification or any provision of this agreement shall be valid unless set forth in a written amendment to this Agreement signed by all parties.

Dated this 23rd day of MAY, 2006.

City of Enumclaw

Chris Searcy, P.E.
Public Works Director

Schodde-Gamblin

David Schodde, Partner
Schodde-Gamblin, President

Partner
Schodde-Gamblin, Secretary

Approved by:
City Attorney

EXHIBIT "A"

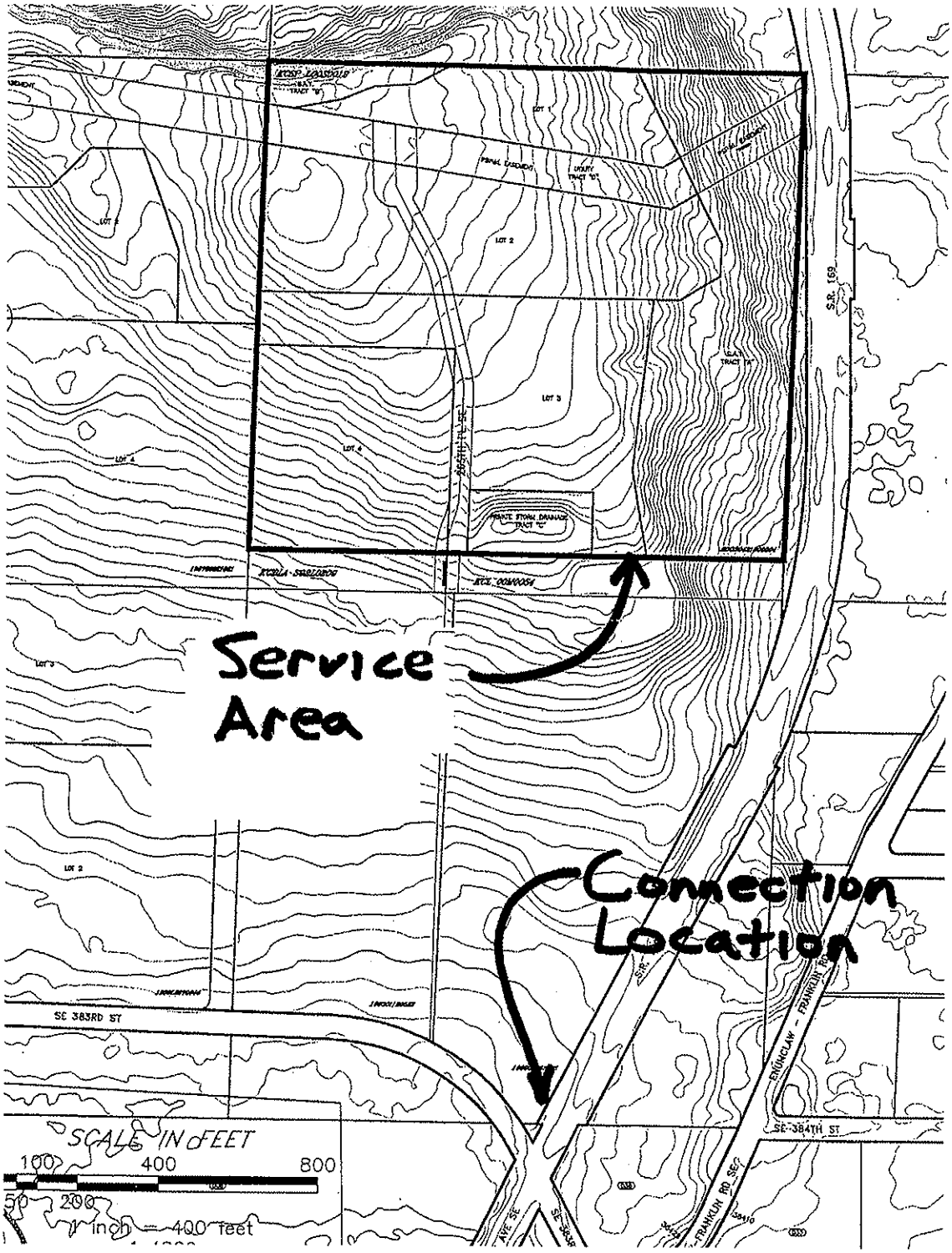
SERVICE CONNECTIONS SPECIFICATIONS

Connection Location	Connection Size	Meter Size	Max HGL Elevation (ft, NGVD)		Meter Flow Capacity (GPM)	Contracted Quantity		
			Enumclaw	S-Gamblin		ERU's	Total MG/YR	Peak GPD
SR169 and SE 383rd Street	8"	2"	888		160	5	0.56	3213

1) Total MG/YR based on 306 gpd/ERU.
2) Peak GPD based on 306 gpd/ERU and 2.1 peaking factor.

EXHIBIT B

GENERAL LOCATION MAP OF SERVICE CONNECTION



RETAIL WATER SERVICE AGREEMENT

BETWEEN CITY OF ENUMCLAW

AND

BACK LLC

This retail water agreement ("Agreement") is made by and between the City of Enumclaw, a municipal corporation (hereafter "Enumclaw"), and BACK LLC (hereafter "BACK"). Enumclaw and BACK collectively shall be referred to as the "Parties" or either Enumclaw or BACK may be referred to as "Party" when appropriate.

A. RECITALS:

WHEREAS, Enumclaw has evaluated its retail projections in its demand forecast and has determined that adequate water resources are available to serve those projected demands; and

WHEREAS, the Parties are responsible for operating and maintaining their respective water systems in accordance with federal, state and local laws and regulations; and

WHEREAS, the Parties further recognize that water resources are finite and valuable, and the prudent use and management of these resources requires cooperation; and

WHEREAS, BACK has requested and Enumclaw has agreed to provide a retail water supply to BACK, and Enumclaw is able and willing to provide the requested quantity of water on the terms and conditions as herein provided, now therefore;

for and in consideration of the mutual covenants, conditions and payments to be made as set forth herein, the Parties hereto agree as follows:

B. DEFINITIONS:

The meaning of certain words or terms, when used in this Agreement, is as follows:

1. "Retail Service Connection" means a physical connection between water mains of the two Parties to this Agreement, at a specifically identified point or points, where water may be transferred from one Party's system to the transmission or distribution facilities of the other Party.

2. "Isolation Valve" means a positive shut off valve that shall be installed at the point in each water system that is used to accept or deliver water through the Retail Service Connection. Each Party has sole responsibility for operating their Isolation Valve.

3. "Retail Service Connection Capacity" means the maximum flow capacity for water to be delivered through a Retail Service Connection as agreed upon by the Parties to this Agreement. Retail service connection facilities shall be designed so as to be capable of conveying no less than the agreed upon Retail Service Connection Capacity.

4. "Emergency" means an unforeseen event that causes damage or disrupts normal operations and requires immediate action to protect public health and safety including exclusively when water system repairs are necessary due to a water system failure or when there is a water supply shortfall.

5. "Enumclaw Municipal Code (EMC)" means the City of Enumclaw's municipal code.

6. The City of Enumclaw water system includes:
   a. two spring sources and a wellfield, all with chlorine disinfection, and an emergency connection with the City of Tacoma;
   b. 4.5 million gallons of storage in three main zone reservoirs;
   c. corrosion control treatment for the spring sources;
   d. over 135 miles of water transmission and distribution mains.

   Detailed information on the water quality, treatment, and operation of the City system is contained in the City of Enumclaw Comprehensive Water System Plan.

7. The BACK water system is within the City of Enumclaw service area and includes: privately owned water lines and booster pump station, separated from the City's water meter by a double check valve assembly. The pump station includes a water storage tank and two 2 HP pumps operating between 26 and 27 gallons per minute for a pump run cycle.

8. The service area of BACK is as described following: Lots 1, 2, 3, and 4 of King County Testamentary Lot Div #L11M0033 recorded under King County file #20120411900001.

C. <u>CONDITIONS</u>:

The responsibilities of the parties to this contract are set forth below:

1. <u>General.</u> Enumclaw agrees to furnish the Retail Service Connection Capacity to BACK of a quality that will satisfy all applicable local, state, and federal

requirements and in accordance with the City's Comprehensive Water System Plan and the terms and conditions of this Agreement.

2. Service Area. The City of Enumclaw and BACK agree that the boundary of the BACK system is as described in Section B of this agreement and that the system is entirely within the Enumclaw retail water service area.

3. Water Quantity Reserved. Enumclaw commits to and agrees to install a 1.5" meter, for the projected use of the BACK water system. As of the date of this agreement the quantity so reserved is shown in Exhibit A and is based on a total number of no more than 4 Equivalent Residential Units (ERUs) to be served by BACK.

4. System Development Charge (SDC). Based upon the water supply request information provided to Enumclaw by BACK, and in accordance with the charges specified in City Resolution No. 1438 and future amendments, BACK shall pay to Enumclaw the determined System Development Charge (SDC) for the initial Retail Service Connection Capacity and any additional connections to the BACK system added after execution of this agreement. Provided Enumclaw has additional capacity available, the 4 contracted Equivalent Resident Unit amount may be adjusted upwards based on additional SDC payment(s). An additional SDC will also be charged if usage is greater than 110 percent of the purchased ERU capacity. This requirement for an additional SDC may be waived upon satisfactory demonstration by BACK that the increased water use was temporary in nature and will return to the originally anticipated level.

5. Retail Water Rates. Enumclaw will supply BACK with retail water at the outside City water service rate as identified in the EMC. In the absence of a specific retail customer class, Enumclaw will charge BACK at the multi-family residential customer class rate. The water rates are periodically adjusted and shall be applicable as set forth in the rate schedule as adopted by the Enumclaw City Council.

6. Reliability. Enumclaw agrees to supply retail water pursuant to this Agreement with the same degree of reliability and surety of supply as water provided by Enumclaw to its existing customers.

7. Connection(s). The cost for design and construction of the new Retail Service Connection at the point of connection shown in Exhibit "B", including pipe, valves, meter(s), Washington State approved backflow device(s), and appurtenances and vaults, shall be the responsibility of BACK. The connection shall meet the requirements of the City of Enumclaw and the State Health Department, Office of Drinking Water. No future Retail Service Connections shall be permissible without a subsequent and separate written agreement between the Parties, which agreement may supplement this Agreement. Neither Party

shall be obligated to agree to or execute any agreement or permit with the other Party to construct additional water Retail Service Connection(s).

8. Ownership, Capital and Maintenance Costs. BACK agrees that the City of Enumclaw owns the retail water meter and all equipment and piping upstream of the meter. Maintenance and operation costs for this equipment are the responsibility of the City of Enumclaw. Any material and installation (capital) costs related to the original equipment, including upgrades or replacement and renewal are BACK's responsibility. BACK is responsible for installation, operation, and maintenance of the BACK system.

9. Transferability. The rights and obligations of this Agreement are transferable to heirs, successors and assignees of the Parties.

10. Resale. Water provided under this Agreement may only be resold to the customers of BACK as allowed under law.

11. Conservation and Curtailment. As a requirement of retail service BACK commits to a water conservation program that is substantially equivalent to Enumclaw's programs and consistent with applicable state law and regulations. In the event that a major water shortage occurs and BACK fails to abide by the conservation and/or curtailment requirements as publicly announced by Enumclaw, then Enumclaw may terminate water supplied under this Agreement until such time as BACK agrees to abide by such requirements or apply appropriate financial penalties to be determined by the Enumclaw City Council.

12. Emergency. BACK acknowledges that during an emergency situation or a planned outage Enumclaw may temporarily be unable to meet all or part of its retail service commitment. If Enumclaw has a planned outage, Enumclaw commits to give BACK a minimum of seven (7) days advance notice in writing. Enumclaw and BACK will work together to identify mutually acceptable dates for planned outages.

13. Indemnification. The City of Enumclaw shall not be liable to BACK customers for the failure of BACK system to supply and deliver water provided under this Agreement at any time or for any reason. Each Party agrees to indemnify the other and hold it harmless from and against any loss, cost, damage, or expense of any kind and nature, including reasonable attorney's fees arising out of injury to person or damage to property in any manner caused by the negligence or omission of the Party in the performance of its roles and responsibilities in connection with this Agreement.

14. Agreement not a Joint Venture. This Agreement is intended to be and is a contract for the purchase and sale of wholesale water, and no provision hereof shall be construed to make the Parties partners or engaged in a joint venture.

Neither Party is the agent of the other nor shall either Party be held liable for the acts of the other on a theory of agency or any other representative capacity.

15. Dispute Resolution. In the event of a disagreement over any aspect of this Agreement, except as herein further provided, it is agreed that any dispute shall be submitted to binding arbitration pursuant to Chapter 7.04 RCW. The Parties shall agree upon who will arbitrate the dispute, and upon failure to reach agreement within a reasonable period of time, the presiding judge of the King County Superior Court may be asked to appoint an arbitrator from one of the recognized dispute resolution services. The Party that substantially prevails in the arbitration proceeding shall be awarded its reasonable attorney fees and costs. If neither Party substantially prevails in the arbitration proceeding, the Parties shall each bear their respective costs and divide the mutual costs associated with the arbitration equally.

16. Notice. All notices, requests, demands and other communications hereunder shall be in writing and shall be deemed given if personally delivered or mailed, certified mail, return receipt requested, or sent by overnight carrier to the following addresses:

If to Enumclaw:
Chris Searcy
Public Works Director
City of Enumclaw
1309 Myrtle Ave
Enumclaw, WA 98022
Phone: 360-825-3593 Ext. 5721
Fax: 360-825-7232

If to BACK:
David Knight
19408 SE 322 St
Kent WA 98042
253-631-9545

Billings for payments due the City by BACK shall be served by regular mail to the address above.

17. Invalidity. If any term of this Agreement is found to be void or invalid, such invalidity shall not affect the remaining terms of this Agreement, which shall continue in full force and effect. The parties shall agree that if any provisions are deemed not enforceable, they shall be deemed modified to the extent necessary to make them enforceable. To the extent that there is any inconsistency between the provisions of this agreement, any exhibit incorporated as part of this agreement, or subsequent amendments and other rules and regulations of the City, the provisions of this agreement shall control.

18. Counterparts. This Agreement may be executed in any number of counterpart copies, each of which shall be deemed an original, but all of which together shall constitute a single instrument.

19. Records Inspection. Each Party shall maintain and make available for inspection at reasonable times all records pertaining to each Party's water system. These records shall be maintained for a minimum 3-year period.

20. Monitoring and Reporting. BACK shall keep records of total water supplied to its system and water consumed. The difference between water supplied and consumed shall be computed monthly. If the difference is more than 10% of water supplied BACK shall conduct leak survey(s) to identify where leakage is occurring and implement a regular program to reduce the leakage within a timeframe mutually agreed upon by the Parties.

21. Improvement and Operation of BACK System. BACK shall be responsible for improvements in the BACK system that may be needed because of differences between the City and BACK system pressures. BACK shall be responsible for obtaining any required county and state approvals of the BACK system improvements. The City is not responsible for ensuring the adequacy of the BACK water system or that all necessary easements and approvals have been obtained. Fire flow to BACK system will not be provided. Residential fire sprinkler systems will not be allowed to be connected to the BACK water system. All services in the BACK system shall be metered and read on a monthly basis. Enumclaw will not be liable for failure of any booster pump used in BACK system if the City water supply loses pressure for any reason. The pump station design should include a protective system to ensure the pump is not damaged because of lack of water. BACK shall be solely responsible for flushing water mains within its system. Flushing allowances will be provided by the City only when the City's Water Maintenance Supervisor determines that flushing is required to maintain or improved water quality.

22. Payment. The City shall bill BACK on a monthly basis for all charges due under the agreement. BACK shall pay such charges within the period of time specified by the EMC. Any amounts disputed by BACK shall be paid under protest within the prescribed time period. All late payments, and any refund of an amount in dispute that was paid under protest, shall accrue interest as specified in the EMC.

23. Uncontrollable Forces or Changes. Uncontrollable forces or State or Federal Law changes may occur during the time this Agreement is in place. Neither of the parties hereto shall be considered to be in default in respect to any obligations hereunder if prevented from fulfilling such obligations by reason or uncontrollable forces or material changes in state or federal law or enforcement thereof. Parties rendered unable to fulfill any obligation hereunder by reason of an uncontrollable force or material change in state or federal law shall exercise due diligence to deal with such uncontrollable force with all reasonable dispatch and to take actions consistent with the purpose of this agreement.

24. Independent Relationship. This Agreement describes the entire relationship of the parties with regard to the subject matter herein concerned. Except as maybe explicitly provided otherwise herein, the parties are independent agencies and shall not be deemed to be partners, joint ventures, principals, or agents or each other for any purpose whatsoever. Each party shall have and maintain sole and complete control over all or its employees, agents and operations. Except as may otherwise be explicitly provided herein, or in separated agreement, each and all of the obligations, responsibilities, and liabilities of the parties under and in connection with this Agreement are several, and not joint, and no separate legal or administrative entity will be created to fulfill the purposes of this Agreement.

25. Term. This Agreement shall remain in effect so long as the City of Enumclaw remains in the business of providing water and so long as BACK meets the terms and conditions of this Agreement. Either party can request amendment or renegotiation of this agreement, but no more frequently than every five years.

26. Authority to Bind. Each of the Parties to this Agreement certifies that the person signing this Agreement has authority to bind the respective governing bodies to all of the terms and conditions of the Agreement herein. No change, amendment or modification or any provision of this agreement shall be valid unless set forth in a written amendment to this Agreement signed by all parties.

27. Succession. The Parties agree that BACK shall be succeeded in this Agreement by a homeowners association to be established. That homeowners association shall replace BACK in this Agreement by notice to the City of Enumclaw. That succession shall remove from BACK any and all duties and responsibilities under this Agreement.

Dated this 26TH day of OCTOBER, 2012.

City of Enumclaw

Chris Searcy, P.E.
Public Works Director

BACK LLC

10/24/12
Sheldon Hay, Manager, BACK LLC

Approved by:
City Attorney

EXHIBIT "A"

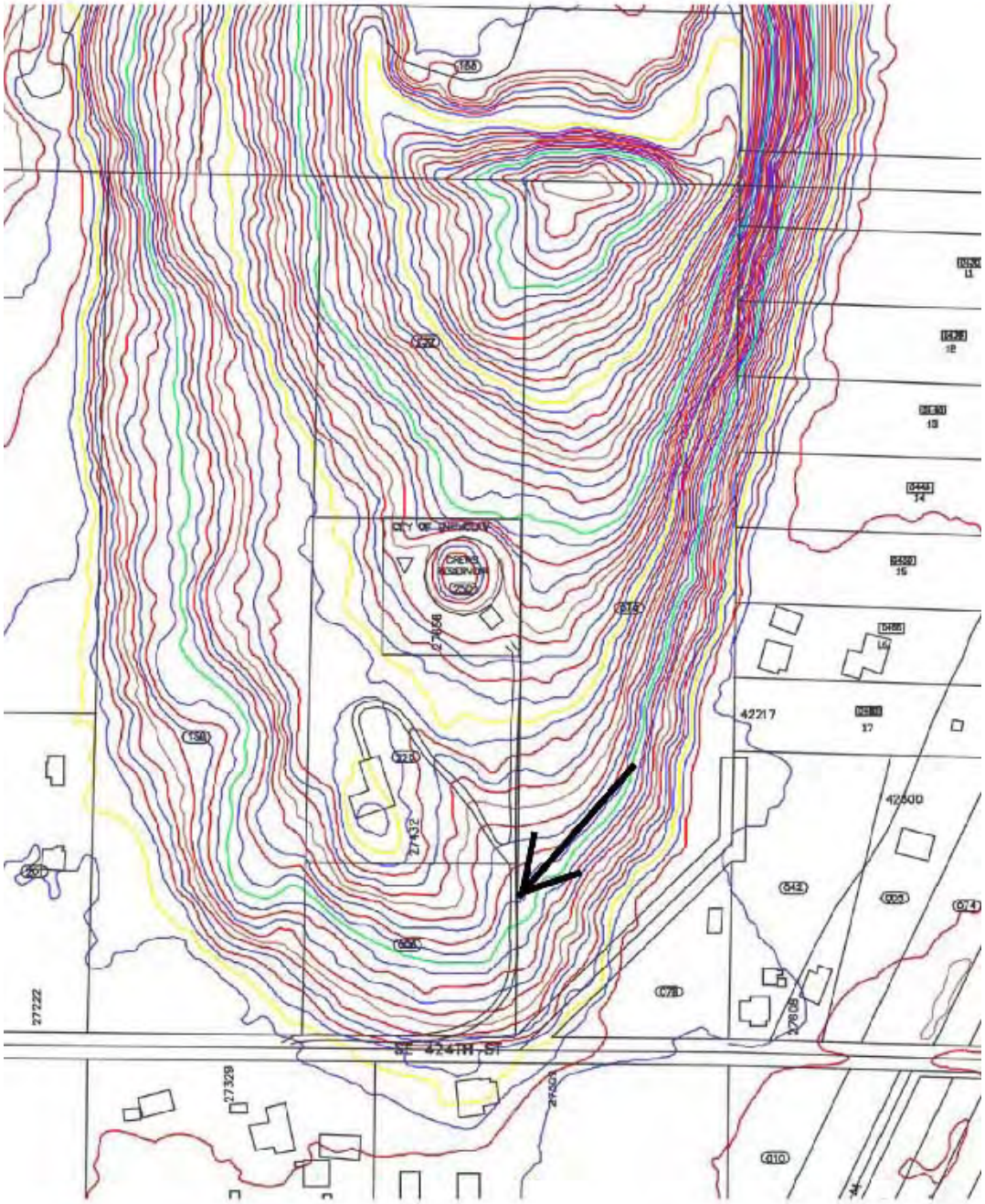
SERVICE CONNECTIONS SPECIFICATIONS

Connection Location	Connection Size	Meter Size	Max HGL Elevation (ft, NGVD 1929)		Peak Flow Capacity (gpm)	Contracted Quantity per ERU Purchased	
			Enumclaw	BACK		Total CCF/yr (1)	Peak GPD
16" water main in access rd to Crews Reservoir	2"	1.5"	888	790 at Meter	80	126	542

1) Total CCF (hundred cubic feet) per year is based on 258 gpd/ERU per EMC 14.04.195.C.
2) Peak GPD based on 258 gpd/ERU and 2.1 peaking factor.
3)

EXHIBIT B

GENERAL LOCATION MAP OF SERVICE CONNECTION



APPENDIX D

CORRESPONDENCE AND APPROVALS

Washington State Department of Health

Local Government Consistency Review Checklist

Water System Name: Enumclaw Water Dept PWS ID: 23600 1

Planning/Engineering Document Title: Comprehensive Water System Plan Plan Date: January 2013

Local Government with Jurisdiction: City of Enumclaw

WAC 246-290-108 Consistency with local plans and regulations:
Consistency with local plans and regulations applies to planning and engineering documents under WAC 246-290-106, 246-290-107, and 246-290-110(4)(b (ii).

1) Municipal water suppliers must include a consistency review and supporting documentation in its planning or engineering document describing how it has addressed consistency with **local plans and regulations**. This review must include specific elements of local plans and regulations, as they reasonably relate to water service as determined by Department of Health (DOH). Complete the table below and see instructions on back.

Local Government Consistency Statement	Page(s) in Planning Document	Yes – No – Not Applicable
a) The water system service area is consistent with the adopted land use and zoning within the applicable service area.	Fig 2-4	Yes
b) The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	3-7	Yes
c) Applies to cities and towns that provide water service: All water service area policies of the city or town are consistent with the utility service extension ordinances of the city or town.	5-3 to 5-5	Yes
d) Service area policies for new service connections are consistent with the adopted local plans and adopted development regulations of all jurisdictions with authority over the service area [City(ies), County(ies)].	5-3 to 5-6	Yes
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable; Coordinated Water System plans, Regional Wastewater plans, Reclaimed Water plans, Groundwater Area Management plans, and Capital Facilities Element of Comprehensive plans.	5-6, 5-7, Chapter 9	Yes

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.

Erika Shook 01/22/2013

Signature Date

Erika Shook, Community Development Director, City of Enumclaw

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 retail 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 non-community 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 per WAC 246-290-110(4)(b)(ii).

A) Documenting Consistency: Municipal water suppliers must document all of the elements in a consistency review per WAC 246-290-108.

1 a) Provide 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 are related to water supply planning.

1 b) Include a copy of the **six-year growth projections** that corresponds to the service area. If the local population growth rate projections are not used, provide a detailed explanation on why the chosen projections more accurately describe the expected growth rate. Explain how it is consistent with the adopted land use.

1c) 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.

1 d) Include all **service area policies** for how new water service will be provided to new customers.

1 e) **Other relevant elements** related to water supply planning as determined by the department (DOH). 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 provide direction on how this inconsistency can be resolved.

C) Documenting Lack of Consistency Review by Local Government: 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 their review. Please include: name of contact, date, and efforts made (letters, phone calls, and e-mails). In order 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).

CITY OF
Enumclaw

March 13, 2013

Jane C. Evancho, City of Tacoma
Chief Joe Clow, Fire District 28
Chief Mike Barlow, Fire District 44
Jason Vangilder, P.E, Muckleshoot Indian Tribe Public Works
Dave Schmidt, P.E., City of Buckley
Seth Boettcher, P.E., City of Black Diamond
David Ballestrasse, Walzak Water System
Allen Roberts, Marion Water System
Dan Brown, Remolif Water System

RE: Submittal of City of Enumclaw Draft 2013 Comprehensive Water System Plan

I am pleased to submit for review the City of Enumclaw Draft 2013 Comprehensive Water System Plan in electronic version on the attached CD. Please return any comments you may have within 45 days from the date of this letter by US mail to the address below or by e-mail to swoodbury@ci.enumclaw.wa.us.

I would appreciate your confirming receipt of this letter either via e-mail or by contacting me at 360-615-5728.

Thank you.

Sincerely,

Scott Woodbury

Scott Woodbury, P.E.
Assistant City Engineer

1309 Myrtle Avenue, Enumclaw, Washington 98022 • (360) 825-3593 • FAX (360) 825-7232

Jane Evancho
City of Tacoma
3628 South 35th Street
Tacoma, WA 98409-3192

Chief Joe Clow
Fire District 28
1330 Wells St
Enumclaw, WA 98022

Chief Mike Barlow
Fire District 44
32316 148th Ave SE
Auburn, WA 98092

Jason Vangilder, P.E
Muckleshoot Indian Tribe
39015 172nd Ave SE
Auburn, WA 98092

Dave Schmidt, P.E.
City of Buckley
811 Main Street
Buckley, WA 98321

Seth Boettcher
City of Black Diamond
PO Box 599
Black Diamond, WA 98010

David Ballestrasse
Walzak Water System
27930 SE 432nd St
Enumclaw, WA 98022

Allen Roberts
Marion Water System
PO Box 2043
Buckley, WA 98321

Dan Brown
Remolif Water System
PO Box 1012
Enumclaw, WA 98022

TACOMA WATER

3628 South 35th Street
Tacoma, Washington 98409-3192

TACOMA PUBLIC UTILITIES

April 19, 2013

DATE RECEIVED
APR 24 2013
CITY OF ENUMCLAW

Scott Woodbury
City of Enumclaw
1309 Myrtle Avenue
Enumclaw, WA 98022

Re: Tacoma Water Review Comments –
City of Enumclaw Draft 2013 Comprehensive Water System Plan

Dear Mr. Woodbury:

Thank you for providing the City of Enumclaw Draft 2013 Comprehensive Water System Plan for review. Tacoma Water offers the following comment for consideration.

Emergency Intertie. Based on our records, we believe the description of the Tacoma – Enumclaw emergency intertie on page 2-13 may not be accurate. According to our records, the 12-inch connection has a 4-inch meter installed, not an 8-inch as described in the water system plan. Please see the attachment "Distribution Order" for details on the intertie.

We appreciate the opportunity to provide feedback on the City of Enumclaw WSP. If you have any follow-up questions regarding this letter please feel free to contact Claire Miccio at (253) 502-8514.

Sincerely,

Heather Kim

for Linda A. McCrea
Water Superintendent

cc: Jennifer Kropack, WSDOH
Dan Cardwell, Pierce County

Attachment: Distribution Order

MAP NO. P/L2-41H-E

ADDRESS OF SERVICE ~~GRANITY 727~~ 580 Hwy 410

ADDITION [redacted] Unplatted

DIST. ORDER 40672

BLOCK

LOT NUMBERS

DATE 3/21/77

CHANGE ADDRESS ON THIS LINE TO LINE ABOVE → STA E 35 + 60

TYPE OF ORDER 12" Service & 4" Meter

CHARGE

WATER W.O.

NAME AND ADDRESS City OF Enumclaw 1339 Griffin Ave. Enumclaw 980

SER OLD NEW | SIZE 12 | LOCATION Eastery side of U.S. Hw. 410

FT. PAV.	SDWLK	FIXED CHARGE	GUAR. DEP.	GUAR. DEP. NO.	WATER MAIN DEP. NO. [redacted]	FILE D/O	INSTALLED	LAST USED	TYPE OF SER Comm'l

MAIN NEW | OLD | SIZE | TYPE | LOCATED IN ST. FT. OF PL

54" Conc. on The Eastery side of U.S. #410

METER SIZE 4" | TYPE Turbo | CITY NO. 5725-36 | ORDER WRITTEN Eset

INSTALLED 5-27-77 | READING 0000 | LEFT | OFF | FOLIO

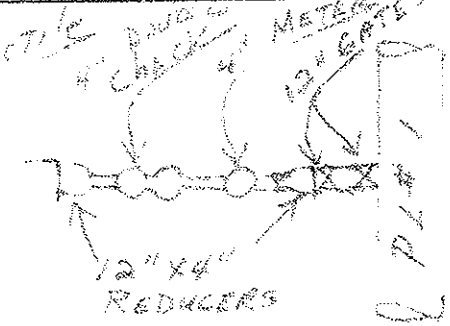
INSTRUCTIONS To be Installed by Neil Halstead.

W.O. 98136

WORK DONE TO COMPLETE ORDER

INSTLD NEW 12" SERVICE
TAPPED 54" CONCRETE MAIN
INSTLD 4" METER AND FTGS.

12" TAPPING GATE R.H. 41 TURNS - IOWA
12" SERVICE GATE R.H 53 TURNS - STOCKHAM
6' x 15' VAULT. Block CONST.



COMPLETED BY R.B. Andrews DATE 5-27-77

SERVICE LOCATED SIDE AT ABOVE STA

MAIN GATE HYD.

431 1/73

DEPT. OF PUBLIC UTILITIES WATER DIVISION

Scott Woodbury

From: Scott Woodbury
Sent: Tuesday, July 09, 2013 8:52 AM
To: Randy Fehr
Subject: RE: Comprehensive Water System Plan Review

Randy,

Thank you for your e-mail. We have 4" storz fittings shown on the fire hydrant standard details and will make sure they are installed on any new hydrant as part of the final inspection before acceptance of the hydrant.

Scott Woodbury, P.E.
City of Enumclaw
Assistant City Engineer
1309 Myrtle Ave
Enumclaw, WA 98022
360-615-5728 office
253-261-1937 cell
360-825-7232 fax

From: Randy Fehr
Sent: Monday, July 08, 2013 9:05 AM
To: Scott Woodbury
Subject: RE: Comprehensive Water System Plan Review

Scott,

I have reviewed the comprehensive water plan. Does the water department have a mechanism to insure that a 4" storz connection has been added? Other wise I have no additional comments. Great work

6. PUBLIC HEARING:

A. 2013 Comprehensive Water System Plan Update and Water Use Efficiency Goal Setting
Mayor Reynolds read Public Hearing procedures.

MAYOR REYNOLDS OPENED THE PUBLIC HEARING FOR THE 2013 COMPREHENSIVE WATER SYSTEM PLAN UPDATE AND WATER USE EFFICIENCY GOAL SETTING AT 7:34 P.M.

City Clerk and Council Members have not received any communication regarding this issue.

Staff Report:
Chris Searcy, Public Works Director –The City is required to update its CWSP every six years with the next update required in 2013. Completed capital projects are removed from the plan and remaining projects, including any newly identified projects are prioritized. Finally, the review process must include the opportunity for customers to provide input on goal setting for the Water Use Efficiency program.
Financials are slowly getting better. It does require us to promote conservation. 2007 goal was achieved. Keep at 1.8 or less for the ratio between the peak water usage to the daily average use.

Council Discussion:
Jensen - Can this be used as an education requirement toward the Strom Water permit?
Searcy – They are related.
Ennis – 200 gallons/day average use?
Searcy – The customer will not need to make any changes. This is to meet the recommendation from DOH temporarily until the reservoir is back up.

Public Input:
None.

MAYOR REYNOLDS CLOSED THE PUBLIC HEARING FOR THE 2013 COMPREHENSIVE WATER SYSTEM PLAN UPDATE AND WATER USE EFFICIENCY GOAL SETTING AT 7:59 P.M.

7. TABLED BUSINESS:

None.

8. COUNCIL COMMITTEE REPORTS:

A. FINANCE – Councilmembers Krebs, Chair; Hogan, LaFleur
Krebs stated that the Committee has not met since the last Council meeting. The next meeting is scheduled for March 25, 2013 at 6:00 p.m. at City Hall.

B. COMMUNITY/ECONOMIC DEVELOPMENT – Councilmembers, Krebs, Chair; Ennis, Dickson
Krebs stated that the Committee last met on March 11, 2013, 2013. Discussed Land Use Zoning Matrix and the Comp Plan. The next meeting is scheduled for March 19, 2013, at 5:30 p.m. at the Stevenson/Yerxa Building.

C. COMMUNITY SERVICES – Councilmembers Jensen, Chair, Diercks, Dickson
Jensen stated that the Committee has not met since the last Council meeting. The next meeting is scheduled for March 18, 2013, at 6:00 p.m. at the Stevenson/Yerxa Building.

RESOLUTION NO. 1474

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ENUMCLAW, KING COUNTY, WASHINGTON ADOPTING THE DRAFT 2013 COMPREHENSIVE WATER SYSTEM PLAN.

Whereas, the Public Works Department is responsible for the construction, maintenance and operation of the Water Utility, and

Whereas, every six years the utility is required to submit a comprehensive water system plan (CWSP) meeting the requirements of WAC 246-290-100 for review and approval by the Washington State Department of Health (WDOH), and

Whereas, the current CWSP was approved on October 19, 2007, and

Whereas, an updated draft CWSP has been prepared by staff that shows that the water system will continue to comply with water quality regulations and fully accommodate expected growth, and

Whereas, the City's 2 million gallon reservoir has been determined structurally deficient and will be kept out of service, resulting in the need to accept a 20% reduction of the standby storage volume recommended by WDOH, and

Whereas, the City Council held a public hearing in the Enumclaw City Hall Council Chambers on March 11, 2013, at or about 7:30 p.m. to receive comments on the proposed draft CWSP and on proposed water use efficiency goals.

Now, therefore, the City Council of the City of Enumclaw, King County, Washington do hereby resolve as follows:

Section 1: The draft 2013 CWSP as amended by the City Council is hereby adopted.

Section 2: A temporary reduced standard of service from the WDOH recommended standby storage volume of 200 gallons per ERU to 160 gallons per ERU is hereby approved until the replacement of the City's 2 million gallon reservoir has been constructed.

Section 3: That a copy of this resolution and the CWSP is to be submitted to King County, Washington State Department of Health and other agencies as required.

RESOLVED IN REGULAR AND OPEN SESSION this 11th day of February, 2013.

Mayor Liz Reynolds

INTRODUCED 3-11-13
PASSED 3-11-13
APPROVED 3-12-13
PUBLISHED n/a

Attested:

Meredith Shirey
City Clerk

Approved as to form:

Michael J. Reynolds
City Attorney

King County

Utilities Technical Review Committee
Department of Natural Resources and Parks
King Street Center
201 South Jackson Street, Suite 512
Seattle, WA 98104-3855
www.kingcounty.gov

DATE RECEIVED
JUN 07 2013
CITY OF ENUMCLAW

June 6, 2013

Scott Woodbury, P.E.
Assistant City Engineer
City of Enumclaw
1309 Myrtle Avenue
Enumclaw, WA 98022

Dear Mr. Woodbury:

Thank you for submitting the City of Enumclaw Comprehensive Water System Plan draft, March 2013 (Plan) for King County approval. In accordance with King County Code (KCC) 13.24 the Utilities Technical Review Committee (UTRC) has reviewed the Plan for consistency with the King County Comprehensive Plan and the code.

In reviewing the Plan, the UTRC found that the Plan is largely consistent with the County's comprehensive plan and code. We have identified 13 points of clarification or additions that are necessary before we can make a recommendation to the King County Council for approval of the City's Plan. We request the final plan include the following:

1) • Clarify the service area in relationship to the South King County Coordinated Water System Plan (CWSP) as the plan proposes no changes to the City's service area as represented in the CWSP (see page 2-5 or 3-4); and also propose a change to the service area with the pending Lisa Retail Water Service Agreement for an area not within the City's service area and outside the CWSP;

2) • Affirm the Plan is consistent with the King County Comprehensive Plan in addition to the King County Countywide Planning Policies;

3) • Clarify that the King County 2012 Countywide Planning Policies and the King County 2012 Comprehensive Plan both guide development in rural, unincorporated King County;

4) • Update references to the King County Countywide Planning Policies and King County Comprehensive Plan to be the current 2012 plans;

5) • Update Table 4-8 to clarify that rural residential lots in unincorporated King County greater than 35,000 square feet are exempt from fire flow requirements. Otherwise, the fire flow requirement is (generally) 1000 gallons per minute for two hours as provided for in KCC 17.04 and 17.08;

6) • Affirm current King County zoning was mapped and used within the retail service area for those portions of the retail service area outside of the City and in unincorporated King County;

7) • Add information to inform a water service applicant in unincorporated King County with a grievance regarding the "timely and reasonable" response of the City to his/her application for water service can make a timely and reasonable appeal under the CWSP;

8) • Clarify the "Existing and Future Population" paragraph. The Plan uses a projected increase in population (within the City) from 11,028 in 2012 to about 16,000 in 2022 and 16,600 in 2023,which would require an average 3.8 percent per year growth rate as stated. However, the stated growth rate it is not a County requirement. The City in collaboration with King County established a housing unit target that calls for much less growth than described in the Plan. The Growth Management Planning Council's housing-growth target projects the City to add 1,425 new housing units by 2031 a 1.6 percent per year growth rate. The assumption of adding five dwelling units per year in the rural service area is reasonable and fits recent trends;

9) • Clarify that the City's policy of allowing individual wells for single family residential use on existing platted lots over 5 acres in size and within the City's service area applies only to the corporate boundaries of the City and not in unincorporated King County;

10) • Please revise the language in the Plan that says, "King County shall assume full legal and financial responsibility if said Group B system fails to meet its statutory and regulatory duties under law." King County has no responsibility for a new Group B system to meet its statutory and regulatory duties as that is Department of Health's jurisdiction;

11) • Clarify that if a new Group A or B system is formed within the retail or future service area of the City consistent with the CWSP, it is a nondiscretionary action that the area served will be withdrawn or deleted from the City's service area;

12) • Clarify that fire hydrants serving residential dwellings within unincorporated King County will be located consistent with KCC 17.04 and 17.08 (700 feet on center, not 900 feet); and

13) • A signed and dated State Environmental Checklist and Determination.

14) The Plan states the City is not prepared at this time to provide and/or contract for satellite system management or ownership services within and/or adjacent to the City's existing retail or future service areas. We encourage the City to move forward and obtain approval for satellite system management or ownership services given the approximately 75 existing small Group A and B systems in your service area with potential future service by the City.

15) If your utility is planning on constructing or performing maintenance work on water lines within the rights-of-way of roads in unincorporated King County, please follow these two requirements to ensure successful completion of your projects:

- Contact the King County Department of Transportation, Road Services Division, Capital Improvement Program, to coordinate scheduling of your work in unincorporated King County with the County's annual overlay program

(cip.roads@kingcounty.gov or 206-296-3746). The timing for obtaining a right-of-way use permit will depend on when an overlay is planned or completed. Insufficient coordination may result in the denial of the permit to work within the right-of-way once an overlay of the road section has been completed.

- Adhere to the current set of King County road and construction standards (http://www.kingcounty.gov/transportation/kcdot/Roads/EngineeringServices/RoadStandards2007.aspx). Generally Utility's standards differ from the County's standards, however when construction and or maintenance of utilities requires work within the road right-of-way in unincorporated King County, the current edition of the King County Road and Construction Standards shall apply to any installation or work in these rights-of-way. Use of methods and materials that do not comply with county standards could require redoing work already completed and could delay or add conditions to acceptance of the work, both at added time and cost to your project.

16) Franchises are not a Plan issue however we take this opportunity to ensure the City's franchise is current. Our records indicate the City holds Franchise 8285 (expires May 13, 2016) for water facilities. Please affirm the franchise area is current.

We look forward to seeing the final Plan and working with you to secure the King County Council's approval. The Council's action represents King County's final action on the Plan and is the statement of consistency under RCW 43.20.260.

If you have any questions or concerns about any of the information in the letter, please do not hesitate to call me at 206-205-0817.

Sincerely,

Stephen Hirschey

Stephen Hirschey
Chair, Utilities Technical Review Committee

cc: Richard Rodriguez, Regional Planner, Washington State Department of Health

CITY OF Enumclaw

July 29, 2013

Stephen Hirschey, King County UTRC Chair
201 S Jackson St, Suite 500
KSC-NR-0512
Seattle, WA 98104-3855

RE: Response to KC UTRC Comments on March 2013 Draft CWSP

Dear Mr. Hirschey:

This letter is in response to your comment letter dated June 6, 2013 regarding the City of Enumclaw's March 2013 Draft Comprehensive Water System Plan (CWSP). A copy your letter is attached with a reference number added to the margin of each paragraph for which there is a response following. Three copies of the revised chapters of the CWSP are attached with a digital copy on CD showing the changes.

Item 1. The approval by King County in 2007 of the prior City CWSP included the addition of several retail service areas outside of the South King County CWSP that were already being served by the City, including the area shown on Figure 2-4 as subject to a pending agreement with Lisa. The only difference between the 2007 and 2013 CWSPs is in how the area subject to the pending Lisa agreement is shown on the service area map, with the actual properties being added to the map in the 2013 CWSP, instead of just showing a highlighted square as was shown in the 2007 CWSP.

Items 2, 3, and 4. The requested affirmation and changes have been included in Chapter 3.

Item 5. Table 4-8 was relocated to replace the table in the Fire Flow section of Chapter 5 and was updated as requested, with a reference inserted in Chapter 4 to the relocated table.

Item 6. A reference to the King County zoning map was added to Chapter 3.

Item 7. The requested information relative to Timely/Reasonable issues in the City's future service area has been included in the customer policies in Chapter 5.

Item 8. The requested clarification has been made in Chapter 3.

Item 9. This policy has been deleted from Chapter 5.

Items 10-11. As background to our following response, please be advised that it is the City understanding per consultations with DOH that should **a new** remote water system be formed within the City's claimed service area(s), the City may: (1) claim no ownership and remove the

1309 Myrtle Avenue, Enumclaw, Washington 98022 • (360) 825-3593 • FAX (360) 825-7232

remote system from the City's service area, or (2) create a policy where the oversight of the new remote system would be required to contract with an existing SMA or contract operator (paid by the new water system), and the system would remain part of the City's service area. In the latter circumstance, there is no requirement under law to remove the system from the City's service area, nor an obligation of the City to own, operate, or extend retail service. Any such action may occur at the discretion of the City.

The comment you made relates to the next to last paragraph in the retail service area policy section of Chapter 5 (now revised), where it is noted that the City may voluntarily withdraw property from its retail service area following a request by King County. This provision was included in the approved 2007 CWSP because such a request had been made by King County to allow an exempt well Group B system within the City's retail service area contrary to its ability to serve and policy preference.

The City has developed a new policy consistent with (2) above in Chapter 5, which has been discussed with and is supported by DOH. The City has also created a separate policy deleting prior text and clarifying that King County is responsible as receiver of last resort for failed remote water systems.

Item 12. The text in Chapter 5 has been revised.

Item 13. The requested documents are attached for inclusion in Appendix E.

Items 14 and 15. Comment noted.

Item 16. The franchise area is current with regard to where work may take place in King County rights-of-way within the City's service area.

The changes noted above are subject to approval by the City Council as part of the final plan adoption process.

If you have any questions, please contact me at 360-615-5728.

Sincerely,

Scott Woodbury

Scott Woodbury, P.E.
Assistant City Engineer

c: Chris Searcy, P.E.
Tom Mortimer, Attorney
Richard Rodriquez, WDOH

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310, Kent Washington 98032-2388

June 14, 2013

SCOTT WOODBURY, ASSISTANT CITY ENGINEER
ENUMCLAW WATER DEPARTMENT
1309 MYRTLE AVE
ENUMCLAW WA 98022

DATE RECEIVED
JUN 19 2013
CITY OF ENUMCLAW

Subject: Enumclaw Water Department, ID #236001
King County
Water System Plan – 2013 Review Comments
Submittal #13-0311

Dear Mr. Woodbury:

Thank you for submitting the draft Water System Plan (WSP) for the City of Enumclaw (the City), which was received in this office on March 14, 2013. We have reviewed the plan and offer the following comments. These comments must be adequately addressed prior to approval of the WSP.

System Description

1. A public water system located in a Public Water System Coordination Act area does not have to be an approved SMA to provide service to potential remote systems that may be created within its claimed service area. (Refer to WAC 246-290-035(1)(a) and (b)). By definition, any remote system that is created within your service area is under the control of the City, unless the City claims no ownership or operation & maintenance responsibility. In that case, the area served by the newly created water system would be removed from the City's claimed service area. Since the City does not have the resources to manage and operate remote systems (as stated on pages 2-7 and 2-8), you could create a policy where the oversight of a new system could be contracted to an existing SMA or Contract Operator (paid for by the members of the new water system) and the system would remain a part of the City's service area. Please indicate how the City wishes to proceed.

2. Please provide more detail on the treatment currently provided by the City. In Chapters 2 and/or 6, please provide the intended chemical doses, sampling conducted to monitor the treatment plant effectiveness, and treatment goals. For chlorination, please indicate whether the treatment is able to provide 4-log inactivation for viruses (or CT equal to 6).

3. Describe in greater detail how the City would ensure that water drawn from the Tacoma intertie meets minimum disinfection treatment requirements. How is the contact time measurement automated as described on page 2-13?

4. Describe why the Cities of Enumclaw and Tacoma wish to update the intertie agreement as stated on page 2-22. When is this negotiation anticipated to occur?

5. Please describe what type of drinking water sources are shown on Figure 2-3a.

Basic Planning Data

6. Each of the tables in Chapter 4-1 have a line for 2012 included which is blank. Did you intend to include this information in the final WSP? Please clarify.

7. The number of connections shown in Table 4-3 does not match the number of connections included on the WFI in Appendix A. For 2011, the number of residential connections on the WFI is 6,598 and only 5.026 in Table 4-3. For 2011, the number of non-residential connections on the WFI is 1,511 and only 530 in Table 4-3. Water demands used for the system analysis components of the WSP are generated based on the number of connections provided in Table 4-3, which is significantly less than what is shown on the WFI. Is it possible you are underestimating the projected residential and non-residential demand for the City? Please clarify.

8. The average day demand and maximum day demand numbers used for water demand projections are based on an average of 2009 through 2011 data. Describe why the same information was not used to generate the basis for the peak hour demand? From text on page 4-7 it appears the ratio of PHD:MDD is based on information from 2006 and 2009. Please comment on whether these data points are representative for use in demand projections.

Water Use Efficiency and Water Rights Self Assessment

9. Please indicate whether the distribution system leakage (DSL) numbers presented in Table 4-7 include the 160,000 gallons per day loss estimated at 2.0 MG City Reservoir. If not, please describe why this known leakage was not included in the calculation.

Source Protection

10. As part of a wellhead protection program (per WAC 246 290 135), an inventory of known and potential contaminant sources must be updated once every two years. The information presented in Appendix J appears to be from 2009. Please provide an updated inventory for your system.

Water Quality

11. The City is required to develop a monitoring plan and be in compliance with the Stage 2 Disinfectants/Disinfection By-Products Rule starting in October 2013. Guidance for this rule can be found on our website, including a template you can use to develop a monitoring plan. Please contact Jolyn Leslie, our DBP Program Lead at (253) 395-6762 with questions and send in your monitoring plan when it is complete.

System Analysis

12. Is the City currently able to utilize the full capacity of the PC Johnson Wellfield? According to Table 4-3, it appears very little water was used from this source between 2007 and 2010 and it was not used at all in 2011. What problems does the City encounter when it is utilized? For the source capacity evaluation shown in Table 7-2, please comment on whether the full capacity of the wellfield should be included in the calculation?

13. Why is fire flow not required in the 995 zone? Please comment on the City's future plans for providing fire flow at a rate commensurate with King County's current code requiring 1,000 gpm.

14. For the water supply facilities evaluation starting on page 7-3, please describe how you calculate the peak hour demand for each pressure zone. Is the available source capacity shown firm capacity at each pump station? Please clarify in text or with footnotes to the tables.

15. The Department was not aware the 2.0 MG City Reservoir was taken offline in late 2012. Please comment on how not having this critical facility online affects the City's ability to provide water service for new connection requests, fight fires in the system with less fire flow storage, and serve customers in the event of an emergency with less standby storage available.

Distribution Facilities Design and Construction Standards

16. A standard detail for a 2-inch blow-off assembly in Appendix H show a drain hole which present a risk for cross contamination if the gravel is submerged and a pressure incident were to take place in the distribution system. Does the City use this type of blow-off assembly in the system? Recommend you discontinue use of this type of assembly and change the standard detail accordingly.

Capital Improvement Program

17. Please provide a system schematic that shows the location of the CIP projects listed in Chapter 9. If possible, please include the areas the City plans to update as a part of the annual water main replacement program (i.e., small diameter pipe, AC pipe, etc.).

18. Some costs included in schedule/budget table (not sure of table number) in Chapter 9 are listed as $0K. Is this a rounding error? Please clarify.

19. Has the City implemented an asset management program which includes a remaining useful life assessment of major water system facilities?

20. The City is required to submit project reports and/or construction documents to the Department for review and approval for installation or construction of any new water system, water system extension or improvement, per WAC 246 290 110 and 120, respectively. Several of the projects included in the City's capital improvement program would require review and approval by the Department prior to putting the facilities in service. It is recommended City staff contact their regional engineer to determine whether document submittal and approval is required for any proposed project.

Miscellaneous

21. Provide signed SEPA Checklist and a SEPA Threshold Determination with the final WSP submittal.

22. The water system must meet the consumer input process outlined in WAC 246-290-100(8). Please include documentation of a consumer meeting discussing the WSP, prior to DOH approval of the WSP.

23. Prior to DOH approval, the City's governing body must approve and adopt the WSP. This is a new requirement resulting from the Municipal Water Legislation.

24. Please provide an Adoption Ordinance for your WSP from King County, if the City provides water service in unincorporated King County.

25. Please provide copies of any comments made by adjacent purveyors or other interested parties along with the City's response to those comments.

We hope that you have found these comments to be clear, constructive and helpful in the development of your final draft WSP. We ask that you submit the revised WSP on or before ***September 14, 2013***. In order to expedite the review of your revised submittal, please include a cover letter summarizing how each of the above comments was addressed in the revised WSP and where each response is located (i.e., page numbers, Appendices, etc.)

Regulations establishing a schedule of fees for review of planning, engineering, and construction documents were adopted August 3, 2007 (WAC 246-290-990). The total cost is $3705.00. An itemized invoice is enclosed. Please note that this fee covers our current review and one more submittal for this project. If additional submittals are required, then an invoice for additional fees will be included with our final approval letter. Please remit your complete payment in the form of a check or money order within thirty days of the date of this letter to: **WSDOH, Revenue Section, PO Box 1099, Olympia WA 99507-1099.**

Thank you again for submitting your draft Water System Plan for our review. If you have any comments or questions concerning our review, please contact either of us.

Sincerely,

Richard Rodriguez
Regional Planner
(253) 395-6771

Paige Igoe, PE
Regional Engineer
(253) 395-6764

Enclosure (invoice)

cc: Steve Hirschey, King County UTRC
Seattle/ King County Health
Jacque Klug, WSDOE – NWRO

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Office of Drinking Water
INVOICE
Engineering, Planning, and Sanitary Survey Review Form

TO: SCOTT WOODBURY
ENUMCLAW WATER DEPARTMENT
1309 MYRTLE AVE
ENUMCLAW WA 98022

Invoice Number	N01282
Invoice Date	June 17, 2013
Billing Period	30 days NW

DATE	DESCRIPTION	QTY	COST	AMOUNT
3/14/13	REVIEW AND/OR APPROVAL OF PROJECT REPORT ENUMCLAW WATER DEPARTMENT KING COUNTY COMPREHENSIVE WATER SYSTEM PLAN SUBMITTAL #: 13-0311	1	1	$3705.00
	Total Payment due within 30 days. Interest shall accrue at 1% per month after 30 days.			$3705.00

Make Checks Payable to Department of Health
Return Lower Portion to:
Department of Health
PO Box 1099
Olympia, WA 98507-1099

Office of Drinking Water
Engineering, Planning, and Sanitary Survey Review Form

NAME	ENUMCLAW WATER DEPARTMENT
INVOICE NUMBER	N01282
INVOICE DATE	6/17/2013 13-0311 NW
AMOUNT	$3705.00

DOH Form #331-332

Return to:
Department of Health
Revenue Section
PO Box 1099
Olympia, WA 98507-1099

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).

2 044129 00878

CITY OF Enumclaw

July 29, 2013

Richard Rodriguez, Regional Planner
Paige Igoe, P.E., Regional Engineer
20425 72nd Ave. S.
Suite 310
Kent, WA 98032-2388

RE: City of Enumclaw, ID#236001
King County
Water System Plan – 2013
Submittal # 13-0311

Dear Mr. Rodriguez and Ms. Igoe:

Thank you for the comments provided in your letter dated June 14, 2013 regarding the City of Enumclaw's draft March 2013 Water System Plan. Following is a response to each of the numbered comments in your letter.

1. New policy text has been added consistent with your comment regarding the conditions under which newly formed remote water systems may be formed and operated within City service areas. Please see pages 5-6, 5-7, and Chapter 2. .

2. The additional requested detail has been added to the Monitoring Requirement and Results section at the end of Chapter 6.

3. Greater detail has been added to the Tacoma Intertie section of Chapter 2.

4. Tacoma would like to update the agreement to be consistent with its current wholesale service contract boilerplate form. Both parties recognize that the provisions of the agreement need updating, but no schedule has been agreed upon to start negotiations.

5. The drinking water sources in Figure 2-3a are noted to be Group B systems on page 2-3. The title and legend of Figure 2-3a were modified to make this clearer.

6. The final WSP includes the 2012 data.

7. Water demands in the WSP are not based on the number of connections in Table 4-3, but on the number of ERUs as calculated in Table 4-6. The growth in ERUs in Table 4-9 is assumed to occur at the same rate as the growth in population.

1309 Myrtle Avenue, Enumclaw, Washington 98022 • (360) 825-3593 • FAX (360) 825-7232

Non-residential connections in the WFI were calculated by taking the total non-residential consumption for 2011 and dividing it by the WSP demand per ERU of 223 gpd. A corrected WFI will be submitted to list only the actual connections. The DOH calculated active residential connections in the WFI are not actual connections, but a combination of the actual number of single family residential connections and the number of multi-family units served. The number of multi-family connections or buildings is only 227 as reported on the WFI, which is much lower than the 1242 units served used in the DOH calculation.

8. For planning purposes a 3-year average was used to calculate the PHD:MDD ratio, rather than a single year. The maximum rolling 3-year average of the data for 2004 to 2012 is 2.1, the same as the ratio from 2009-2011. The PHD:MDD ratio was determined by examining hourly data from the year with the highest MDD (2009) and a second year (2006) that was the 3rd highest MDD. Actual digital real-time hourly data was not available for analysis prior to 2005.

9. The DSL excludes the 2 MG reservoir leakage since a project was identified to stem the leakage. Excluding this leakage had been discussed with DOH NW Region staff. However, it is understood that this will not be allowed in the future.

10. A review of potential contaminant sources was conducted by City staff as noted on page 2 of Appendix J.

11. A copy of the City's Stage 2 monitoring plan has been included in Appendix L of the final WSP.

12. The PC Johnson Wellfield was tested successfully in 2005 at its full water right capacity of 1500 gpm. Due to high levels of manganese, this source is only used if demand cannot be met with the spring sources. Both wells in the wellfield are run to waste at least monthly to flush the wells and test that the facilities are operational. Therefore, the full capacity of the wellfield is believed eligible for inclusion in the system source capacity evaluation.

13. Fire flow is not required for the 995 zone because the lots served are over 35,000 square feet in size, the threshold for which properties are exempt from fire flow under King County code. This is clarified in Table 5-2 added to Chapter 5.

14. A clarifying paragraph has been added to the text on page 7-4 prior to the water supply evaluation for the 888 zone facilities.

15. Taking the 2 MG reservoir off-line did not reduce the fire flow storage available, but only the level of standby storage. A temporary reduction in standby storage was later formally approved by the City Council on March 11, 2013, to remain in effect until a replacement reservoir was constructed. The temporary loss of the

reservoir results in 160 gallons per ERU of available standby storage instead of the DOH recommended volume of 200 gallons per ERU.

16. We appreciate the recommendation and are open to considering alternative blowoff designs. However, the challenge also applies to fire hydrants which also have an underground drain separated from the pressurized system by only a single valve. The same can also true for test ports on double check valve assemblies in underground boxes.

17. Figure 9-2 has been added to show the CIP projects as requested. Table 9-3 has also been added to list the water mains identified for replacement.

18. The $0K costs appear in the column totaling year 2013 to 2019 costs for projects that are scheduled more than 6 years in the future.

19. An asset management program is desired, but will likely not be implemented until closer to the next WSP update or possibly even later. As noted in Chapter 7 there are over 7 miles of steel or galvanized iron water mains identified for replacement and there is no substantial funding available until 2018 and later, as shown in Table 9-2 on page 9-11. To date there have been few issues with the City's older cast iron mains as there has been with the younger steel or iron pipes. Therefore the priority is the steel and iron pipes that may cost over $5 million to replace and take until the 2026 to 2033 period to accomplish.

20. The regional engineer will be consulted as recommended.

21. This has been added to Appendix E.

22. Minutes of a hearing held on March 11, 2013, has been added to Appendix D.

23. Adoption of the final WSP by the City will take place before forwarding the WSP to DOH for approval.

24. A copy of King County's ordinance will be included in Appendix D.

25. The only comments received were from the City of Tacoma, Enumclaw Fire District 28, and King County and are included in Appendix D. The Tacoma letter commented that the intertie meter is 4" rather than 8" as noted in Chapter 2. However, there is an 8" meter inside the pump station for use by Enumclaw to measure station output. Tacoma also has a separate 4" meter on the service for its use in measuring and billing water pumped by the station.

Other changes to the draft plan are as follows:

1. Modifications were made in response to King County's June 6, 2013, comment letter as highlighted in the response letter included in Appendix D.

2. The 2011 Consumer Confidence Report in Appendix K and the 2011 Water Use Efficiency Report in Appendix F were replaced with the 2012 reports.

3. Since the draft March 2013 WSP was prepared it was discovered that the overflow elevation of the Fairway Hill Reservoir Zone 1002 was incorrect. Based on a 2008 topographic survey that included the reservoir site, the overflow elevation of the reservoir, and hence the zone elevation, is 983 feet (NGVD 1929 datum). All references to the 1002 Zone have been changed in the WSP to the 983 Zone. The water model calibration was also checked and an addendum memo prepared and included in Appendix N.

4. Water use efficiency measures #8 through #10 were deleted from Page 6 of Appendix F, as only 6 measures are required based on the number of connections that Enumclaw has.

If you have any comments or questions concerning the responses, please contact me at 253-261-1937.

Sincerely,

Scott Woodbury

Scott Woodbury, P.E.
Assistant City Engineer

cc: Chris Searcy, Public Works Director/Interim City Administrator
Steve Hirschey, King County UTRC Chair
Tom Mortimer, Attorney at Law
Attachments

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310, Kent Washington 98032-2388

September 9, 2013

SCOTT WOODBURY PE
CITY OF ENUMCLAW
ASSISTANT CITY ENGINEER
1309 MYRTLE AVE
ENUMCLAW WA 98022

DATE RECEIVED
SEP 12 2013
CITY OF ENUMCLAW

RE: Enumclaw, City of, ID#23600
King County
Water System Plan 2013 - APPROVAL
Submittal # 13-0311

Dear Mr. Woodbury:

The City of Enumclaw water system plan (WSP), received in this office on March 14, 2013, with a subsequent submittal on July 31, 2013, has been reviewed and in accordance with the provisions of WAC 246-290-100, is hereby APPROVED.

Approval of this WSP is valid as it relates to current standards outlined in Washington Administrative Code (WAC) 246-290 revised March 18, 2012; WAC 246-293 revised September 1997, and is subject to the qualifications herein. Future revisions in the rules and statutes may be more stringent and require facility modification or corrective action. An approved update of this WSP is required on or before **September 10, 2019**, unless ODW requests an update or plan amendment pursuant to WAC 246-290-100(9).

APPROVED NUMBER OF CONNECTIONS

The analysis provided in this WSP shows the water system has sufficient capacity to meet the growth projections during this planning period. The City of Enumclaw water system can support an **"unspecified"** designation for its approved number of connections. A specific number of approved connections will not be applied at this time. Development may occur in compliance with the schedule and information provided in this WSP. This designation may be rescinded (and replaced with a specified number of approved connections) if ODW determines that the WSP is no longer representative of system activities.

LOCAL GOVERNMENT CONSISTENCY

Submittal of your WSP included local government determinations of consistency from the City of Enumclaw and King County as required by RCW 90.03.386 and RCW 43.20. Local government determination of consistency from King County is provided in the form of an ordinance adopting your WSP, with any conditions or finding of facts that may apply. We understand that the King County UTRC is forwarding your WSP to the King County Council with a do pass recommendation, and that your WSP may not be scheduled for hearing before the King County Council until the first quarter of 2014. Please provide us a copy of the adopting ordinance from King County local government when it is received.

SERVICE AREA AND DUTY TO SERVE

Pursuant to RCW 90.03.386(2), the service area identified in this WSP service area map may now represent expanded "place of use" for this system's water rights. Changes in service area should be made through a WSP amendment.

The City of Enumclaw has a duty to provide new water service within its retail service area. This WSP includes service policies to describe how your system plans to provide new service within your retail service area.

CONSTRUCTION WAIVERS

Standard Construction Specifications for distribution main extensions in this WSP are approved. Consistent with WAC 246-290-125(2), this system may proceed with the installation of distribution main extensions provided this system completes and keeps on file the enclosed construction completion report form in accordance with WAC 246-290-125(2) and WAC 246-290-120(5) and makes it available for review upon request by ODW.

WATER RESOURCES

Below is the general regulatory language that applies to all water system approvals:

This approval does not provide any guarantee and should not be considered to provide any guarantee concerning legal use of water or subsequent water rights decisions by the Department of Ecology. Questions concerning water rights should be directed to the Department of Ecology.

Thank you for your cooperation. King County is being notified of the terms of this approval and the determination of the approved number of connections. If you have any questions or wish to check our records, you may contact either of us at the numbers listed below.

Sincerely,

Richard Rodriguez
WSDOH Regional Planner
(253) 395-6771

Steve Deem, P.E.
Regional Engineer
(253) 395-6767

Encl: Construction Completion Report

cc:

Steve Hirschey, King County UTRC
Seattle/King County Health
Jacque Klug, Dept. of Ecology, NWRO
Thomas Mortimer, Attorney at Law

CONSTRUCTION COMPLETION REPORT FOR DISTRIBUTION MAIN PROJECTS

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

(1) The report form **must** bear the seal, date and signature of a professional engineer (PE) licensed in the state of Washington; and

(2) Per WAC 246-290-120(5)(c), the amount of change in the physical capacity of a system must be documented, if the project results in a change in physical capacity.

ENUMCLAW WATER DEPARTMENT
Name of Water System

DOH System ID No.: **23600**

SCOTT WOODBURY
Name of Purveyor (Owner or System Contact)

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

1309 MYRTLE AVE
Mailing Address

Date Standard Specifications Approved by DOH: _____

ENUMCLAW, WA 98022
City State Zip

PROJECT NAME AND DESCRIPTIVE TITLE:
(Include the name of any development project and number of services.)

Date Project or Portions Thereof Completed

PROFESSIONAL ENGINEER'S ACKNOWLEDGMENT

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

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

P.E.'s Seal

Date Signed

Name of Engineering Firm

Name of PE Acknowledging Construction

Mailing Address

City State Zip

Engineer's Signature

State/Federal Funding Type (if any) _____

Please keep a completed, signed, and stamped copy on file.

☒ **NWRO Drinking Water**
Department of Health
20425 72nd Ave. S, Ste 310
Kent, WA 98032-2358
(253) 395-6750

☐ **SWRO Drinking Water**
Department of Health
PO Box 47823
Olympia, WA 98504-7823
(360) 236-3030

☐ **ERO Drinking Water**
Department of Health
16201 E Indiana Ave, Suite 1500
Spokane Valley, WA 99216
(509) 329-2100

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

SEPA NOTICE

ENUMCLAW COMPREHENSIVE WATER SYSTEM PLAN
DETERMINATION OF NONSIGNIFICANCE (DNS)

Permit Application Number: SEPA Environmental Checklist #13-061

Applicant: City of Enumclaw, Public Works Department, 1309 Myrtle Ave., Enumclaw, WA 98022.

Description of Proposal: City of Enumclaw Comprehensive Water Supply Plan (CWSP). The City is required to submit an updated CWSP to the Washington State Department of Health every 6 years. The new 6-year plan identifies and prioritizes needed improvements and sustainable funding programs in order to ensure continued compliance with water quality regulations and anticipated population growth. This is a non-project action. Future actions resulting from the plan will be subject to SEPA.

Location of Proposal: The City of Enumclaw's water service area encompasses approximately 37 square miles and includes the entire City as well as areas in King County outside of the City limits.

Other Permits Required: The CWSP will be submitted to King County for consistency determination under King County Code (Title 13.24) and to the Washington Department of Health (WDOH) for review under Washington Administrative Code (WAC) 246-290.

Dates: This application was submitted on: March 13, 2013
This application was deemed complete on: March 27, 2013
This notice was published on: May 1, 2013

Lead Agency: City of Enumclaw

Determination of Non-Significance: The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

Comment Period: The lead agency will not act on this proposal for fourteen (14) days from the publication date identified above. Written comments must be received by 4:30 p.m., May 15, 2013. For further information contact the Community Development Department at (360) 825-3593.

Comment Period for Other Agencies: This DNS is issued under WAC 197-11-340(2). Commenting agencies should submit any comments within the above-stated period. Upon request, the City will reconsider its lead agency status, the issuance of this DNS, or any mitigating measures.

Administrator of Development Regulations and Responsible SEPA Official

Erika Shook, Community Development Director
1309 Myrtle Avenue
Enumclaw, WA 98022
Phone 360-825-3593 FAX 360-825-7232

05/01/2013
Date

Distribution List:
Land Use Action Bulletin Board posting
SEPA Register (WSDOE Environmental Review Section)
Washington State Department of Natural Resources (Marine Land Management Division)
Washington State Community, Trade and Economic Development Department (CTED)
Enumclaw Courier-Herald
Muckleshoot Indian Tribe
Enumclaw School District #216
Comcast
CenturyLink
City of Enumclaw Website
King County DDES (Environmental Division)
DNR SEPA Center
Washington State Department of Ecology
Puget Sound Energy
Drainage District 5, 5A, and 6
Hedges Engineering
Washington State Dept. of Transportation
Washington Department of Fish and Wildlife (Boise Creek)
U.S. Army Corps of Engineers
City of Buckley

City of Enumclaw

Community Development Department
1309 Myrtle Avenue
Enumclaw, WA 98022-3101
(360) 825-3593

DATE RECEIVED
MAR 13 2013
CITY OF ENUMCLAW

Environmental Checklist Application Form

To be completed by Staff:

Application # 13061 w/ Disk

Received by: CB Date: 3/13/13 Processing Fee: 0

A. Staff review determined that project:

___ Meets categorically exempt criteria.

✓ Has no probable significant adverse environmental impact(s) and application should be processed without further consideration of environmental effects.

___ Has probable, significant impact(s) that can be mitigated through conditions. EIS not necessary.

___ Has probable, significant averse environmental impact(s). An Environmental Impact Statement will be prepared.

Erica Shook 03/27/2013
Signature of Responsible Official Date

B. Comments:

C. Type of Permit or Action Requested:

_____

_____

D. Zoning District:

_____

To be completed by Applicant:

Evaluation for Agency Use Only

A. BACKGROUND INFORMATION

1. Name of proposed project:

City of Enumclaw Comprehensive Water System Plan (CWSP)

2. Name of applicant and Mailing Address:

City of Enumclaw, 1309 Myrtle Avenue, Enumclaw, WA 98022

3. Contact person and Telephone:

Scott Woodbury, P.E., Assistant City Engineer
Phone: (360) 615-5728

4. Applicant is (owner, agent, other):

Owner

5. Location:

The City of Enumclaw's water service area encompasses approximately 37 square miles and includes the entire City as well as areas in King County outside of the City limits. The Comprehensive Water System Plan (CWSP) identifies and provides maps of the water service area.

6. Legal description and tax identification number:

Not applicable.

7. Existing conditions: Give a general description of the property and existing improvements, size, topography, vegetation, soil, drainage natural features, etc. (If necessary, attach a separate sheet).

A detailed description of the existing water system infrastructure and service area, including environmental setting is included in Chapter 2 of the CWSP.

8. Site Area (acres and/or square feet) and Site Dimensions:

The CWSP is a Non-Project Action. The City of Enumclaw's water service area encompasses approximately 37 square miles.

9. Project Description: Give a brief but complete description of the intended use of the property or project including all proposed uses, day

and hours of operation and the size of the project and site. (Attach site plans as described in the instructions):

Evaluation for Agency Use Only

Every six years the City is required to submit a CWSP for review and approval by the Washington State Department of Health (WDOH) meeting the requirements of WAC 246-290-100. The City's latest CWSP plan was approved by WDOH on October 19, 2007. Many improvements identified in the previous CWSP have been completed. A new 6-year plan of improvements has been identified, prioritized, and a sustainable funding program set in place so that the water system will continue to comply with water quality regulations and fully accommodate expected growth.

10. Schedule: Describe the timing or schedule (include phasing and phasing dates, if possible)

A draft CWSP is available for review on the City's website . A final CWSP will be prepared following receipt of public and agency review comments. Approval of a final CWSP by WDOH and adoption of the final CWSP by the City Council should be accomplished by October 2013.

11. Future Plans: Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

The City's water system needs and components may change from time to time. Such revisions will be incorporated in future versions or amendments of the CWSP.

12. Permits/Approvals: List all permits or approvals for this project from local, state, federal, or other agencies for which you have applied or will apply as required for your proposal.

The CWSP will be submitted to King County for consistency determination under King County Code (Title 13.24) and to the Washington Department of Health (WDOH) for review under Washington Administrative Code (WAC) 246-290.

13. Environmental Information: List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

A Wellhead Protection Plan Update was completed in 2009 for the City's water supply sources.

14. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

Evaluation for Agency Use Only

The proposed adoption of the CWSP is a Non-Project Action under SEPA, which includes decisions on policies, plans and programs, and is intended for planning purposes. The CWSP refers to projects that either are, or may become components of the City's water system in the future.

Project Actions referenced by the CWSP that have environmental impacts associated with the construction, maintenance, and operation of those site-specific projects will be evaluated under SEPA during the project review process as applicable.

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other ……..

b. What is the steepest slope on the site (approximate percent slope)?

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 prime farmland.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed.Indicate source of fill.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Sections 1(a) through 1(h) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-

Evaluation for Agency Use Only

Project Actions, which provides non-project environmental impact information.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Sections 2(a) through 2(c) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

3. Water

a. Surface:

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.

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.

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.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

Evaluation for Agency Use Only

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

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

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.

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.

2) Could waste materials enter ground or surface waters? If so, generally describe.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

Sections 3(a) through 3(d) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

4. Plants

a. Check or circle types of vegetation found on the site:

_____ deciduous tree: alder, maple, aspen, other

_____ evergreen tree: fir, cedar, pine, other

_____ shrubs

Evaluation for Agency Use Only

——— **grass**

——— **pasture**

——— **crop or grain**

——— **wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other**

——— **water plants: water lily, eelgrass, milfoil, other**

——— **other types of vegetation**

b. What kind and amount of vegetation will be removed or altered?

c. List threatened or endangered species known to be on or near the site.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Sections 4(a) through 4(d) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

5. Animals

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other:

b. List any threatened or endangered species known to be on or near the site.

c. Is the site part of a migration route? If so, explain.

d. Proposed measures to preserve or enhance wildlife, if any:

Sections 5(a) through 5(d) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

Evaluation for Agency Use Only

6. Energy and natural resources

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.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

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:

Sections 6(a) through 6(c) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

7. Environmental Health

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 special emergency services that might be required.

2) Proposed measures to reduce or control environmental health hazards, if any:

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

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.

3) Proposed measures to reduce or control noise impacts, if any:

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Sections 7(a) through 7(b) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

8. Land and shoreline use

a. What is the current use of the site and adjacent properties?

b. Has the site been used for agriculture? If so, describe.

c. Describe any structures on the site.

d. Will any structures be demolished? If so, what?

e. What is the current zoning classification of the site?

f. What is the current comprehensive plan designation of the site?

g. If applicable, what is the current shoreline master program designation of the site?

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

i. Approximately how many people would reside or work in the completed project?

j. Approximately how many people would the completed project displace?

k. Proposed measures to avoid or reduce displacement impacts, if any:

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Sections 8(a) through 8(l) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

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9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

c. Proposed measures to reduce or control housing impacts, if any:

Sections 9(a) through 9(c) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

b. What views in the immediate vicinity would be altered or obstructed?

c. Proposed measures to reduce or control aesthetic impacts, if any:

Sections 10(a) through 10(c) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

b. Could light or glare from the finished project be a safety hazard or interfere with views?

c. What existing off-site sources of light or glare may affect your proposal?

d. Proposed measures to reduce or control light and glare impacts, if any:

Sections 11(a) through 11(d) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

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12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

b. Would the proposed project displace any existing recreational uses? If so, describe.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Sections 12(a) through 12(c) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

13. Historic and cultural preservation

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

c. Proposed measures to reduce or control impacts, if any:

Sections 13(a) through 13(c) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

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b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

c. How many parking spaces would the completed project have? How many would the project eliminate?

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

g. Proposed measures to reduce or control transportation impacts, if any:

Sections 14(a) through 14(g) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

15. Public services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Sections 15(a) through 15(b) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

16. Utilities

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

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b. 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.

Sections 16(a) through 16(b) do not apply to the proposed adoption of the CWSP. Please refer to Section D, Supplemental Sheet for Non-Project Actions, which provides non-project environmental impact information.

C. SIGNATURE

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: Scott Woodbury
Scott Woodbury, P.E.

Date Submitted: March 2013

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D. SUPPLEMENTAL SHEET FOR NON-PROJECT ACTIONS

(do not 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.

Major elements of the CWSP include:

- Existing system description and land use.
- Policies and design criteria.
- Population and demand forecasts.
- Source and system evaluations and identifications of deficiencies.
- Operation and maintenance recommendations.
- Recommended improvements.
- Financial status and recommendations.

The proposed non-project action is the adoption of the CWSP which of itself will not cause any environmental impact. However, environmental impacts would be associated with the construction, maintenance, and operation of the specific projects proposed in the CWSP. Those impacts will be evaluated during the environmental review of the specific projects as applicable. The following paragraphs discuss potential impacts in a general manner.

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?

The construction of some of the proposed projects may temporarily result an increase in vehicle exhaust and construction related noise emissions. Effects on surface waters during construction could include increased runoff volumes and increased peak flows. The construction of some facilities may also result in the creation of impervious surfaces and the associated runoff.

Diesel powered emergency electrical generation equipment located at some facilities would produce emissions to the air as well.

The production and release of toxic or hazardous substances is not anticipated. There would, however, likely be some storage and use of chemicals associated with the operation of water treatment facilities.

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Proposed measures to avoid or reduce such increases are:

Minimization of impacts to surface waters would be achieved through implementation of applicable BMPs and compliance with regulatory requirements and permit conditions.

Minimization of impacts to noise and air quality could be achieved by keeping exposed soil damp, covering truck loads, use of rock construction entrances onto public roads, removing particulate matter deposited on public roads, covering dirt and debris piles, limiting work hours, and maintaining equipment.

Any necessary chemical storage would be designed to meet required safety and environmental regulatory requirements including secondary containment, leak detectors, alarms, and the use of plans for the prevention, containment, and clean-up of any spills.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Plants, animals, or fish could be affected by certain projects depending on their location and function. Pipeline replacements would comprise a majority of the projects and their impacts would be temporary and limited to the construction period. For above-ground facilities such as pump stations and water treatment facilities, effects could extend beyond the construction period.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

The locating and design of system components would emphasize avoidance of impacts to plants, animals, and fish. Where complete avoidance was not possible, the principal of minimization would be stressed. Impacts would be mitigated and enhancement measures implemented, as appropriate. Generally, these protective provisions are set forth in land use codes, laws and regulations, and permit conditions.

3. How would the proposal be likely to deplete energy or natural resources?

Proposed water system components would consume, but not deplete, energy and natural resources.

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Proposed measures to protect or conserve energy and natural resources are:

System improvements would be located, designed, constructed, maintained, and operated to be as efficient as possible.

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?

None of the CWSP projects would be located on prime farmlands, wild and scenic rivers, or wilderness. It is possible that some components could be located near, partially within, or traverse environmentally sensitive areas such as wetland buffers. Parks, endangered species habitat, and historic or cultural sites would be avoided whenever possible.

Proposed measures to protect such resources or to avoid or reduce impacts are:

System components would be designed to avoid environmentally sensitive areas. If use of an environmentally sensitive area were necessary, the area and construction impacts of the component would be minimized.

Additional measures include, avoiding the construction of above-ground facilities in floodplains, using trenchless technologies for crossing significant fish-bearing water courses, and observing "fish windows" set by fish agencies for work below the ordinary high water mark.

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?

CWSP projects would neither affect land and shoreline use nor allow or encourage land or shoreline uses incompatible with existing plans.

Proposed measures to avoid or reduce shoreline and land use impacts are:

Projects would comply with existing land use and shoreline management plans. Construction of above-ground facilities in shoreline areas would be avoided whenever possible.

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6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Some of the improvements identified in the CWSP would increase the demands on public services and utilities. The increases should be insignificant, with the possible exception of the need for electrical power associated the operation of pumps and water treatment equipment. Transportation impacts would occur during construction, especially for water main replacements along busy roadways.

Proposed measures to reduce or respond to such demand(s) are:

Equipment would be utilized to maximize efficiency and minimize power consumption. Traffic control during construction would be in accordance with local and/or state requirements to maintain safety and minimize impacts.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

Projects identified in the CWSP will not conflict with local, state, or federal laws or requirements for the protection of the environment.

APPENDIX F

WATER USE EFFICIENCY PROGRAM

CITY OF ENUMCLAW

Water Use Efficiency Program

INTRODUCTION

The City of Enumclaw recognizes that water is a valuable and essential natural resource that needs to be used wisely. This program provides an approach to increase water use efficiency (WUE) within the City's water service area and has been prepared to be fully compliant with Washington State Department of Health WUE requirements.

RULE BACKGROUND AND REQUIREMENTS

In 2003, the Washington State Legislature passed Engrossed Second Substitute House Bill 1338, better known as the Municipal Water Law, to address the increasing demand on our state's water resources. The law established that all municipal water suppliers (MWS) must use water more efficiently in exchange for water right certainty and flexibility to help them meet future demand. The Legislature directed the Department of Health to adopt an enforceable WUE program, which became effective on January 22, 2007. To assist MWS with complying with the WUE rule, the Department of Health (DOH) has produced DOH Publication 331-375, the Water Use Efficiency Guidebook.

The WUE requirements emphasize the importance of measuring water use and evaluating the effectiveness of a WUE program. There are three fundamental elements:

Planning Requirements. As part of a water system plan, MWS are required to:

- Collect data.
- Forecast demand.
- Evaluate WUE measures.

Distribution Leakage Standard. MWS are required to meet a distribution system leakage (DSL) standard to minimize water loss from their distribution system. WUE requirements establish a 10 percent or less DSL standard based on a 3-year rolling average. If the DSL exceeds 10 percent the MWS must develop and implement a water loss control action plan in order to be in compliance.

Goal Setting and WUE Reporting. Every 6 years, MWS are required to set WUE goals through a public process and report annually on their performance to their customers and the DOH. They also must make the information available to the public. Goals must be measurable, address water supply and demand forecasting, and include an implementation schedule for each goal. The requirement for reporting to the public may be fulfilled by including information in the annual Consumer Confidence Report.

WATER SUPPLY CHARACTERISTICS

The City owns and operates 4 groundwater supply facilities at three sites to the east of the City: Boise Springs, Watercress Springs, and PC Johnson Wellfield. The City also has an emergency intertie connected to the Tacoma Water pipeline that carries surface water from Tacoma's Green River source through the City. Water produced at the spring sites and wellfield is chlorinated, while water supplied from the spring sites receives additional treatment for corrosion control. Water from Tacoma is chlorinated and fluoridated. Water storage is provided by five reservoirs that have a total maximum capacity of 4.74 million gallons (MG). In addition, the City's water system has nine pressure zones with one pressure reducing station, seven booster pump stations, and more than 142 miles of water main. **Chapter 2** of the City Comprehensive Water system Plan (CWSP) includes more detailed information on the City system. **Chapter 6** of the CWSP includes detailed information on the City's water rights.

While the City has sufficient supply from its existing sources to meet the demand requirements of the system for the planning horizon of year 2033, the future system capacity analysis in **Chapter 7** of the CWSP concluded that the most limiting factor of future system capacity is the supply for the maximum day demand (MDD) scenario. If the MDD were reduced the City would have more capacity to meet future supply needs.

HISTORICAL WATER USE EFFICIENCY PROGRAM

The planning element of a WUE program requires the collection of water use data, forecasting demand, and evaluating WUE measures. The City's system is fully metered at all production and intertie sources and at customer connections. Installing meters is one of the most significant WUE requirements because meters provide the information necessary to calculate accurate distribution system leakage and evaluate the effectiveness of a WUE program. Customer meters are read monthly and source meters are read once every business day.

Data from the metering program and system-wide demand forecasts are contained in **Chapter 4** of the CWSP. As noted in **Table 4-1** in **Chapter 4**, water consumption dropped from 132 to 111 average gallons per day per capita from 2004 to 2011. Factors believed to contribute to the decline include customer and supply side conservation efforts, adverse economic conditions, adoption of a residential increasing rate block structure, and significant increases in sewer volumetric rates to finance expansion of the City's wastewater treatment plant.

The WUE goal adopted by the City in the 2007 CWSP targeted achieving an average water use reduction of 5 percent by the year 2012 with 2004 as the base year. As of the end of 2011 average residential water use dropped by 12 percent from 2004 based on a 3-year average, representing a savings of nearly 150,000 gallons a day. WUE measures implemented by the City include the following:

Public Education

Theme Shows and Fairs – Portable displays and other educational materials are exhibited at local fairs and theme shows. This measure has been accomplished by the Saving Water Partnership, Partnership for Water Conservation, King County, and larger MWS. Because resources to

accomplish this conservation measure are allocated at the regional level, rather than directly from Enumclaw, this measure is highly cost-effective for the City**.**

Program Promotion – Conservation related informational and/or promotional materials are included in each annual consumer confidence report. The City has also included information with utility bills and on the City's website. Other more costly measures such as newspaper articles, radio advertisements, or presentations at local schools are not implemented due to limited resources and the fact that other measures, such as water and sewer rates, have a much larger effect.

Bill Showing Consumption History – Water bills received by the City's customers compare current water use with consumption history of the same period in the previous year.

System Measures

Source and Customer Meters – Every source has a water meter that is read and recorded each business day. All customer services are metered and are read monthly.

Leak Detection and Repairs – The City has conducted leak surveys when its Distribution System Leakage exceeded 10 percent and when contracting leak detection services for pinpointing a known leak and more time was available in the minimum charge allotted for a service call. Leaks are repaired as soon as practical.

Incentives/Other Measures

Conservation Pricing - The City adopted an increasing rate block structure for residential customers beginning in 2007. Water used above specified levels will be charged at a higher rate. Although separate from the water utility, the City's sewer rates include a volumetric charge that is 3 times larger than the middle rate block for inside City residential customers and may be the largest contributing factor to the continued decline in customer water consumption.

Seasonal Demand Management - The City has requested customers to restrict outdoor water usage to odd/even days in accordance with their street address to reduce summertime peak water demands. This measure may be very cost effective in reducing maximum day demand, currently the most limiting factor in the water system's capacity to accommodate additional growth.

Recycling/Reuse – The City considered potential water reclamation opportunities in Appendix F of the 2007 CWSP, which is attached and updated at the end of this chapter. A copy of the King County Water Reclamation Evaluation Checklist is also attached. All of the potential opportunities identified would require Class A effluent that would require a filtration system at the City's Wastewater Treatment Plant to produce. This could cost several hundred thousand dollars, depending on the volume of Class A quality reclaimed water to be produced, just for the additional treatment. However, use of reclaimed water by many of the City's largest potential non-potable water consumers would be unlikely because they are scattered throughout the water service area and their distance from the wastewater treatment plant would make such use cost prohibitive. Customers in closer proximity to the wastewater plant are the most likely candidates for use of reclaimed water, but the costs to install the infrastructure to deliver the treated effluent

could easily be much higher than that estimated for installing the treatment. In summary, the cost of providing reclaimed water would still easily exceed the cost savings that would be realized from the reduced use of potable water. In addition, current regulation and opposition from tribes and other environmental groups would likely prevent implementation of a reuse program that would remove any of the flow that enters the White River from the City's wastewater treatment plant.

DISTRIBUTION SYSTEM LEAKAGE

Authorized consumption is defined as the volume of water authorized for use by the water system. All unauthorized uses and any water that cannot be tracked is considered DSL. DSL is defined as the water lost from the distribution system and includes both apparent losses and real losses. Apparent losses include things such as theft, meter inaccuracies, and data collection errors. Real losses are the physical losses from the distribution system and include such things as reservoir overflows, leaky valves, and water main breaks. Neither apparent nor real losses are authorized uses of water, therefore they are considered leakage even if they are not actual "leaks." Known or credibly estimated losses can be excluded from the leakage calculations and may include uses such as firefighting and flushing.

The City's calculated DSL history since 2004 is shown in **Table 4-7** in **Chapter 4** of the CWSP. The City's DSL of 9.5% in 2011 is significantly lower than the 49 percent DSL experienced in 1999. The decrease is primarily due to the repair of a leaking reservoir and an extensive water main replacement program in 1997 through 2002.

GOAL SETTING PROCESS

Goals are to be established by the elected governing board, the City Council, through a public process. A public hearing was held during the March 11 regularly scheduled City Council meeting concurrent with Council review of the draft CWSP. Notice of the hearing was placed in the local newspaper, on the City website, and on customer utility bills. No comments were received prior to or at the hearing. Customers and the public are invited to participate and comment on the goals throughout the CWSP review process until final plan adoption, anticipated sometime in October 2013.

Goals

The following goals are recommended because they will work together to achieve a reduction in the maximum day demand, the most limiting factor of the system's capacity to accommodate future growth. Limiting the maximum day demand will also work to defer the need for expensive manganese removal treatment at the PC Johnson Wellfield or the need to convert the Tacoma intertie from an emergency to a seasonal source. The cost for treatment of the wellfield is estimated to exceed $2.5 million. The cost to convert the intertie to a seasonal source would be minimal since the infrastructure is already in place. However, City policy continues to be to avoid using the intertie due to the substantial difference in water quality and the fact that it costs less to produce water from City sources. Also, once the intertie is converted to a seasonal source

the City will have to comply with the more rigorous reporting and frequent monitoring required of a surface water source.

Goal #1. Maintain a three year running annual average of less than 200 gallons per connection per day (gpcd) for single family residential usage.

Goal #2. Reduce the yearly ratio of maximum to average day demand so that by 2017 and thereafter it does not exceed 1.8.

PROPOSED WATER USE EFFICIENCY PROGRAM

The WUE rule requires that the City evaluate a minimum of nine WUE measures for their cost-effectiveness in supporting the adopted WUE goals. Supply side measures such as leak detection surveys or replacing meters do not count as one of the minimum number of measures. These are the types of measures that must be implemented in order to reduce water loss and achieve the leakage standard. Measures must be evaluated for cost-effectiveness from the following categories: indoor residential, outdoor, and industrial/commercial/institutional. Certain measures can be used for more than one category.

Measures

#1 Conservation Rate Structure. The City's existing increasing rate block structure is shown in **Table 10-2** in **Chapter 10** of the CWSP. The increasing block structure has been in place since 2007 and there has been a 94 MG or 15% reduction in system-wide water consumption for the period of 2007 to 2011. The actual water reduction benefit attributable to the water rate structure is impossible to quantify because several significant sewer rate increases were also put in place during the same period. Regardless, it is believed that this measure is cost effective at reducing water use.

#2 Notifying Customers Regarding Leaks on Their Service. The City data collector for reading meters alerts staff to unusually high water consumption at a customer service. The customer is notified of the potential leak by posting a notice on the customer's door. This measure has been highly effective.

#3 Educating Customers. Educating customers more than once per year about the importance of using water efficiently counts as a WUE measure. This will be accomplished through an article in the annual consumer confidence report, through an informational note at least once per year on each customer's utility bill, and conservation tips on the City's website. The cost is nominal but will serve as a reminder to customers of the need to use water efficiently.

#4 Seasonal Demand Management - The City will request customers to restrict outdoor water usage to odd/even days in accordance with their street address to reduce summertime peak water demands. Compliance would be voluntary. If monitoring indicates unacceptably low participation levels the measure would be re-evaluated to determine if it should be revised to be mandatory compliance with enforcement or if a different measure needs to be selected.

#5-#7 Water Bill Showing Consumption History. The City will continue to include on water bills current water use compared to consumption of the same period in the previous year. This

measure does not require any additional resources from the City that is not already in place. Therefore this is a cost-effective measure.

WATER DEMAND FORECAST

Table 1 shows future water demand projections with and without WUE program goals and the resulting savings in maximum day demand if the goals are realized. At buildout of the City's current urban growth area the savings are approaching the current purchased maximum day capacity of the Tacoma intertie source of 424 gpm. This will serve to further delay the need for converting the intertie into a seasonal source and defer the need for manganese removal treatment at the PC Johnson Wellfield.

Table 1
Future Water Demand Projections

Year	Population	ERUs	ADD (gpm)	MDD (gpm)	MDD w/ WUE (gpm)	Savings (gpm)
2013	15,713	7,573	1,173	2,463	2,463	0
2014	16,159	7,788	1,206	2,533	2,472	60
2015	16,621	8,011	1,241	2,605	2,481	124
2016	17,101	8,242	1,276	2,680	2,489	191
2017	17,598	8,481	1,313	2,758	2,496	263
2018	18,113	8,730	1,352	2,839	2,569	270
2019	18,647	8,987	1,392	2,923	2,644	278
2023	20,989	10,116	1,567	3,290	2,977	313
2033	22,846	11,011	1,705	3,581	3,240	341
Buildout	23,842	11,491	1,779	3,737	3,381	356

CONSERVATION PROGRAM MONITORING AND REPORTING

The City will continue to monitor overall water use, per capita water use, and the amount of distribution system leakage on an annual basis. The City will monitor the success or failure of its water conservation program by analyzing this data and determining the long-term trend in per capita water usage. The City will also evaluate the cost-effectiveness of water conservation methods, both implemented and not implemented, to determine if existing methods should be continued, or if new methods should be instituted. If the results of the program monitoring show that the water savings' goals for per capita water use are not being met, more rigorous program implementation or additional program items will be considered.

Annual performance reports will be submitted to DOH as required and a copy of the report posted on the City's website. City water customers will also be provided updates on WUE program results in the City's annual Consumer Confidence Report.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Date Submitted: 4/11/2013

Water Use Efficiency
Annual Performance Report - 2012

WS Name: ENUMCLAW WATER DEPARTMENT Water System ID# : 23600 WS County: KING

Report submitted by: *Scott Woodbury*

Meter Installation Information:

Estimate the percentage of metered connections: *100%*

If not fully metered - Current status of meter installation:

Production, Authorized Consumption, and Distribution System Leakage Information:

12-Month WUE Reporting Period: *01/01/2012* To *12/31/2012*

Incomplete or missing data for the year? *No*

If yes, explain:

Distribution System Leakage Summary:

Total Water Produced and Purchased (TP) – Annual Volume	*619,599,783* gallons
Authorized Consumption (AC) – Annual Volume	*555,586,543* gallons
Distribution System Leakage – Annual Volume TP – AC	*64,013,240* gallons
Distribution System Leakage – Percent DSL = [(TP – AC) / TP] x 100	*10.3 %*
3-year annual average	*9.6 %*

Goal-Setting Information:

Date of Most Recent Public Forum: *03/11/2013* Has goal been changed since last performance report? *Yes*

Note: Customer goal must be re-established every 6 years through a public process

WUE Goals:

Customer Goal (Demand Side):

Goal #1. Maintain a three year running annual average of less than 200 gallons per connection per day (gpcd) for single family residential usage.
Goal #2. Reduce the yearly ratio of maximum to average day demand so that by 2017 and thereafter it does not exceed 1.8.

Describe Progress in Reaching Goals:

Customer (Demand Side) Goal Progress:

WATER RECLAMATION OPPORTUNITIES

The City currently operates its own Wastewater Treatment Plant that could be a source of reclaimed water for non-potable uses such as irrigation, commercial and/or other beneficial uses. Located at 451 Semanski Street S the plant uses treated effluent for facility cleaning and landscape irrigation within the secure plant grounds.

The following identifies additional potential water reclamation opportunities that the City may pursue. All of these opportunities would require Class A effluent which cannot be achieved with the upgraded Wastewater Treatment Plant. A filtration system would be required to produce the Class A effluent and could cost several hundred thousand dollars, depending upon the volume of Class A quality reclaimed water to be produced. As a consequence of this cost, and absence of cost-effective demand for reclaimed water, the City is not currently prepared to undertake water reclamation projects within its retail service area.

Water Trucks

Potential Use: Reclaimed water could be used for dust control and other construction purposes, street sweeping, and in line maintenance operations.

Potential Water Savings: 60,000 gallons per year or roughly one-sixth of current water truck usage.

Operational Feasibility: The alternative depends upon Class A effluent being available and would not be inclusive of all water truck usage since many would likely elect not to use the reclaimed water.

Financial Feasibility: Since the water trucks need to be filled with water regardless of the water source, there would be minimal additional cost for filling trucks with reclaimed water. However, the cost to produce a Class A effluent per unit volume would exceed the savings that would realized with the use of this option.

Enumclaw School District Fields Between Semanski St and 244th Ave SE

Potential Use: Field irrigation.
Potential Water Savings: 0.8 million gallons per year.

Operation Feasibility: Several Enumclaw School District fields are located approximately 1000 to 3300 feet west-southwest of the Wastewater Treatment Plant and have approximately 52 acres of total area. Irrigation pipe and associated appurtenances will need to be constructed to supply reclaimed water to the sites.

Financial Feasibility: Construction of the irrigation pipe would be highly costly. Further financial analysis is required to determine potential cost sharing opportunities that may be achieved between the City and the school district.

Boise Creek Park

Potential Use: Field irrigation.

Potential Water Savings: 1 million gallons per year

Operational Feasibility: The City could utilize reclaimed water for irrigation and landscaping at Boise Creek Park. The park is approximately 16 acres and is located at 1300 SE 469th Street, approximately 3300 feet southwest of the Wastewater Treatment Plant. Irrigation pipe and related appurtenances will need to be constructed to convey reclaimed water to the park.

Financial Feasibility: Construction of the irrigation pipe would be highly costly. Further financial analysis is required to determine potential cost sharing opportunities that may be achieved between the City and the school district.

City of Enumclaw

Potential Use: City park and ball field irrigation.

Potential Water Savings: 2.5 million gallons per year.

Operational Feasibility: The City could utilize reclaimed water to irrigate the City's approximately 31 acres of parks and ball fields spread throughout the City at 14 different locations (excluding Boise Creek Park).

Financial Feasibility: Construction of the irrigation pipe would be highly costly. Further financial analysis is required to determine potential cost sharing opportunities that may be achieved between the City and other potential reclaimed water users that may be located along the proposed alignment.

Enumclaw Golf Course

Potential Use: Course irrigation, maintenance, and grounds keeping.

Potential Water Savings: Irrigation water for the golf course is provided by non-potable surface water and ground water sources based on irrigation and domestic use water rights conveyed to Enumclaw by King County in 2004. Said rights were originally secured by King County to serve the golf course property, and are considered municipal purpose rights pursuant to the Municipal Water Law, RCW 90.03.015. In 2007, the City installed a replacement well for the two groundwater rights. Although well installation has occurred, the replacement well has not been connected to the City's water system as a new municipal water source due to funding constraints. Assuming funding can be found in the next 6 years to connect the golf course well to the City's water system, it shall: (1) serve as an additional peaking source for the existing system; and (2) continue to provide irrigation water to the golf course. Analysis of water use practices at the golf course will determine the feasibility of substituting reclaimed water to meet irrigation needs with reclaimed water, and the total amount of reclaimed water that would be needed.

Operational Feasibility: The course is located approximately 2.3 miles northeast of the Wastewater Treatment Plant. Irrigation pipe and related appurtenances would need to be constructed to convey reclaimed water to the course and the irrigation system modified to be able to use the reclaimed water.

Financial Feasibility: Construction of the necessary piping would be highly costly and would

require a Class A effluent system at the wastewater plant. Further financial analyses would need to consider potential cost sharing opportunities that may be achieved between the city and other potential reclaimed water users that may be located along the proposed alignment. The need for providing reclaimed water to the golf course to convert more golf course water to domestic use is beyond the current 20-year planning period of the Comprehensive Water System Plan.

Other Large Water Users

Potential Use: A list of Enumclaw's largest water users in 2011 is shown in **Table 4-5** of the City of Enumclaw's Comprehensive Water System Plan. Potential reclaimed water use would likely include outside watering and dairy facility cleaning.

Potential Water Savings: An estimated 4 million gallons per year could be saved assuming some of the large water users could convert a portion of their use to reclaimed water.

Operational Feasibility: Use of reclaimed water by many of the large water users would be unlikely because they are scattered throughout the water service area and their distance from the wastewater treatment plant would make it cost prohibitive. The customers nearer to reclaimed water piping that might be extended to the golf course or other reclaimed water use noted above are the most likely candidates for use of reclaimed water.

Financial Feasibility: Construction of the necessary piping would be highly costly and likely significantly exceed the cost savings that may be realized by using reclaimed water. Much depends on their location relative to the plant or reclaimed water piping installed for other uses.

For questions, call Kristina Westbrook,
King County Reclaimed Water Program Manager at (206) 296-5279
www.kingcounty.gov/reclaimedwater

King County

Water Reclamation Evaluation Checklist
For Systems with 1,000 or more Connections

The County and State recognize that changing conditions could initiate a need to respond in new ways to future water quality standards, wastewater discharge requirements, take advantage of advances in treatment technologies and/or allow our region to be positioned to respond to changes associated with climate change and population growth.

In 2003, Chapter 90.46 of the Revised Code of Washington (RCW) was amended to require public water systems serving 1,000 or more connections to evaluate opportunities for reclaimed water when completing their water system plans. Please use this checklist to meet King County consistency requirements in responding to this legislation.

Please use this checklist, including the inventory template, to ensure that your water system plan includes sufficient information about opportunities for reclaimed water and your system's efforts to develop those opportunities. If a question is not applicable or the information is unavailable, then answer, "unknown" or "n/a." King County will consider the checklist completed if each answer is filled in with the best available information, even if the utility states that it is not aware of any reclaimed water opportunities within its service area.

Water System Name: Enumclaw Water Department
Date: January 2013
PWS ID# 236001
Contact: Scott Woodbury 360-615-5728

1. **Identifying Potential Future Demand for Reclaimed Water:** King County maintains a database and map of potential reclaimed water users for evaluating future projects. Please use the template below, or similar table, to provide information to assist King County in further researching these potential uses.
   - **Large Utility Water Users** (choose one):
     - ☐ Attached is an inventory of twenty large (above 20,000 gallons/month on average), non single-family residential, water users served by our utility that have a potential for reclaimed water use, or
     - ☑ Attached is an inventory of our utility's top twenty water users, or
     - ☐ The information requested is unknown or not available.
       Additional Comments: See Table 4-5 in Chapter 4 of the CWSP
   - **Large Self Suppliers** (choose one):
     - ☐ Attached is an inventory of large, self-supplied water users within our water utility's service boundaries - especially those near wastewater treatment plants, mainlines, outfalls, and pump stations or similar reclaimed water facilities), or
     - ☑ The information requested is unknown or not available.
       Additional Comments: _____
   - **Other** (choose one):
     - ☐ Attached is an inventory of other water users (such as those that are clustered near one another and could be served by a single system) that may be likely candidates for reclaimed water use, or
     - ☑ The information requested is unknown or not available.
       Additional Comments: See Appendix F of the CWSP

2. **Environmental Commitment**: Are you a city/town, or providing water service to a city/town, that has made commitments within resource management plans, salmon recovery plans, or other environmental initiatives for which there is a potential opportunity for using reclaimed water to assist in meeting commitments? (choose one)

   ☐ Yes, here are plans that have potential for reclaimed water use in our service area to meet the above commitments:
   _____
   _____

   ☑ The information requested is unknown, not available.
   Additional Comments: _____

3. **Identifying Areas of Potential Use of Reclaimed Water for Environmental Benefit:**
   Below are ***examples*** of uses of reclaimed water ***that comply with State, Federal and other reclaimed water environmental, health and safety standards***. All of these uses are currently in effect somewhere in Washington State. To the best of your knowledge, are any of these potential uses for reclaimed water applicable to your area?

   River Augmentation (choose one):

   ☐ Yes, our water rights are limited by instream flows. For more information, King County may contact:
   _____
   _____

   ☑ The information requested is unknown, or not available.
   Additional Comments: _____

   Groundwater Recharge (choose one):

   ☐ Yes, we withdraw water from an aquifer that is in a groundwater management area, or from a declining aquifer, where water levels may need to be replenished or to maintain aquifer storage. For more information, King County may contact:
   _____

   ☑ The information requested is unknown, or not available.
   Additional Comments: _____

   Water Rights Mitigation (choose one):

   ☐ Yes, our area is pursuing, or planning to pursue, new or additional water rights, and there may be an opportunity to use reclaimed water for mitigation of those new water rights. For more information, King County may contact:
   _____

   ☑ The information requested is unknown, or not available.
   Additional Comments: _____

   Potential Areas of Environmental Need (choose one):

   ☐ Yes, parts of our service area include potential environmental enhancement locations, such as wetlands enhancement, aquifer recharge, stream flow augmentation, that might be candidates for reclaimed water use. For more information, King County may contact:
   _____

   ☑ The information requested is unknown, or not available.
   Additional Comments: _____

4. **Local Reclaimed Water Legislation**: If water reclamation is mandated for this water system through local government agreement, contract, local regulations, ordinances, or other mechanisms, please provide a copy of the governing mechanism (choose one).

   ☐ Yes, local legislation exists in our area in support of reclaimed water use. The following relevant legislation is attached (please list titles of documents):

   _____

   _____

   ☑ No water reclamation legislation exists, or is known to exist, at a local level in our service area.

5. **Coordination with Local Wastewater Utility:** Include a brief description of your interactions with any wastewater or reclaimed water utility (King County or other) adjacent to your service area to evaluate any potential opportunities to develop reclaimed water (choose one).

   ☐ Describe if applicable:

   _____

   _____

   ☑ None. Additional Comments: See Appendix F of the CWSP

Template for
Inventory of Water Users and Identification of Potential Reclaimed Water Users

Site Owner or Site Name	Site Address (for general mapping purposes)	Estimated Annual Water Use	Water uses not requiring potable water[1]	Is this a Potential Reclaimed Water Customer?

[1] See Washington State Reclamation and Reuse Standards, September 1997, Section 1, Articles 1-5 for allowable uses of reclaimed water. http://www.ecy.wa.gov/PROGRAMS/WQ/reclaim/standards.html

APPENDIX G

CROSS CONNECTION CONTROL PROGRAM

CITY OF ENUMCLAW

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 and pollution of the municipal water supply, which is done by preventing backflow of contaminants or pollutants 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 CCC program. The purpose of a purveyor's CCC program shall be to protect the public water system from contamination via cross-connections. All required elements of a local CCC program must be documented and included in the Comprehensive Water System Plan. Compliance oversight is provided by the state Department of Health (DOH). The State mandate for and the required elements of a CCC program are contained in Washington Administrative Code (WAC) 246-290-490 Cross-Connection Control. 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, 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 (CCS), 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 sets forth the City's CCC program to protect the public water supply from possible contamination from backflow. The City's program is a combined program allowing for both premise isolation and in-premise or fixture protection.

AUTHORITY AND RESPONSIBILITY

The City's authority for ensuring its water system is adequately protected from potential contamination via cross connections is through Ordinance 1498 and the CCC program outlined in this document. A copy of the ordinance is included at the end of this document. The ordinance cites the controlling authority as the WAC section on cross connection control (now WAC 246-290-490) and the Cross Connection Control Manual of the Pacific Northwest Section of the American Water Works Association. These documents include definitions, acronyms, CCC history, cross connection hydraulic principles and examples, backflow preventor types and selection criteria, degree of hazard identification, testing and other procedures, and other information that the City will rely on and reference in the implementation of its CCC program. The CCC program shall be administered by the Certified Water System Operator who shall maintain certification as a Cross Connection Control Specialist.

Customers shall be responsible for all initial and continuing design, procurement, installation, permit, testing, inspection, maintenance, and other costs associated with complying with CCC requirements of the City. Any customer who violates any provisions and requirements of this document and CCC ordinance shall be subject to discontinuance of supply of City water to the premise. Discontinuance of the City potable supply to the premise shall remain in effect until corrective action, as required by the City, is completed, tested and approved.

Under the provision of WAC 246-290-490, purveyors are not responsible for eliminating or controlling cross connections within the customer's plumbing system. Under RCW 19.27, the responsibility for cross connection control within the customer's plumbing system falls under the jurisdiction of the local administrative authority. Coordination between the City water utility and the City local administrative authority or building department is summarized in the 2007 memo included at the end of this document. The City attempted to formalize coordination with the King County local administrative authority with permitting control over that portion of the City water service area outside the City limits, but was unsuccessful.

EVALUATION OF SERVICE CONNECTIONS

New service connections shall be evaluated during the building permit or utility service application review process. Installation of the required backflow assembly shall be a condition of water service from the City.

Existing connections shall be evaluated during the building permit review process for tenant improvements and during business license review process. Any other existing customer considered high hazard or that poses a potentially high risk for cross connections shall be inspected on an on-going basis as staffing time allows.

The City will inform customers in writing of the results of any evaluation and of any corrective action deemed necessary, the options for completing the corrective action, and the time allowed

for compliance. Up to 90 days will be allowed, however this time period may be shortened depending upon the degree of hazard involved and if shorter timeframes are required by the controlling authority adopted by City ordinance or any other pertinent factor. Upon installation, the customer shall arrange for inspection and testing of the assembly by a backflow assembly tester certified by the state of Washington who shall submit the test results to the City.

Customers that have failed to comply with the City's request shall receive written notice, via registered mail, that water service to the premise will be terminated within a period not to exceed 30 calendar days. In the event the customer informs the City of extenuating circumstances as to why the correction has not been completed, the City may grant a time extension up to but not exceeding 60 days. If the City determines at any time that a serious threat to the public health exists, the water service shall be terminated immediately, provided, however, that notice will be posted on the premises affected at the time said service is terminated. Except in the event of an emergency, the City shall notify the local administrative authority prior to denying or discontinuing water service to a customer.

Inspection shall be done during the initial installation, during on-site reviews of existing installations, and after any relocation.

When an initial installation or test identifies a backflow prevention assembly is not properly functioning, the customer shall correct the malfunction and have the assembly inspected and re-tested until the assembly operates correctly.

The City may allow that the public supply be protected by fixture protection as long as the level of protection is adequate to protect the City's distribution system as determined by the City’s CCC program administrator.

Residential flow-though fire systems using approved water pipe and materials shall not be required to install backflow protection. Residential fire systems not designed as a flow through system shall be metered separately from the potable supply and have backflow protection. All non-residential fire systems shall have detector meters.

Irrigation systems shall at a minimum be protected by a double check valve assembly.

CROSS-CONNECTION CONTROL AND ELIMINATION

The City will endeavor to eliminate potential cross-connections where possible. The City will not allow any potential cross-connections unless it is protected by an approved backflow prevention assembly. Customers 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.

The City shall continue to eliminate potential cross-connections at existing facilities and require installation of backflow assemblies at all premises deemed to be high hazard or Table 9 facilities per WAC 246-290-490. Once potential high hazard cross-connections are evaluated and addressed, the City will concentrate its efforts on reducing potential medium and low risk cross connections.

Customers shall inform the City of any proposed or modified cross-connection and also any existing cross-connections of which the customer has actual knowledge but have not been found by the City.

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. The City complies with this requirement and will encourage all water utility operation and maintenance personnel to obtain and maintain CCS certification.

BACKFLOW ASSEMBLY INSPECTION AND TESTING

DOH requires that all backflow assemblies are routinely inspected and tested by certified personnel. Inspections and testing are required at the time of installation, annually thereafter, after a backflow incident, and/or after the assembly is repaired, reinstalled, or relocated.

Customers shall arrange for testing of any assemblies they own. The City will notify customers annually of required testing, and the testing must be completed before a corrective action date passes. The customer will be subject to all applicable testing, maintenance and repair fees.

Tests shall be performed by a State of Washington certified Backflow Assembly Tester (BAT) and the results reported to the City within 30 days on a form provided by or approved by the City. BATs shall notify the City of all test results, improper installations, unapproved assemblies, repairs, corrections to data, disconnections with removal of assemblies, and assembly replacements. Test reports shall be filled out completely and legibly and must include detector assembly readings where applicable. BATs must have current certification and calibration records on file or test reports will not be accepted.

When a test indicates that a backflow assembly is not functioning properly, the owner shall correct the malfunction within 5 working days or other timeframe as directed by the City. After correcting the problem, the owner shall arrange for re-inspecting and testing of the assembly.

TESTING QUALITY CONTROL ASSURANCE PROGRAM

The City shall ensure that all testing procedures are completed in a consistent manner. Only certified personnel shall be utilized to test all backflow assemblies. Personnel shall be trained as outlined by the State, fulfilling all necessary requirements in order to comply with WAC 246-290-490.

The City annually updates a list of BATs expressing interest in testing devices served by the City water system. Persons or organizations wishing to be added to this list are required to provide the City with copies of the following:

1. Proof of current certification by the State of Washington as a BAT for all persons that are authorized to perform tests.
2. Proof of current calibration tests performed for all testing equipment (annual calibration is required).

Each test submitted shall be reviewed by CCS certified staff for completeness, including BAT certificate number, equipment calibration data, differential pressure above minimum requirements, and system pressure reasonably close to that expected for the location based on the hydraulics of the water system.

As more BATs transition to submitting test reports electronically, the inclusion of a digital photo

of the device with the electronic test report may become standard and allow the reviewing CCS to verify that no changes have been made to the device from the previous year's test, since the tester may not be the same each year. It may be several years before all BATs submit electronically or carry camera phones to make this option feasible and for it to be accepted by BATs and not result in additional charges to device owners.

INCIDENT RESPONSE

Emergency response to a reported backflow incident shall be as follows:

1. Notify the City's Cross Connection Control Specialist of the incident immediately and DOH within 24 hours using the state approved incident report form included at the end of this document.
2. Shut down the affected mains to contain the affected contaminants and notify affected customers of the problem and the need to boil water for consumption and cooking if necessary.
3. Flush affected water mains to remove contaminants and disinfect as necessary. After the necessary disinfection contact time has passed, restore water service into the isolated area in a manner that removes air and allows unidirectional flushing. Take samples for water quality analysis in the affected mains and in other parts of the distribution system as necessary to ensure that all contaminants were removed. Keep the unidirectional flow scheme in operation until receipt of acceptable test results and concurrence from DOH to return to the system to normal operation. Ensure all valves are opened. Notify all parties previously contacted that normal operation is restored.

PUBLIC EDUCATION

Educational information regarding CCC will be included in the annual consumer confidence report, on utility bills, and on the City's website.

RECORD KEEPING

At a minimum the City shall record and maintain the following information:

- Master list of service connections and/or premises where backflow prevention assemblies are protecting the public water system or fixtures and assessed hazard level of each backflow assembly.
- Information on approved air gaps, including location, degree of hazard, installation date, inspection history, inspection results, and personnel conducting inspections.
- Backflow assembly information including location, assembly description, installation date, inspection history, test and repair history, test results, and inspecting personnel.
- Approved atmospheric vacuum breakers used for irrigation system applications including location, description, installation date, inspection history, and inspecting personnel.
- Program summary and backflow incident reports.

The City maintains a Microsoft Office Access database inventory of premise isolation and in-premise backflow assemblies currently served by the City water system. Device test reports, annual summary reports, and backflow incident reports are saved electronically. Together these records include the minimum information required by WAC 246-290-490.

RECLAIMED WATER REQUIREMENTS

Additional CCC requirements may be imposed by DOH in any permits issued in accordance with Chapter 90.46 RCW for systems that distribute or receive reclaimed water within their water service area. The City currently does not distribute or receive reclaimed water within its service area, therefore these requirements are not applicable.

DATE: January 2, 2007

TO: To all City of Enumclaw Staff working with any water supply system within the City of Enumclaw.

FROM: Steve Gurr, Building Official

SUBJECT: Cross Connection Control Procedure For Facilities Receiving Water From The City Enumclaw, or any other water purveyor

It has come to my attention that there is still some confusion as to when permits should be issued for cross connection control devices where the facility is served by the City of Enumclaw or any other purveyor or a private system with in the City of Enumclaw. This letter is to clarify this issue.

The Uniform Plumbing Code in chapter 6 section 603 requires that all water operated equipment or devices (lawn sprinkler systems, fire sprinkler systems, commercial hot water heating boilers, etc.), which may cause pollution or contamination, must be protected by an approved backflow protection device or assembly. It is the responsibility of the Jurisdictions Plumbing Official to regulate these in-premises devices.

Therefore we must issue permits for all such devices. Phillip Lay/Water Supernatant and Cross Connection specialist will be involved in the initial testing verification, code compliance, and annual testing record keeping of this devices for the water, building departments.

Where Premises protection required by WAC 246-290-490 and is the responsibility of the water purveyor, whether it is a private system, or a water purveyors. The purveyor will establish premises protection requirements for the facility. If the premises protection device is placed on the facility side of the meter or in the facility, the Building Department will issue a permit for such device as per the Uniform Plumbing Code with in the City of Enumclaw. Initial testing and annual monitoring of testing of such device shall be the responsibility of the outside purveyor.

If there is any questions or concerns please let me know.

Steve Gurr
Building Official
City of Enumclaw
(360) 825-3593 Ext. 5731

Chapter 14.16
CROSS-CONNECTION CONTROL PROGRAM

Sections:

14.16.010 Purpose.
14.16.020 Controlling authority.
14.16.030 Definitions.
14.16.040 Customer responsibility.
14.16.050 Prohibition.
14.16.060 Inspections.
14.16.070 Contingent service.
14.16.080 Backflow devices.
14.16.090 Violation – Penalty.

14.16.010 Purpose.
The protection of the public health of the water customers of the city by the control of actual or potential cross-connections. (Ord. 1498 § 1, 1985).

14.16.020 Controlling authority.
The policies, procedures and criteria established in WAC 248-54-285, and the accepted procedure and practice in Cross-Connection Control Manual – Pacific Northwest Section – American Waterworks Association, 3rd Edition, and later superseding editions. (Ord. 1498 § 2, 1985).

14.16.030 Definitions.
A. “Backflow” means the flow other than the intended direction of flow, of any foreign liquids, gases or substances into the distribution system of the public drinking water system.

B. “Contamination” means the entry into or the presence in the public drinking water system of any substance or matter which when present in drinking water above an acceptable level may adversely affect the health of the consumer and/or the aesthetic qualities of the water consumed.

C. Cross-connection means any physical arrangement connecting a public drinking water system, directly or indirectly, with anything, other than another public drinking water system, capable of contaminating the public drinking water system as a result of backflow.

D. “Customer” means any person(s), firm or corporation that is furnished drinking water through a legal service connection to the drinking water system.

E. “Department” means the Washington State Department of Social and Health Services.

F. “Illegal user” means any person(s), firm or corporation that is not authorized by the purveyor to use a customer’s service.

G. “Public drinking water system” means any water system or supply intended or used for human consumption or other domestic uses; including source, treatment, storage, transmission, and distribution facilities where water is furnished to any community, collection or number of individuals; however excluding a system serving one single-family residence.

H. “Purveyor” means the city of Enumclaw, or its authorized agent.

I. “Service” means a physical connection between the public drinking water system and the customer’s system. (Ord. 1498 § 3, 1985).

14.16.040 Customer responsibility.
It shall be the responsibility of the customer of the city water utility to provide cross-connection control in a manner approved by the city. (Ord. 1498 § 4, 1985).

14.16.050 Prohibition.
The installation or maintaining of any actual or potential cross-connection which would endanger the purveyor’s public drinking water system is prohibited. Any such cross-connection now existing is declared unlawful and shall be removed immediately. (Ord. 1498 § 5, 1985).

14.16.060 Inspections.
Authorized employees of the city with proper identification shall have free access at reasonable hours of the day, to all parts of the premises or within buildings to which water is supplied. Water service may be refused or terminated to any premises for failure to allow necessary inspections. (Ord. 1498 § 6, 1985).

14.16.070 Contingent service.
Water service to any premises shall be contingent upon the customer providing cross-connection control in the manner approved by the city. (Ord. 1498 § 7, 1985).

14.16.080 Backflow devices.
When backflow devices are required to be installed they shall be a model approved by the department and shall be tested a minimum of once a year. (Ord. 1498 § 8, 1985).

14.16.090 Violation – Penalty.
Service to any premises receiving its water from the purveyor’s public drinking water system shall be contingent upon compliance with all rules and regulations of the department and the purveyor. Service shall be disconnected to any premises for failure to comply with rules and regulations of the department and this purveyor. (Ord. 1498 § 9, 1985).

This page of the Enumclaw Municipal Code is current through Ordinance 2512, passed July 9, 2012.
Disclaimer: The City Clerk's Office has the official version of the Enumclaw Municipal Code. Users should contact the City Clerk's Office for ordinances passed subsequent to the ordinance cited above.

City Website: http://www.cityofenumclaw.net/ (http://www.cityofenumclaw.net/)
City Telephone: (360) 802-6282
Code Publishing Company (http://www.codepublishing.com/)
eLibrary (http://www.codepublishing.com/elibrary.html)

APPENDIX H

WATER SYSTEM CONSTRUCTION STANDARDS

WATER LINE SPECIFICATIONS

Work shall be in accordance with Sections 7-09 to 7.15 of the latest edition of the WSDOT Standard Specification except these specifications shall prevail where they conflict with the Standard Specification.

Materials

Ductile-Iron Pipe (DIP)

A. Pipe:

1. Ductile iron pipe shall conform to the requirements of AWWA C-151, with cement mortar lining and seal coat conforming to the requirements of AWWA C-104 and Section 7-09 of the Standard Specifications. Pipe class shall be 52 or greater. Pipe shall bear Underwriters' Laboratories (UL) and National Sanitation Foundation (NSF) labels.

2. Pipe plain ends: Beveled.

3. Bell ends: AWWA/ANSI C110/A21.10 bell and spigot dimensions modified for AWWA/ANSI C111/A21.11 push-on joint.

B. Fittings:

1. Fittings shall be flanged, mechanical joint or push-on as specified herein or as shown on the Plans and in accordance with Section 7-09 of the Standard Specifications.

a. Fittings shall be Ductile Iron or Class 250 grey iron conforming to AWWA C110 and C111 and shall be cement-mortar lined and seal coated conforming to AWWA C104. Short body ductile iron fittings conform to AWWA C153 and cement-mortar lined and seal coated per AWWA C104 are also acceptable. Rubber gasket joints for ductile iron pipe and fittings shall conform to the requirements of AWWA C-111.

2. Gaskets and lubricants: AWWA/ANSI C111/A21.11.

C. Joint Restraining Glands

1. Joint restraining glands called MEGALUG as manufactured by EBAA Iron Sales, Inc. of Eastland, TX, or approved equal, can be used in lieu of thrust blocks or tie rods where prior approval by Engineer is obtained.

2. Joint restraining shall not be allowed in lieu of thrust blocks on 6-inch diameter fittings or smaller.

High Density Polyethylene Pipe (HDPE) and Service Lines

A. Pipe and Service Lines

1. High density polyethylene pipe (not tubing) shall be used for the 2-in pipe and 1" service lines from the main to the meter and from the new meter to existing meter or water service line.

2. Polyethylene pipe shall be Driscoplex 5100 Ultra-Line iron pipe size polyethylene pipe or equal, DR11, pressure class 160 psi, conforming with AWWA C901 and having standard PE code designation PE 3408.

B. Corporation Stop

1. The Contractor shall install corporation stops on the main for each service connection.

C. Fittings shall be as shown on the Plans. Insert fittings shall be used on all compression couplings.

D. Traffic Bearing Meter Box:

1. Where called for on the Plans, the traffic bearing box shall be Fogtite 1-D with steel cover plate, or an approved equal.

Locate Wire

A. The following materials, or an approved equal, shall be used to provide continuous locate wire along all main and service lines:

1. Bare magnesium anodes, 1 lb. weight.

2. Copper "C" tap connectors manufactured by Thomas Betts, Memphis, TN.

3. Tack tape manufactured by Royston Laboratories, Pittsburg, PA.

4. Commercially available electrical and "duct" tape.

5. DBR direct bury splice kits manufactured by 3M.

6. Single strand locating wire, 12 gauge, heavy coated, blue color.

Fire Hydrants

A. Fire hydrants shall be center stem compression style and conform to the latest revision of AWWA Specifications C 502, except as herein modified, minimum 5-1/4-inch main valve opening, 6-inch mechanical joint pipe spool with 6-inch auxiliary resilient wedge gate valve flanged to main tee, and shackle rod, MEGALUG or other approved restraint from gate valve to fire hydrant. Hydrant shall be furnished with break off flange on barrel and break off coupling for stem, two 2-1/2-inch hose connections, one 4-1/2-inch NST thread steamer port with 4-inch STORZ quick connect fitting (NST thread). Nozzles shall be fitted with renewable bronze nipples locked in place.

B. Auxiliary Gate Valve and Valve Box

1. Auxiliary gate valves and valve boxes shall be furnished and installed in accordance with this section.

Valves

A. Gate valves shall be AWWA C515 resilient seated gate valves. End connections may be flanged, mechanical joint or push-on as shown on the Plans. Valve stem extensions with plate welded to operating nut shall be required where cover is greater than 3 feet. Valve shall open when stem is rotated counterclockwise. Valves shall be certified by supplier to withstand system test pressures of 200 psi minimum without leaking.

B. Tapping sleeves shall be dual compression, full body, stainless steel tapping sleeves. Tapping sleeve shall have a service rating of 250 psi. Flange outlet shall be Class 250 and comply with ANSI B16.1 Standard. Bolts shall be corrosion resistant, high strength stainless steel 18-8 Type 304. Tapping valves shall be flanged by mechanical joint ends.

C. Valve Boxes:

1. Valve boxes shall be cast iron of sliding, adjustable height type with round or oval bottom hood sections to fit over the top of the valve. The top section shall be recessed to receive a close fitting "eared" lid with the word "WATER" cast into it. Internal diameter of the smallest section shall be not less than 5 inches. Minimum thickness of the metal shall be not less than 5/16-inch. Castings shall be smooth and the workmanship shall be first class. Valve boxes shall be provided with dust covers.

2. Valve boxes shall be supplied with valve operator extension rods such that the maximum depth from the ground surface to the operator nut does not exceed 3 feet.

Related Materials

A. Meter setter, meter box and fittings shall be as shown on the Plans.

B. Thrust blocking shall be concrete as shown on the WSDOT Standard Details or as shown on the Plans. Commercial concrete shall be used. At no time shall the contractor be allowed to mix concrete in the trench or on-site.

C. Water line detector tape shall be Alertline detectable underground utility marking tape, or equal, color blue per “APWA Uniform Color Code,” 2-inch minimum width.

Meters

A. Meters will be furnished and installed by the City.

Construction Requirements

Materials Handling and Delivery

A. Pipe and appurtenances shall be handled in such a manner as to insure delivery to the trench in a sound, undamaged condition. Particular care shall be taken to not damage the pipe, pipe coating or lining. The City or the Engineer shall be present when materials are unloaded. Before installation, the pipe and appurtenances shall be examined by the Engineer for defects.

B. The amount of pipe strung at the job site shall be limited to the amount that can be installed in one day.

C. Rubber gaskets shall be stored in a cool, dark place to prevent damage from the direct rays of the sun.

D. Cut pipe squarely avoiding sharp, ragged, or unbeveled plain ends and do not damage lining by cutting.

E. The Contractor shall exercise special care during the unloading, handling, and storage of all HDPE pipe to ensure that the pipe is not cut, gouged, scored or otherwise damaged. Any pipe segment which has cuts in the pipe wall exceeding 10 percent of the wall thickness shall be cut out and removed from the site at the Contractor's cost. The pipe shall be stored so that it is not deformed axially or circumferentially which may hinder pipe installation.

F. Remove damaged or rejected materials from Project site.

Installation

A. Installation shall be in accordance with the requirements of AWWA C-600. The interior of the pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench. The pipe shall be kept clean during laying operation by plugging. Depth of cover shall be 36" below proposed finish grade except as shown on the plans.

B. Pipe and appurtenances shall be carefully lowered into the trench by means of derrick, ropes, belt slings or other suitable equipment. Under no circumstances shall any of the pipe or appurtenances be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe coating. Poles used as levers or skids shall be of wood and shall have broad, flat faces to prevent damage to the pipe and coating. Broken or otherwise defective pipe shall be removed and replaced. Repair bands or clamps shall not be used to repair broken pipe, on new construction.

C. The trench bottom shall be graded to provide uniform support for the pipe barrel. Water shall be kept out of the trench by pumping, if necessary, until the jointing is completed. When work is not in progress, open ends of the pipe, fittings, and valves shall be securely plugged so that no trench water, earth or other substances will enter the pipes or fittings. Where any part of the coating of lining is damaged, the repair shall be made by the Contractor at his expense and in a manner satisfactory to the Engineer. At a sufficient distance, prior to encountering a known obstacle or tie into an existing pipe, the Contractor shall expose and verify the exact location, size, and type of obstacle or pipe and verify available fittings so that proper alignment and/or grade may be determined, and connections can be made before the pipe sections are laid in the trench and backfilled. The connections shall be made by using special parts and/or fittings to suit actual conditions. All connections made under pressure shall be witnessed by City of Enumclaw Public Works personnel.

D. Pipe ends left for future connections shall be plugged, or capped, and anchored as shown on the Plans or as directed by the Engineer. The Contractor shall install vertically an 8-foot wood post, directly over the end of the pipe. This post shall be painted blue and the word "WATER" stenciled neatly upon it.

E. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe.

F. Poured in place concrete thrust blocks or joint restraining glands such as MEGALUG shall be installed where the pipe line terminates or changes alignment, utilizing a tee, cross, bend or similar fitting. It is the Contractor's responsibility to determine the amount of restraint required, unless otherwise shown.

G. All pipe and fittings exposed to concrete shall be double wrapped with 4 mil polyethylene film prior to placement of the concrete.

H. Detector tape shall be placed approximately 12 inches above all watermains.

Alignment and Grade

A. The pipe shall be so laid in the trench that after the line is completed, the bottom of the pipe conforms accurately to the depth and alignment shown on the Plans and confirmed in the field prior to construction. The pipe shall be generally straight to visual observation as determined by the Engineer.

B. Both line and grade shall be periodically checked and recorded in a field book for each piece of pipe and appurtenances laid. The Contractor shall furnish to the Engineer a copy of as-built drawings for the newly-installed pipe and appurtenances.

C. Deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets shall not exceed half the manufacturer's recommendations for the type of pipe being installed.

D. If the alignment requires deflection in excess of the above limitations, the Contractor shall furnish special bends to provide angular deflections within the limits allowable.

Jointing of Ductile Iron Pipe

A. The Contractor has the option of using either mechanical or push-on joints unless otherwise specified or shown. All joints shall conform to the requirements of AWWA C-600.

B. Whenever flange connections are shown on the Plans, called for in the Specifications, or required in the Work, the flange and fittings shall conform to the requirements of AWWA C-110 for 250 pound pressure ratings.

Installation and Joining of HDPE Pipe

A. The Contractor shall exercise special care during the unloading, handling, and storage of all HDPE pipe to ensure that the pipe is not cut, gouged, scored, or otherwise damaged. Any pipe segment which has cuts in the pipe wall exceeding 10 percent of the wall thickness shall be cut out and removed from the site at the Contractor's cost. The pipe shall be stored so that it is not deformed axially or circumferentially which may hinder pipe installation.

B. The Contractor shall notify the Engineer prior to pipe joining. HDPE pipe segments and fittings shall be joined by heat fusion welding and shall be joined in strict accordance with the pipe manufacturer's requirements. Fusion equipment used in the joining procedure shall be

capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, fusion temperature, alignment, and fusion pressure. Pipe segments and fittings joining methods shall meet the requirements of AWWA C901, as applicable based on pipe size.

C. Heat fusion welding to join pipe segments or fittings shall be conducted solely outside the trench. The pipe and fittings may be moved while the welding machine remains stationary provided that the pipe or fittings are not overstressed by pulling across the ground. The Contractor shall obtain maximum pulling distance recommendations from the manufacturer for pipe and stay within 80 percent of the maximum allowable distance. Fittings shall be moved in a manner such that they travel with the pipe without inducing any pulling stress across the fitting. The Contractor shall not scrape, gouge, or damage the pipe in any manner due to pulling to the next joint.

D. All other manufacturer and AWWA C901 requirements as applicable on pipe size shall be followed.

Valves

A. Valves and valve boxes shall be installed where shown on the Plans or as directed by the Engineer.

1. Valves shall have the interiors cleaned of all foreign matter before installation. If the valve is at the end of the line, it shall be plugged prior to backfilling. The valve shall be inspected by the Engineer in the open and closed positions to insure that all parts are in working condition.

2. In areas where running sand is encountered, provisions shall be made to restrict the sand from entering the bottom section of the valve box.

3. The Contractor shall expose all valve boxes for pre-final and final inspection. After final inspection of the valves located in unpaved areas, florescent surveying flagging shall be placed directly over the valve box lid and covered with gravel to facilitate location in the future.

4. Install “eared” valve box lid such that the “ears” are aligned parallel to pipe.

B. All valve box adjustments will be accomplished as directed by the Engineer. Any damage to a mainline valve or valve box resulting from construction under this item shall be repaired or the damaged portion replaced at the Contractor's expense.

1. Valve operator extension rods shall be installed whenever the depth to the valve operating nut exceeds 36 inches. The costs of furnishing and installing the extension rods shall be considered incidental to the price of the valve.

Fire Hydrants

A. The Contractor shall install the hydrant assemblies in accordance with the Details.

B. Hydrants installed but not available for use shall be covered with burlap and securely tied.

C. In lieu of valve box markers for the auxiliary gate valves, the Contractor shall paint in two 2-inch black lettered stencils, the direction and distances to the nearest 1/10-foot the distance to the valve box on the face of the fire hydrant directly below the bonnet flange.

Service Connections

A. A corporation stop or main valve shall be installed at a point in the service line as close to the main water supply as possible. There shall be line pressure in the main at all times connections are being made. Service connections shall be made following testing, disinfecting and flushing. Service connection shall be defined as the connection between the watermain and meter setter, including the meter setter.

1. The Contractor shall make the connection to the City of Enumclaw's main water supply in a manner consistent with the Standard Specifications and Standard Details. A water service shall not cross property lines or adjoining lots, unless shown otherwise on the Plans.

2. Contractor shall provide 72 hours notice to Engineer prior to shutdown of any existing water main.

3. A water service connection shall not have more than one union every 100 feet.

4. HDPE service tubing sections shall be joined by heat fusion welding only. Heat fusion welders shall be certified by the manufacturer.

B. The Contractor shall excavate whatever substances that are encountered to the depth required for the connections. The Contractor shall excavate for water connections in such a manner that the excavation is 90 degrees to the street line, whenever possible.

1. Trenches shall be of sufficient width at the bottom to allow for laying of the particular service.

2. The Contractor shall expose the mains to be tapped for distances of 4 feet in length. Excavation on both sides of the pipe shall be carried to the bottom of the pipe. Excess excavation below the required level shall be backfilled and compacted with bedding material at the Contractor's expense as directed by the Engineer.

3. No water service shall be installed within a distance of 10 feet from a sewer service.

4. The Contractor shall be responsible for and shall bear the expenses incurred, in the event that a main should be damaged during excavation or backfilling. The City of Enumclaw's Public Works Department will repair all City owned damaged mains; however, the Contractor shall bear the cost of all materials, labor and other expenses incurred by the City in repairing the damaged main.

C. Trench backfill shall commence only after the water service lines and appurtenances have been properly completed and inspected.

1. The Contractor shall exercise due care in excavating and backfilling to keep the meter box vertical and in place.

D. At the Contractor's option, they may install the water service up to the meter setter, but not including the meter setter prior to testing, disinfecting, and flushing the main.

Locating Wire Installation

A. Locate wire shall be installed to provide a continuous, interconnected wire along all water main and service lines. A separate continuous wire shall be installed on all service lines on the customer side of the water meter.

B. Wire shall be installed on top of all water main lines in a series of narrow "S" curves to provide for slack in the wire and shall be fastened with "duct" tape at minimum 9-foot intervals. Loop the wire in each main line valve box with sufficient wire to allow the wire to be pulled to just below the valve cover.

C. Locate wire for service lines must have minimum 1-foot length of wire coiled and accessible in the meter box. Locate wire shall be fastened to the top of service lines with "duct" tape at minimum 15-foot intervals.

D. Separate lengths of wire shall be connected using DBR splice kits.

E. Service line wire shall be connected to the main line wire by striping a short length of insulation from the main line wire and the end of the service line wire. The service line wire shall be tightly crimped to the main line wire using a tap connector. The entire area of exposed wire shall then be covered with tack tape and wrapped securely with electrical tape.

F. Anodes shall be installed on the main line wire at each end of the new main. The anode wire connection to the main line wire shall be made similar to the connection for service line wire.

G. The wire will be tested by the City using locating equipment for continuity of the signal after the installation is complete.

Hydrostatic Testing, Disinfection, and Flushing/ Connection to Existing

A. No new water main shall be directly connected to the City's water supply until all hydrostatic testing, disinfection, and flushing is accomplished by the Contractor and approved by the City. A temporary connection is allowed with appropriate cross-connection control devices and measures in place. These devices and measures shall be used to eliminate any potential health hazard associated with water main or service line installation. Operation, maintenance, testing and repair of cross-connection control facilities shall be the responsibility of the Contractor and shall be approved by the City prior to connection. The contractor shall provide a copy of a recent test report on the cross connection device. The City will test the device after it has been installed and prior to its use. The device must pass testing to be used.

B. The Contractor shall perform an initial flush prior to hydrostatic testing. Following a satisfactory hydrostatic test, the Contractor shall disinfect the facilities and lastly complete a final flushing. The new fire hydrant called for on the plans shall be pretested and have a satisfactory bacteriological sample in accordance with 7.09.3(23)C. The contractor is responsible for providing temporary end cap with fill port on the end of the hydrant spool for testing purposes.

1. Hydrostatic Testing

a. A hydrostatic test shall be conducted on all newly constructed water mains, fire hydrant leads and stub-outs after flushing in the presence of City of Enumclaw representatives. Ductile iron water mains and fire hydrants shall be pressure tested in accordance with Section 7-09.3 of the Standard Specifications. Testing of HDPE pipe shall be in accordance with Performance Pipe Technical Publication PP-802.

2. Disinfection

a. Disinfection of water mains prior to being placed in operation shall be in accordance with Section 7-09.3 of the Standard Specifications and AWWA Specification C651 and shall be by the solution feed method. Bacteriological test samples will be taken by the City from the completed and disinfected water main to health authorities for testing for contamination.

Samples are picked up on Tuesdays and the Contractor shall coordinate its operations accordingly. The Contractor shall provide a flow meter on the chlorine injector for the solution feed. The solution feed shall be continuous to ensure uniform distribution of chlorine.

b. The Contractor shall be responsible for dechlorination prior to discharging any water from the pipeline.

3. Flushing/Connection to Existing

a. Flushing of water mains shall be in accordance with Section 7-09.3 of the Standard Specifications. Water for the initial flushing may be obtained from a hydrant or temporary blowoff piping provided with a double check valve backflow prevention assembly and flow meter. The temporary piping to and from the backflow prevention assembly can be a hose or pipe at the Contractor’s option. Size of backflow device, temporary piping, and size and number of taps to water source shall be determined by the Contractor to achieve adequate flushing velocities. Disinfection of the hose or connecting pipe shall be witnessed by the City.

c. It shall be the Contractor's responsibility to notify the Engineer and the City of Enumclaw's Public Works Department 48 hours in advance of any flushing operations. All flushing of newly-constructed mains shall be done between the hours of 8:00 AM and 4:00 PM weekdays, unless otherwise authorized by the City of Enumclaw. The City of Enumclaw will not be responsible for any flushing costs caused by the Contractor's negligence, through faulty workmanship, or erosion from the flushing waters.

d. After disinfection and receipt of acceptable tests, the Contractor shall connect the new line to the existing system and perform final flushing. Connection to the existing system and final flushing procedures shall be coordinated with the City. The distance between the existing pipe and the new pipe shall not be greater than 18 feet.

e. It shall be the responsibility of the Contractor to provide 72 hours notice to the Engineer prior to the shutdown of any existing water main so that affected

water customers can be notified by the City. If more than one notice has to be given due to delay by the Contractor, then the cost to serve additional notices will be charged to the Contractor.

f. Contractor shall provide 24 hours notice, given no later than 3:00 PM, to the Engineer prior to any tie-ins to the City's water supply to ensure the Contractor has procured and assembled proper fittings. Tie-ins shall be scheduled on Tuesday, Wednesday, or Thursday only. No tie-ins shall be scheduled Monday or Friday unless approved by the City.

4. Test and Air Vent Pipe Removal

a. After completion of testing, all test and air vent pipe shall be removed, the corporation cock closed at the main, and a brass cap shall be installed on the closed corporation in the presence of Public Works personnel.

C. Abandonment of Existing Water Line

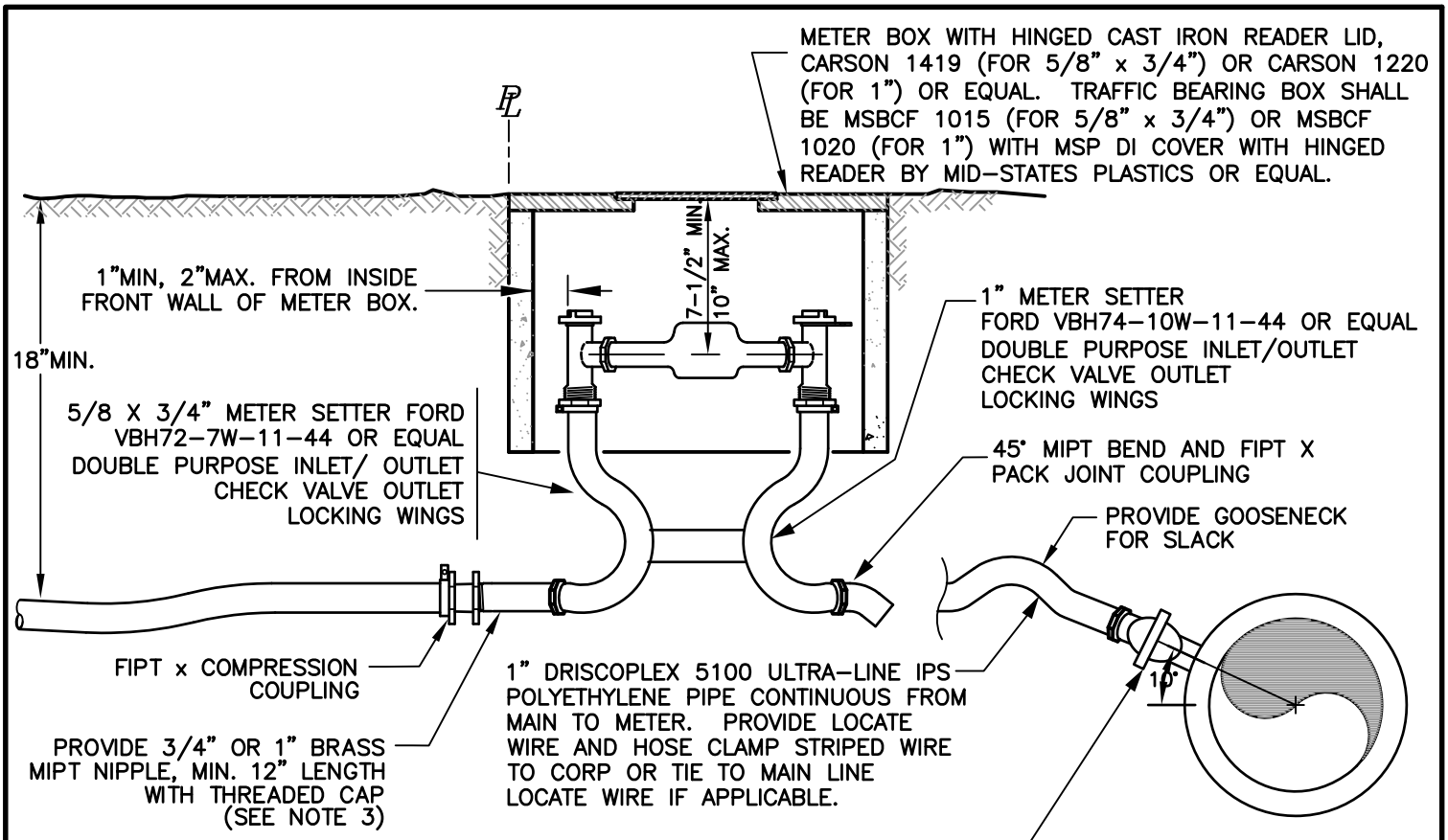
1. Ends of existing water lines that are to be abandoned shall be drained then capped, plugged, or crimped to form a watertight seal.

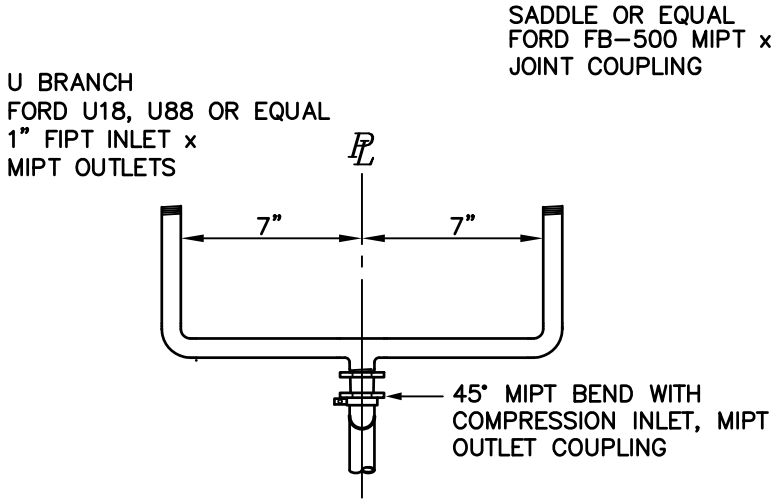
2. Coordinate abandonment of existing water lines with City and only abandon after new water line is in operation and all services have been transferred to the new main.

3. Unless otherwise noted, remove all existing fire hydrant assemblies, valves, and valve boxes from water lines that are to be abandoned and existing meter setters from meters that are to be replaced and deliver them to the City of Enumclaw maintenance yard. Provide 24 hours notice to City shops prior to delivery.

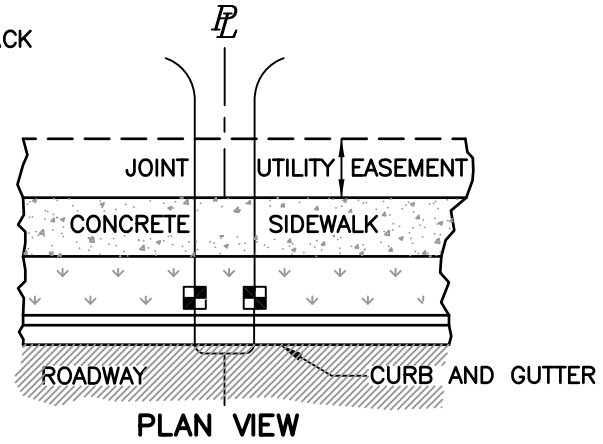
4. Items deemed unsuitable for salvage by the City shall be properly disposed of by the Contractor.

END OF WATER LINE SPECIFICATION





DOUBLE SERVICE



METER LOCATION FOR DETACHED SIDEWALK

NOTES:

1. DO NOT BACKFILL UNTIL ALL FITTINGS HAVE BEEN INSPECTED. METER TO BE SUPPLIED AND INSTALLED BY CITY AT CUSTOMER EXPENSE.

2. ALL MATERIAL SHALL BE BEDDED IN 5/8" MINUS CRUSHED ROCK.

3. SERVICE LINE SHALL EXTEND ACROSS SIDEWALK AND JOINT UTILITY TRENCH WHERE APPLICABLE. ALL FITTINGS SHALL BE BRASS. COMPRESSION FITTINGS SHALL HAVE INSERT STIFFENERS.

4. METER BOXES SHALL BE OUTSIDE OF VEHICLE TRAFFIC AREAS UNLESS SPECIAL APPROVAL IS GRANTED BY THE CITY.

REVISIONS	DATE:
CHECK PRINT	03/04/2003
UPDATES	06/29/2004
UPDATES	08/01/2005
UPDATES	02/01/2006
METER BOX/LOCATE WIRE/LINE SIZE	07/25/2011
DRAWN BY: KW	CHECKED BY: SW

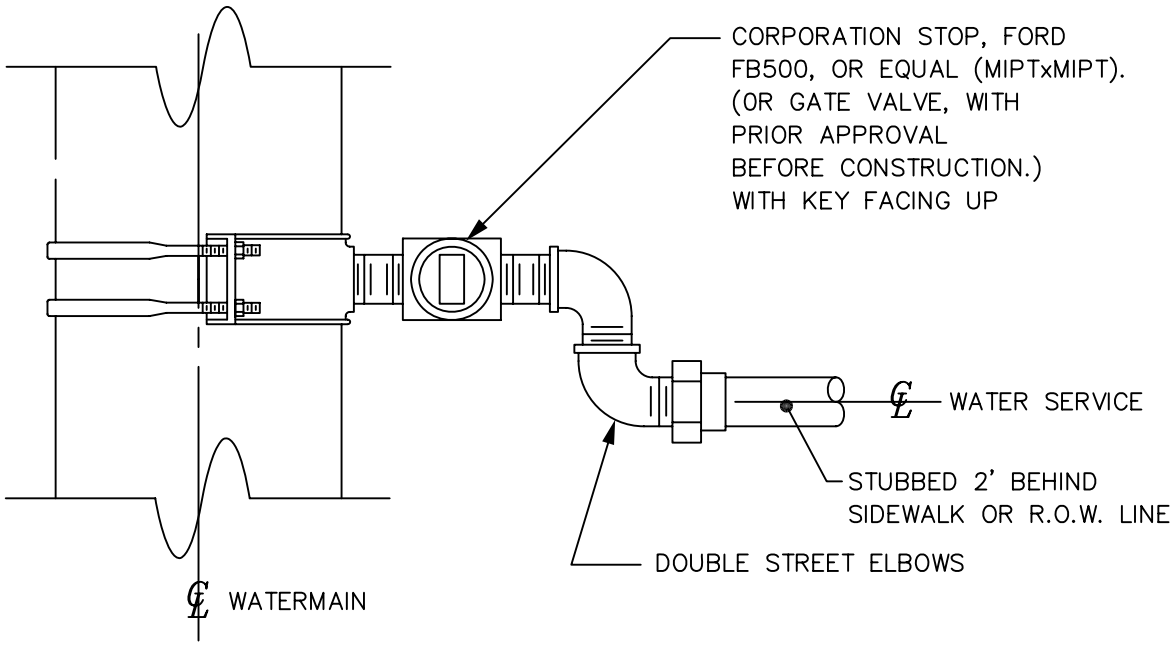
City of Enumclaw

SINGLE OR DOUBLE WATER SERVICE

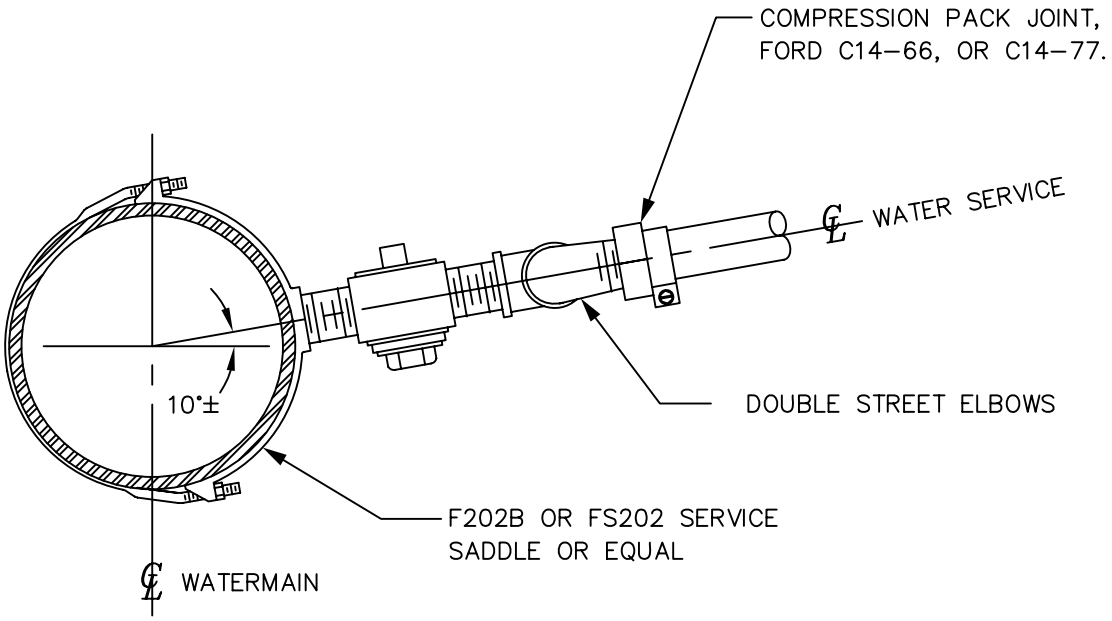
DWG. NO.

WA

01



PLAN



ELEVATION

NOTES:

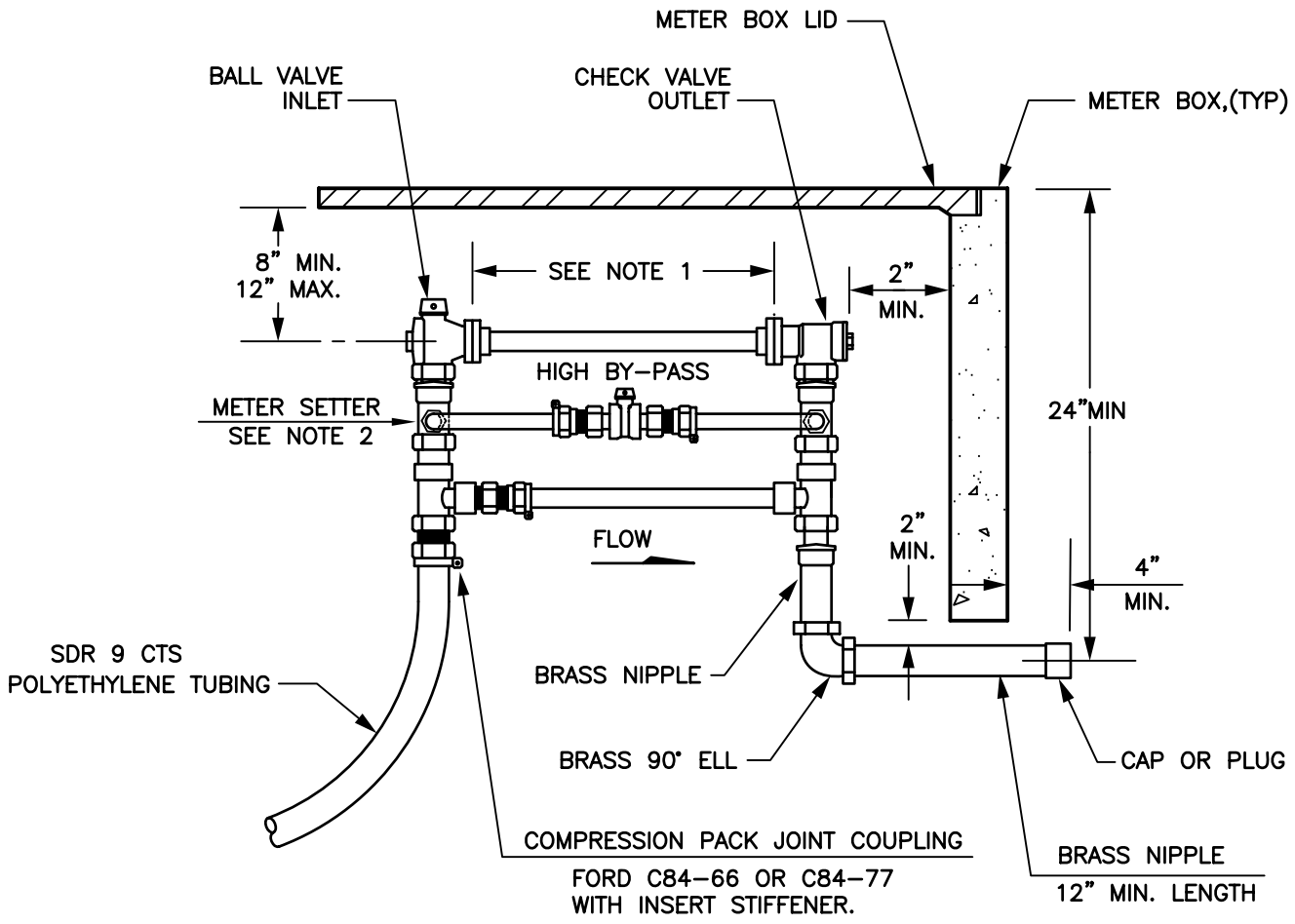
1. ALL METAL PARTS SHALL BE BRASS.
2. SERVICE PIPE SHALL BE CTS, SDR 9 POLYETHYLENE TUBING (PET) IN ACCORDANCE WITH AWWA C-901 AND ASTM D2239 AND SHALL BE FREE OF JOINTS BETWEEN THE MAIN AND METER SETTER.
3. ALL PET JOINTS SHALL BE COMPRESSION WITH INSERT STIFFENERS, FORD 50 SERIES OR EQUAL.
4. PROVIDE 12 ga VINYL COATED COPPER LOCATE WIRE FROM CORP STOP TO METER.
5. SERVICE LINE SHALL BE BEDDED IN SAND, 3" MINIMUM TO 6" MAXIMUM AROUND PIPE.
6. SERVICE SADDLE, CORP STOP AND BRASS FITTINGS SHALL BE BEDDED IN 5/8" MINUS CRUSHED ROCK, 6" MINIMUM ALL AROUND.

REVISIONS	DATE:
checkprint	10/16/1997
UPDATES	07/09/2004
UPDATES	08/01/2005
UPDATES	02/01/2006
DRAWN BY: CCS CHECKED BY: LCW	

City of Enumclaw

1-1/2" AND 2" SERVICE CONNECTION

DWG. NO.
WA
02



ELEVATION

NOTE 1:

1-1/2" METER = 13"
2" METER = 17"
** INSTALL IDLER IF METER WILL BE SET AT A LATER DATE.

NOTE 2:

1-1/2" DIA-USE FORD #VBH 86-15HB-11-66 (PACK END IPS), OR EQUAL.
2" DIA-USE FORD #VBH 87-15HB-11-77 (PACK END IPS), OR EQUAL.

GENERAL NOTES

1. METERS TO BE SUPPLIED AND SET BY THE CITY AT LANDOWNER'S EXPENSE.
2. ABOVE REFERENCED PART NUMBERS REFER TO ITEMS MANUFACTURED BY FORD METER BOX CO, INC. THESE OR EQUIVALENT FITTINGS SHOULD BE USED.
3. METER SETTER TO BE APPROVED BY THE CITY PRIOR TO BACKFILL.
4. PLASTIC METER BOX WITH HINGED CAST-IRON READER LID TO BE APPROVED BY THE CITY. METER BOX SHALL BE CENTERED OVER SETTER. METER BOX SHALL BE OUTSIDE OF VEHICLE TRAFFIC AREAS UNLESS SPECIAL APPROVAL IS GRANTED BY THE CITY.

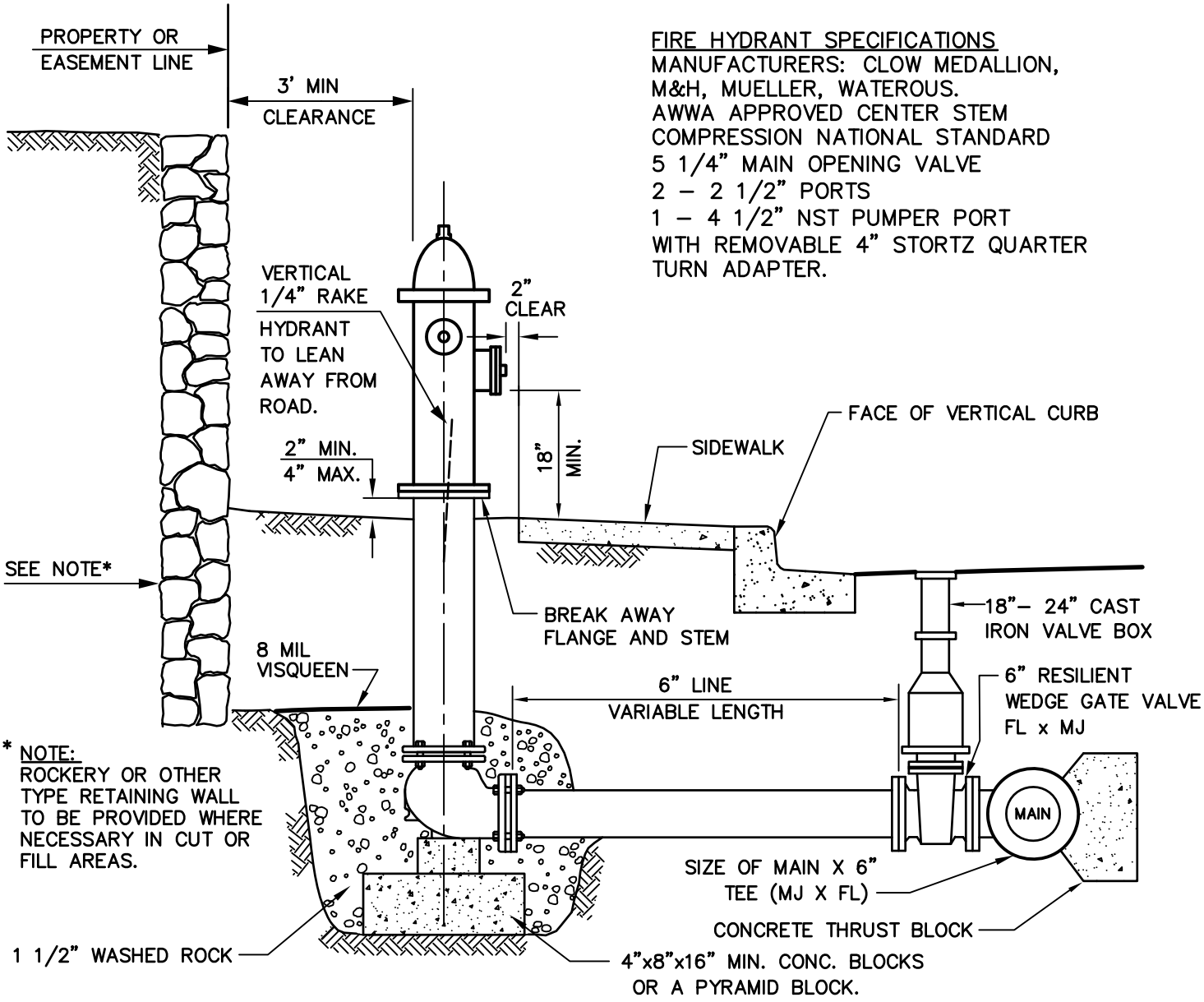
REVISIONS	DATE:
checkplot	10/17/1997
UPDATES	07/09/2004

DRAWN BY: CCS CHECKED BY: LCW

City of Enumclaw

1-1/2" AND 2"
METER SETTERS

DWG. NO.
WA
03



FIRE HYDRANT SPECIFICATIONS
MANUFACTURERS: CLOW MEDALLION, M&H, MUELLER, WATEROUS.
AWWA APPROVED CENTER STEM COMPRESSION NATIONAL STANDARD
5 1/4" MAIN OPENING VALVE
2 – 2 1/2" PORTS
1 – 4 1/2" NST PUMPER PORT WITH REMOVABLE 4" STORTZ QUARTER TURN ADAPTER.

* NOTE:
ROCKERY OR OTHER TYPE RETAINING WALL TO BE PROVIDED WHERE NECESSARY IN CUT OR FILL AREAS.

HYDRANT RUN:
1. MAXIMUM LENGTH OF 50 FEET UNLESS APPROVED BY ENGINEER.
   A. USE 6" D.I. PIPE WITH MJ MEGALUG RETAINER GLANDS.
   B. DRAIN ROCK TO BE 8" ABOVE DRAIN HOLE.

HYDRANT:
1. SHALL BE CLEANED & PRIME COATED WITH HEAVY DUTY BRUSH TYPE OR APPROVED EQUAL. ALL HYDRANTS SHALL BE PAINTED WITH TWO COATS KRYLON RUST TOUGH #00431, SAFETY YELLOW OR APPROVED EQUAL.
2. STENCIL ON FACE OF HYDRANT BARREL WITH 2" BLACK LETTERS, THE DISTANCE FROM HYDRANT TO GV.IN FEET.
3. SURFACE TO BE GRADED UNIFORMLY AROUND HYD.(3' RAD.)
4. PROVIDE A TYPE 2 BLUE RAISED PAVEMENT MARKER IN CENTER OF ROADWAY ADJACENT TO EACH HYDRANT LOCATION.

REVISIONS	DATE:
CHECKPRINT	10/17/1997
UPDATED	06/11/2007
UPDATES	08/12/2013

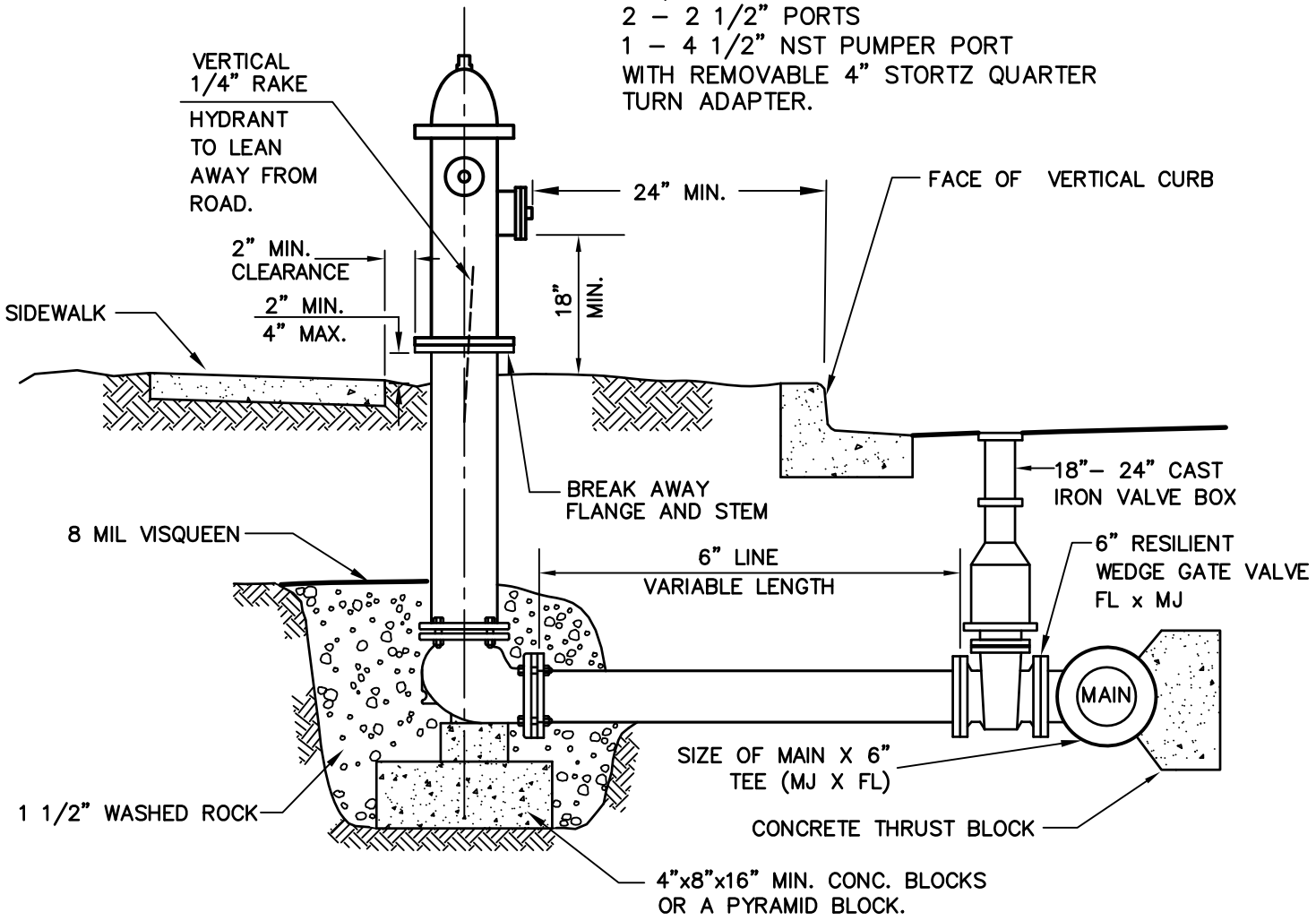
DRAWN BY: KKW CHECKED BY: LCW

City of Enumclaw

FIRE HYDRANT WITH ATTACHED CURB

DWG. NO.
WA
04

FIRE HYDRANT SPECIFICATIONS
MANUFACTURERS: CLOW MEDALLION, M&H, MUELLER, WATEROUS.
AWWA APPROVED CENTER STEM COMPRESSION NATIONAL STANDARD
5 1/4" MAIN OPENING VALVE
2 – 2 1/2" PORTS
1 – 4 1/2" NST PUMPER PORT WITH REMOVABLE 4" STORTZ QUARTER TURN ADAPTER.



HYDRANT RUN:
1. MAXIMUM LENGTH OF 50 FEET UNLESS APPROVED BY ENGINEER.
   A. USE 6" D.I. PIPE WITH MJ MEGALUG RETAINER GLANDS.
   B. DRAIN ROCK TO BE 8" ABOVE DRAIN HOLE.

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2. STENCIL ON FACE OF HYDRANT BARREL WITH 2" BLACK LETTERS, THE DISTANCE FROM HYDRANT TO GV.IN FEET.
3. SURFACE TO BE GRADED UNIFORMLY AROUND HYD.(3' RAD.)
4. PROVIDE A TYPE 2 BLUE RAISED PAVEMENT MARKER IN CENTER OF ROADWAY ADJACENT TO EACH HYDRANT LOCATION.

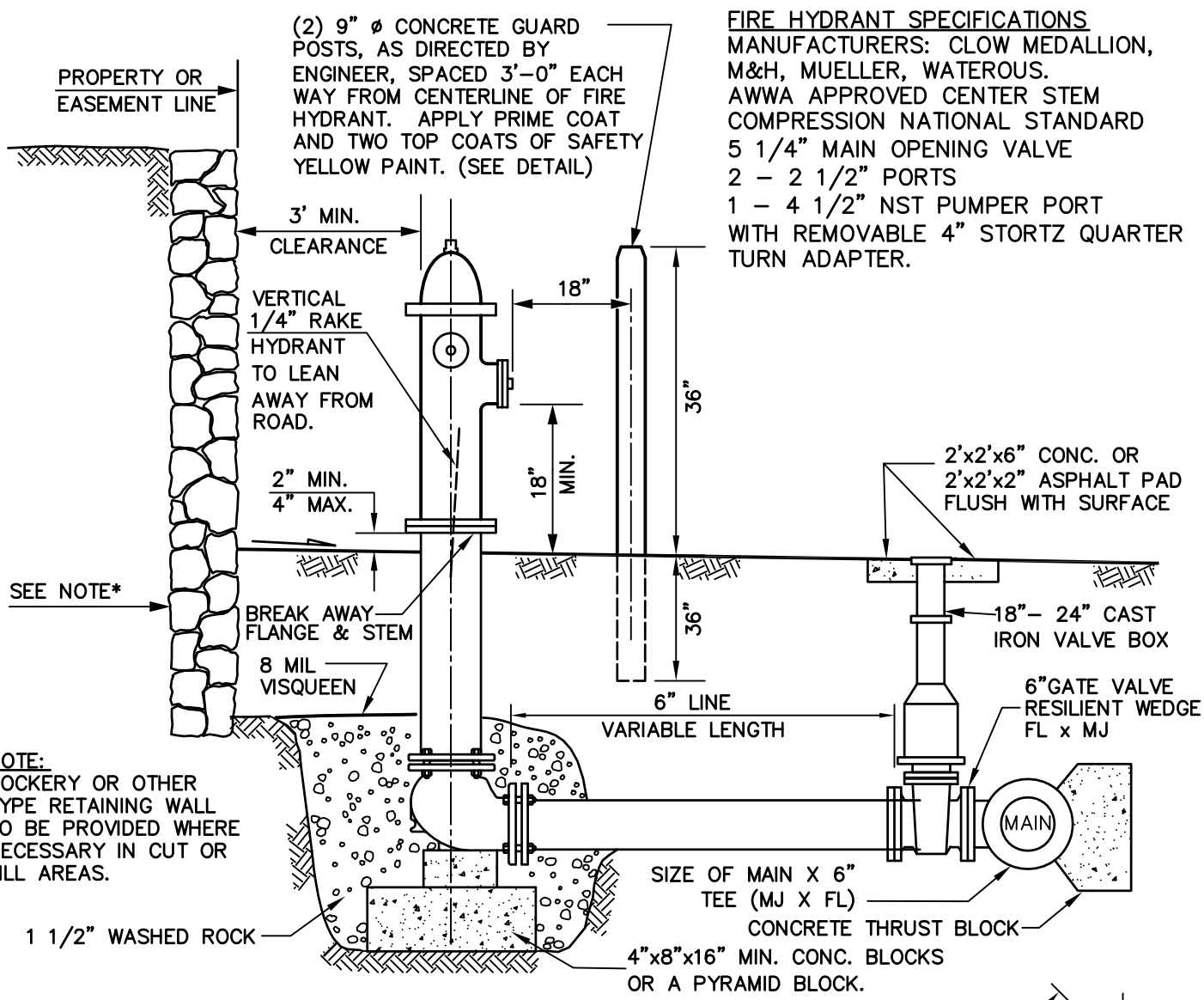
REVISIONS	DATE:
CHECKPRINT	06/14/1998
UPDATED	06/11/2007
UPDATES	08/12/2013

DRAWN BY: KKW CHECKED BY: LCW

City of Enumclaw

FIRE HYDRANT WITH DETACHED CURB

DWG. NO. WA 05



FIRE HYDRANT SPECIFICATIONS
MANUFACTURERS: CLOW MEDALLION, M&H, MUELLER, WATEROUS.
AWWA APPROVED CENTER STEM COMPRESSION NATIONAL STANDARD
5 1/4" MAIN OPENING VALVE
2 – 2 1/2" PORTS
1 – 4 1/2" NST PUMPER PORT WITH REMOVABLE 4" STORTZ QUARTER TURN ADAPTER.

* NOTE:
ROCKERY OR OTHER TYPE RETAINING WALL TO BE PROVIDED WHERE NECESSARY IN CUT OR FILL AREAS.

HYDRANT RUN:
1. MAXIMUM LENGTH OF 50 FEET UNLESS APPROVED BY ENGINEER.
   A. USE 6" D.I. PIPE WITH MJ MEGALUG RETAINER GLANDS.
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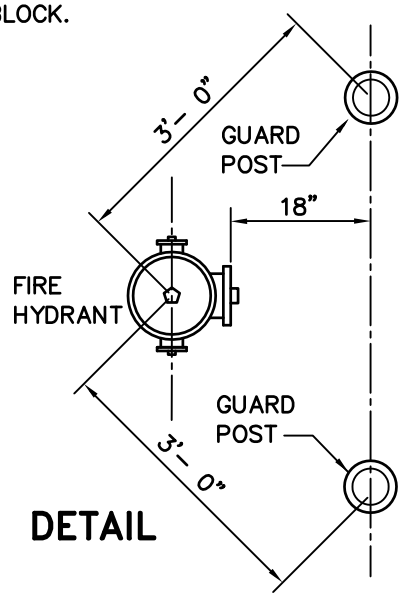
1. SHALL BE CLEANED & PRIME COATED WITH HEAVY DUTY BRUSH TYPE OR APPROVED EQUAL. ALL HYDRANTS SHALL BE PAINTED WITH TWO COATS KRYLON RUST TOUGH #00431, SAFETY YELLOW OR APPROVED EQUAL.
2. STENCIL ON FACE OF HYDRANT BARREL WITH 2" BLACK LETTERS, THE DISTANCE FROM HYDRANT TO GV.IN FEET.
3. SURFACE TO BE GRADED UNIFORMLY AROUND HYD.(3' RAD.)
4. PROVIDE A TYPE 2 BLUE RAISED PAVEMENT MARKER IN CENTER OF ROADWAY ADJACENT TO EACH HYDRANT LOCATION.
5. GUARD POSTS SHALL BE INSTALLED WHERE SHOWN ON THE PLANS. GUARD POSTS SHALL BE REINFORCED CONCRETE HAVING A COMPRESSION STRENGTH OF 3,500 PSI AND SHALL BE 6 FEET IN LENGTH AND 9 INCHES IN DIAMETER. REINFORCING SHALL CONSIST OF A MINIMUM OF FIVE (5) #3 DEFORMED STEEL BARS.



DETAIL

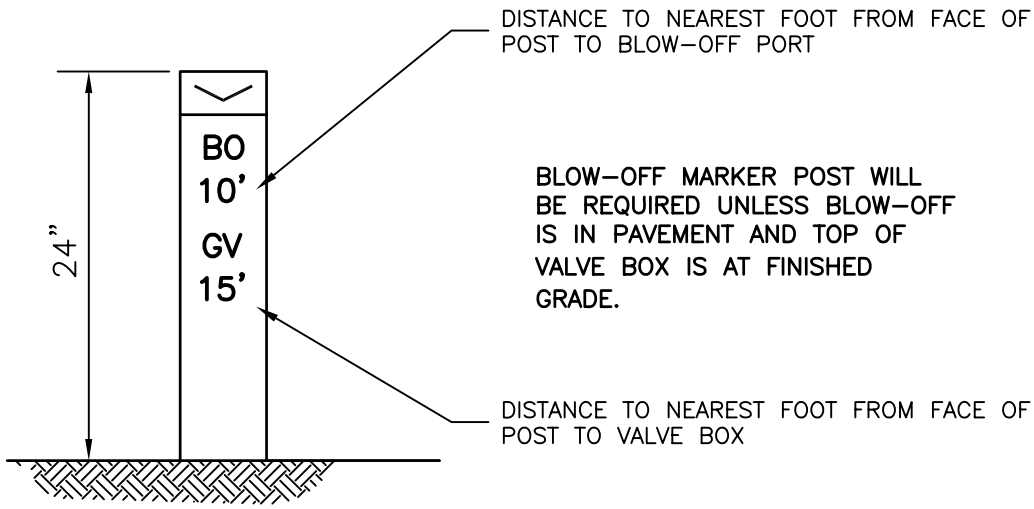
REVISIONS	DATE:
CHECKPRINT	08/14/1998
UPDATES	06/11/2007
UPDATES	08/12/2013

DRAWN BY: MRB CHECKED BY: LCW

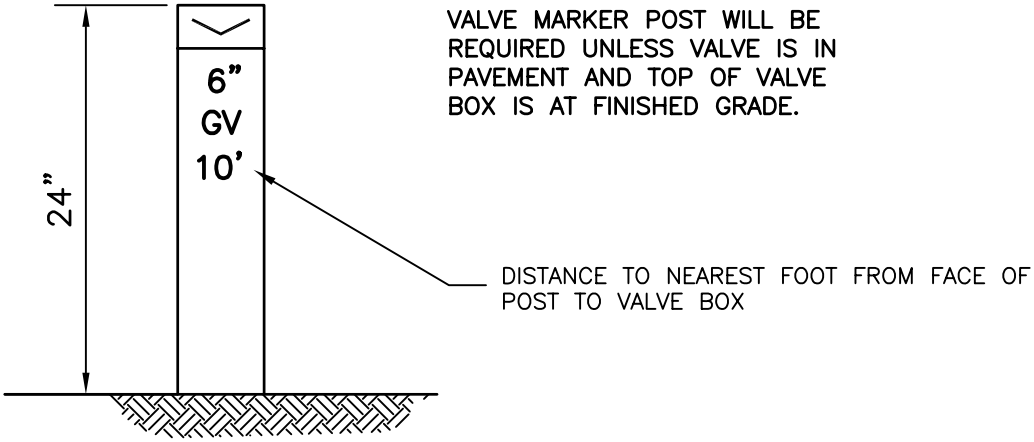
City of Enumclaw

FIRE HYDRANT WITHOUT CURB

DWG. NO.
WA
06



2" BLOW-OFF ASSEMBLY MARKER POST



VALVE MARKER POST

NOTES:

1. MARKER POSTS SHALL BE PAINTED WITH TWO (2) COATS OF SAFETY YELLOW PAINT AND LETTERS SHALL BE 2" HIGH AND STENCILED IN BLACK PAINT.

2. MARKER POSTS SHALL BE CONSTRUCTED AS CONCRETE WITH 4" MIN. SQUARE SECTION AND 42" LENGHT REINFORCED WITH ONE 3/8" X 39" REINFORCING BAR.

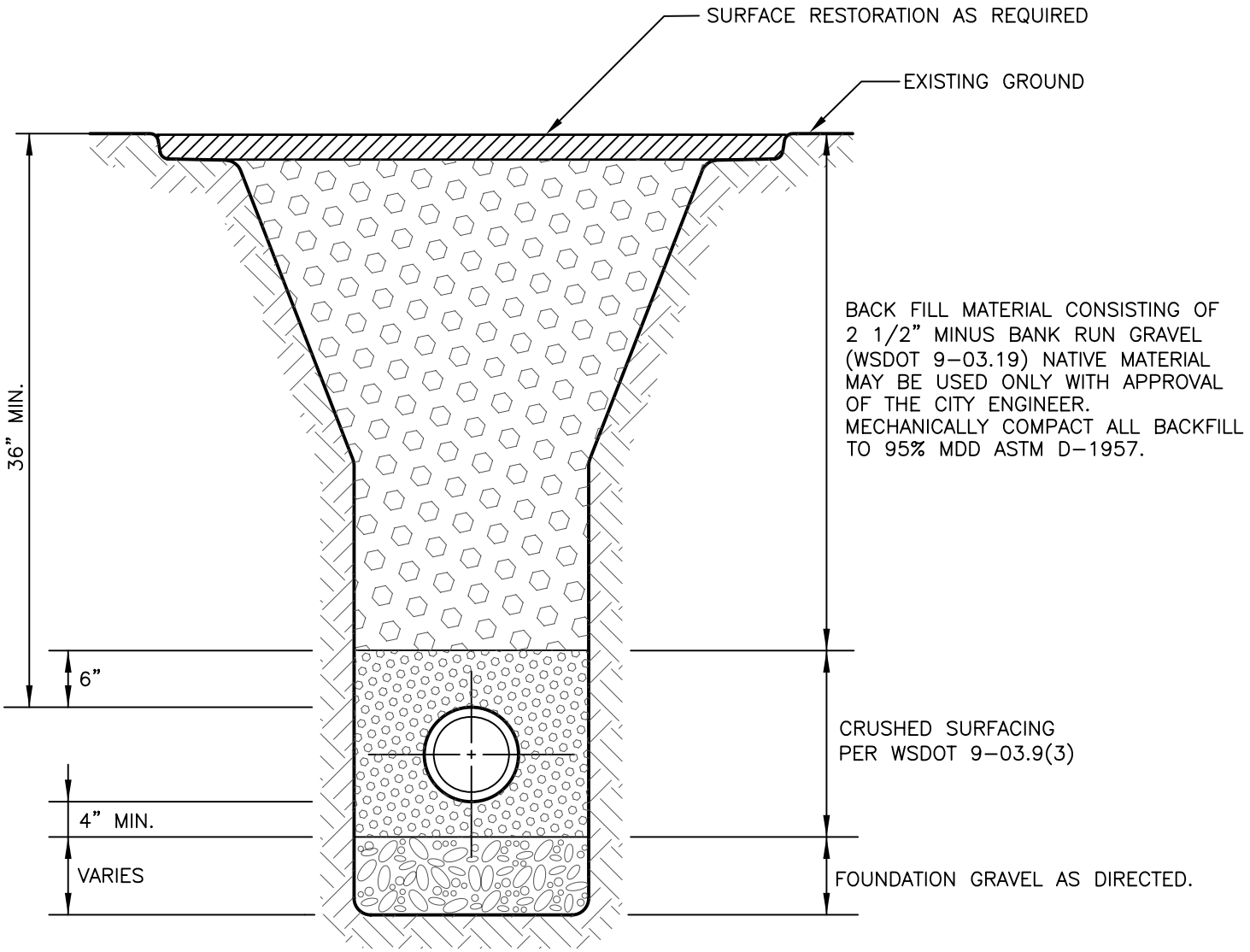
REVISIONS	DATE:
checkprint	10/17/1997
UPDATES	07/09/2004

DRAWN BY: CCS CHECKED BY: LCW

City of Enumclaw

VALVE MARKER POST

DWG. NO. WA 07



NOTES:

1. MINIMUM TRENCH WIDTH SHALL BE THE PIPE O.D. + 12" (6" EACH SIDE OF PIPE).
2. MAXIMUM TRENCH WIDTH SHALL BE THE PIPE O.D. + 18".
3. SHORING SHALL BE PROVIDED IN ACCORDANCE WITH O.S.H.A. & W.I.S.H.A. REQUIREMENTS WHEN NECESSARY.

REVISIONS	DATE:
CHECKPRINT	03/12/1998
UPDATES	07/09/2004

DRAWN BY: KKW CHECKED BY: CCS

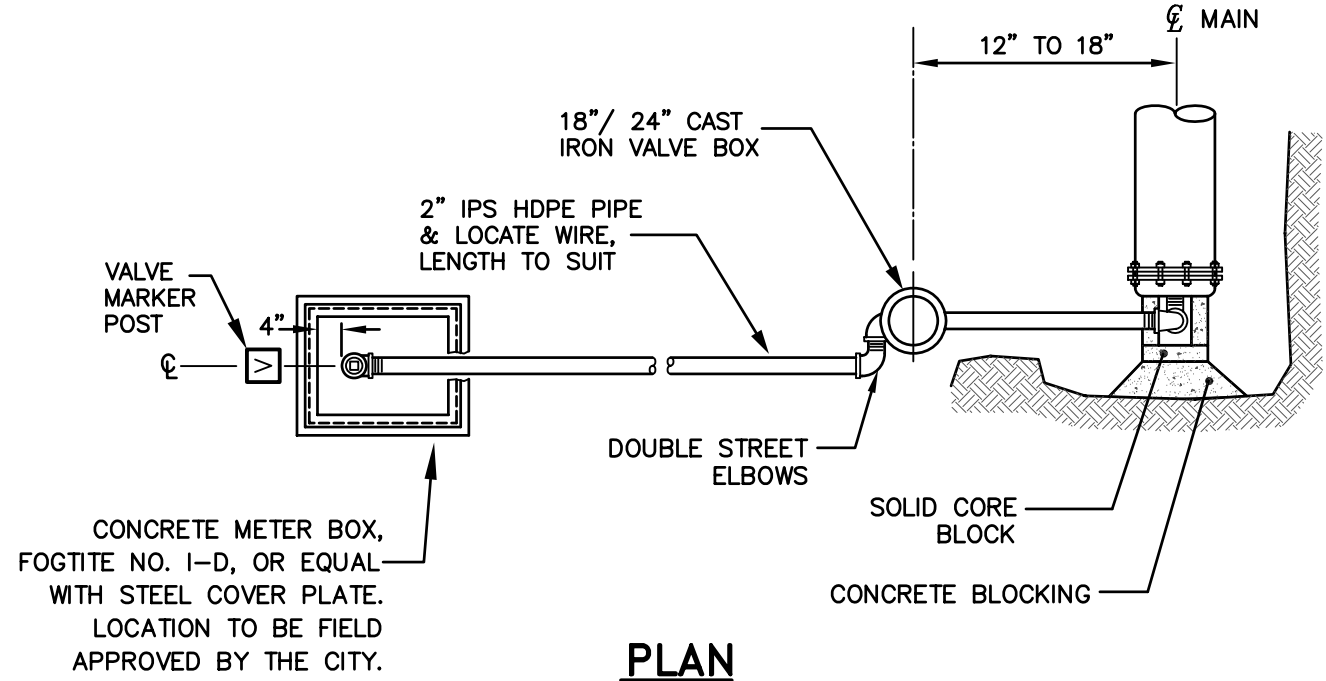
City of Enumclaw

WATER LINE TRENCH DETAIL

DWG. NO.

WA

08



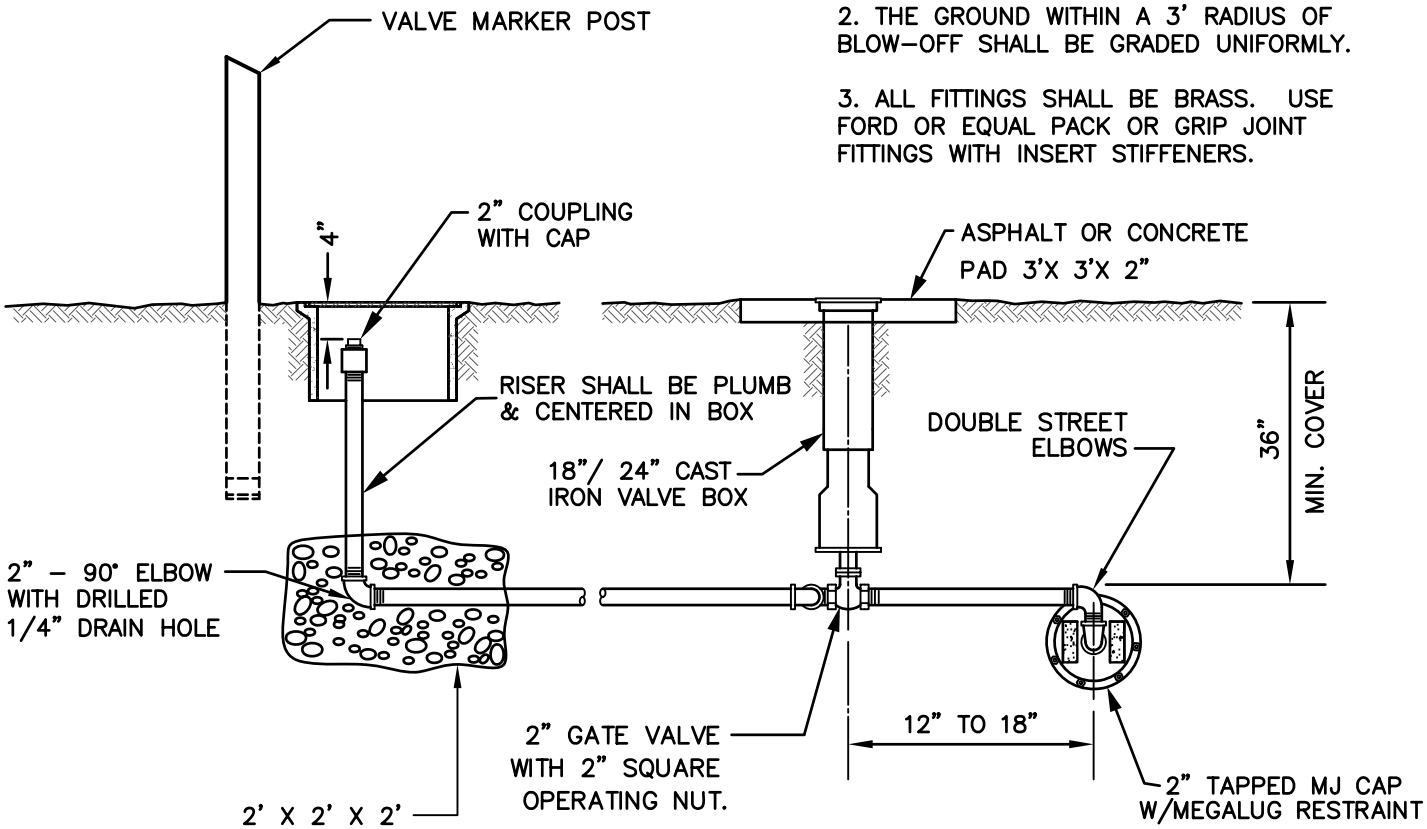
PLAN

NOTES:

1. LOCATE BLOW-OFF AS CLOSE AS POSSIBLE TO MAIN, OR AS DIRECTED THE THE CITY.

2. THE GROUND WITHIN A 3' RADIUS OF BLOW-OFF SHALL BE GRADED UNIFORMLY.

3. ALL FITTINGS SHALL BE BRASS. USE FORD OR EQUAL PACK OR GRIP JOINT FITTINGS WITH INSERT STIFFENERS.



ELEVATION

REVISIONS	DATE:
CHECK PRINT	03/09/1998
UPDATED	06/29/2004
UPDATED	02/01/2006
UPDATED	11/28/2006

DRAWN BY: KW CHECKED BY: SW

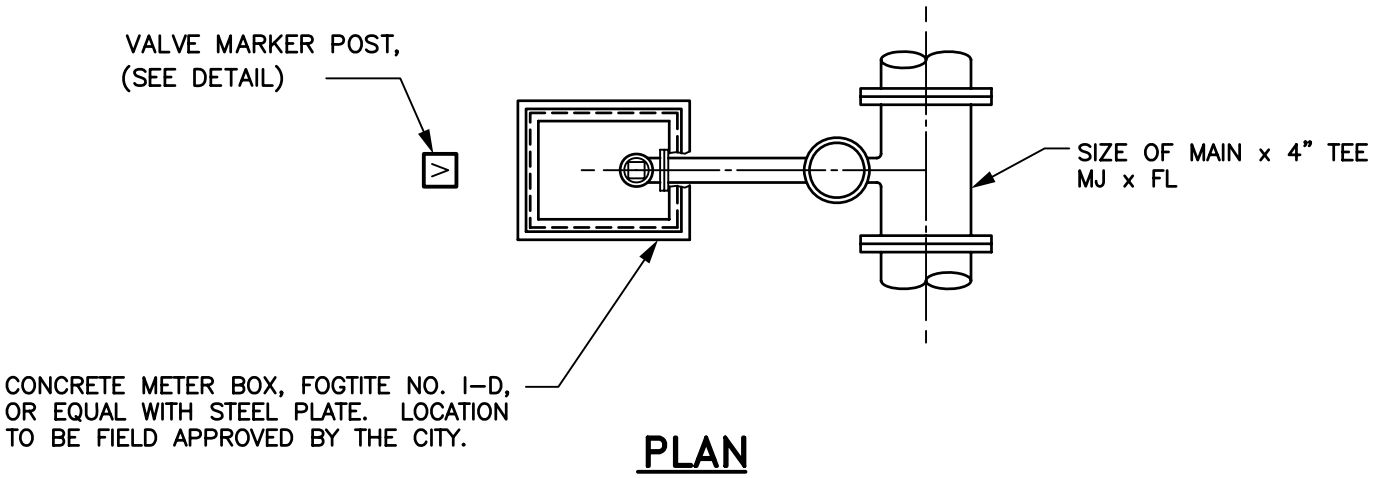
City of Enumclaw

2" BLOW-OFF ASSY. OUTSIDE PAVEMENT

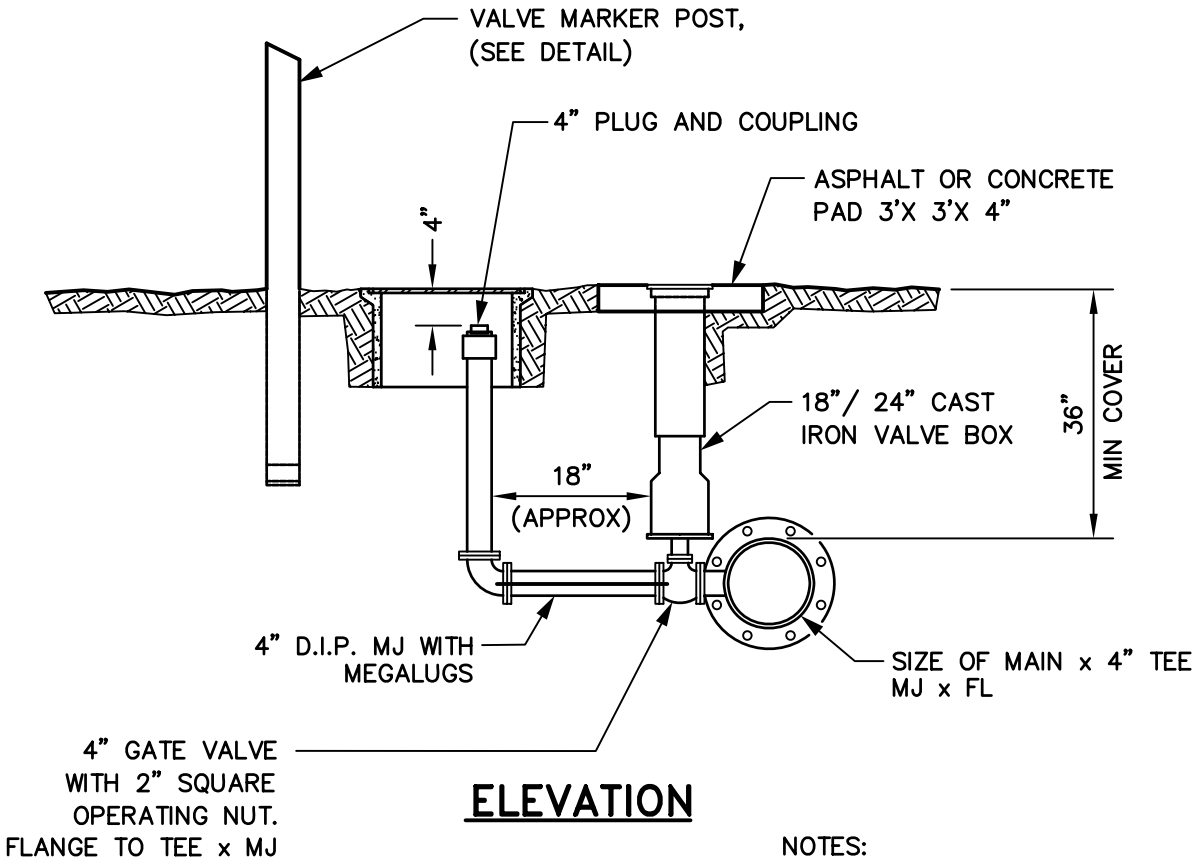
DWG. NO.

WA

09



PLAN



ELEVATION

NOTES:

1. LOCATE BLOW-OFF AS CLOSE AS POSSIBLE TO MAIN, OR AS DIRECTED BY CITY.
2. THE GROUND WITHIN 3' RADIUS OF BLOW-OFF SHALL BE GRADED UNIFORMLY.
3. 4" DIP SHALL BE PRESSURE CLASS 350 OR GREATER WALL THICKNESS.

REVISIONS	DATE:
CHECKPRINT	10/17/1997
UPDATES	07/09/2004
UPDATES	02/01/2006

DRAWN BY: CCS CHECKED BY: LCW

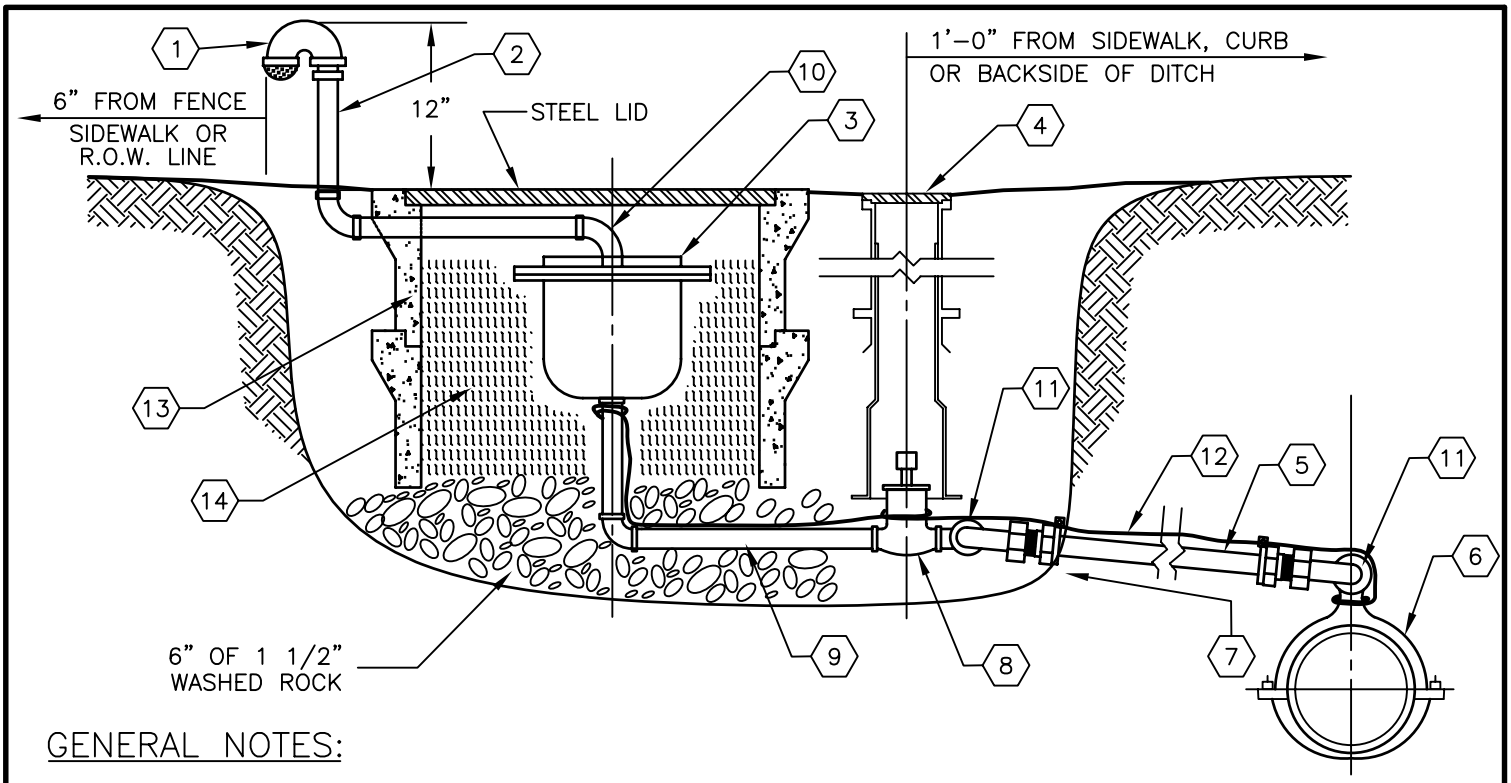
City of Enumclaw

4" BLOW-OFF ASSY. OUTSIDE PAVEMENT

DWG. NO.

WA

10



GENERAL NOTES:

ALL PIPE AND FITTINGS FROM THE MAIN TO THE AIR & VACUUM VALVE SHALL BE POLYETHYLENE AND BRASS. AIR AND VACUUM VALVE ASSEMBLY MUST BE INSTALLED AT HIGHEST POINT IN LINE. IF HIGH POINT FALLS IN LOCATION WHERE ASSEMBLY CANNOT BE INSTALLED, PROVIDE ADDITIONAL DEPTH OF LINE TO CREATE HIGH POINT AT A LOCATION WHERE ASSEMBLY CAN BE INSTALLED. FIELD LOCATION IS TO BE APPROVED BY THE CITY INSPECTOR.

KEYED NOTES:

1. 2" BRONZE BEEHIVE STRAINER, 2" RETURN BEND, PAINTED SAFETY YELLOW.
2. 2" GALV. PIPE. EXTEND HORIZONTALLY THROUGH BACK OF BOX. USE LENGTH AS NECESSARY.
3. 2" COMBINATION AIR VALVE, APCO OR EQUAL WITH DRAIN VALVE AND STRAINER.
4. CAST IRON 2 PIECE VALVE BOX W/ LID.
5. CONTINUOUS LENGTH AS NECESSARY TO PROVIDE SAFE TRAFFIC FREE LOCATION.
6. 2" DOUBLE STRAP SADDLE (FORD F202 OR EQUAL) WITH IP BALL CORP STOP (FORD FB500 OR EQUAL.
7. MAINTAIN POSITIVE SLOPE FROM MAIN TO AIR RELEASE VALVE.
8. 2" R/S GATE VALVE, CAST IRON BODY, SCREWED, NON-RISING STEM, 2" SQUARE OPERATING NUT.
9. 2" PE TUBING WITH 90° ELL COUPLING (MIP x PJ) FORD L84-77 OR EQUAL.
10. 2" STREET 90° BENDS.
11. SWIVEL ELBOWS AS SHOWN.
12. TRACER WIRE, 12 GA. INSULATED COPPER FROM CORP TO GATE VALVE TO AIR/VAC.
13. #2 FOGTITE CONCRETE BOX W/ STEEL TRAFFIC BEARING LID.
14. INSTALL BOX PERPENDICULAR TO PAVING. INSULATE W/ FIBERGLASS INSULATION TO TOP OF AIR/VACUUM VALVE.

REVISIONS	DATE:
CHECKPRINT	11/03/1997
UPDATES	07/09/2004
UPDATES	02/01/2006

DRAWN BY: MRB CHECKED BY: LCW

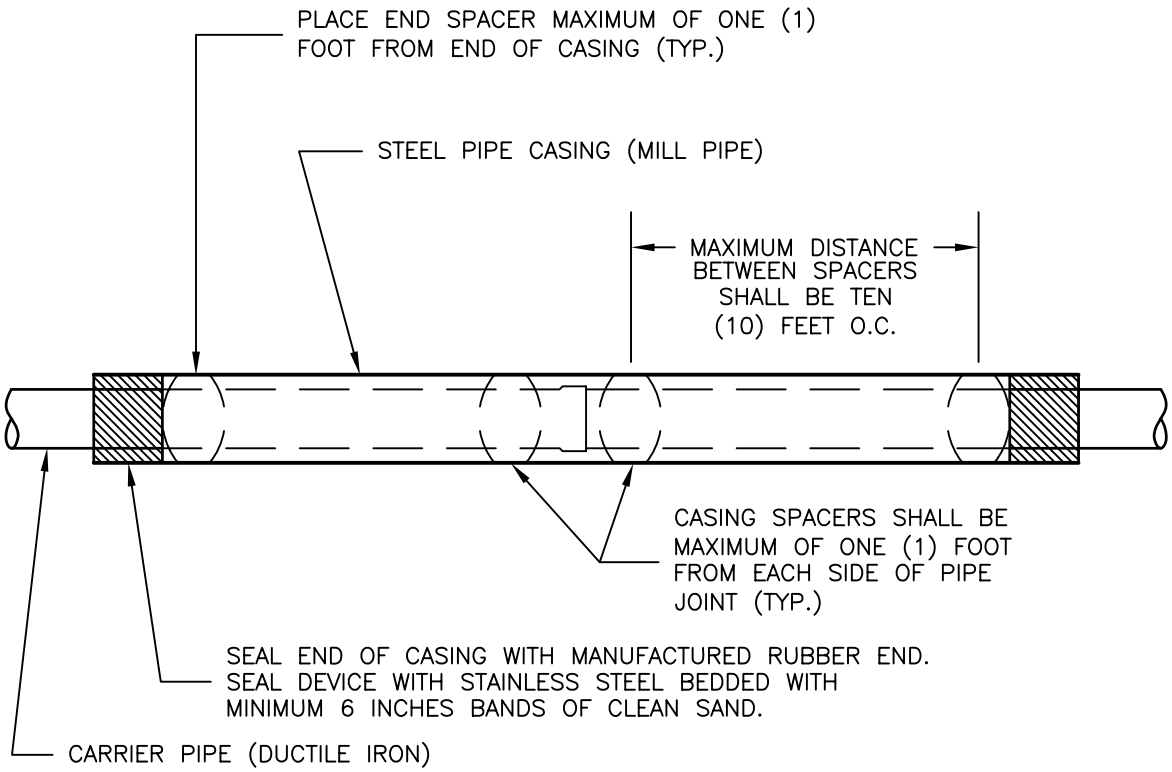
City of Enumclaw

2" AIR/VACUUM RELIEF VALVE ASSEMBLY

DWG. NO.

WA

11



CASING SPACERS (SEE APPROVED MATERIALS LIST)

CARRIER PIPE DIAMETER	4"	6"	8"	10"	12"
CASING DIAMETER (PUSH–ON JOINT CARRIER PIPE)	10"	12"	14"	16"	20"
CASING DIAMETER (MECHANICAL JOINT CARRIER PIPE)	14"	16"	18"	20"	22"
STEEL CASING THICKNESS	0.25"	0.25"	0.25"	0.25"	0.25"
SPACER BAND WIDTH	8"	8"	12"	12"	12"

ANTICORROSIVE COATING THICKNESS:
CARRIER – 8 MILLS DFT
CASING – 8 MILLS DFT

NOTES:

1. CASING SPACERS SHALL BE "CENTER POSITIONING" TYPE.
2. MINIMUM RUNNER WIDTH SHALL BE 2 INCHES
3. RUNNER HEIGHT SHALL BE SIZED TO PROVIDE:
   A. MINIMUM 0.75" BETWEEN CARRIER PIPE BELL AND CASING PIPE WALL AT ALL TIMES.
   B. MINIMUM 1" CLEARANCE BETWEEN RUNNERS AND TOP OF CASING WALL TO PREVENT JAMMING DURING INSTALLATION.
4. STEEL CASING DIAMETERS ARE "OUTSIDE DIAMETER" FOR 16" AND LARGER.

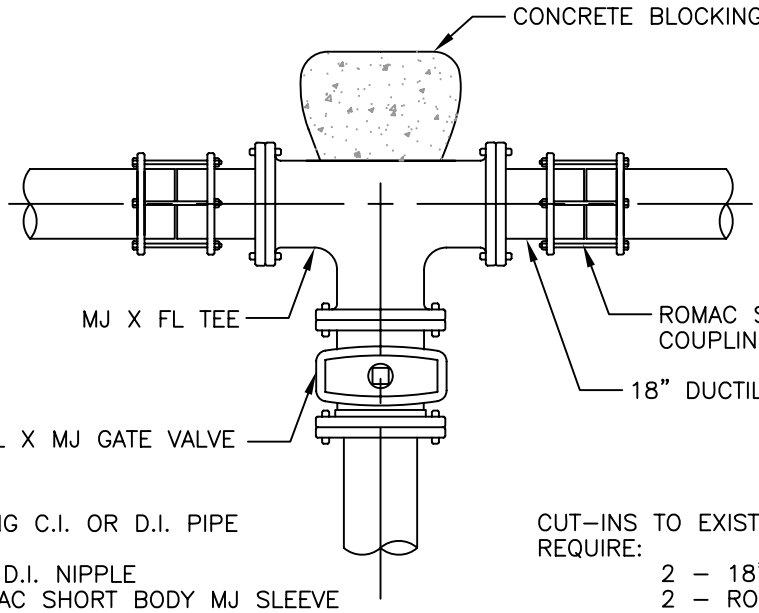
REVISIONS	DATE:
CHECKPRINT	11/03/1997
UPDATES	07/09/2004
UPDATES	02/01/2006

DRAWN BY: MRB CHECKED BY: LCW

City of Enumclaw

WATER MAIN CASING INSTALLATION

DWG. NO.
WA
12



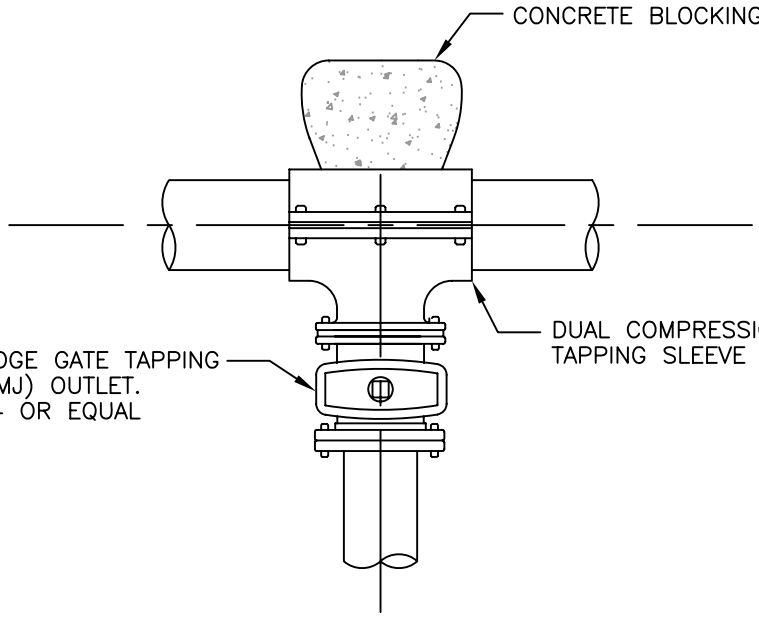
CUT–INS TO EXISTING C.I. OR D.I. PIPE REQUIRE:

- 2 – 18" D.I. NIPPLE
- 2 – ROMAC SHORT BODY MJ SLEEVE COUPLING OR FORD FC.

CUT–INS TO EXISTING A.C. OR STEEL PIPE REQUIRE:

- 2 – 18" D.I. NIPPLES
- 2 – ROMAC 501 OR FORD FC2A TRANSITION COUPLINGS

CUT–IN TO MAINS



WET TAP MAINS 6" OR LARGER

NOTES:

1. ALL CONNECTIONS TO EXISTING MAINS WILL BE MADE WITH THE CITY INSPECTOR PRESENT. BOLTS SHALL BE STAINLESS STEEL.
2. OPERATION OF VALVES SHALL ONLY BE PERFORMED BY CITY UTILITY CREWS.
3. ALL FITTINGS TO BE SWABBED WITH CL2 SOLUTION (1–5%).
4. SIZE ON SIZE WET TAPS MAY BE ALLOWED AT THE SOLE DISCRETION OF THE CITY ENGINEER.
5. STEEL PIPES SHALL BE RECOATED WHERE WRAPPING HAS BEEN DISTURBED.
6. ADDITIONAL VALVES MAY BE REQUIRED ON EACH LEG OF CUT–IN TEES.
7. WET–TAPS ON A.C. MAINS ARE NOT ALLOWED UNLESS SPECIFIC APPROVAL OF SUCH IS GIVEN BY THE CITY ENGINEER.

REVISIONS	DATE:
CHECKPRINT	02/05/1998
UPDATES	07/09/2004
UPDATES	02/01/2006

DRAWN BY: KKW CHECKED BY: CCS

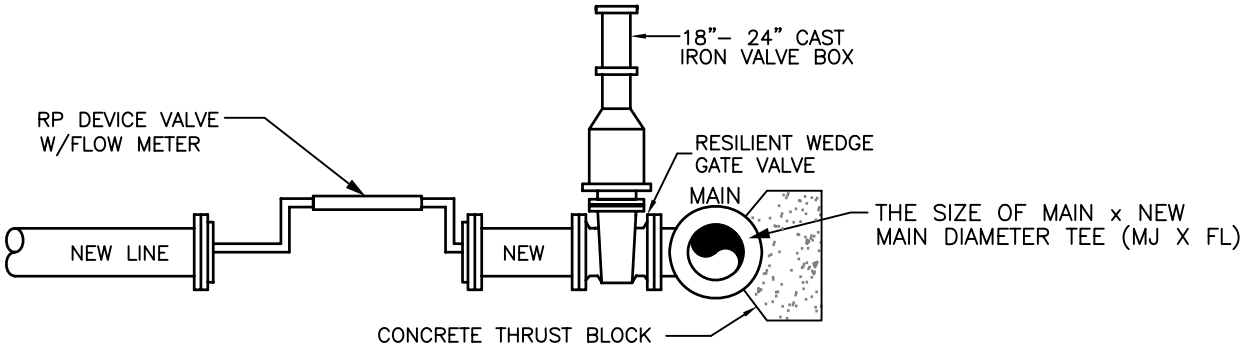
City of Enumclaw

WATER MAIN CUT-INS AND LIVE TAPS

DWG. NO.

WA

13



WATER MAIN ISOLATION
FOR NEW LINE TEST
NTS

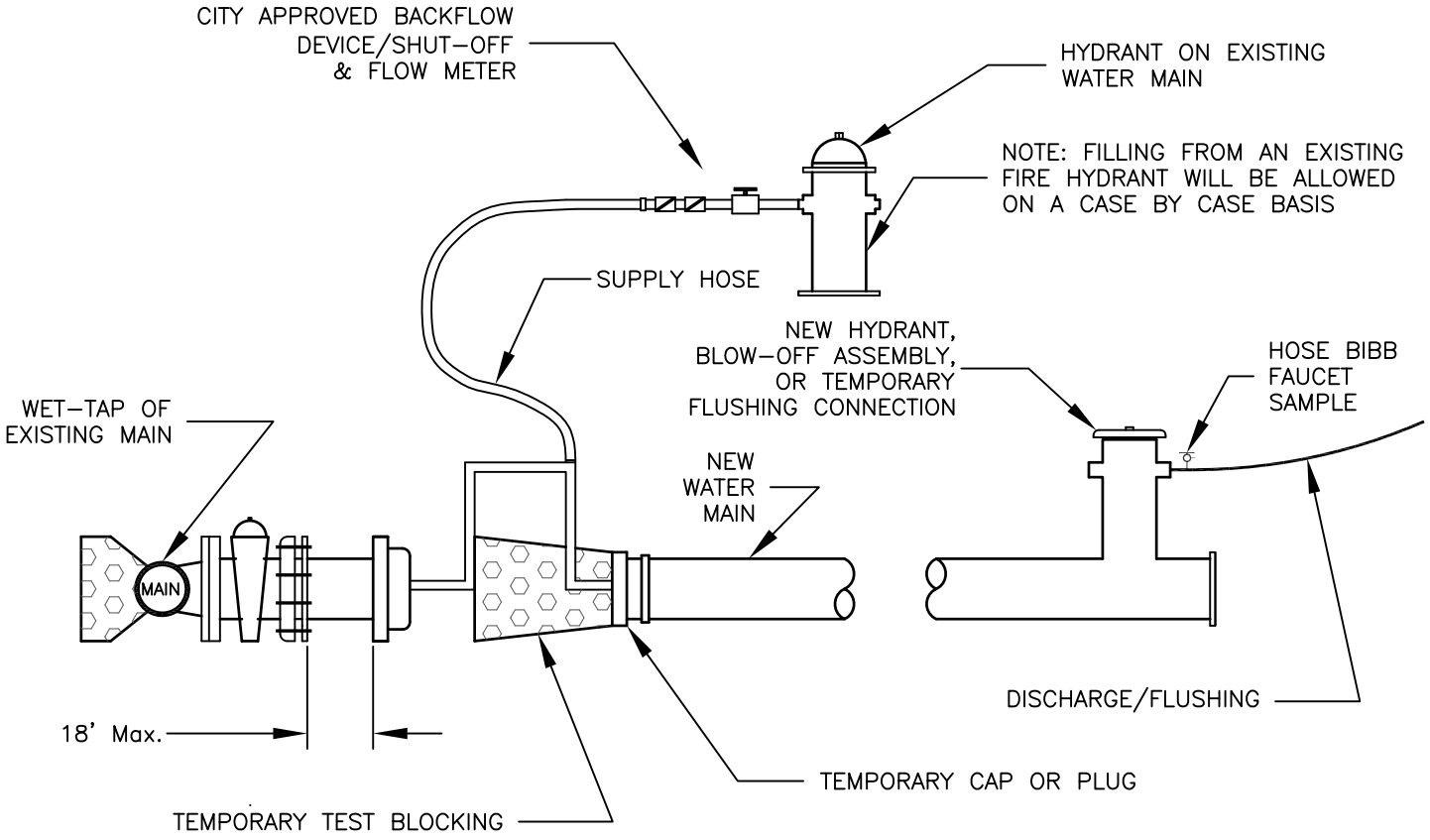
REVISIONS	DATE:
CHECKPRINT	10/16/1997
UPDATES	07/09/2004
UPDATES	02/01/2006

DRAWN BY: MRB CHECKED BY: LCW

City of Enumclaw

NEW WATER MAIN
ISOLATION TEST

DWG. NO.
WA
14



1. AN APPROVED BACKFLOW PREVENTION ASSEMBLY (BPA) SHALL BE INSTALLED BETWEEN THE EXISTING AND NEW WATER LINES DURING DISAFFECTION AND FLUSHING OF WATER MAIN. CONTACT THE WATER UTILITY MANAGER AT (360)825-5541 TO ARRANGE AN INSPECTION OF THE PROPOSED BPA.

2. THE BACKFLOW PREVENTION ASSEMBLY AND SUPPLY HOSE MUST BE DISCONNECTED DURING HYDROSTATIC PRESSURE TESTING OF THE NEW MAIN.

3. THE NEW WATER MAIN SHALL BE CONNECTED TO THE EXISTING SYSTEM ONLY AFTER THE NEW MAIN IS FLUSHED, DISINFECTED AND SATISFACTORY BACTERIOLOGICAL SAMPLE RESULTS ARE OBTAINED.

4. THE INTERIORS OF ALL PIPES AND FITTINGS TO BE USED IN FINAL CONNECTION MUST BE SWABBED OR SPRAYED WITH A 1% AVAILABLE CHLORINE SOLUTION TO BE WITNESSED BY CITY FORCES. LENGTH OF FINAL COMMECTION NOT TO EXCEED 18'

REVISIONS	DATE:
CHECKPRINT	10/07/1998
UPDATES	07/09/2004
UPDATES	02/04/2008

DRAWN BY: DD CHECKED BY: LCW

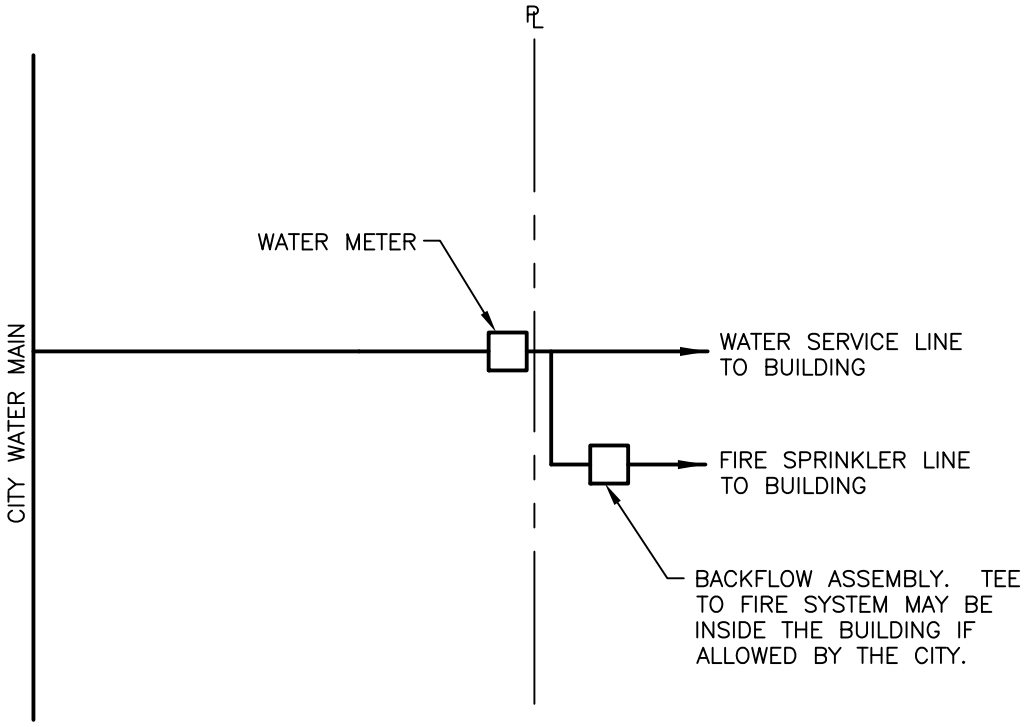
City of Enumclaw

FILLING NEW WATER MAINS

DWG. NO.

WA

15



NOTES:

1. ABOVE DESIGN APPLICABLE TO SINGLE FAMILY AND OTHER RESIDENTIAL DEVELOPMENT WHERE REQUIRED BY THE CITY.

2. CONNECTION TO CITY WATER MAIN PER CITY REQUIREMENTS.

3. PLANS AND CALCULATIONS FOR FIRE SPRINKLER SYSTEM MUST BE SUBMITTED AND APPROVED BY FIRE MARSHAL PRIOR TO INSTALLATION OF THE WATER SERVICE.

4. A BACKFLOW DEVICE WILL NOT BE REQUIRED IF A FLOW-THROUGH FIRE SYSTEM IS PROPOSED AND IS ALLOWED BY THE CITY. CITY APPROVAL WILL BE ON A CASE-BY-CASE BASIS. METER OVERSIZING UP TO A 1" METER WILL BE ALLOWED WITHOUT ADDITIONAL CONNECTION CHARGES. YEARLY FIRE SERVICE LINE FEES STILL APPLY.

REVISIONS	DATE:
APPROVED	11/14/2000
UPDATES	07/09/2004
UPDATES	09/26/2012
UPDATES	08/12/2013

DRAWN BY: KKW CHECKED BY: SW

City of Enumclaw

RESIDENTIAL FIRE SERVICE DETAIL

DWG. NO.

WA

16

APPENDIX I

WATER RIGHT CERT., PERMITS, AND SELF-ASSESSMENT FORM

Local Name: Boise Spring

Date of Priority: February 25, 1977

Certificate Number: S1-22798-C

Control Number:

Permit Number: S1-22798-P

Page Number:

Application Number: S1-22798

Type of Withdrawal: Surface Water

Quantity:

2.0 cfs

1,270 acre feet

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

CERTIFICATE OF WATER RIGHT

Boise Spring

[X] 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
February 25, 1977	S1-22798	S1-22798P	S1-22798C

NAME
CITY OF ENUMCLAW

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
1339 Griffin Avenue	Enumclaw	Washington	98022

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
Unnamed springs (City Spring or Boise Spring)

TRIBUTARY OF (IF SURFACE WATERS)
Boise Creek

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
2.0		1270.0

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal supply - continuously

82/02/18 #0509 E
RECD F
CASHSL ****4.00

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
750 feet north and 250 feet west from the center of Sec. 29

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SE¼NW¼	29	20	7 E	9	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by City of Enumclaw.

FILED for Record at Request of
Name City of Enumclaw
Address 1339 W Griffin Ave.
Enumclaw Wash. 98022

RECORDED THIS DAY
FEB 18 2 16 PM '82
BY THE DIVISION OF
RECORDS & ELECTIONS
KING COUNTY

PROVISIONS

The amount of water granted is a maximum limit that shall not be exceeded and the water user shall be entitled only to that amount of water within the specified limit that is benefically used and required.

Diversion intake shall be tightly screened at all times with wire mesh having openings with dimensions not greater than 0.125 (1/8) inch.

8202180509

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 Redmond *Washington, this* 16th *day of* February, *19* 82

ENGINEERING DATA
OK YY

Department of Ecology

by Robert K. McCormick

ROBERT K. McCORMICK, Regional Manager

FOR COUNTY USE ONLY

BOISE SPRING

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PROOF OF APPROPRIATION OF WATER

APPLICATION NUMBER S1 - 22798	PERMIT NUMBER S1 - 22798 P

NAME OF PERMITTEE
City of Enumclaw

POST OFFICE ADDRESS	(CITY)	(STATE)	(ZIP CODE)
1339 Griffin Avenue,	Enumclaw	WA	98022

ACTUAL SOURCE OF APPROPRIATION
Boise Spring

PURPOSE OR PURPOSES WATER IS USED FOR
Municipal Supply - continuously

DATE WATER WAS COMPLETELY APPLIED TO PERMITTED USE 1912	IF USED FOR IRRIGATION, NUMBER OF ACRES ACTUALLY IRRIGATED N/A
IF SOURCE IS A WELL, IS AN ACCESS PORT NOW INSTALLED ☐ YES ☐ NO N/A	MONTHS DURING WHICH WATER IS USED January through December

PUMP SIZE
N/A

ACTUAL AMOUNT WITHDRAWN OR DIVERTED FROM PERMANENT SYSTEM 2.0 C.F.S.	☐ GPM ☒ CFS
HAVE ALL PROVISIONS AS REQUIRED BY PERMIT BEEN ACCOMPLISHED ☒ YES ☐ NO	IF NO, EXPLAIN

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS USED (USE ADDITIONAL SHEET IF NECESSARY)

Beginning at a point 1673.5 feet south and 446.4 feet west of the northwest corner of the northeast quarter of Section 29, Township 20 North, Range 7 East W.M. in King County, Washington; Thence east 1000 feet; Thence south 653.4 feet; Thence west 1000 feet; Thence north 653.4 feet to the point of beginning.

STATE OF WASHINGTON,
County of KING } ss.

I, MARGARET E. HIGH, 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 4th day of JANUARY, 19 82.

Margaret E. High
Permittee Signature City Clerk

Subscribed and sworn to before me this 4th day of JANUARY, 19 82.

E. Kholl

FILE WITH WATER RIGHTS

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PERMIT

TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

[X] 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
February 25, 1977	S1-22798	S1-22798P	

NAME
CITY OF ENUMCLAW

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
1339 Griffin Avenue	Enumclaw	Washington	98022

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
Unnamed springs (City Spring or Boise Spring)

TRIBUTARY OF (IF SURFACE WATERS)
Boise Creek

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
2.0		1270.0

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal supply - continuously

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
750 feet north and 250 feet west from the center of Sec. 29

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SE¼NW¼	29	20	7 E	9	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by City of Enumclaw.

DESCRIPTION OF PROPOSED WORKS

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	Complete	November 30, 1981

PROVISIONS

The amount of water granted is a maximum limit that shall not be exceeded and the water user shall be entitled only to that amount of water within the specified limit that is benefically used and required.

In accordance with the recommendations of the departments of Fisheries and Game, the permit shall be issued subject to the following provision: Diversion intake shall be tightly screened at all times with wire mesh having openings with dimensions not greater than 0.125 (1/8) inch.

A certificate of water right will not be issued until a final investigation is made.

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 Redmond *Washington, this* 29th *day of* May *19* 81

Department of Ecology

ENGINEERING DATA

OK

by Robert K. McCormick

ROBERT K. McCORMICK, Regional Manager

Local Name: Watercress Spring

Date of Priority: February 7, 1945

Certificate Number: 5576

Control Number:

Permit Number: 4176

Page Number: 5576

Application Number:

Type of Withdrawal: Surface Water

Quantity:

.75 cfs

Watercress Springs OC

S. P. No. 369—3-51—75C. 27755.

CERTIFICATE RECORD NO. 12, PAGE NO. 5576

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 CITY OF ENUMCLAW

of Enumclaw, *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* Water Cress Spring, *a tributary of* Newaukan Creek, *with point or points of diversion within* Lot 1 of *Sec.* 19, *Twp.* 20 *N., R.* 7 E *, W. M., under and subject to provisions contained in* Appropriation *Permit No.* 4176 *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* 12, *at Page* 5576, *on the* 31st *day of* December, 19 53, *that the priority date of the right hereby confirmed is* February 7, 1965; *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*

0.75 of a cubic foot per second for the purpose of domestic supply for community.

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:

City of Enumclaw, 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 31st *day of* December, 19 53.

Chas J. Carkeek

State Supervisor of Water Resources.

ENGINEERING DATA

O.K.

Form 10 S. F. No. 310—6-44.—1M. 6920.

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
Division of Hydraulics

Permit to Appropriate Public Waters of the State of Washington

Book No. 16 of Permits, on Page 4176 Under Application No. 6308

CITY OF ENUMCLAW

of Enumclaw, 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 February 7, 1945

Source of the proposed appropriation is Water Cress Spring

tributary of Newaukum Creek

The quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 0.75 cubic feet per second, or its equivalent in case of rotation, to be used for the following purposes:

community domestic supply

as more definitely set out below.

The approximate point of diversion is located 100 feet west and 100 feet north of the southeast corner of Lot 1 of Section 19

being within Lot 1 Sec. 19 Twp. 20 N. Rge. 7 E. W. M.

county of King.

The use, or uses, to which water is to be applied:

For Domestic Supply and Miscellaneous Uses: 0.75 cubic feet per second during entire year for community domestic supply to be used within the land described below Sec. Twp. N. Rge. W. M.

For Irrigation: cubic feet per second, from to

each year, for irrigation of acres, described as follows:
within the boundaries of the City of Enumclaw.

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 . . . . . ft.; Length on top . . . . . ft.; Length on bottom . . . . . ft.

Material to be used and character of construction . . . . . .

Description of headgate . . . . . .

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 . . . . . August 1, 1947 Extension ext 1950 B 1-53

and shall thereafter be prosecuted with reasonable diligence and completed on or before . . . . . August 1, 1948 . . . . . .

and complete application of water to proposed uses shall be made on or before . . . . . October 1, 1948 . . . . . .

Given under my hand and the seal of this office at Olympia, Washington, this . . . . . 20th . . . . . day of August . . . . . 194 5.

J. T. R. Allen
Assistant State Supervisor of Hydraulics.

Local Name: Watercress Spring

Date of Priority: August 9, 1951

Certificate Number: 5579

Control Number:

Permit Number: 7960

Page Number: 5579

Application Number:

Type of Withdrawal:

Quantity:

1 cfs

Watercress Springs c.c.

S. F. No. 309—3-51—75C. 27755.

CERTIFICATE RECORD NO. 12, PAGE NO. 5579

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 CITY OF ENUMCLAW WATER DEPARTMENT *of* Enumclaw, *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* Water Cress Spring, *a tributary of* Ditch 5-A and Newaukum Creek, *with point or points of diversion within* ~~SW~~ Lot 1 of *Sec.* 19, *Twp.* 20 *N., R.* 7 E., *W. M., under and subject to provisions contained in* Appropriation *Permit No.* 7960 *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* 12, *at Page* 5579, *on the* 31st *day of* December, 1953, *that the priority date of the right hereby confirmed is* August 9, 1951; *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*

1.0 cubic feet per second for the purpose of municipal 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:

The City of Enumclaw, 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 31st *day of* December, 1953.

State Supervisor of Water Resources.

ENGINEERING DATA

O.K. [illegible]

Form 10. S. F. No. 370—3-51—75C. 27754.

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
Division of Water Resources

Permit to Appropriate Public Waters of the State of Washington

Book No. 23 of Permits, on Page 7960 Under Application No. 10594

CITY OF ENUMCLAW WATER DEPARTMENT

of Enumclaw, 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 Water Resources. It is further provided that the diversion intake shall be tightly screened with wire having a mesh opening not greater than .125 (1/8) inch.

Priority date of this permit is August 8, 1951

Source of the proposed appropriation is Water Cress Spring

tributary of Ditch 5-A and Newaukum Creek

The quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 1.0 cubic feet per second, or its equivalent in case of rotation, to be used for the following purposes: municipal supply

as more definitely set out below.

The approximate point of diversion is located 100 feet West & 100 feet North of Southeast corner of Lot 1, Sec. 19

being within Lot 1 of Sec. 19 Twp. 20 N., Rge. 7 E. W. M.,

county of King

The use, or uses, to which water is to be applied:

For Domestic Supply and Miscellaneous Uses: cubic feet per second during entire year for to be used within Sec. , Twp. N., Rge. W. M.

For Irrigation: cubic feet per second, from to each year, for irrigation of acres, described as follows:

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: 1.0 cubic feet per second during entire year to supply the City of Enumclaw

DESCRIPTION OF DIVERSION WORKS

Height of dam ..... ft.; Length on top ..... ft.; Length on bottom ..... ft.

Material to be used and character of construction .....

Description of headgate .....

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 April 1, 1953 and shall thereafter be prosecuted with reasonable diligence and completed on or before April 1, 1954 and complete application of water to proposed uses shall be made on or before April 1, 1955

Given under my hand and the seal of this office at Olympia, Washington, this 5th day of April, 1952.

Chas. J. Burkhard

State Supervisor of Water Resources

Local Name: Watercress

Date of Priority: March 28, 1968

Certificate Number:

Control Number:

Permit Number:

Page Number:

Application Number: G1-9339

Type of Withdrawal: Surface Water

Quantity:

3.35 cfs

1,220 acre feet

S. F. No. 7361—(Rev. 10-00)—10-00—5M. 15000.

CERTIFICATE RECORD NO. 14, PAGE NO. 6894-A

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 amendments thereto, and the rules and regulations of the Department of Water Resources thereunder.)

THIS IS TO CERTIFY *That* CITY OF ENUMCLAW

of Enumclaw, Washington, *has made proof to the satisfaction of the Department of Water Resources of a right to the use of the public ground waters of the State of Washington from* a well

located within Government Lot 1

Sec. 19, *Twp.* 20 *N., R.* 7 E. *W.M.,*

for the purpose(s) of municipal supply

under and specifically subject to provisions contained in Ground Water Permit No. 9044 *issued by the Department of Water Resources and that said right to the use of said ground waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the Department of Water Resources and entered of record in Volume* 14 *at page* 6894-A*; that the priority of the right hereby confirmed dates from* March 27, 1968*; that the quantity of ground water under the right hereby confirmed for the aforesaid purposes, is limited to an amount actually beneficially used for said purposes, and shall not exceed* 1500 gallons per minute, 1220 acre-feet per year, each year, for municipal supply.

A description of the lands to which such ground water right is appurtenant is as follows:

Area served by the City of Enumclaw.

The right to use of 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 ground water right is specifically subject to relinquishment for nonuse of water as provided in RCW 90.14.180.

WITNESS the seal and signature of the Assistant Director, Division of Water Management, Department of Water Resources, affixed this 22nd *day of* June, *1970*

Glen H. Lindley

Assistant Director
Division of Water Management
Department of Water Resources

S. F. No. 7354—05—7 68.

STATE OF WASHINGTON
DEPARTMENT OF WATER RESOURCES
DIVISION OF WATER MANAGEMENT

Permit to Appropriate Public Ground Waters of the State of Washington

Book No. 19 of Ground Water Permits, on page 9044 under Application No. 9339

CITY OF ENUMCLAW

of Enumclaw, Washington

is hereby granted a permit to appropriate the following described public ground waters of the State of Washington, subject to existing rights, and to the limitations and provisions set out herein.

Priority date of this permit is March 27, 1968

Source of the proposed ground water appropriation is a well

within ..... area, ... sub-area

..... zone. Name or number of works is .....

Quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 1513 gallons per minute; 1220 acre-feet per year, to be used for the following purposes: .....

as more definitely set out below.

Location of the well, tunnel, or infiltration trench is 1065 feet south and 1250 feet east of the northwest corner of Sec. 19

being within Government lot 1 of Sec. 19, T. 20 N., R. 7 E.W.M.

county of King

Use, or uses to which water is to be applied:

For municipal supply: 1513 gallons per minute; 1220 acre-feet per year, to supply an expected population of 27,500 by the year 2000

For irrigation: ..... gallons per minute; ..... acre-feet per year, for the irrigation of ..... acres.

For miscellaneous uses: ..... gallons per minute; ..... acre-feet per year, for .....

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by City of Enumclaw

DESCRIPTION OF WORKS FROM WHICH WATER IS TO BE WITHDRAWN

The well will be dug (Dug or drilled) and have a diameter of 25x60 ~~inches~~ feet and depth of 9 feet.

Description of tunnel or infiltration trench:

SPECIAL LIMITATIONS AND PROVISIONS: The installation of an access port as described in Ground Water Bulletin No. 1 shall be required prior to issuance of final Certificate of Water Right.

As provided under RCW 43.21.130, 90.03.360, 90.44.250 and 90.44.020, a master meter shall be installed in this system to measure the total amount of the withdrawal.

Total annual diversion under this permit shall not exceed 1220 acre-feet, less any amount in excess of 2033 acre-feet diverted under prior rights.

This permit shall be subject to cancellation should the permittee fail to comply with the development schedule contained herein and/or fail to give notice to the Division of Water Management on forms provided by said office documenting such compliance.

Construction work shall begin on or before Started

and shall thereafter be prosecuted with reasonable diligence and completed on or before

May 1, 1970

and complete application of water to proposed use shall be made on or before

May 1, 1971

Given under my hand and the seal of this office at Olympia, Washington, this 18th day of April, 1969

Glen H. Fuller

Assistant Director
Division of Water Management
Department of Water Resources

Local Name: P. C. Johnson 1

Date of Priority: April 23, 1980

Certificate Number: G1-23600C

Control Number:

Permit Number: G1-23600P

Page Number:

Application Number: G1-23600

Type of Withdrawal: Groundwater

Quantity: 550 gpm

880 acre feet

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.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
April 23, 1980	G1-23600	G1-23600P	G1-23600C

NAME
CITY OF ENUMCLAW

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
1339 Griffin Avenue	Enumclaw	Washington	98022

8209210547

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
Well

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	550	880

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal Supply - continuously

RECORDED THIS DAY
SEP 21 12 10 PM '82
OF THE DIV. OF ...
KING CO.

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
100 feet south and 100 feet west of center of Sec. 18

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NE¼SW¼	18	20	7 E	9	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Water will be used for municipal use within the area served by the City of Enumclaw.

82/09/21 #0547 D
RECD F 4.00
CASHSL ****4.00
22

FILED for Record at Request of
Name City of Enumclaw
Address 1339 Griffin Avenue
Enumclaw, Wa. 98022

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.

At such time that the Department of Ecology determines that regulation and management of the subject waters is necessary and in the public interest, an approved measuring device shall be installed and maintained in accordance with RCW 90.03.360 and WAC 508-64-020 through WAC 508-64-040.

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 Redmond. *Washington, this* 15th *day of* September, *19* 82

Department of Ecology

ENGINEERING DATA
OK.

by Robert K. McCormick
ROBERT K. McCORMICK, Regional Manager

FOR COUNTY USE 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
April 23, 1980	G1-23600	G1-23600 P	

NAME
CITY OF ENUMCLAW

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
1339 Griffin Avenue	Enumclaw	Washington	98022

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
Well

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	1500	2400

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal Supply - continuously

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
100 feet south and 100 feet west of center of Sec. 18

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NE¼SW¼	18	20	7 E	9	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Water will be used for municipal use within the area served by the City of Enumclaw.

DESCRIPTION OF PROPOSED WORKS

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	August 31, 1982	August 31, 1983

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.

At such time that the Department of Ecology determines that regulation and management of the subject waters is necessary and in the public interest, an approved measuring device shall be installed and maintained in accordance with RCW 90.03.360 and WAC 508-64-020 through WAC 508-64-040.

A certificate of water right will not be issued until a final investigation is made.

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 Redmond *Washington, this* 31st *day of* August, *19* 81

Department of Ecology

by Robert K. McCormick

ROBERT K. McCORMICK, Regional Manager

ENGINEERING DATA

OK

Local Name: P. C. Johnson 2

Date of Priority: October 16, 1986

Certificate Number: G1-24918C

Control Number:

Permit Number: G1-24918P

Page Number:

Application Number: G1-29918

Type of Withdrawal: Groundwater

Quantity: 1,500 gpm

1,680 acre feet

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.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
October 16, 1986	G1-24918	G1-24918P	G1-24918C

NAME
City of Enumclaw

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
1339 Griffin Avenue	Enumclaw	Washington	98022

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.

PUBLIC WATER TO BE APPROPRIATED

SOURCE
Well

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
—	1500	1680*

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal water supply - continuously.

*Totally supplemental to existing rights.

8801210592

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
Approximately 2500 feet east and 2600 feet north of southwest corner of

Section 18.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NE¼SW¼	18	20	7E	9	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by the City of Enumclaw.

88/01/21 #0592 B
RECD F 6.00
CASHSL 6.00
11

RECEIVED
JAN 21 10 37 AM '88
BY THE

FILED for Record at Request of
NAME City of Enumclaw
ADDRESS 1339 Griffin Ave.
CITY Enumclaw WA 98022

(SEE REVERSE SIDE)

CERTIFICATE

PROVISIONS

The groundwater withdrawal is subject to the following conditions:

1. P.C. Johnson Well 1 should be used as a backup supply in the event of pump failure in Well 2.

2. The applicant should monitor the well regularly for early detection of well or aquifer problems. Monitoring data should be collected at least on a monthly basis and contain data as to static water level, pumping water level, instantaneous and total pumpage records.

8801210592

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 Redmond, *Washington, this* 15 *day of* January, *19* 88

Department of Ecology

ENGINEERING DATA

OK Ron

by Nancy Ellison

Nancy Ellison, Regional Manager

FOR COUNTY USE ONLY

application

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
October 16, 1986	G1-24918		

NAME
City of Enumclaw

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
1339 Griffin Avenue	Enumclaw	Washington	98022

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Well

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
—	1500	1680*

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal water supply - continuously.

*Totally supplemental to existing rights.

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
Approximately 2500 feet east and 2600 feet north of southwest corner of Section 18.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NE¼SW¼	18	20	7E	9	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by the City of Enumclaw.

COPY

DESCRIPTION OF PROPOSED WORKS

Well 16" X 227', 150 HP pump.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	1 year from permit issuance	2 years from permit issuance

REPORT

Background:

On October 16, 1986, this application was received from the City of Enumclaw requesting 1500 gallons per minute from a well for municipal water supply.

Notice was published in the Enumclaw Courier-Herald on December 4 and 11, 1986. No protests were filed.

Investigation:

Evaluation for this application consists of review of office records, visit to the site on June 29, 1987.

The well site is one mile northeast of Enumclaw at the intersection of S.E. 424th Street and 284th S.E. being with the SW¼ of Section 18, Township 20N., Range 7E. The city has another well located at the same site. Both wells are developed in the same aquifer and are 60 feet apart. The earlier established well at this location will be referred to as Well #1 and the well for this application as Well #2.

Office records indicate the City of Enumclaw holds the following rights:

Cert. No.	Priority Date	Source	Rate	Annual Quantity (acre-feet)
4239	8/17/60	Well Cascade	97 gpm	28
6894	3/27/68	Watercress well	1500 gpm	1220
5576	2/7/45	Watercress spring	.75 cfs	540
5579	8/9/51	Watercress spring	1.0 cfs	720
S1-22798C	2/25/77	Boise springs	2.0 cfs	1270
G1-23600C	4/23/80	P.C. Johnson Well #1	550 gpm	800
				4658

Pending

G1-24918 (this App)	10/16/86	P.C. Johnson Well #2 1500 gpm	1680*

*Supplemental to existing rights

According to the city's comprehensive water plan prepared by Kramer Chin and Mayo and adopted in 1983, the 20-year population figure for the city's service area will be 19,420. The 1985 water consumption figures indicate 79,227,500 cubic feet used by 3,017 services which figures to 0.6 acre-foot per year per service. Figuring 3 persons per service, the city would require 3883.8 acre-feet of water per year to meet their projected 20-year demand.

The well for this application was constructed in February 1986 to a depth of 227.2 feet. The screens were set from 203 feet to 224 feet. The firm of Robinson and Noble conducted a 24-hour pump test on Well #2. Drawdown and recovery was monitored in both Wells 1 and 2. Static water level was at 42.65 feet in Well 2 and 43.75 feet in Well 1 prior to the pump test. Well 2 was pumped at 1500 gallons per minute with a total drawdown of 95.05 feet. Drawdown in Well 1 was 35.85 feet. The recovery data indicates that water level in Well 2 registered at 1.3 feet below pre-test conditions, 24 hours after the pump test ended. The recovery graph does not plot the water levels for Well 1 beyond 30 minutes past pump shut off at which it measured 23.6 feet of recovery.

It was the recommendation of Robinson and Noble in their report on P.C. Johnson Well 2, that Well 1 and 2 not be pumped simultaneously. The interference between the two wells would restrict the pumping capacity and duration if both wells were allowed to operate together at any time. A telephone conversation between John Noble and this writer confirmed Robinson and Noble's findings that Well 2 was capable of 1500 gpm when pumped

alone. This writer was informed that the city would follow Robinson and Noble's recommendations.

A check of office files for well logs in the area indicate the only other well within a quarter mile from the well is the city's Well 1.

The yearly volume allowed for Well 2 would be 1680 acre-feet (based on continuous pumping at 70% full use). The quantity would be totally supplemental to the city's existing rights since existing rights total 4,658 acre-feet and the city's projected 20-year needs amount to 3883.8 acre-feet per year.

Conclusion:

In accordance with Section 90.03 and 90.44 RCW, I find that there is water available for appropriation from the source in question and that the appropriation as recommended above will not impair existing rights or be detrimental to the public welfare. Therefore, permit should issue subject to existing rights and indicated provisions.

Recommendation:

A permit should issue for 1500 gpm, 1680 acre-feet per year supplemental to existing rights from P.C. Johnson Well 2 for the purpose of municipal domestic supply.

The groundwater withdrawal is subject to the following conditions:

1. P.C. Johnson Well 1 should be used as a backup supply in the event of pump failure in Well 2.

2. 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.

3. 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 hereto).

4. The applicant should monitor the well regularly for early detection of well or aquifer problems. Monitoring data should be collected at least on a monthly basis and contain data as to static water level, pumping water level, instantaneous and total pumpage records.

REPORT BY: Janet Jory DATE: 9-2-87

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
October 16, 1986	G1-24918	G1-24918P	

NAME
City of Enumclaw

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
1339 Griffin Avenue	Enumclaw	Washington	98022

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
Well

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
—	1500	1680*

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal water supply - continuously.

*Totally supplemental to existing rights.

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
Approximately 2500 feet east and 2600 feet north of southwest corner of Section 18.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NE¼SW¼	18	20	7E	9	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by the City of Enumclaw.

DESCRIPTION OF PROPOSED WORKS

Well 16" X 227', 150 HP pump.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	October 15, 1988	October 15, 1989

PROVISIONS

The groundwater withdrawal is subject to the following conditions:

1. P.C. Johnson Well 1 should be used as a backup supply in the event of pump failure in Well 2.

2. 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.

3. 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 hereto).

4. The applicant should monitor the well regularly for early detection of well or aquifer problems. Monitoring data should be collected at least on a monthly basis and contain data as to static water level, pumping water level, instantaneous and total pumpage records.

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 Redmond, *Washington, this* 15 *day of* October, *19* 87

Department of Ecology

ENGINEERING DATA
OK. CTJ

by Nancy Ellison
Nancy Ellison, Regional Manager

Local Name: Golf Course Water Right 1: Surface Water Right S-5127C

Date of Priority:	**9/9/1940**
Certificate Number:	**S-5127C**
Control Number:	
Permit Number:	**3370**
Page Number:	
Application Number:	**5251**
Type of Withdrawal:	**Surface Water**

Quantity:

90 gpm

60 acre feet

S. F. No. 369—3-51—75C. 27755.

CERTIFICATE RECORD NO. 11 PAGE NO. 5127

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 KING COUNTY DEPARTMENT OF PUBLIC WORKS *of* Kent, *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* Chappel Springs, *a tributary of* Boise Creek, *with point or points of diversion within the* NW¼ of NW¼ of *Sec.* 29, *Twp.* 20 *N., R.* 7 E., *W. M., under and subject to provisions contained in* Appropriation *Permit No.* 3370 *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* 11 *at Page* 5127 *on the* 27th *day of* February, 19 53 *that the priority date of the right hereby confirmed is* September 3, 1940; *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*

0.20 of a cubic foot per second for the purposes of domestic supply and the irrigation of 30 acres.

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:

Beginning at the Northwest corner of Sec. 29, Twp. 20 N., Rge. 7 E.W.M., and running south along the west line of said Section 208.5 feet, more or less, to the south boundary line of the right-of-way of State Road No. 5, as now located, which is the true point of beginning of this description, then south along the west line of said Section 29, 150.0 feet; then in an easterly direction on a curve to the right having a radius of 1232.5 feet a distance of 615.0 feet, more or less; thence North 37°51' West along the radius of a 4° curve a distance of 150.0 feet, more or less, to the Engineer's Station 86+22.0 point on the south boundary line of the right-of-way of State Road No. 5; then southeasterly along said boundary line 400 feet, more or less; then south 925.0 feet, more or less; thence west 660.00 feet, more or less; then south 330.0 feet, more or less; then west 330.0 feet, more or less; then north 400 feet, more or less; then west 330 feet, more or less, on a line which shall be parallel to the south line of Northeast quarter of the NE¼ of Sec. 30, Twp. 20 N., Rge. 7 E.W.M.; then north 330 feet, more or less; then east along the south line of the foresaid NE¼ of NE¼ of Sec. 20, 990 feet, more or less, to the quarter corner of the NE¼ of said Sec. 30, then north along the west line of the foresaid NE¼ of NE¼ of Sec. 30, 450.0 feet, more or less; thence South 89°35' East 290.5 feet, more or less; then North 10°19' East 467.0 feet, more or less; then South 75°51' East 343 feet, more or less; then North 10°19' West 330 feet, more or less, to the south boundary line of the right-of-way of State Road No. 5, then along said south boundary line to the true point of beginning; less portions used for county roads.

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 27th *day of* February, 19 53.

Geo. L. Crickmay

State Supervisor of Water Resources

Form 10. S. F. No. 370—7-20-40—3M. 19676.

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
Division of Hydraulics

Permit to Appropriate Public Waters of the State of Washington

Book No. 14 of Permits, on Page 3370 Under Application No. 5251

King County Department of Public Works, Parks & Playgrounds, District #2

of Kent, 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; and it is also provided that Permittee shall at all times allow not less than 1.0 c.f.s. to pass their intake.

Priority date of this permit is September 3, 1940

Source of the proposed appropriation is (Boise Creek) Chappel Springs

tributary of Boise Creek (White River)

The quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 0.2 cubic feet per second, or its equivalent in case of rotation, to be used as set out below:

The approximate point of diversion is located South 26°00' East a distance of 1325 feet from the NW corner of Section 29

being within Sec. el. of Ot of Klis: NW¼ of NE¼ Sec. 29 Twp. 20 N., Rge. 7 E. W. M.,

county of King

The use, or uses, to which water is to be applied:

For Domestic Supply and Miscellaneous Uses: 0.01 cubic feet per second during entire year for Domestic supply for field house to be used within lands described below Sec. Twp. N. Rge. W. M.

For Irrigation: 0.19 cubic feet per second, from April 15 to October 1 each year, for irrigation of 30 acres, described as follows: (on golf course, baseball park, football field, tennis courts, and surrounding ground):

Sections 29 & 30, Twp. 20 N., Rge. 7 E.W.M.; NE¼ of the NE¼ of Sec. 30; East 330 feet of the North 264 feet of the SE¼ of the NE¼ of Sec. 30; West 990 feet of that portion of the NW¼ of the NW¼ of Sec. 29 South of the Naches Highway. The West 990 feet of the North 330 feet and the North 330 feet of the remaining 330 feet of the SW¼ of the N½ of Section 29.

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 ..... ft.; Length on top ..... ft.; Length on bottom ..... ft.

Material to be used and character of construction .....

.....

Description of headgate .....

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 June 1, 1942

and shall thereafter be prosecuted with reasonable diligence and completed on or before June 1, 1943 extended to 10-1-46 10-1-49

and complete application of water to proposed uses shall be made on or before 10-1-49 7-1-51 June 1, 1944

Given under my hand and the seal of this office at Olympia, Washington, this 27th day of August, 1941

Chas J. Bonthoux

State Supervisor of Hydraulics.

Local Name: Golf Course Water Right 2: Ground Water Right G-2514A

Date of Priority:	**11/28/1952**
Certificate Number:	**G-2514A**
Control Number:	
Permit Number:	**2593**
Page Number:	
Application Number:	**2838**
Type of Withdrawal:	**Ground Water**

Quantity:

126 gpm

80 acre feet

2514

S. F. No. 7361—3-53—3M. 34100.

CERTIFICATE RECORD No. 6 PAGE No. 2514-A

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 amendments thereto, and the rules and regulations of the State Supervisor of Water Resources thereunder.

THIS IS TO CERTIFY *That* PAUL W. MOORE

of Enumclaw, Washington, *has made proof to the satisfaction of the State Supervisor of Water Resources of Washington, of a right to the use of the ground waters of a* well

located within the NW¼SE¼, sec. 30, T.20 N., R.7 E.W.M.

for the purpose of irrigation and stock water

under and subject to provisions contained in Ground Water Permit No. 2593 *issued by the State Supervisor of Water Resources and that said right to the use of said ground 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* 6 *at page* 2514-A; *that the right hereby confirmed dates from* November 28, 1952; *that the quantity of ground water under the right hereby confirmed for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed* 126 gallons per minute; 80 acre-feet per year for stock water and *for irrigation of* 40 *acres.*

A description of the lands to which such ground water right is appurtenant, and the place where such water is put to beneficial use, is as follows:

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 Water Resources affixed this 9th *day of* March, 19 56.

M. G. Walker
State Supervisor of Water Resources.

The W½SW¼NE¼, sec. 30, T.20 N., R.7 E.W.M., EXCEPT the North 40 feet and the South 10 feet thereof:

That part of the N½SE¼ described as follows: Beginning at the quarter corner on the east line of said sec. 30; thence West along the East-West center line of said section to a point 602.5 feet East of the center of said section and the true point of beginning; thence S.0°59' West 23.8 feet; thence S.83°13' East 114.4 feet; thence S.45°55' East 120.3 feet; thence S.14°23' West 320.[illegible] feet; thence S.49°47'30" West 149.8 feet; thence S.8°20'30" West 186.5 feet; thence S.49°55' West 123.1 feet; thence S.9°41' West 72.2 feet; thence S.2°37' East 202.4 feet; thence S.0°43' East 36.4 feet; thence East parallel with the south line of the N½SE¼ of said section to an intersection with the east line of Sec. 30; thence South along the East line of said section to the South line of the N½SE¼ of said section; thence West along the South line of the N½SE¼ of said section to the North-South center line of said section; thence North along the North-South center line of said section to the center of said section; thence East along the East-West center line of said section to the true point of beginning.

The N½SW¼SE¼, sec. 30:

The North 313.5 feet of the S½SW¼ of said sec. 30, EXCEPT the West 973.5 feet thereof and EXCEPT the East 295.25 feet of the North 295.25 feet thereof; EXCEPT portion, if any, of said last described tract lying within the right-of-way for drainage ditch condemned in King County Superior Court Cause No.121089 by Drainage District No. 6, and EXCEPT county roads; ALSO EXCEPT EASEMENTS.

S. F. No. 7354—3-31—75C. 27701.

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
DIVISION OF WATER RESOURCES

Permit to Appropriate Public Ground Waters of the State of Washington

Book No. 6 of Ground Water Permits, on page 2593 under Application No. 2838

PAUL W. MOORE

of Enumclaw, Washington

is hereby granted a permit to appropriate the following described public ground waters of the State of Washington, subject to existing rights, and to the limitations and provisions set out herein.

Priority date of this permit is November 28, 1952

Source of the proposed ground water appropriation is a well

within ..... area, ... sub-area

..... zone. Name or number of works is .....

Quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 400 gallons per minute: 80 acre-feet per year, to be used for the following purposes: irrigation and stock water

as more definitely set out below.

Location of the well, tunnel, or infiltration trench is 300 feet South and 300 feet East of center of Sec. 30

being within the NW¼ of SE¼ of Sec. 30, Twp. 20 N., Rge. 7 E.W.M.

county of King

Use, or uses to which water is to be applied:

For municipal supply: ..... gallons per minute; ..... acre-feet per year, to supply .....

For irrigation: 400 gallons per minute; 80 acre-feet per year, for the irrigation of 40 acres.

For miscellaneous uses: ..... gallons per minute; ..... acre-feet per year, for .....

DESCRIPTION OF WORKS FROM WHICH WATER IS TO BE WITHDRAWN

The well will be drilled and have a diameter of 8 inches, and depth of 70 feet.
(Dug or drilled)

Description of tunnel or infiltration trench:

(Please read carefully provisions below)

Particular specifications required by the Supervisor of Water Resources for the purpose of preventing waste of public waters:

Construction work shall begin on or before February 1, 1954

and shall thereafter be prosecuted with reasonable diligence and completed on or before August 1, 1954

and complete application of water to proposed use shall be made on or before August 1, 1955

Given under my hand and the seal of this office at Olympia, Washington, this 6th day of February, 19 53.

N. Walker, Actg Asst
State Supervisor of Water Resources

Local Name: Golf Course Water Right 3: Ground Water Right G1-20890C

Date of Priority:	**9/6/1973**
Certificate Number:	**G1-20890C**
Control Number:	
Permit Number:	**G1-20890P**
Page Number:	
Application Number:	**G1-20890**
Type of Withdrawal:	**Ground Water**

Quantity:

550 gpm

516 acre feet

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.)

[X] *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
G1-20890C	G1-20890P	G1-20890	September 6, 1973

NAME
KING COUNTY DIVISION OF PROPERTY AND PURCHASING

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
King County Courthouse, Rm. E531, 3rd and James	Seattle,	Washington	98104

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
Wells (2)

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	550	516.0

QUANTITY, TYPE OF USE, PERIOD OF USE
Irrigation - during irrigation season

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION/WITHDRAWAL
#1 - 280 feet East and 650 feet South of center of Sec. 30

#2 - 560 feet East and 1050 feet South from center of Sec. 30

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE (E. OR W.) W.M.	W.R.I.A.	COUNTY
NW¼SE¼	30	20	7 E	9	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY WATER TO BE USED ON

Those portions of land owned by King County which are contained within the NE¼; N½SE¼; and SW¼SE¼ Sec. 30 and the W½NW¼ Sec. 29, T. 20 N. R. 7 E containing 258 acres more or less.

2514 is Paul Moore 1952

PROVISIONS

G1-20820C is supplemental to existing rights perfected under Certificates No. 2514 and No. 5127, the total combined quantity should not exceed 516.0 acre-feet per year.

5127 is KC 1940

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 28th *day of* February, *19* 77

~~JOHN A. BIGGS, Director~~
Department of Ecology

ENGINEERING DATA
OK

by
ROBERT K. McCORMICK, Regional Manager

FOR COUNTY USE 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
G1-20890P	G1-20890	September 6, 1973

NAME
KING COUNTY DIVISION OF PROPERTY AND PURCHASING

ADDRESS (STREET) (CITY) (STATE) (ZIP CODE)
King County Courthouse, Rm. E531, 3rd and James Seattle, Washington 98104

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
Wells (2)

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	550	516.0

QUANTITY, TYPE OF USE, PERIOD OF USE
Irrigation - during irrigation season

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION/WITHDRAWAL
#1 - 280 feet East and 650 feet South of center of Sec. 30

#2 - 560 feet East and 1050 feet South from center of Sec. 30

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NW¼SE¼	30	20	7 E	9	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OFFICIAL NAME OF PLAT OR ADDITION

LEGAL DESCRIPTION OF PROPERTY WATER TO BE USED ON

Those portions of land owned by King County which are contained within the NE¼; N½SE¼; and SW¼SE¼ Sec. 30 and the W½NW¼ Sec. 29; T. 20 N. R. 7 E containing 258 acres more or less.

DESCRIPTION OF PROPOSED WORKS

DEVELOPMENT SCHEDULE

BEGINNING DATE	COMPLETION DATE	DATE COMPLETE APPLICATION OF WATER TO BE MADE
Started	April 15, 1976	April 15, 1977

PROVISIONS

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 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.

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 15th *day of* April *19* 75

JOHN A. BIGGS, *Director*
Department of Ecology

ENGINEERING DATA
OK. [illegible]

by [signature]
R. JERRY DOLL
Assistant Director

Local Name: Cemetery Well

Date of Priority:	**8/17/1960**
Certificate Number:	**G-4239A**
Control Number:	
Permit Number:	**5363**
Page Number:	
Application Number:	**5705**

Type of Withdrawal: **Ground Water**

Quantity:

97 gpm

28 acre feet

S. F. No. 7361—5-60—3M. 62396.

CERTIFICATE RECORD No. 9 PAGE No. 4239-A

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 amendments thereto, and the rules and regulations of the State Supervisor of Water Resources thereunder.

THIS IS TO CERTIFY *That* CITY OF ENUMCLAW, WASHINGTON

~~or~~ _____, *has made proof to the satisfaction of the State Supervisor of Water Resources of Washington, of a right to the use of the ground waters of a* well *located within* NW¼NE¼ *Sec.* 15, *Twp.* 20 *N., R.* 6 E. *W. M.* *for the purpose of* irrigation of municipal cemetery *under and subject to provisions contained in Ground Water Permit No.* 5363 *issued by the State Supervisor of Water Resources and that said right to the use of said ground 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* 9 *at page* 4239-A; *that the right hereby confirmed dates from* August 17, 1960; *that the quantity of ground water under the right hereby confirmed for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed* 97 gallons per minute; 28 acre-feet per year for the irrigation of 14 acres.

Special provisions required by the Supervisor of Water Resources:

A description of the lands to which such ground water right is appurtenant:

West 924 feet of the north 660 feet of NE¼, sec.15, T.20 N.,R.6 E.W.M.

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 Water Resources affixed this 9th *day of* August, 19 62.

Robert H. Russell
State Supervisor of Water Resources.

SIGNATURE DATA

S. F. No. 7354—9-60—35M. 6.2060.

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

Permit to Appropriate Public Ground Waters of the State of Washington

Book No. 11 of Ground Water Permits, on page 5363 under Application No. 5706

CITY OF ENUMCLAW, WASHINGTON

is hereby granted a permit to appropriate the following described public ground waters of the State of Washington, subject to existing rights, and to the limitations and provisions set out herein.

Priority date of this permit is August 17, 1960

Source of the proposed ground water appropriation is a well

within _____ area, _____ sub-area

_____ zone. Name or number of works is _____

Quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 100 gallons per minute; 28 acre-feet per year, to be used for the following purposes: irrigation of municipal cemetery

as more definitely set out below.

Location of the well, tunnel, or infiltration trench is 330 ft. south of the northwest corner of NE¼, sec.15

being within NW¼NE¼, sec.15, T.20 N., R.6 E.W.M.

county of King

Use, or uses to which water is to be applied:

For municipal supply: _____ gallons per minute; _____ acre-feet per year, to supply _____

For irrigation: 100 gallons per minute; 28 acre-feet per year, for the irrigation of 14 acres.

For miscellaneous uses: _____ gallons per minute; _____ acre-feet per year, for _____

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

West 924 feet of the north 660 feet of NE¼, sec.15, T.20 N., R.6 E.W.M.

DESCRIPTION OF WORKS FROM WHICH WATER IS TO BE WITHDRAWN

The well will be ~~drilled~~ or dug and have a diameter of 18 inches, and depth of 20 feet.
(Dug or drilled)

Description of tunnel or infiltration trench:

(Please read carefully provisions below)

Particular specifications required by the Supervisor of Water Resources for the purpose of preventing waste of public waters:

Construction work shall begin on or before November 1, 1961

and shall thereafter be prosecuted with reasonable diligence and completed on or before May 1, 1962

and complete application of water to proposed use shall be made on or before May 1, 1963

Given under my hand and the seal of this office at Olympia, Washington, this 28th day of October, 1960.

M G Walker
State Supervisor of Water Resources

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 1

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – EXISTING STATUS

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		EXISTING CONSUMPTION		CURRENT WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/Certificates										
S-5127C	King County	9/09/1940	Golf Course	Supplemental	90	60	0	0	90	0
S1-10594C	Enumclaw	2/07/1945	Watercress Spring	Primary	337	543	337	543	0	0
S1-6308C	Enumclaw	8/09/1951	Watercress Spring	Primary	449	724	449	724	0	0
G-2514A	Paul W. Moore	11/28/1952	Golf Course	Supplemental	126	80	0	0	126	0
G-4239A	Enumclaw	8/17/1960	Cemetery Well	Primary	97	28	0	0	97	28
G1-9339C	Enumclaw	3/27/1968	Watercress Spring	Primary	1500	1220	1500	1220	0	0
CG1-20398C	Enumclaw	1/5/1973	Y Bar S	Primary	45	18.6	0	0	45	18.6
CG1-20529C	Enumclaw	4/4/1973	Y Bar S	Primary	45	18.6	0	0	45	18.6
G1-20890C	King County	9/06/1973	Golf Course	Primary(1)	550	516	0	0	550	516
S1-22798C	Enumclaw	2/25/1977	Boise Spring	Primary	898	1270	898	1270	0	0
G1-23600C	Enumclaw	4/23/1980	PC Johnson Wellfield	Primary	550	880	550	880	0	0
G1-24918	Enumclaw	10/16/1986	PC Johnson Wellfield	Supplemental(2)	1500	1680	950	0		0
TOTAL	**********	*********	*********	**********	5637	5218	4684	4637	953	581

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		EXISTING CONSUMPTION THROUGH INTERTIE		CURRENT INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1. N/A							

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. N/A					

(1) Annual total of the Golf Course rights cannot exceed the annual right listed for Cert. No. G1-20890C.
(2) Annual portion of water right for Cert. No. G1-24918 is supplemental to Cert. No. G1-23600C and thus excluded from totals.

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.

To return form, please see reverse side.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 2

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – 6 YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (6-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/Certificates										
S-5127C	King County	9/09/1940	Golf Course	Supplemental	90	60	0	0	90	0
S1-10594C	Enumclaw	2/07/1945	Watercress Spring	Primary	337	543	337	543	0	0
S1-6308C	Enumclaw	8/09/1951	Watercress Spring	Primary	449	724	449	724	0	0
G-2514A	Paul W. Moore	11/28/1952	Golf Course	Supplemental	126	80	126	0	0	0
G-4239A	Enumclaw	8/17/1960	Cemetery Well	Primary	97	28	0	0	97	28
G1-9339C	Enumclaw	3/27/1968	Watercress Spring	Primary	1500	1220	1500	1220	0	0
CG1-20398C	Enumclaw	1/5/1973	Y Bar S	Primary	45	18.6	0	0	45	18.6
CG1-20529C	Enumclaw	4/4/1973	Y Bar S	Primary	45	18.6	0	0	45	18.6
G1-20890C	King County	9/06/1973	Golf Course	Primary(1)	550	516	550	456	0	60
S1-22798C	Enumclaw	2/25/1977	Boise Spring	Primary	898	1270	898	1270	0	0
G1-23600C	Enumclaw	4/23/1980	PC Johnson Wellfield	Primary	550	880	550	880	0	0
G1-24918	Enumclaw	10/16/1986	PC Johnson Wellfield	Supplemental(2)	1500	1680	950	0	0	0
TOTAL	**********	*********	*********	**********	5637	5218	5360	5093	277	125

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1. N/A							

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. N/A					

(1) Annual total of the Golf Course rights cannot exceed the annual right listed for Cert. No. G1-20890C.
(2) Annual portion of water right for Cert. No. G1-24918 is supplemental to Cert. No. G1-23600C and thus excluded from totals.

To return form, please see reverse side.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 3

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – 20 YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (20-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/Certificates										
S-5127C	King County	9/09/1940	Golf Course	Supplemental	90	60	0	0	90	0
S1-10594C	Enumclaw	2/07/1945	Watercress Spring	Primary	337	543	337	543	0	0
S1-6308C	Enumclaw	8/09/1951	Watercress Spring	Primary	449	724	449	724	0	0
G-2514A	Paul W. Moore	11/28/1952	Golf Course	Supplemental	126	80	126	0	0	0
G-4239A	Enumclaw	8/17/1960	Cemetery Well	Primary	97	28	0	0	97	28
G1-9339C	Enumclaw	3/27/1968	Watercress Spring	Primary	1500	1220	1500	1220	0	0
CG1-20398C	Enumclaw	1/5/1973	Y Bar S	Primary	45	18.6	0	0	45	18.6
CG1-20529C	Enumclaw	4/4/1973	Y Bar S	Primary	45	18.6	0	0	45	18.6
G1-20890C	King County	9/06/1973	Golf Course	Primary(1)	550	516	550	456	0	60
S1-22798C	Enumclaw	2/25/1977	Boise Spring	Primary	898	1270	898	1270	0	0
G1-23600C	Enumclaw	4/23/1980	PC Johnson Wellfield	Primary	550	880	550	880	0	0
G1-24918	Enumclaw	10/16/1986	PC Johnson Wellfield	Supplemental(2)	1500	1680	950	0	0	0
TOTAL	**********	*********	*********	**********	5637	5218	5360	5093	277	125

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1. N/A							

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. N/A					

(1) Annual total of the Golf Course rights cannot exceed the annual right listed for Cert. No. G1-20890C.
(2) Annual portion of water right for Cert. No. G1-24918 is supplemental to Cert. No. G1-23600C and thus excluded from totals.

To return form, please see reverse side.

APPENDIX J

WELLHEAD PROTECTION PROGRAM

CITY OF ENUMCLAW

Wellhead Protection Program

INTRODUCTION

The Washington State Department of Health (DOH) administers the Washington State Wellhead Protection Program. The required elements for a wellhead protection program are contained in WAC 246-290-135(3) and include:

- Completed susceptibility assessment of each water source;
- Delineation of wellhead protection areas for each water source for six month, one, five, and ten year time of travel boundaries;
- An inventory of known and potential contaminant sources (this inventory list must be updated every two years);
- Documentation of the purveyor's notification to all owners/operators of known and potential sources of contamination within wellhead protection areas;
- Documentation of the purveyor's notification to regulatory agencies and local governments of the defined boundaries of the wellhead protection areas and the findings of the contaminant source inventory;
- A contingency plan to ensure that customers have an adequate supply of water in the event that contamination causes a temporary or permanent loss of the system's principal source of supply; and
- Documentation of the purveyor's coordination with local emergency spill responders (i.e. police, fire and health departments) regarding wellhead protection area boundaries, source susceptibility, inventory findings, and contingency plans.

In October 2000, DOH ruled that the Boise Creek and Watercress Spring sources are not considered to be surface water or ground water under the influence of surface water (GWI) and are therefore not subject to the requirement of a Watershed Control Plan under WAC 246-290-135(4). A copy of DOH's determination is included at the end of this document.

SUSCEPTIBILITY ASSESSMENT

In 1994, DOH 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 assessments may provide monitoring waivers which allows reduced source water quality monitoring. Copies of completed forms are included Appendix B of the City of Enumclaw's Wellhead Protection Plan Update completed in October 2009 by Robinson Noble & Saltbush. A copy of the 2009 update is included at the end of this document.

DELINEATION OF WELLHEAD PROTECTION AREAS (WHPA)

Detailed information on the delineation of WHPAs for the six-month, one-year, five-year and ten-year time of travel boundaries is included in the City of Enumclaw's Wellhead Protection Plan Update completed in October 2009 by Robinson Noble & Saltbush. A copy of the 2009 update is included at the end of this document.

INVENTORY OF POTENTIAL CONTAMINANT SOURCES

Detailed information on potential contaminant sources is included in the City of Enumclaw's Wellhead Protection Plan Update completed in October 2009 by Robinson Noble & Saltbush. A copy of the 2009 update is included at the end of this document. Review of potential contaminant source inventory data on the DOH Source Water Assessment Program web site did not reveal any new potential sources. Also, staff frequently visits or travels through the WHPAs and have not noticed or are not aware of any new potential sources of contamination.

DOCUMENTATION AND NOTIFICATION

Required notifications were completed in December 2012, copies of which are included following this document.

CONTINGENCY PLAN

An Emergency Response Plan has been developed as part of the City's Comprehensive Water System Plan. The Emergency Response Plan includes a contingency operation plan for the sources and other water system facilities.

PROTECTION STRATEGIES AND IMPLEMENTATION TASKS

Detailed protection strategies and implementation tasks are included in the City of Enumclaw's Wellhead Protection Plan Update completed in October 2009 by Robinson Noble & Saltbush. A copy of the 2009 update is included at the end of this document

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
20435 72ND Ave S, Suite 200, K17-12 • Kent, Washington 98032-2358

RECEIVED
OCT 30 2000
CITY OF ENUMCLAW

October 23, 2000

MR MARK BAUER
CITY OF ENUMCLAW
1339 GRIFFIN AVE
ENUMCLAW WA 98022

Subject: Enumclaw Water System - ID# 236001
King County
Groundwater Under the Direct Influence of Surface Water (GWI) Program
Boise and Watercress Springs – Ground Water Declaration

Dear Mr. Bauer:

The department has completed review of the Microscopic Particulate Analyses (MPA) results collected from the Boise and Watercress Springs, sources S01 and S02. The results are summarized below.

Source	MPA Sample Date	MPA Result
Boise Spring, S01	March 29, 1999	0 – Low Risk
	December 20, 1999	0 – Low Risk
Watercress Spring, S02	March 29, 1999	0 – Low Risk
	August 23, 1999	11 – Low Moderate Risk
	August 7, 2000	10 – Low Moderate Risk
	August 28, 2000	4 – Low Risk

(These samples were analyzed by the Washington State Department of Health Public Health Laboratory using the Environmental Protection Agency (EPA) Consensus Method. The final two Watercress samples were also examined for the presence of *Giardia* and *Cryptosporidium* with neither organism present.)

According to the current MPA Protocols that have been developed for the department to make GWI determinations, sources that exhibit these characteristics in the MPA results are NOT considered to be influenced by surface water. The Springs are, however, in "hydraulic connection" with surface water and therefore must be disinfected in accordance with the requirements of WAC 246-290-451 that for chlorination include a minimum CT 0f 6 mg/L-min prior to the first service connection.

RECEIVED
OCT 30 2000
CITY OF ENUMCLAW

WAC 246-290-640 requires that the City obtain the services of a licensed professional engineer to evaluate the current level of disinfection provided by the City and to recommend improvements, and an implementation schedule if necessary. This evaluation should be completed within ninety days and submitted to the department for review. The department may want to modify the existing Bilateral Compliance Agreement with the City if it appears that the construction of any improvements will take a number of months.

The department reserves the right to require the City to re-evaluate one or both of these sources in the future should either the conditions affecting the water quality of the sources change or the regulatory approach to determining the influence of surface water upon ground water be modified. Thank you to you and your staff for your efforts to document the water quality of this source. Please feel free to call me at 253-395-6768 if you have any questions.

Sincerely,

Robert E. James

Robert E. James, PE
Regional Engineer
WSDOH

cc: Public Health – Seattle & King County
GWI File
Jim Nilson, DOH

City of Enumclaw

DEPARTMENT OF PUBLIC WORKS

December 10, 2012

«TaxpayerName»
«Mailing_Address»
«CityState», «State» «ZipCode»

Re: Property Located Within City of Enumclaw Wellhead Protection Area

To Whom It May Concern:

To protect the drinking water supply for the customers of the City of Enumclaw water system, we are developing a wellhead protection program as required by state law. As part of our wellhead protection program, the recharge area of our drinking water supply wells was mapped and is shown on the reverse side of this letter. This is called our wellhead protection area. You are being sent this letter as taxpayer of record for a property within the wellhead protection area to ask for your help in ensuring that activities on your property are conducted in a manner that protects against groundwater contamination. Many of you have wells of your own that use this same groundwater for your own drinking water and so are aware of the importance of protecting this resource.

While we realize you are already careful to protect the environment we hope that learning that your property is in our wellhead protection area will result in more precautions to ensure that your activities will not affect our drinking water quality. Things you can do include:

- Use and dispose of harmful materials properly and avoid disposal of any chemicals in septic systems.
- Don't overuse herbicides, pesticides or fertilizers, or preferably do not use them at all.
- Maintain fuel oil storage tanks and properly abandon them when no longer used.

More information is available at http://water.epa.gov (search for “source water protection”).

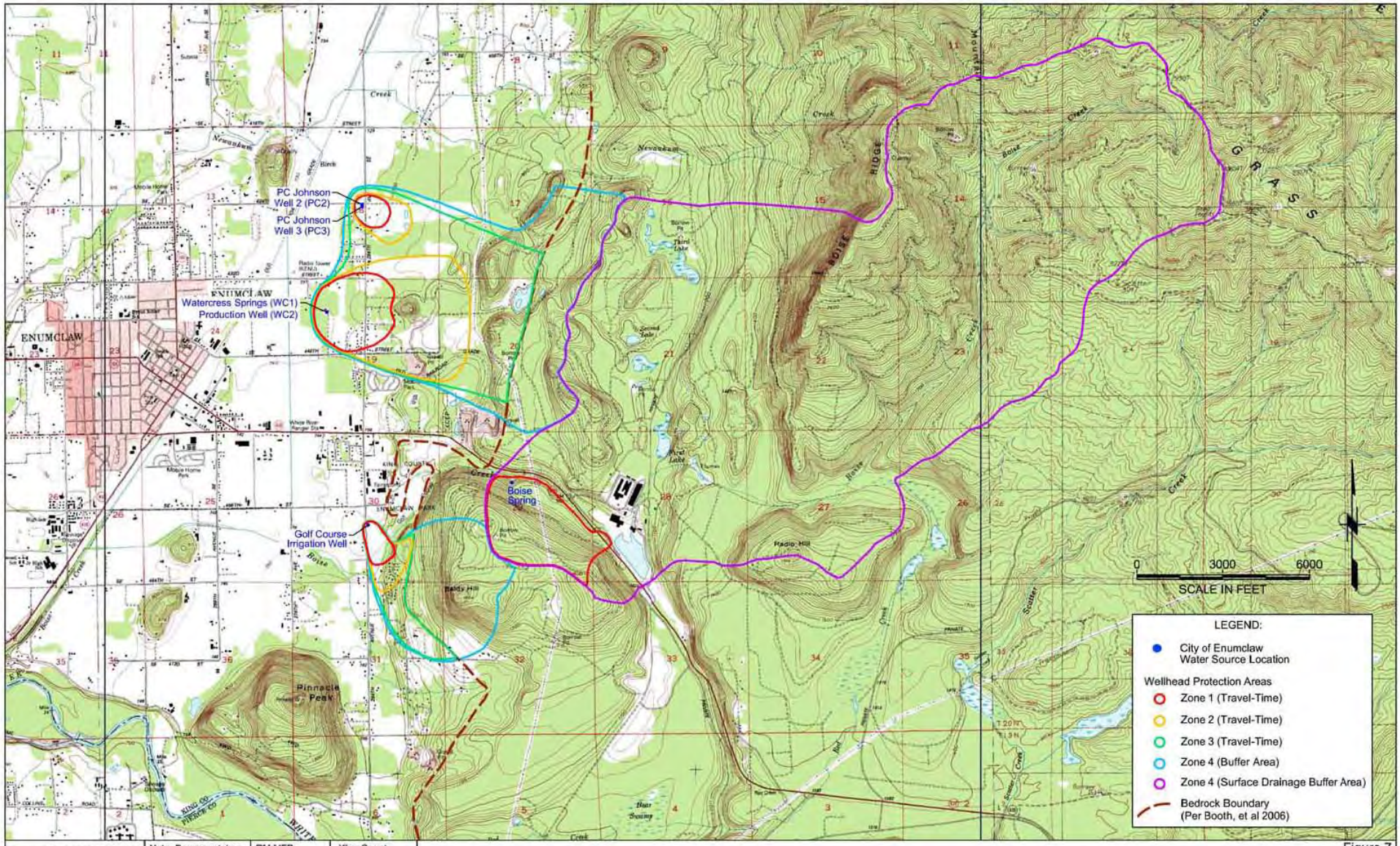
We appreciate informing anyone else who may be using your property of the importance of taking care to prevent any contamination from entering the groundwater. If you have any questions, please contact me at 360-615-5728.

Sincerely,

Scott Woodbury, P.E.
Assistant City Engineer

Attachments

1309 Myrtle Avenue, Enumclaw, Washington 98022 – 360-825-3593 – FAX 825-7232



ROBINSON NOBLE SALTBUSH INC.
GROUNDWATER & ENVIRONMENTAL SCIENTISTS

Note: Basemap taken from USGS Buckley, Enumclaw and Cyclone Creek Quads.

PM:MFP
October 2009
1281-005A

King County
T 20 N/R 07 E
Scale 1" = 3000'

Figure 7
Recommended Wellhead Protection Areas
City of Enumclaw: Wellhead Protection Plan

Notice Mailing List

TaxpayerName	Mailing Address	CityState	State	ZipCode
240 ACRE LLC	11250 SE 293RD ST	AUBURN	WA	98092
ADAMS ELAINE P	7683 SE 27TH ST #369	MERCER ISLAND	WA	98040
ADEN DORIS I	PO BOX 855	ENUMCLAW	WA	98022
AINSWORTH DUANE+KARI	43715 284TH AVE SE	ENUMCLAW	WA	98022
ALBRECHT ROBERT+KELLIE	27913 SE 432ND ST	ENUMCLAW	WA	98022
ALDERSON ROBERT+JOANNE M	29708 SE 472ND ST	ENUMCLAW	WA	98022
ALLEN NAOMI M	46409 287TH AVE SE	ENUMCLAW	WA	98022
AMES JOHN G	43927 283RD PL SE	ENUMCLAW	WA	98022
ANDREW DANIEL	28217 SE 430TH ST	ENUMCLAW	WA	98022
ARMSTRONG MICHAEL M+RONDA M	29030 SE 424TH ST	ENUMCLAW	WA	98022
ATKINS NOAH	42308 284TH AVE SE	ENUMCLAW	WA	98022
AUMAN STEVEN E	28712 SE 440TH ST	ENUMCLAW	WA	98022
B & N HOLDINGS	1800 ELLIS ST	BELLINGHAM	WA	98225
BAHR REGAN H	42215 284TH AVE SE	ENUMCLAW	WA	98022
BAIN JAMES H	28322 SE 430TH ST	ENUMCLAW	WA	98022
BAKER SCOTT+JOHNSTON LORI E	29020 SE 434TH ST	ENUMCLAW	WA	98022
BALLASTRASSE DAVID A	27930 SE 432ND ST	ENUMCLAW	WA	98022
BELLAH LENNY L	47306 294TH SE	ENUMCLAW	WA	98022
BENNEST KAROL L	42430 284TH AVE SE	ENUMCLAW	WA	98022
BERETTA JOSEPH P III+BOGRAN	28114 SE 430TH ST	ENUMCLAW	WA	98022
BERGGREN JOHN+DIANA	28735 SE 462ND PL	ENUMCLAW	WA	98022
BIESOLD RONALD E+DONNA F	42823 283RD SE	ENUMCLAW	WA	98022
BIRDWELL CARL A & BETTY A	43408 278TH AVE SE	ENUMCLAW	WA	98022
BLACK JASON P+JODI R	28117 SE 432ND ST	ENUMCLAW	WA	98022
BOEHM CATHERINE E	28639 SE 435TH ST	ENUMCLAW	WA	98022
BOLTON JUSTIN+RESA	28210 SE 440TH ST	ENUMCLAW	WA	98022
BRAA FRANCES	26117 SE 425TH ST	ENUMCLAW	WA	98022
BRAMLETT MORRIS H+ASHLEIGH	28102 SE 432ND ST	ENUMCLAW	WA	98022
BRANCH MARVIN E	42526 284TH AVE SE	ENUMCLAW	WA	98022
BREVIK RONALD D	28323 SE 430TH ST	ENUMCLAW	WA	98022
BRINT WENDEL E	43907 283RD PL SE	ENUMCLAW	WA	98022
BROWN CHARLES W+CATHERINE L	1420 YEW AVE NE	OLYMPIA	WA	98506
BRUHN DEANNA	29520 SE 472ND ST	ENUMCLAW	WA	98022
BRUNE FREDERICK R+JUDITH A	315 39TH AVE SW STE 10	PUYALLUP	WA	98373
BURLISON DEAN T	28003 SE 432ND ST	ENUMCLAW	WA	98022
BUSHNELL DAVID E+RENEE	28306 SE 432ND ST	ENUMCLAW	WA	98022
CALLAHAN KELLY O	28914 SE 424TH ST	ENUMCLAW	WA	98022
CARMAN RICHARD & LUCY	PO BOX 980	ENUMCLAW	WA	98022
CARTER PAUL F+MARY	47105 290TH AVE SE	ENUMCLAW	WA	98022
CASSIDY JOHN ALLEN+SUSAN E	46013 290TH AVE SE	ENUMCLAW	WA	98022
CHRISTENSON LUCAS M	46914 286TH AVE SE	ENUMCLAW	WA	98022
CLARK GARETT	43701 284TH AVE SE	ENUMCLAW	WA	98022
COPPOLA ORLANDO F JR+JEAN C	28313 SE 432ND ST	ENUMCLAW	WA	98022
CORLISS SCOTT D	PO BOX 487	SUMNER	WA	98390
COULTER CHRISTOPHER J+DARAM	42828 282ND AVE SE	ENUMCLAW	WA	98022
COWAN JOSEPH T	28326 SE 428TH PL	ENUMCLAW	WA	98022

Notice Mailing List

TaxpayerName	Mailing Address	CityState	State	ZipCode
COX CARSON L	47303 294TH AVE SE	ENUMCLAW	WA	98022
CROSSLIN CHARLES+WILLIAMS R	29029 SE 434TH ST	ENUMCLAW	WA	98022
DEPT OF NATURAL RESOURCES	PO BOX 47016	OLYMPIA	WA	98504
DIETZ DAVID H+EVA R	28116 SE 428TH PL	ENUMCLAW	WA	98022
DILLON MICHAEL A	43729 284TH AVE SE	ENUMCLAW	WA	98022
DYAR VERA M	PO BOX 601	ENUMCLAW	WA	98022
EATON DALE+LAURIE ANN	P O BOX 354	ENUMCLAW	WA	98022
EATON DELBERT H+SUSAN G	PO BOX 566	ENUMCLAW	WA	98022
EATON FREDRICK+JOYCE	46505 303RD AVE SE	ENUMCLAW	WA	98022
EATON HELEN	718 GRIFFIN AVE PMB #31	ENUMCLAW	WA	98022
ELH LLC	47014 286TH AVE SE	ENUMCLAW	WA	98022
FEUTZ JOHN + KELLY	28216 SE 432ND ST	ENUMCLAW	WA	98022
FINGERSON CODY M	46426 287TH AVE SE	ENUMCLAW	WA	98022
FRANCIS JOHN R+BARBARA L	28208 SE 440TH ST	ENUMCLAW	WA	98022
FRANZ JASON J+MELISSA	43827 284TH AVE SE	ENUMCLAW	WA	98022
G M LANDCO MGMT LTD	6800 OLDFIELD RD	SAANICHTON	BC V8	CANADA
GARDNER T JAY	45107 284TH AVE SE	ENUMCLAW	WA	98022
GIERKE SONJA I	28702 SE 436TH PL	ENUMCLAW	WA	98022
GLENN CAROLYN G	28624 SE 434TH ST	ENUMCLAW	WA	98022
GLOBE JEROME D+RENEE J	28620 SE 464TH CT	ENUMCLAW	WA	98022
GRAHAM JOHN D	PO BOX 991	ENUMCLAW	WA	98022
GRIGGS SARA MAYERS	46205 287TH AVE SE	ENUMCLAW	WA	98022
GRUSNICK SIDNEY P+ANNETTE E	46318 287TH AVE SE	ENUMCLAW	WA	98022
GUNDERSON JOHN P	2435 LEE WAY	BELLINGHAM	WA	98226
GUSMAN DENNIS N	PO BOX 1117	ENUMCLAW	WA	98022
HAMERTON ROBERT P+LOIS A	46306 284TH AVE SE	ENUMCLAW	WA	98022
HANCOCK FOREST MANAGEMENT	17700 MILL PLAIN BLVD	VANCOUVER	WA	98683
HARDING GEORGE D	43821 284TH AVE SE	ENUMCLAW	WA	98022
HARP TRAVIS & PENNY	46223 290TH AVE SE	ENUMCLAW	WA	98022
HATCHER ROBBERT D	PO BOX 1080	MAPLE VALLEY	WA	98038
HICKS DENNIS J & TEENA	PO BOX 292	ENUMCLAW	WA	98022
HOLMES RONALD C+BETTY ANN	28030 SE 440TH ST	ENUMCLAW	WA	98022
HORTA MARIA DEL CARMEN	28310 SE 430TH ST	ENUMCLAW	WA	98022
HORTON BRENT+LISA	28810 SE 424TH ST	ENUMCLAW	WA	98022
HOUSTON LEROY	42232 284TH AVE SE	ENUMCLAW	WA	98022
HOWARD CARRIE JANE	46226 287TH AVE SE	ENUMCLAW	WA	98022
HUGHES KATHLEEN MARIE	11955 SE 253RD ST	KENT	WA	98030
HUGHES WADE A & JAIME	28015 SE 432ND ST	ENUMCLAW	WA	98022
HUMMEL DAVID	43917 283RD PL SE	ENUMCLAW	WA	98022
JANICH LAURA+MICHAEL	46118 290TH AVE SE	ENUMCLAW	WA	98022
JENSEN LARRY W & BONNIE L	46728 286TH AVE SE	ENUMCLAW	WA	98022
JOHNSON ARNIE D	28229 SE 432ND	ENUMCLAW	WA	98022
JOHNSON BRUCE M	29131 SE 472ND	ENUMCLAW	WA	98022
JOHNSON RENA FORD	171 E BARNSBY PL	SHELTON	WA	98584
JOHNSON STEVEN D+JANET L	43101 284TH AVE SE	ENUMCLAW	WA	98022
KAHNE HOLDINGS INC	2001 GARRETT ST #23	ENUMCLAW	WA	98022

Notice Mailing List

TaxpayerName	Mailing Address	CityState	State	ZipCode
KASCHMITTER CHRIS L	29432 SE 472ND ST	ENUMCLAW	WA	98022
KAUPPILA DAVID P&RUTH L	46419 287TH AVE SE	ENUMCLAW	WA	98022
KAYS DAN & LISA	46410 287TH AVE SE	ENUMCLAW	WA	98022
KENNEDY ROBERT B+LARSON WEN	422 106TH AVE E	EDGEWOOD	WA	98372
KESSLER RONALD W	29206 SE 424TH ST	ENUMCLAW	WA	98022
KING COUNTY-SOLID WASTE	500 4TH AVE	SEATTLE	WA	98004
KLEIN FAMILY TRUST	28900 GLADIOLUS	CYN CITY	CA	91387
KLEMPEL LOIS E	PO BOX 338	ENUMCLAW	WA	98022
KNOTTS EARNEST L+BEVERLY E	1049 COLE ST	ENUMCLAW	WA	98022
KOCHEUAR	46305 290TH AVE SE	ENUMCLAW	WA	98022
KOVASH JOHN D+DONNA L	43804 284TH SE	ENUMCLAW	WA	98022
KROHN JANE+JANE	46225 287TH AVE SE	ENUMCLAW	WA	98022
KRUSE BRAD P+LANETTE M	28511 SE 435TH ST	ENUMCLAW	WA	98022
KRUSE DONALD P	42922 284TH AVE S E	ENUMCLAW	WA	98022
KUNTZ CHIP	27013 LOWER BURNETT RI	BUCKLEY	WA	98321
LAFANTASIE KEN A JR+DAPHNE	28126 SE 432ND ST	ENUMCLAW	WA	98022
LANE JEFF S+JENNIFER L	P O BOX 1282	ENUMCLAW	WA	98022
LANZA ROQUE A	42524 284TH AVE SE	ENUMCLAW	WA	98022
LAURNEN MATTHEW SCOTT+SUSAN	46310 290TH AVE SE	ENUMCLAW	WA	98022
LEASY LELAND	PO BOX 132	ENUMCLAW	WA	98022
LEENSTRA ROBERT L	17302 SE 236TH PL	KENT	WA	98042
LEWIS SUZANNE M	28700 SE 462ND PL	ENUMCLAW	WA	98022
LIPPARD STEVEN R+KAY M	28234 SE 430TH ST	ENUMCLAW	WA	98022
LISA INC	PO BOX 130	AUBURN	WA	98071
LITTLE CLEM & MARILYNNE	PMB 246 718 GRIFFIN	ENUMCLAW	WA	98022
LOKOVSEK MARTIN O JR	42625 284TH AVE SE	ENUMCLAW	WA	98022
LONGTINE MICHAEL E+LISA C	46209 287TH AVE SE	ENUMCLAW	WA	98022
MALLERY JOE+BETTY	24922 SE 406TH ST	ENUMCLAW	WA	98022
MARAS MICHAEL A	42824 283RD SE	ENUMCLAW	WA	98022
MARRAPODI ANTHONY D	28931 SE 434TH ST	ENUMCLAW	WA	98022
MARTIN KATHLEEN M+WAHLEN JEREMY T	28302 SE 428TH PL	ENUMCLAW	WA	98022
MARTINEZ MIKE+KATIE	43815 284TH AVE SE	ENUMCLAW	WA	98022
MAVIN JOSHUA	28115 SE 430TH ST	ENUMCLAW	WA	98022
MCCALLUM JOHN B+TRACEY L	42822 282ND AVE SE	ENUMCLAW	WA	98022
MCDONOUGH LONNIE J	46111 290TH AVE SE	ENUMCLAW	WA	98022
MCGONEGLE BRIAN K+SHARON M	28912 SE 434TH ST	ENUMCLAW	WA	98022
MCGUIRE HAROLD W	43902 284TH SE	ENUMCLAW	WA	98022
MCSWAN PATRICIA J+GARY M	46457 288TH PL SE	ENUMCLAW	WA	98022
MEADOWS MICHELLE+CURTIS	43630 284TH AVE SE	ENUMCLAW	WA	98022
MILLER MERRY D	46420 287TH AVE SE	ENUMCLAW	WA	98022
MITCHELL SHAWN & HILLARY	PO BOX 1004	ENUMCLAW	WA	98022
MONK JOHN A	28714 SE 462ND PL	ENUMCLAW	WA	98022
MOULDEN DONALD J	43713 284TH SE	ENUMCLAW	WA	98022
NIEDERLE PETER	16125 SE 156TH ST	RENTON	WA	98058
NOBLEMAN COUNTRY ESTATE	718 GRIFFIN AVE #254	ENUMCLAW	WA	98022
O'BRIEN JOHN C & MAIA	924 CENTRAL ST NE	OLYMPIA	WA	98506

Notice Mailing List

TaxpayerName	Mailing Address	CityState	State	ZipCode
OLSON GILBERT B+RENEE V-	46002 290TH AVE SE	ENUMCLAW	WA	98022
OLSON KENNET L+JODI L	42827 282ND AVE SE	ENUMCLAW	WA	98022
OLSON KRISTOPHER L	43908 283RD PL SE	ENUMCLAW	WA	98022
OLSON OPAL A	28215 SE 424TH ST	ENUMCLAW	WA	98022
OLSON PAUL D	28514 SE 464TH	ENUMCLAW	WA	98022
OPLAND FLOYD A	43726 284TH AVE SE	ENUMCLAW	WA	98022
OSBORN GREG T+JENNIFER N	28204 SE 440TH ST	ENUMCLAW	WA	98022
PARKIN RANDI+R BLACKBURN	43524 284TH AVE SE	ENUMCLAW	WA	98022
PARKINSON SARAH L NONEXEMPT	7683 SE 27TH ST #369	MERCER ISLAND	WA	98040
PARMELEE JAMES L	28619 SE 464TH CT	ENUMCLAW	WA	98022
PATRICK KYLE M+KIMBERLY J	46201 287TH AVE SE	ENUMCLAW	WA	98022
PEARSON ALVIN T+JUDY	47210 294TH AVE SE	ENUMCLAW	WA	98022
PEASE DONALD J+JEANETTE M	46216 287TH AVE SE	ENUMCLAW	WA	98022
PEDERSEN GEORGE F	43615 284TH AVE SE	ENUMCLAW	WA	98022
PEET JAMES+REBECCA B R	46728 303RD AVE SE	ENUMCLAW	WA	98022
PETERSON MATILDA	28224 SE 432ND ST	ENUMCLAW	WA	98022
PHELAN KATHLEEN+PATRICK	PO BOX 1006	ENUMCLAW	WA	98022
PIRELLO DENNIS M	28625 SW 435TH	ENUMCLAW	WA	98022
PORTILLO MAURICIO A+GLORIA	PO BOX 338	ENUMCLAW	WA	98022
PRENOVOST JUDY	29300 SE 472ND ST	ENUMCLAW	WA	98022
PRINCE EDWIN J+JUDY L	47108 290TH AVE SE	ENUMCLAW	WA	98022
PYLE ALLAN J	28218 SE 430TH	ENUMCLAW	WA	98022
PYLE DONALD R	46217 287TH AVE SE	ENUMCLAW	WA	98022
RASMUSSEN MICHAEL	38322 247TH AVE SE	ENUMCLAW	WA	98022
REAGAN ROBERT J+BARBARA A	28016 SE 440TH ST	ENUMCLAW	WA	98022
REID BARRY+BRENDA	BOX 1274	ENUMCLAW	WA	98022
RICHARDSON GREGORY L	28713 SE 462ND PL	ENUMCLAW	WA	98022
RICHTER RITA M	28831 190TH SE	KENT	WA	98042
RINKS MARIANNE L +	PO BOX 875	ENUMCLAW	WA	98022
RIVERA ROSTOMD	28407 SE 464TH	ENUMCLAW	WA	98022
SABSOWITZ THOMAS MICHAEL	28216 SE 440TH ST	ENUMCLAW	WA	98022
SAVAGE JENNIFER	38120 297TH PL SE	ENUMCLAW	WA	98022
SAWHILL WILLIAM A+SHARON A	PO BOX 134	ENUMCLAW	WA	98022
SCHAFFER CINDY+WHEELOCK PHI	46825 290TH AVE SE	ENUMCLAW	WA	98022
SCHMITT GREG J & CAROL A	PO BOX 1454	ENUMCLAW	WA	98022
SCHNYDERS JEFF S+JULIE L	211 SPRING PL	ENUMCLAW	WA	98022
SEELIG HOWARD+BEATRICE	PO BOX 6576	BELLEVUE	WA	98008
SEVON TERRY J+DE ANN K	28114 SE 432ND ST	ENUMCLAW	WA	98022
SIGNANI MICHAEL K	43928 283RD PL SE	ENUMCLAW	WA	98022
SILVERTON JAMES C+KAREN G	28621 SE 434TH ST	ENUMCLAW	WA	98022
SKORE PAUL E+NANCY J	46229 287TH AVE SE	ENUMCLAW	WA	98022
SMITH RUSSELL D+MICHELLE L	413 MICHAEL AVE	ENUMCLAW	WA	98022
SOI 42830 ENUMCLAW / HARRIS	PO BOX 8002	COVINGTON	WA	98042
STANGLAND GERALD	28210 SE 430TH ST	ENUMCLAW	WA	98022
STARK BRUCE G	43819 284TH AVE SE	ENUMCLAW	WA	98022
STEBLY GREGORY J+JOCELYN GI	43616 284TH AVE SE	ENUMCLAW	WA	98022

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TaxpayerName	Mailing Address	CityState	State	ZipCode
STEPHENS JOAN L	46430 287TH PL SE	ENUMCLAW	WA	98022
STEVENS MARK A	28622 SE 472ND ST	ENUMCLAW	WA	98022
STEVENSON NANCY L	28005 SE 432ND ST	ENUMCLAW	WA	98022
STICKNEY LORETTA+BRIAN	43922 284TH AVE SE	ENUMCLAW	WA	98022
STOLL MARK E	43210 284TH AVE SE	ENUMCLAW	WA	98022
STRALSER JAMES	28328 SE 424TH	ENUMCLAW	WA	98022
SULLIVAN PATRICK D	28129 SE 430TH ST	ENUMCLAW	WA	98022
TAMM RICHARD E	28314 SE 428TH PL	ENUMCLAW	WA	98022
TANONA DUANE T+TANONA AMY L	29408 SE 472ND ST	ENUMCLAW	WA	98022
TAYLOR JAMESSA	28115 SE 428TH PL	ENUMCLAW	WA	98022
THAYER ROBERT R	28204 SE 428TH PL	ENUMCLAW	WA	98022
TUCKER SARAH K	43900 283RD PL SE	ENUMCLAW	WA	98022
TYLER HAROLD O	28705 SE 462ND CT PL	ENUMCLAW	WA	98022
TYLER TOM & ANNETTE	42815 260TH AVE SE	ENUMCLAW	WA	98022
VANDERBILT MORTGAGE & FINAN	500 ALCOA TRL	MARYVILLE	TN	37804
VANWIERINGEN KENNETH	29218 SE 472ND ST	ENUMCLAW	WA	98022
VANWIERINGER MARK & DEBRA	46423 288TH PL SE	ENUMCLAW	WA	98022
VEREECKEN LAURENT A+WATKINS	29604 SE 472ND ST	ENUMCLAW	WA	98022
VERSCHAEVE CRIST J	43804 284TH AVE SE	ENUMCLAW	WA	98022
VILCA JOSIE L+REGINA S	28701 SE 436TH PL	ENUMCLAW	WA	98022
VOELLER ROGER L	28927 SE 472ND ST	ENUMCLAW	WA	98022
VOGE PAUL A+VERA	46608 286TH AVENUE SOU	ENUMCLAW	WA	98022
WARFORD TIMOTHY L+DEBORAH S	28311 SE 430TH ST	ENUMCLAW	WA	98022
WATTS JEREMY+JENNIFER I	PO BOX 1226	ENUMCLAW	WA	98022
WEAVER CHELSY N+CULPEPPER C	28130 SE 430TH ST	ENUMCLAW	WA	98022
WEBB MASON	707 VICTOR ST	ENUMCLAW	WA	98022
WEYERHAEUSER CO	PO BOX 9777	FEDERAL WAY	WA	98063
WIEBENGA JR HAROLD H+ANNE M	42611 284TH AVE SE	ENUMCLAW	WA	98022
WILHELM MARK E+LISA M	28209 SE 430TH ST	ENUMCLAW	WA	98022
WILKENING STEPHEN P	28615 SE 436TH PL	ENUMCLAW	WA	98022
WILSON PATRICK J+CHERYL A	46444 287TH PL SE	ENUMCLAW	WA	98022
WINTERFELD DEL & JANE	42829 283RD AVE SE	ENUMCLAW	WA	98022
WOOD DONALD L+LINDA M	29103 SE 434TH ST	ENUMCLAW	WA	98022
WOODCOCK DOROTHY JEAN	28600 SE 424TH ST	ENUMCLAW	WA	98022
WOODCOCK JEANNE M+JAMES W	43816 284TH AVE SE	ENUMCLAW	WA	98022
WORK FAMILY LLC	24707 NE 26TH ST	SAMMAMISH	WA	98074
WYLES PAUL D & ELAINE R	28704 SE 462ND PL	ENUMCLAW	WA	98022
YOHANNES ASMEROM	1616 SUMMIT AVE #102	SEATTLE	WA	98122
ZWIEFELHOFER LYN R+JUDY A	42727 284TH AVE SE	ENUMCLAW	WA	98022

City of Enumclaw

DEPARTMENT OF PUBLIC WORKS

December 12, 2012

«Agency»
«Address»
«City_State_Zip»

Re: City of Enumclaw Wellhead Protection Area

To Whom It May Concern:

We are writing to let you know that land use activities you regulate, manage, and or provide assistance to are in our water system wellhead protection area. Our system has about 5600 connections and serves about 15,300 people. Water sources that we use throughout the year are rated by the Washington State Department of Health as "highly susceptible."

The enclosed map shows our wellhead protection area. Travel times for wellhead protection zones are given below. Aquifer boundaries are reached before the ten-year time of travel limit so Zone 4 represents a buffer zone rather than a true ten-year time of travel.

Zone 1	6-month time of travel
Zone 2	1-year time of travel
Zone 3	5-year time of travel
Zone 4	Buffer zone

The wellhead protection area map also shows reported and potential contamination sites with the listed numbers correlating to the table on the back of this page. Any groundwater contamination that occurs within the wellhead protection area has a high potential to reach our sources. Site 2 ceased to be a site for bio-solid application in 2008.

We appreciate your taking all reasonable steps to ensure that land use activities within this area do not contaminate our drinking water sources. Thank you for your support in protecting our drinking water. If you have any questions, please contact me at 360-615-5728.

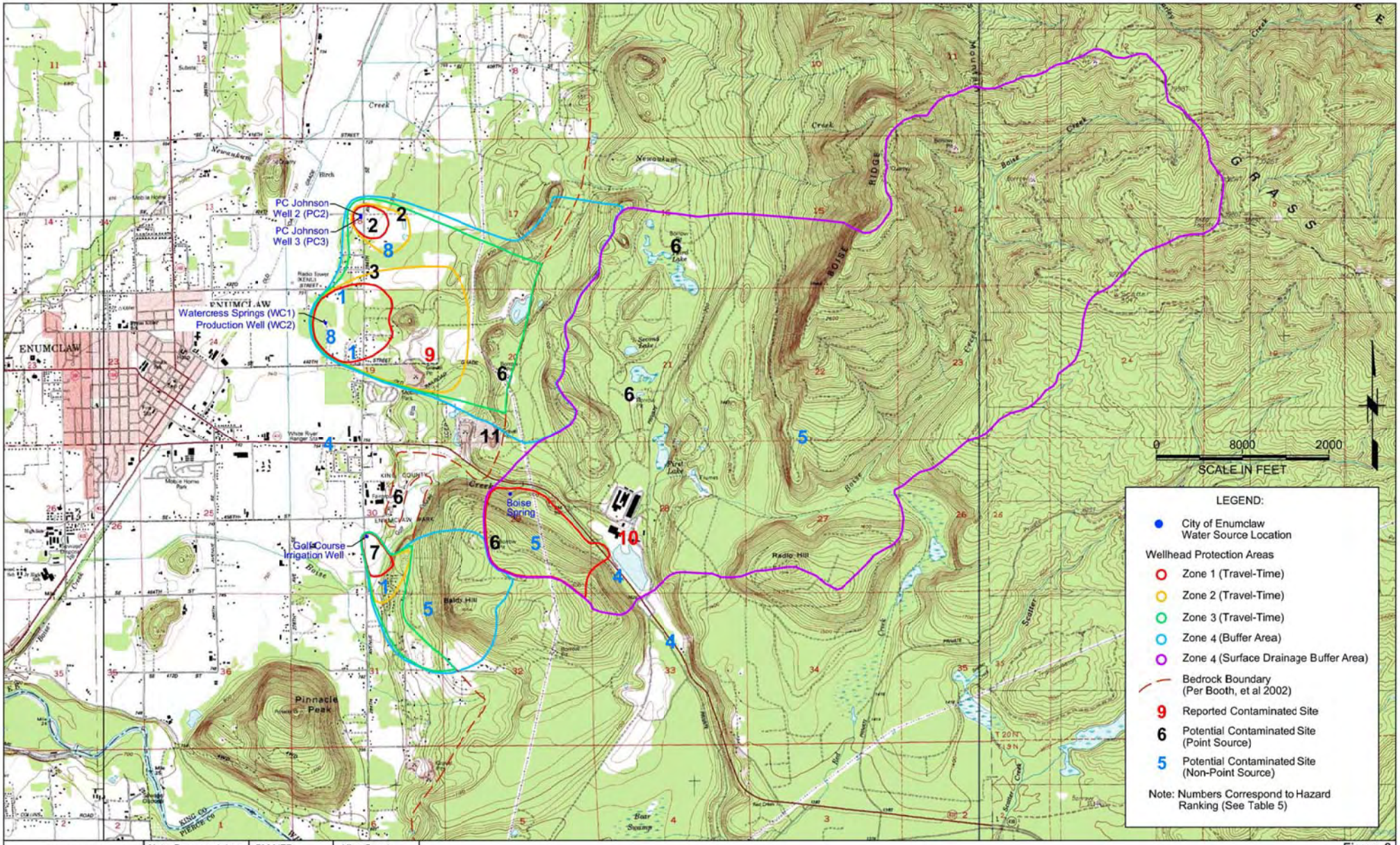
Sincerely,

Scott Woodbury, P.E.
Assistant City Engineer

Enclosures

Table 5: Reported and Potential Contamination Sites

Ranking/Map Reference Number	Site/Land Use	Address	Database	Hazard/Contaminant	WHPA Zone(s)
1	Residential land	n/a	n/a	septic tanks, pesticides	1, 2, 3
2	Land application of bio-solids	Branch Farm	n/a	nitrogen loading	1, 2
3	Dairy farms	n/a	n/a	nitrogen, animal waste	1,2
4	Highway 410	n/a	n/a	chemical/fuel spills, pesticides, herbicides	1, 4
5	Logging activities/Forest land use	n/a	n/a	fuel/chemical spills	3, 4
6	Borrow pit (multiple locations)	n/a	n/a	reduced impedance to groundwater system, illegal dumping	1, 3, 4
7	Enumclaw Golf Course	45220 288th Avenue Southeast	n/a	fertilizers, pesticides, herbicides	
8	Agricultural land	n/a	n/a	fertilizers, pesticides, herbicides	1, 2, 3
9	King Co. Solid Waste Land Fill	SE 440th St	SWLF KING, RCRA	leachates	2
10	Weyerhaeuser Facility and mill pond (closed)	31002 Highway 410	RCRA SQG, CSCSL, UST	petroleum products	4
11	Corliss Resources gravel mine	29416 Highway 410	n/a	reduced impedance to groundwater system, fuel spills	4



ROBINSON NOBLE SALTBUSH INC. GROUNDWATER & ENVIRONMENTAL SCIENTISTS	Note: Basemap taken from USGS Buckley, Enumclaw and Cyclone Creek Quads.	PM:MFP October 2009 1281-005A	King County T 20 N/R 05 E Scale 1" = 8000'

Figure 8
Hazard Inventory Map
City of Enumclaw: Wellhead Protection Plan

Agency Mailing List

Agency	Address	City, State Zip
EPA Office of Water	1200 Sixth Street, Suite 900, MS OWW-136	Seattle, WA 98101
Dept of Agriculture Rural Development	1835 Black Lake Blvd SW, Suite B	Olympia, WA 98512-5715
Indian Health Service	1220 SW Third Avenue, Room 476	Portland, OR 97204
Natural Resources Conservation Service	316 West Boone Avenue, Suite 450	Spokane, WA 99201-2348
Geological Survey	934 Broadway, Suite 300	Tacoma, WA 98402
Agriculture & Natural Resource Program	P. O. Box 646248	Pullman, WA 99164-6248
Municipal Research and Services Center	2601 4th Avenue, Suite 800	Seattle, WA 98121-1280
Dept of Agriculture Pesticide Management Div	PO Box 42589	Olympia, WA 98504-2589
Growth Management Services	PO Box 42525	Olympia, WA 98504-2525
Dept of Commerce Public Works Board	PO Box 42525	Olympia, WA 98504-2525
DOE Hazardous Waste and Toxics Reduction Program	PO Box 47600	Olympia, WA 98504-7600
DOE Water Resources Program/Well Identification	PO Box 47600	Olympia, WA 98504-7600
DOE Water Quality Program	PO Box 47600	Olympia, WA 98504-7600
DOE NW Regional Office	3190 160th Avenue SE	Bellevue, WA 98008-5452
DOE SW Regional Office	300 Desmond Drive	Lacey, WA 98503
WSDOT Environmental Services	PO Box 47331	Olympia, WA 98504-7331
Steve Hirschey, KC Water Quality Planner	201 S Jackson St Rm 512	Seattle, WA 98104
King County GIS Center	201 S. Jackson St. Rm 706	Seattle, WA 98104
King County Solid Waste Div	201 S. Jackson St. Rm 701	Seattle, WA 98104

Scott Woodbury

From: Scott Woodbury
Sent: Monday, December 17, 2012 10:36 AM
To: Joe Clow; Jim Zoll-PD; 'Rich.Tokarzewski@kingcounty.gov'; 'IncidentResponse@wsdot.wa.gov'; 'CKEE461@ecy.wa.gov'
Cc: Chris Searcy
Subject: Coordination With Emergency Responders - City of Enumclaw Wellhead Protection Areas
Attachments: Hazard Inventory Table.pdf; WHPP Figure 8.pdf; Spill Response Plan.pdf

State law requires water purveyors to coordinate with local emergency responders regarding their wellhead protection areas. The City of Enumclaw sources of supply are located on four sites east of the City and are shown on the attached WHPP Figure 8 map: Boise Spring, Watercress Spring and Well, PC Johnson Wellfield, and Golf Course Irrigation Well. The Boise Spring and Watercress sites are used throughout the year and are rated as highly susceptible while the other sources are of low susceptibility. The Golf Course well currently does not feed into the City water supply, but is planned as a future source pending sufficient funding.

The WHPP Figure 8 map shows our wellhead protection areas. Travel times for wellhead protection zones are given below. Aquifer boundaries are reached before the ten-year time of travel limit so Zone 4 represents a buffer zone rather than a true ten-year time of travel.

Zone 1	6-month time of travel
Zone 2	1-year time of travel
Zone 3	5-year time of travel
Zone 4	Buffer zone

The WHPP Figure 8 map also shows reported and potential contamination sites with the listed numbers correlating to the attached Hazard Inventory Table. Any groundwater contamination that occurs within the wellhead protection area has a high potential to reach our sources. Site 2 ceased to be a site for bio-solid application in 2008.

Lastly I have attached a copy a March 2009 Spill Response Plan that is in an appendix of our 2009 Wellhead Protection Plan Update document. We would appreciate any input that you may have with regard to emergency response coordination or to any of the attached documents. Please let us know of any training or response exercises that you feel would be important for us to attend.

Thank you.

Scott Woodbury, P.E.
City of Enumclaw
Assistant City Engineer
1309 Myrtle Ave
Enumclaw, WA 98022
360-615-5728 office
253-261-1937 cell
360-825-7232 fax

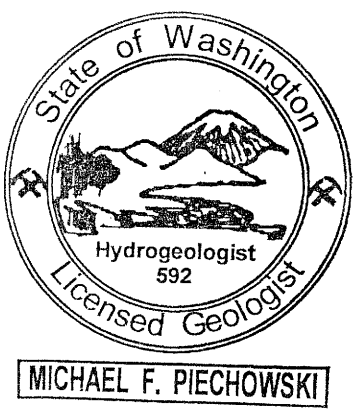
ROBINSON NOBLE SALTBUSH INC. Established 1947
GROUNDWATER & ENVIRONMENTAL SCIENTISTS

WELLHEAD PROTECTION PLAN UPDATE
CITY OF ENUMCLAW

OCTOBER 2009

by

Michael F. Piechowski, LHG
Senior Hydrogeologist



3011 South Huson Street, Suite A Tacoma, Washington 98409 ▪ (253) 475-7711 ▪ Fax: (253) 472-5846
e-mail: mail@robinson-noble.com

WELLHEAD PROTECTION PLAN UPDATE
CITY OF ENUMCLAW
OCTOBER 2009

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3. WATERCRESS SITE DETAIL MAP
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6. CONCEPTUAL DIAGRAM
7. WELLHEAD PROTECTION AREAS
8. HAZARD INVENTORY MAP

APPENDIX

A. WELL LOGS
B. GROUND WATER CONTAMINATION SUSCEPTIBILITY ASSESSMENT SURVEY FORM
C. PARCEL INSIGHT REPORTS
D. HAZARD INVENTORY LIST
E. SPILL RESPONSE PLAN

ATTACHMENT (on CD)

COMPLETE WHPP REPORT AS PDF AND IN ORIGINAL FORMAT
COMPLETE GROUNDWATER MODELS IN ORIGINAL FORMAT
COMPLETE PARCEL INSIGHT REPORT

WELLHEAD PROTECTION PLAN UPDATE
CITY OF ENUMCLAW
OCTOBER 2009

1.0 Executive Summary

A wellhead protection area (WHPA) is a management zone around a groundwater source designed to protect the quality of the source water. It is based upon the horizontal representation of capture zones, which describe the area of an aquifer (and all overlying material) that may contribute water to the well or other groundwater source within a given period of time. In the preparation of a Wellhead Protection Plan, capture zones are typically defined for time-of-travel periods of one-half, one, five, and ten years. When the City's 1998 Wellhead Protection Plan was prepared, the wellhead protection areas were defined for Boise Spring, Watercress Spring, and the PC Johnson Wells through the use of groundwater models. The basic groundwater models used did not account for the heterogeneous nature of the region's geology or the interactions with surface water.

In this update to the Wellhead Protection Plan, wellhead protection areas were delineated for each of the City's groundwater sources. The considerable amount of recent work at the Boise and Watercress sites as well as the recent development of the new production and irrigation well at the Enumclaw Golf Course provided a more detailed understanding of the subsurface at these locations. Two analytical element models were developed for this project, one including Watercress and the golf course and one for the PC Johnson Wellfield. Boise Spring wellhead protection areas were determined through hydrogeologic analysis and time of travel calculations.

1.1 Existing and Potential Contamination Hazard Identification

The inventory of potential contamination sources within the WHPA was performed according to the Washington State Department of Health publication, "*Inventory of Potential Contaminant Sources in Washington's Wellhead Protection Areas (1993)*." Parcel Insight (PI), an environmental database research company, reviewed 27 federal and state databases for any known or potential contaminant sites within a one-mile radius of each City water source (or group of sources in the case of the PC Johnson Wells and Watercress Springs). This area included the time-of-travel based capture zones for the sources but not the entire buffer area. An evaluation of various land-use categories and activities was also performed. The results of the contamination source inventory include a list of potential and known environmental hazards in proximity to the Enumclaw water sources. From this process, six sites or categories of land-use activities were identified as known or potential hazards to the City's wells. These were prioritized and ranked such that the Wellhead Protection implementation process can address each site or land use in a systematic manner. Each site was ranked according to three factors. The factors are: 1)

proximity of potential hazard to the WHPA, 2) type of contamination, and 3) the straight-line distance from the source to the potential hazard.

1.2 Protection Strategies and Implementation Tasks

The completion of wellhead protection planning provides no safeguards unless effective management strategies are implemented to prevent potential contamination of groundwater sources. With the hazards identified, the Wellhead Protection Plan provides for six strategic strategies and 18 specific tasks suggested for the City to undertake to complete the process. A spill response plan (included as Appendix E) was also prepared. Additionally, the City's contingency plan, presented in the City's 2007 Water System Comprehensive Plan, was reviewed to ensure it adequately addresses the possible loss of one or more of the City's water sources.

2.0 Introduction

2.1 Wellhead Protection Plan

In response to the 1986 Amendments to Section 1428 of the Federal Safe Drinking Water Act, the Washington Administrative Code (WAC) was modified in July 1994 to include mandatory wellhead protection measures[1] for Group A public water systems (WAC 246-290). The overall goal of the state wellhead protection program is to prevent the contamination of ground waters used by Group A public water systems. This is to be accomplished by the definition of management zones around public wells, detection of any existing groundwater contamination sources, and management of potential sources of groundwater contamination prior to their entry into the drinking water system. The state requires that a Wellhead Protection Plan (WHPP) shall, at a minimum, include the following aspects:

- A completed susceptibility assessment
- A delineated wellhead protection area
- An inventory of potential contamination threats
- Distribution of findings to required entities
- Contingency plans for alternative sources of drinking water
- Appropriate spill/incident response measures

Under the WAC, local public water systems have primary responsibility for developing and implementing local wellhead protection programs. Due to the limited jurisdictional and regulatory authority afforded most purveyors, it is essential that they work with other local, state, and federal agencies possessing the appropriate authority. The State Department of Health (Health) oversees the wellhead protection program.

[1] The legislative authority to require wellhead protection planning can be found in the Revised Code of Washington (RCW) Chapters 43.20.050, 70.119A.060, and 70.119A.080.

2.2 Scope of City Wellhead Protection Plan

The City of Enumclaw is located on a relatively flat plain at the base of the Cascade foothills, on the upland between the Green and White Rivers (located north and south of the City, respectively). Figure 1 shows the locations of the City's water sources and the approximate study area. The plain on which the City sits was formed by the deposition of the Osceola Mudflow. The City of Buckley is located to the southwest of the City, across the White River. The land north of the City is generally rural, with small farms or homes on large lots. According to the most recent census, completed in 2000, the population of Enumclaw is 11,116 residents.

The City of Enumclaw currently relies upon three wells and two spring collection facilities to supply their customers' water needs. A fourth well at the City's golf course has been drilled and is planned to be made operational in the near future once the new well facility has been constructed. In case of an emergency, the City is able to pump water from the City of Tacoma's Pipeline 1. The City's Public Works Department is responsible for the maintenance of the City's water and sewer utilities, along with many other important parts of the City's infrastructure. Approximately 15,950 retail water customers are served through 5,350 connections. Similarly, the City currently serves approximately 3,350 sewer customers.

The City of Enumclaw began operating its water system in 1912. Boise Creek Spring was developed sometime earlier by the Weyerhaeuser Company. The Watercress Spring source was first developed for use by the City in 1953. In 1977, the City secured an emergency connection with the City of Tacoma. In 1980 and 1986, the City installed new wells at the PC Johnson property. Throughout the years, the system has expanded to the point where the City serves not only the incorporated area, but also a sizable portion of nearby unincorporated King County. The City completed a new water system plan in 2007. This plan included the preliminary design to connect the replacement well that was drilled at the City's golf course in 2007. This well was constructed to improve water supply to the golf course and to provide additional supply to the City's potable water system. In 2007, the City constructed a replacement well project to restore production capacity at the Watercress facility. Past water quality testing has allowed the City's spring sources to be classified as groundwater sources. Thus, with the exception of the emergency Tacoma supply, groundwater constitutes the City's primary and most economical guaranteed source of supply.

This wellhead protection plan focuses on four primary areas:

1) The review of previous characterizations for the City of Enumclaw's water sources, including those from the following studies:
   - GeoEngineers, Inc., 1998, Wellhead Protection Plan Enumclaw, Washington
   - Hart Crowser & Associates, 1980, Enumclaw Test Well, King County, Washington
   - Pacific Groundwater Group (PGG), 2008, City of Enumclaw – Boise Spring Phase III Field Investigations and Hydrogeologic Interpretation (DRAFT)
   - Robinson & Noble, Inc., 1986, Construction Report for P.C. Johnson Well 2 for the City of Enumclaw

- Robinson, Noble & Saltbush, 2006, City of Enumclaw Watercress Springs Water Resource Evaluation Report
- Robinson, Noble & Saltbush, 2006, City of Enumclaw Golf Course Test Well Construction Report
- Robinson, Noble & Saltbush, 2007, City of Enumclaw Construction and Testing of the Golf Course and Zone 888/1002 Replacement Production Well
- Robinson, Noble & Saltbush, 2007, City of Enumclaw Construction and Testing of Watercress Springs Production Well
- Robinson, Noble & Saltbush, 2009, City of Enumclaw PC Johnson Wellfield Management Plan,

2) The delineation of appropriate capture zones and Wellhead Protection Areas for the City's water sources,
3) An inventory of potentially hazardous materials inside the delineated WHPAs for the City, and
4) The development and/or review of management, spill response, and contingency plans.

3.0 Hydrologic Assessment

3.1 Introduction

The City of Enumclaw produces its water supply from three different aquifer systems. These three aquifers are known as the perched Vashon recessional outwash (Qvr) aquifer, the semi-confined Vashon recessional outwash (Qvr) aquifer, and the deeper, confined, pre-Vashon (Qpv) aquifer. The purpose of this study is to provide the City with a plan that allows it to protect its water resources from these aquifers.

The initial step in the development of a Wellhead Protection Plan (WHPP) is the determination of zones that have the greatest potential to allow contaminants to reach the groundwater system. These zones surround each source and are collectively referred to as a Wellhead Protection Area (WHPA). To accurately define the WHPAs, information about the geology and hydrology of the aquifer systems contributing to the wells and other groundwater sources needs to be analyzed. Once available geologic and hydrologic information is analyzed, a conceptual model for the hydrologic system that immediately encompasses the wellheads is formed. The conceptual model is used to develop analytical models used to delineate the time-of-travel zones, known as capture zones, for each groundwater source. Finally, the WHPA can be defined based on the delineated capture zones. For this revision to the City of Enumclaw's Wellhead Protection Plan, capture zones were determined though the use of an analytic element model for the Watercress, PC Johnson, and Golf Course facilities and a time-of-travel calculation based on hydrogeologic mapping for the Boise Spring. Further refinement of the capture zones was accomplished based on the local geology and topography.

3.2 Geology and Hydrology

The City of Enumclaw is located on the upland between the Green and White Rivers, at the base of the Cascade foothills, in eastern King County, Washington. The City is built on a relatively

flat plain formed by the deposition of the Osceola Mudflow over glacial outwash deposits. Typically, the surficial material is a brown loamy, silty soil formed on the mudflow deposits, though there are knobs of volcanic bedrock forming hills in the area. The most recent geologic mapping in the area was completed in 2006 by Booth, et al. in the Geologic Map of King County (Pacific Northwest Center for Geologic Mapping Studies, 2006). The nomenclature presented in Booth, et al. has been used for the preparation of this document.

3.2.1 Geologic Units

Besides the sedimentary and crystalline bedrock forming the Cascades, there are six geologic units in the Enumclaw area which together form four hydrostratigraphic units. The geologic units, from youngest to oldest, are:

Osceola Mudflow (Qom): a heterogeneous mixture of silt, clay, sand, rock, and wood deposited as mudflow debris from Mount Rainier. Typical thicknesses range from 0 to 80 feet. Deposits typically have low permeability.

Vashon recessional outwash (Qvr): predominantly well sorted, permeable, sand, and gravel deposited by meltwaters off the Vashon glacier as it retreated. May include or grade into ice-contact deposits. Thicknesses range to over 80 feet.

Vashon ice-contact deposits (Qvi): poorly sorted sand and gravel which may include silt and/or large boulders. These sediments were deposited in the Enumclaw area in a strong fluvial environment by meltwater from the Vashon glacier and drainage off the Cascades and, therefore, are generally coarse and permeable (Luzier, 1969). Thicknesses in the Enumclaw area are highly variable; the unit may reach a thickness of 100 feet or more.

Vashon till (Qvt): gray compact mixture of clay, silts, sand, and gravel with occasional boulders. Deposited beneath the Vashon glacier, this unit typically has a low permeability. Thicknesses vary, but generally it is less than 80 feet thick.

Vashon advance outwash (Qva): compact sand and gravel unit deposited by meltwaters in front of the advancing Vashon glacier. Though it can be up to 300 feet thick elsewhere in the Puget Sound region, in the Enumclaw area the unit is apparently relatively thin, being less than 20 feet thick at the PC Johnson site. Drilling at the Boise Spring site identified 46.5 feet of material interpreted to be the Qva, though the upper 15 feet was dry.

Pre-Vashon, undifferentiated (Qpvu): for the purposes of this study, no further differentiation of unconsolidated geologic units was made below the Vashon Drift. This unit includes all sediments below the Vashon Drift and above bedrock and includes both permeable and low permeability zones.

Hydrostratigraphic units are generally defined as being either aquifers or confining layers. In the Enumclaw area, the hydrostratigraphic units of importance to this project are:

Osceola Mudflow confining unit is a low-permeability confining unit at the surface (at least in the Enumclaw area) formed by the Osceola Mudflow. This unit impedes downward infiltration of water to underlying water-bearing units. The confinement that results from this unit causes water levels in the uppermost aquifer to rise to near surface, thereby allowing springs to form where "windows" occur in the unit. The original, natural Watercress Spring likely formed in a small window or in a weak zone in the mudflow deposits that allowed water to percolate through the mudflow, similar to many of the other springs found on the plain. The recently compiled geologic map of King County (Pacific Northwest Center for Geologic Mapping Studies, 2006) indicates this unit is at the surface west of Watercress Springs, but is absent most of the area east of the springs. Drilling at the Watercress site found the unit to be 11 to 16 feet thick; the thickness was 45 feet at the golf course well site.

Vashon recessional aquifer is formed by water-bearing zones within the Qvr and Qvi. Where covered by the Qom confining unit, this aquifer is confined. Where Qvr or Qvi is at the surface, the aquifer is unconfined and forms a water table. The unit is confined at its base by the Qvt. At the Watercress site, the aquifer is confined with water levels within several feet of ground surface. Further east, the unit is likely unconfined. At Watercress, the aquifer was found to be 8 to 30 feet thick during drilling. The golf course well penetrated a thickness of 86 feet. The test well at Boise Spring found a thickness of 64 feet, though only the lower 17 feet were saturated.

Vashon till confining unit provides a base for the Qvr aquifer and confines the next regionally significant aquifer (in which the PC Johnson wells are completed). The upper portion of the confining unit is formed by Vashon till, but it also includes low permeability portions of the Qpvu deposits.

Drilling at the Watercress site did not fully penetrate this confining unit. It was found at depths of 19 to 46 feet. Drilling near Boise Spring found a Qvt thickness of 9 to 11 feet with up to 46.5 feet of Qva present as well beneath the till. Though the Qva forms an aquifer where the saturated thickness is sufficient to supply a well, it is not considered a significant aquifer for the City, as none of the City's sources are supplied by the Qva.

Pre-Vashon aquifer supplies the PC Johnson wells. It was identified as part of the Salmon Springs Drift by GeoEngineers (1998). The aquifer occurs at a depth of approximately 190 feet at the PC Johnson site. Its presence has not been confirmed at Watercress (approximately 0.5 miles south of PC Johnson) nor at the golf course site. It is believed to be absent at Boise Spring.

3.2.2 Boise Spring Hydrology

The Boise Spring facility has been a water source for the City since the early 1900s. The facility is located to the east of the City, south of Highway 410 on the northern flank of Baldy Hill, in the

SW ¼ of the NE ¼ and the SE ¼ of the NW ¼ of section 29, Township 20 North, Range 7 East (figure 2). The spring collection system is located on City-owned property and is surrounded by a fenced sanitary setback. The area surrounding the City's property is privately-owned timber land. The City has certificated municipal water rights for the site that authorize an instantaneous rate of 898 gpm (Qi) and an annual quantity of 1,270 acre feet (Qa).

Based on a review of records provided by the City, the Boise Spring source was constructed in the early 1900s. The structure has been updated several times. The facility currently consists of an "L"-shaped, below-ground vault constructed of concrete and stacked rock, with a concrete lid supported by concrete pillars. The longer arm of the L measures approximately 20 feet by 6 feet and has two 12-inch lateral collector lines entering its end. The short arm of the L measures 14 feet by 7 feet and houses the overflow and water system inlet. The long arm of the L is generally oriented to the southeast, the short leg to the southwest. An investigation of the facility in 2007 by Robinson, Noble & Saltbush indicated that the facility is in generally good condition. However, based on testing accomplished as part of the 2007 site investigation, there does not appear to be a significant amount of additional water production capacity available from this site in its current configuration as the head losses in the piping leading to the City's distribution system limit the amount of flow from the facility.

Recent test drilling at the City's Boise Spring property determined that unconsolidated material at the site is 57 feet thick (Pacific Groundwater Group, 2008). The spring is formed in the uppermost sequence of the coarse permeable deposits, interpreted as the Vashon recessional outwash. Underlying these sediments is approximately ten feet of Vashon till, which is sufficient to create a low permeability layer to perch the spring. The till caps approximately 40 feet of Vashon advance outwash sands which are deposited directly on the Tertiary bedrock. A test well and monitor well drilled to the east of the spring indicate that the recessional outwash thickens considerably to the east. Water level responses observed at the spring during drilling and testing of the test well imply continuity between the Vashon recessional outwash aquifer observed at the test well and Boise Spring. Figure 2 presents a diagram of the Boise Spring property with the location of the new test and monitor wells added. Available water well reports are presented in Appendix A.

The Vashon recessional outwash, while less than five feet thick at the spring location, is considerably thicker in the two wells drilled to the east of the spring. These wells penetrated 65 feet of Vashon recessional outwash material, though the upper 48 feet was dry. Pumping tests indicate an average aquifer transmissivity of 7,400,000 gpd/ft, and the average storage coefficient of 0.12 (dimensionless ratio), which indicates the aquifer is unconfined. GeoEngineers (1998) identified a northwest gradient for the Boise Spring site consistent with that indicated by the recent drilling and testing by Pacific Groundwater Group.

The Vashon recessional outwash is truncated to the north and west of the spring where it has been eroded away. The southern limit of the aquifer is the bedrock or lower permeability sediments on the flank of Baldy Hill. The eastern boundary is not clear from available

information, but the deposits appear to extend to a point where the recessional outwash sediments are in continuity with Boise Creek. Based on the elevation of the underlying till surface, it is believed a losing reach of Boise Creek (a reach where the net discharge to groundwater is greater than the recharge from groundwater) is recharging the aquifer. This presumption is supported by the fact that the small topographic catchment where the spring facility is situated is insufficient to provide the volume of discharge observed at the spring. Discharge from this aquifer forms springs along the valley wall where the aquifer is truncated. Larger springs (such as Boise Spring) form where the shape of the underlying till surface focuses flow into a smaller discharge area.

3.2.3 Watercress Spring Hydrology

The Watercress Spring site is located approximately one mile east of the City in the NW ¼ of section 19, Township 20 North, Range 7 East. The facilities at the site include a spring collection facility, a monitoring well network, and the new replacement well (Figure 3). The springs in this area are fed by the semi-confined Vashon recessional aquifer which is locally covered to varying degrees by the Osceola Mudflow deposits. The Vashon recessional aquifer overlies the Vashon till which provides a low permeability layer for the base of the aquifer. The spring collection system is surrounded by a sanitary setback, and the area surrounding this is undeveloped land. The City has certificated municipal water rights for the site that authorize an instantaneous rate of 2,287 gpm (Qi) and an annual quantity of 2,487 acre feet (Qa).

Historically, Watercress Spring was capable of producing the full instantaneous water right, but this rate could not be sustained for prolonged periods. In an effort to address this deficiency of the Watercress Spring source facility, Robinson, Noble & Saltbush recently completed an investigation of the hydrogeologic conditions at the facility for the City of Enumclaw (Robinson, Noble & Saltbush, 2006a). During this investigation, five monitoring wells were installed around the spring collection facility to characterize the shallow aquifer that feeds the spring and monitor water level responses to production from the spring facility.

As a result of this investigation, a 20-inch replacement well was drilled to a depth of 50 feet at this location (Robinson, Noble & Saltbush, 2007b). This well is screened in a coarse gravel deposit (Vashon recessional outwash) present from 20 to 40 feet below ground. This deposit was also encountered throughout the monitoring network. Subsequent testing indicates that the unit is the same geologic unit supplying the nearby spring system.

The new well was constructed with a sanitary surface seal of hydrated bentonite. It is better protected than the spring collection facility nearby because this seal is installed through the entire 20-foot cover of mudflow deposits between the aquifer and land surface. Refer to Appendix A for a construction diagram and a geologic log of the well. During testing, the Watercress Well was pumped at rates of up to 4,300 gpm. The Watercress Well is rated for production at 2,287 gpm (which correlates with the instantaneous withdrawal rate under the City's existing water rights for Watercress Spring).

The Vashon recessional outwash varies in thickness in the vicinity of the Watercress facility. Monitor well drilling identified aquifer thicknesses ranging from 8 to 30 feet. In fact, the aquifer was not encountered at the initial drilling location for the replacement well (to a depth of 35 feet). The location was moved less than 50 feet and 20 feet of aquifer was encountered. The outwash gravel was deposited directly on the eroded surface of the Vashon till, forming an irregular base. Drilling records indicate that the upper surface of the gravel deposit is also irregular, either as a result of depositional processes or subsequent erosion.

The recessional outwash aquifer responds in a channel-like fashion rather than as an extensive and uniform deposit of gravel. Significant boundary effects were apparent in the water levels recorded during the pumping tests of the replacement well. The hydraulic conductivity of the aquifer materials are among the highest seen in the region, with implied values as high as 26,700 ft/day. The very early test data at the replacement well itself (prior to the serious reflection of the aquifer boundaries) indicate an aquifer transmissivity of approximately 4,000,000 gpd/ft. The calculated storage coefficient for the recessional outwash aquifer is 0.12 (dimensionless ratio). Even with the limited lateral extent and channel-like nature of the aquifer, it can support substantial production given such highly permeable material.

3.2.4 PC Johnson Wellfield Hydrology

The PC Johnson Wellfield is located approximately two miles to the northeast of the City at the intersection of Southeast 424th Street and 284th Avenue Southeast in the SW ¼ of section 18, Township 20 North, Range 7 East. Three wells have been drilled at this location: PC1, PC2, and PC3. All of these wells were completed in a confined pre-Vashon sand and gravel aquifer (Hart Crowser, 1980; Robinson & Noble, 1986; Robinson, & Noble, 1997). A diagram of the PC Johnson wellfield is presented in Figure 4. Please refer to Appendix A for the construction diagrams and geologic logs of the three wells.

Test drilling by Hart Crowser in 1980 identified 59 feet of permeable sand and gravel present below 171 feet at this location. Subsequent drilling at the site (Wells PC2 and PC3) encountered the brown sand and gravel aquifer somewhat deeper (205 and 195 feet below surface, respectively). These permeable sands and gravels are interbedded with lower permeability silty sands and gravels. In the initial work by Hart Crowser, these sediments were referred to as the Salmon Springs aquifer. The actual type section for the Salmon Springs formation is located approximately 10 miles to the west of Enumclaw on the valley wall east of Sumner at an elevation of approximately 250 feet. This elevation is approximately 300 feet lower than bottom of the formation forming the aquifer at the PC Johnson Wellfield. Recent mapping and interpretation in the Puget Lowland has resulted in a significant revision to the stratigraphic nomenclature. Based on this stratigraphic re-interpretation, the aquifer supplying the PC Johnson Wellfield is not likely correlative with the Salmon Springs deposits, which have recently been dated to approximately 1 million years in age. Based on the reviewed information and without age dating of the deposits or overlying/underlying units, it is not possible to confidently determine the formation name for the aquifer supplying the PC Johnson wellfield.

A recent analysis of the wellfield provides a detailed chronology of the development of this source and the efforts at maintaining the individual wells since their installation (Robinson, Noble & Saltbush, 2008). In summary, PC2 has undergone multiple redevelopment attempts in order to regain lost productivity. Due to a loss in production as a result of encrustation and fouling problems, Holt Drilling decommissioned PC1 in 1997. Well PC3 was drilled in 1997 to replace PC1. Per the recent review of the City's water rights at this location, it has been determined that the City has certificated municipal water rights for the site that authorize an instantaneous rate of 1,500 gpm (Qi) and an annual quantity of 1,680 acre feet (Qa).

The permeable pre-Vashon deposits that supply the PC Johnson Wellfield are found from 175 to 231 feet below land surface at the wellfield where, according to the driller's log for PC1, bedrock was encountered. Other than the information at the wellfield, there is limited information regarding the extent or thickness of these deposits. Clearly, the bedrock of the Cascade foothills bounds the aquifer to the east. The valleys of the White and Green Rivers are incised through these sediments and truncate the aquifer materials forming effective boundaries to the north, south, and west. Pumping tests indicate an aquifer transmissivity of 50,000 gpd/ft, and the measured storage coefficient of $2.5X10^{-4}$ indicates the aquifer is confined. The recharge to the aquifer results from the downward percolation of precipitation through the overlying aquifers and confining units. Discharge points include reaches of the White and Green Rivers, springs along the valley sides, and the lower reaches of Newaukum Creek.

3.2.5 Golf Course Well Field Hydrology

In 2004, the City was deeded the Enumclaw Golf Course, formerly owned and operated by the King County Parks department. The golf course has historically relied upon a well to provide irrigation water. The irrigation well was drilled in the 1950s. The irrigation well is located near the 16th tee box, on the western edge of the golf course. An investigation of this well in 2006 suggested that, while the well produces a considerable amount of water, the general condition of the well house and wellhead are poor. A test well was drilled approximately 200 feet to the south of the golf course irrigation well in June 2006 (Robinson, Noble & Saltbush, 2006b). The test well confirmed the presence of a significant thickness of aquifer material at the location and served as a monitoring point during a pumping test of the golf course irrigation well.

Based on these test results, a replacement for the irrigation well was drilled in 2007 (Robinson, Noble & Saltbush, 2007a). The replacement production well is located at 45224 284th Avenue SE in the SE ¼ of section 30, Township 20 North, Range 7 East, near the Enumclaw Golf Course and the Enumclaw Expo Center (formerly the King County Fairgrounds). The well was drilled to 137 feet below ground surface and is screened from 81 to 131 feet below ground surface (see Appendix A for well construction and geologic log). Figure 5 presents a diagram showing the locations of the old irrigation well, the monitoring well, and the new Golf Course Replacement Production Well.

The aquifer in which the irrigation well, test well, and replacement well are completed has a transmissivity of over 1,000,000 gpd/ft. Data collected during the pumping test of the

replacement well identified a negative aquifer boundary (an apparent transmissivity decrease to 488,000 gpd/ft after five hours of pumping). Clearly, the aquifer is bounded to the east where it is truncated by the bedrock outcrops forming Baldy Hill and the Cascade foothills. The valley of the White River also forms an effective boundary to the south as it cuts completely through the aquifer deposits. The western extent of the aquifer has not yet been determined.

Recharge to this aquifer is a result of infiltration of precipitation through the overlying sediments. Discharge points may include the lower reaches of Boise Creek and springs formed in the valley of the White River where the valley truncates the aquifer. The City has certificated water rights for the site that authorize an instantaneous rate of 676 gpm (Qi) and an annual quantity of 516 acre feet (Qa).

3.3 Conceptual Model

The geology of the Enumclaw area is quite complex, varying from volcanic and sedimentary bedrock to highly permeable glacial outwash deposits. The area can generally be described as an alluvial upland extending westward from the Cascade foothills, truncated by the valleys of the Green and White Rivers. Sediments forming the upland consist of recent alluvial deposits, glacial outwash and till deposits, older interglacial and glacial sedimentary deposits, and lahar or mudflow deposits from Mt. Rainier. Aquifers form in the higher permeability sand and gravel unconsolidated deposits that are present below the water table. Confining units are formed by lower permeability deposits such as mudflow and till.

As delineated by the Cascade Foothills and the two rivers, the upland is generally triangularly shaped. Bedrock forms an effective eastern boundary for aquifers in the area. The White and Green Rivers form discharge boundaries on the other two sides of the triangle.

A conceptual model of the hydrogeologic system was developed for this study based on known and available information. Aquifers were defined based on the geology of the area as presented by the Pacific Northwest Center for Geologic Mapping Studies (2006), the subsurface information available from water well reports, and the boundary conditions created by the upland and foothills. Aquifer parameters were defined at the locations of the production wells where detailed testing information was available. The extents of the aquifers were defined based on information from geologic mapping, water well reports, and geographic features. A diagram of the conceptual model is presented on Figure 6.

3.3.1 Hydrostratigraphic Units

The geologic and hydrostratigraphic units of the area are described in Section 3.2. The hydrostratigraphic units of the conceptual model are essentially the same as presented with some minor simplifications. The Vashon recessional and the ice contact deposits are lumped together as a single hydrostratigraphic unit. Bedrock is not differentiated by type, but represented as a single hydrostratigraphic unit. The aquifer units were defined at the locations of the sources and refined based on additional subsurface data and observations. Thicknesses

and hydraulic conductivities for the aquifers were established at each known location. The areal extent of each aquifer was based on additional well logs, well testing, and geologic mapping.

3.3.2 General Recharge and Discharge

The Enumclaw area received an average of over 56 inches of precipitation per year for the period from 1999 to 2007, most of this falling as rain. The foothills to the east of the City receive even higher amounts of rain and snow. Recharge to the aquifers is a result of the direct infiltration of precipitation into the aquifer sediments (particularly for the Vashon recessional outwash aquifer), runoff from bedrock and its subsequent infiltration along the edge of the foothills, infiltration of runoff in losing reaches of local streams (reaches where water from the stream percolates into the subsurface), and indirect infiltration of precipitation through overlying confining units. Septic return flow also provides a minor source of recharge in some areas. Discharge from the aquifers occurs in gaining reaches of streams and rivers (where groundwater percolates into the streams), as well as at springs, seeps, and wells. Evapotranspiration may also be an important discharge mechanism of the Vashon recessional outwash aquifer.

3.3.3 General Flow System Patterns

Generally speaking, water flows from the foothills of the Cascades toward the discharge points. The ice contact deposits along the foothills capture precipitation (both directly and as runoff) and recharge the aquifer systems. The balance between the recharge and the rate of discharge through springs and seeps creates a gradient with a westerly pattern. Local bedrock outcrops and geologic changes influence the gradient, as does recharge from or discharge to the streams.

3.3.4 Model Description

At Watercress and the golf course locations, the two major, nearby boundaries for the Vashon recessional aquifer are bedrock (on the east) and local creeks (Newaukum Creek for Watercress and Boise Creek for the golf course site). The bedrock bounds the aquifer and the creeks form a line of discharge for the aquifer. The White River forms a more distant discharge boundary further to the west and southwest. Recharge to the Vashon recessional aquifer system is largely from precipitation. Discharge is by several mechanisms.

Water from precipitation enters the aquifer via four distinct routes: direct infiltration where the mudflow deposits do not cover the Vashon recessional aquifer, direct infiltration of runoff from the bedrock foothills, leakage out of losing stream reaches, and leakage of infiltration through the overlying mudflow deposits. Water levels in the aquifer are higher near the bedrock foothills in part because the recharge rate is higher in this area. This is where the aquifer at least partially lacks a confining layer (the mudflow deposits are partially absent in this area) so that the permeable sediments containing the aquifer receive direct infiltration of precipitation. Further, this is where runoff from the bedrock can also directly recharge the aquifer. A smaller source of recharge is septic system return flow in areas not connected to sanitary sewer systems.

The main discharge from the Vashon recessional aquifer is to local (and regional) surface waters, through water production (wells), and as leakage to deeper hydrostratigraphic units. The aquifer provides baseflow to Newaukum Creek and Boise Creek either directly or through springs (such as Watercress). To the west and south of Enumclaw, the Vashon recessional aquifer likely discharges to the White River. To the north, the aquifer likely discharges as spring flow above and tributary to the Green River. Leakage out the base of the aquifer, through the confining layer formed by the underlying Vashon till, also forms a major discharge for the Vashon recessional aquifer (and provides considerable recharges to the deeper aquifers). Water production from the City's facilities at Watercress and the golf course (and to a lesser extent by domestic wells) also serves as a large aquifer discharge, though not at the scale of the other two outflow mechanisms. Where the water table is near the ground surface, evapotranspiration can become an important discharge mechanism.

Generally,water flows through the Vashon recessional aquifer from the bedrock highlands toward discharge points along Newaukum Creek and the White River. This makes the flow generally in a western direction. GeoEngineers (1998) identified a northwest trending gradient for the Vashon recessional aquifer through the Watercress site (toward Newaukum Creek). Measurements collected from the monitoring network at the Watercress site during the Watercress study completed in 2006 indicate the gradient is to the west-northwest (Robinson, Noble & Saltbush, 2006a).

The deeper, pre-Vashon aquifer that the PC Johnson Wellfield is completed in receives recharge via the infiltration of water from overlying saturated materials as described above. The flow pattern is somewhat easier to describe, as there is less of an influence on the aquifer system from the shallower creeks and springs. Discharge points include reaches of the White and Green Rivers with elevations below approximately 550 feet above sea level, springs along the valley sides below this elevation, and the lower reaches of Newaukum Creek. In a general sense, water flows through this aquifer system from the bedrock highlands of the east toward discharge points along the Green River, the lower reaches of Newaukum Creek, and the White River. This makes the flow generally in a west to northwest direction. GeoEngineers (1998) identified a northwest trending gradient for the aquifer at the PC Johnson site.

4.0 WHPA Delineation

4.1 Introduction

Wellhead protection areas are based on capture zones. Capture zones are the area around a groundwater source that contributes flow to the source during a specified period of time. Capture zones are typically presented as boundaries on a map, though this mode of presentation does not account for the vertical component of the system. Water applied to the ground surface within the travel-time capture zone may or may not reach the source within the indicated travel time, as the aquifer supplying the source in question may be at depth beneath the surface, or may be protected from surficial impacts by a low permeability deposit between the top of the aquifer supplying the source and the land surface.

Travel-time boundaries of capture zones can be determined by either technical or non-technical methods, although technical methods are preferred so that the WHPP better protects the actual area contributing water to the source. There are four delineation methods approved by the Health for the development of a WHPP. They are, from generally least to generally most accurate: the calculated-fixed-radius method, analytical modeling, hydrogeologic mapping, and numerical modeling. The particular method employed (and the accuracy of that method) depends largely on the availability of hydrogeologic data. Numerical modeling, for example, can be highly accurate but also typically requires a relatively large amount of data. For areas with typical data availability, time-of-travel boundaries are commonly delineated by hydrogeologists through the use of analytical modeling, hydrogeologic mapping, or a combination of these two methods. These methods typically provide a reasonably technical level of delineation.

4.2 Model Descriptions

For this study, two techniques were employed to delineate the capture zones for the City's wellfields, analytic element modeling, and hydrogeologic mapping. Analytic element modeling is a specialized form of analytical model that allows considerably more flexibility than standard analytical modeling. While analytic element modeling is typically limited to a single layer, it is well suited to modeling areas where there is considerable interaction between groundwater and surface water, such as the springs and shallow aquifers that supply the City of Enumclaw. Analytic element modeling is not as intensive an approach as numerical modeling. However, unlike simple analytical modeling, the analytic element modeling approach can address complex boundary conditions and heterogeneities in subsurface materials and recharge.

An analytic element model was developed for an area that included both the Watercress and golf course locations; another somewhat simplified analytic element model was developed for the PC Johnson wellfield. After review of the PGG's Boise Spring investigation (PGG, 2008), it was concluded that the perched sequence of the Vashon recessional that forms Boise Spring is heavily influenced by flow in Boise Creek. Analytic element modeling was found to not be appropriate for the definition of capture zones for Boise Spring due to the short residence time of water in the aquifer. As a result, the capture zone delineation for Boise Spring was accomplished by hydrogeologic mapping using existing maps, topographic data, and evaluation of the recently completed work (PGG, 2008). The capture zones were evaluated and analyzed to define appropriate wellhead protection areas. The WHPAs defined for the City's sources by this project are shown on Figure 7.

Analytic element models were generated with the program GFLOW 2000, version 2.1.2, by Haitjema Software. This modeling code divides a modeled domain into near-field and far-field regions. Generally, modeled features in the near-field region can directly be recharge or discharge points. Features in the far-field region do not directly provide recharge or discharge to the model, but provide head control for the near-field area. Thus, modeled streams within the near field gain or lose water to the aquifer, while streams in the far field only provide head

control. Boise Creek and Newaukum Creek have both near-field and far-field reaches defined. The White and Green Rivers were represented by elevation-controlled line sinks[2] in the far field as a means for water to exit the model. The elevations of the streams were determined based on elevation information on U.S. Geological Survey topographic maps of the area.

Recharge from precipitation was applied over the entire modeled domain. It was assigned a value of 0.0064 feet per day (28 inches per year) based on calculations detailed in Woodward and others (1995). Additional recharge was applied in areas representing the unconfined portions of the Vashon recessional and Vashon ice contact deposits at a rate of 0.0032 feet per day (an additional 14 inches per year). The additional recharge provided in these areas was also based on calculations from Woodward and others (1995). The confined and semi-confined Vashon recessional aquifer did not have additional recharge applied to it, as the overlying Osceola Mudflow confining unit (which was the basis for the primary recharge coverage) controls the amount of recharge reaching the aquifer.

The model used for the calculation of the Watercress and golf course capture zones was built based on the considerable amount of recent subsurface work in the area (Robinson, Noble & Saltbush, 2006a, 2006b 2007a, and 2007b). The recent drilling and testing provided accurate aquifer thicknesses and hydraulic conductivity information as well as accurate gradients and head values. Aquifer thickness was set at 50 feet for the Watercress area and 95 feet for the area around the golf course. Hydraulic conductivities were 2,430 and 1,575 feet per day for the near-field aquifer areas, respectively. Bedrock forming the Cascade foothills was defined as an aquifer inhomogeneity with a very low hydraulic conductivity and porosity using the mapped geology (Pacific Northwest Center for Geologic Mapping Studies, 2006). Smaller bedrock features (such as Pinnacle Peak southwest of the golf course well and the smaller, unnamed bedrock knob near Watercress) were represented by no-flow boundaries. Ice contact deposits and lower-permeability aquifer regions were represented by aquifer inhomogeneities with lower conductivity values bordering the higher conductivity areas. Shapes of these inhomogeneities were controlled by subsurface information where available, and adjusted as appropriate to create the observed head patterns.

The model for the PC Johnson wellfield used the same bedrock boundary as was defined in the Watercress version, as well as the same recharge and drain configurations. The aquifer was modeled with a thickness of 200 feet and a hydraulic conductivity of 250 feet per day. Similar to the Watercress/golf course model, the PC Johnson model included several regions with differing thicknesses and hydraulic conductivities around the aquifer as the model transitions to the background values. The shapes and characteristics of these inhomogeneties were adjusted to calibrate the head pattern and levels in the model.

The model that was used for the investigation of Boise Spring was defined based on the geology presented by PGG in the recent Boise Spring study (PGG, 2008). Modeling was approached in a similar fashion, but a smaller region was considered. As in the Watercress/golf course model

[2] A line sink is a model element with defined water elevations.

and the PC Johnson model, the hydrogeology of the region was represented by several regions of differing hydraulic conductivity. The aquifer thickness varied based on the location in the model, as the Vashon recessional is unconfined. Hydraulic conductivity was set at 5,000 feet per day, somewhat less than the value measured by PGG. Boise Creek was modeled in the near field and provided head control as well as discharge and recharge. Similar to the other models, shapes and characteristics of the model's inhomogeneties were adjusted to calibrate the head pattern and levels in the model.[3]

While an analytic element model is not generally calibrated in the way a numerical model can be, the calibration of the models used in this effort was accomplished through the adjustment of the base model hydraulic conductivity, the conductivity of the line sinks, and the thicknesses and hydraulic conductivities of the inhomogeneities bordering the aquifers. Calibration targets were the observed water levels at the respective wellfields, general gradient patterns, and estimated water levels in areas without sufficient field-supported data.

4.3 Uncertainty

As with any sort of method used to delineate capture zones, the methods used in this effort contain an inherent amount of uncertainty. Modeling can accurately delineate capture zones when the system involved is well defined and relatively simple. Unfortunately, real-world groundwater systems are typically not simple, and hydrologic information is often sparse. While the models used herein were specifically designed to simulate the systems and were developed based on available geologic information, the information used is by no means comprehensive.

With the exception of the bedrock boundaries that were based on observation of the outcrops, the stratigraphic boundaries used were inferred based on interpretations of the geologic information available, particularly that presented by the Pacific Northwest Center for Geologic Mapping Studies (2006). Subsurface information and aquifer parameters are only available at limited locations, requiring an interpretative approach for the generation of the models. Application of detail where information is available and interpretation of the remainder of the subsurface (based on the site-specific information) helps to mitigate uncertainty in the models resulting from the variability of the subsurface. Generally speaking, the effects of localized heterogeneities in the aquifer "average out" as the modeled domain gets larger and as one moves further from the production points.

Gradient has a significant control on the location and shape of the delineated capture zones. The gradients modeled are similar to the measured values for the Watercress site as presented in Robinson, Noble & Saltbush (2006a). Unfortunately, no such time-synchronous data sets are available for the golf course or PC Johnson sites to determine gradients for these locations. For these sites, the modeled gradients are generally consistent with what was presented in

[3] While a model was made for Boise Spring, it was not used to determine WHPAs when analyses indicated the residence time for water in the aquifer supplying the spring was less than six months.

GeoEngineers (1998). Capture zones were slightly broadened to account for gradient uncertainty when defining the wellhead protection areas.

4.4 Wellhead Protection Areas

Wellhead protection areas are typically presented as zones based upon the horizontal time of travel for water captured by a well (or other groundwater source) to move through the aquifer. Typically, they are defined for periods of six months, one year, five years, and ten years. In all cases for the City's groundwater sources, aquifer boundaries are reached before the ten-year time of travel limit, so Zone 4 represents a buffer zone rather than a true ten-year time of travel. Defining travel times for wellhead protection Zones 1 to 4 are given below. Collectively, the zones for a specific source form the wellhead protection area for that source.

Zone 1	6-month time of travel
Zone 2	1-year time of travel
Zone 3	5-year time of travel
Zone 4	Buffer zone

4.4.1 Boise Spring

The Boise Spring capture zone and wellhead protection area were determined through hydrogeologic mapping of the catchment area and time-of-travel calculations. Initial calculations of the catchment area and precipitation indicate that precipitation falling within the probable catchment (the topographically defined basin contributing water to the spring) is inadequate to supply all of the discharge observed from Boise Spring. This indicates that the spring is supplied by an area of contribution larger than the valley in which the spring is located. An analytical element model of the Vashon recessional aquifer in this area supports this calculation.

The Vashon recessional aquifer supplying the spring is unconfined locally and will readily accept recharge resulting from the infiltration of precipitation on the north-eastern side of Baldy Hill. Further to the east, the Vashon recessional is covered with lower permeability deposits from the Osceola mudflow. As discussed in Section 3.2.2, the spring is formed within the Vashon recessional and is perched on top of the Vashon till. According to the information presented in PGG (2008), the surface of the till slopes downward from the north and west toward the location of the spring. The shape of the till surface serves to direct water in the overlying Vashon recessional outwash to the spring. Additionally, a reach of Boise Creek flows across the Vashon recessional outwash to the east of the spring. An analysis of the elevation relationships between the spring, the water levels in the test and monitoring wells, and the creek suggests that this reach of Boise Creek may be a losing reach, providing recharge to the aquifer supplying the spring.

The recent drilling and testing at the Boise Spring property (PGG, 2008) observed groundwater seepage velocities (average linear velocity of water traveling through the aquifer) that approached 1,500 feet per day based on the impact to water quality at the spring due to drilling.

With such a high velocity, a volumetric analysis of the local spring catchment suggests that it has a residence time of less than 6 months. This analysis is based on constant production from the spring set to the maximum instantaneous water right flow of 898 gpm (approximately 14% more than the average flow allowed on an annual basis) and an average annual recharge falling on the catchment area. This analysis, as well as the PGG study, determined that Boise Spring is fed by the Vashon recessional aquifer.

With the short residence time described above, water travels from recharge to discharge in this system within a 6-month period. Consequently, the WHPA for Boise Spring is formed solely by Zones 1 and 4. Zone 1 of the Boise Spring wellhead protection area forms an irregular "rectangular" shape trending from the southeast to the northwest on its long axis. This zone extends to the top of Baldy Hill, approximately 3,000 feet from the spring facility. The first topographic ridge to the west of the spring forms part of the western boundary of Zone 1, the remainder of the western boundary is formed by the edge of the recessional outwash deposits which also forms the northern edge. The southeastern boundary of Zone 1 occurs along the topographic ridge extending northward from the easternmost peak of Baldy Hill, approximately 3,500 feet from the spring facility. The eastern boundary of Zone 1 was established based on the location of the topographic ridge to the east of the spring. Due to the complexities of the interaction between the Vashon recessional aquifer and Boise Creek, the remainder of the Boise Creek drainage basin has been delineated as Zone 4, a buffer zone, for Boise Spring.

4.4.2 Watercress Spring and Production Well

Capture zones for the Watercress Spring facility were calculated using the analytic element model described earlier. Production from this facility was modeled at a rate of 2,287 gallons per minute from the Watercress Well, which corresponds to the maximum withdrawal rate allowed under the water rights for the facility. Were the instantaneous rate produced continuously, the total withdrawal would exceed the total annual production rate allowed under the City's water rights. Use of the instantaneous pumping rate is a conservative approach for the delineation of capture zones and is generally consistent with the methodology used in the previous wellhead protection plan (GeoEngineers, 1998).

Due to the modeling software and technique used, the modeled capture zones extended past the bedrock forming the Cascade foothills that truncate the aquifer. This is an artifact of the modeling method, as bedrock was not modeled as a no-flow boundary but rather was modeled as an aquifer material with a low porosity and hydraulic conductivity. The capture zones will be effectively truncated at the bedrock boundary, though the aquifer may receive recharge from precipitation falling on the western side of the divide at the top of the ridge. The modeled capture zones were evaluated and interpreted to form the wellhead protection areas presented on Figure 7.

The wellhead protection area for the Watercress Spring facility forms an ellipsoid that extends to the east and intercepts the wellhead protection area for the PC Johnson Wellfield. Zone 1 of

the Watercress Spring WHPA forms a rough circle that extends 2,300 feet to the east of the facility and 500 feet to the west. Zone 2 for Watercress Spring reaches 5,000 feet to the east, almost to the bedrock boundary formed by the Cascade foothills. Zone 3 intersects with Zone 3 of the PC Johnson Wellfield, creating a roughly rectangular combined wellhead protection area that reaches the limits of the aquifer where it is truncated by the bedrock located 6,700 feet to the east of the facility. Zone 4 (the buffer zone) extends eastward to the first topographic divide east of Zone 3 and represents the topographically defined area that drains into Zone 3.

4.4.3 PC Johnson

Capture zones for the PC Johnson Wellfield were calculated using the analytic element model described earlier. Production from the two wells was set at 900 gallons per minute for PC2 and 600 gallons per minute for PC3. These rates correspond to the combined 1,500 maximum instantaneous pumping rates allowed from the wellfield by the City's water rights. This rate of production would exceed the annual production rate allowed under the wellfield water rights by approximately 44% if operated continuously at these rates. Because a portion of the annual quantity allowed on the wellfield water rights is defined as supplemental to the annual quantity on the City's Watercress and Boise Springs water rights, the total production assumed for PC Johnson in this analysis would never be produced concurrent with the maximum annual water production allowed for Watercress. However, for simplicity and conservatism in defining the WHPAs, the maximum instantaneous water right production rates were assumed to be produced concurrently at both the wellfield and at Watercress in the modeling effort.

The PC Johnson Wellfield (PCJ) Zone 1 forms an ellipsoid that reaches 1,100 feet to the east of the wells. PC Johnson Zone 2 intercepts the Watercress Spring Zone 2, forming an irregular shape as described above. Zone 3 is fully combined with Zone 3 from the Watercress facility and is truncated by bedrock approximately 6,500 feet to the east of the site. Zone 4 (the buffer zone) extends to the first topographic divide to the east of Zone 3.

4.4.4 Golf Course

The Golf Course Replacement Production Well has an irregularly shaped capture zone that wraps around the southern end of Baldy Hill. Similar to the other areas, bedrock truncates the aquifer before a ten-year time of travel is reached. The production rate of the Golf Course Production Well was set at 676 gallons per minute, which corresponds to the instantaneous rate allowed under the City's water rights but is approximately twice the allowed annual water right quantity.

The Zone 1 of the WHPA for the Golf Course Replacement Production Well extends 1,500 feet to the southeast from the wellhead, reaching Boise Creek. As the water in the creek is at a higher elevation than the water in the aquifer, it is possible that surface water from the creek may be recharging the aquifer at this location, and therefore, that the well may potentially capture any contaminant introduced to the creek. However, the geology of the area is mapped as mudflow deposits which are expected to have a low vertical permeability, likely and substantially mitigating this risk. Regardless, the potential for impact to the well due to a surface spill

reaching the creek is something to be aware of. Zone 2 extends nearly to the base of Baldy Hill, approximately 2,000 feet to the southeast of the wellhead. Zone 3 is truncated by the bedrock forming Baldy Hill and extends to the south for approximately 5,500 feet. Zone 4 (the buffer zone) extends to the top of Baldy Hill.

5.0 Hazard Inventory and Risk Assessment

5.1 Introduction

The inventory of potential contaminant sources within the wellhead protection areas was performed according to the December 1993 Washington Department of Health guidance document entitled, "Inventory of Potential Contaminant Sources in Washington's Wellhead Protection Areas." This section summarizes the basic steps for conducting an inventory, including:

- Review and identification of potential and known contaminant sources
- Data management
- Prioritizing risks to the WHPA

A summary of potential contaminant sources presented in the Health document is reproduced in Table 1. These sources were considered when performing the contaminant inventory for the Enumclaw WHPA. The inventory was completed for the area surrounding Enumclaw and its four water sources.

5.2 Contaminant Source Inventory Methodology

Parcel Insight, Inc. (PI), an environmental database research company, reviewed federal and state environmental databases for any known or potential contaminant sites within a designated area surrounding Enumclaw. The area researched can be found in the PI report presented in Appendix B. Identified hazard locations within and proximal to the wellhead protection areas can be found on the hazard inventory map (Figure 8). The identified hazard inventory list can be found in Appendix C. The following Washington State Department of Ecology and EPA databases were reviewed in order to locate sites of known or potential soil and groundwater contamination. Definitions of these databases can be found in the PI report.

- NPL
- RCRA CORRACTS
- RCRA TSD
- CERCLIS
- CERCLIS NFRAP
- ERNS
- RCRA LQG
- RCRA SQG
- RCRA CESQG
- LUST ACTIVE TRIBAL
- LUST INACTIVE TRIBAL
- BROWNFIELDS
- HMIRS
- TRIS
- CSCSL
- CSCSL HSL
- CSCSL NFA
- LUST
- UST
- SWLF SEA
- SWLF KING
- SWLF STATE
- DECISIONS
- INST ENG CONTROLS
- RCRA ND

Table 1: Potential Contaminant Sources Listed by Type

Category I

Sources Designed to Discharge Substances

Subsurface Percolation (e.g. septic tanks and cess-pools)
Injection Wells
- Hazardous waste
- Non-hazardous waste (e.g. brine disposal and drainage)
- Non-waste (e.g. enhanced recovery, artificial recharge solution mining, and in situ mining)

Land Application
- Wastewater (e.g. spray irrigation)
- Wastewater by-products (e.g. sludge)
- Hazardous waster
- Non-hazardous waste

Category II

Sources Designed to Store, Treat, and/or Dispose of Substances; Discharge through Unplanned Release

Landfills
- Industrial hazardous waste
- Industrial non-hazardous waste
- Municipal sanitary

Open Dumps, Including Illegal Dumping (Waste)
Residential (or Local) Disposal (Waste)
Surface Impoundments
- Hazardous waste
- Non-hazardous waste

Waste Tailings
Waste Piles
- Hazardous waste
- Non-hazardous waste

Materials Stockpiles (Non-waste)
Graveyards
Animal Burial
Above-ground Storage Tanks
- Hazardous waste
- Non-hazardous waste
- Non-waste

Underground Storage Tanks
- Hazardous waste
- Non-hazardous waste
- Non-waste

Containers
- Hazardous waste
- Non-hazardous waste
- Non-waste

Open Burning Sites
Detonation Sites
Radioactive Disposal Sites

Category III

Sources Designed to Retain Substances during Transport or Transmission

Pipelines
- Hazardous waste
- Non-hazardous waste
- Non-waste

Materials Transport and Transfer Operations
- Hazardous waste
- Non-hazardous waste
- Non-waste

Category IV

Sources Discharging Substances as a Consequence of Other Planned Activities

Irrigation Practices (e.g. return flow)
Pesticide Applications
Fertilizer Applications
Animal Feeding Operations
De-Icing Salt Applications
Urban Runoff
Percolation of Atmospheric Pollutants
Mining and Mine Drainage
- Surface mine-related
- Underground mine-related

Category V

Sources Providing Conduit or Inducing Discharge through Altered Flow Patterns

Production Wells
- Oil (and gas) wells
- Geothermal and heat recovery wells
- Water supply wells

Other Wells (non-waste)
- Monitoring wells
- Exploration wells

Construction Excavation

Category VI

Naturally Occurring Sources whose Discharge is Created and/or Exacerbated by Human Activity

Ground Water - Surface Water Interactions
Natural Leaching
Saltwater Intrusion/Brackish Water
- Upconing (or intrusion of other poor-quality natural water)

5.2.1 Field Survey

A windshield survey was performed by Robinson, Noble & Saltbush, Inc. on November 29, 2007 in order to verify the location of sites identified in the regulatory database review as well as locate potentially unregulated or unknown sites of potential contamination. This survey consisted of a drive-by reconnaissance of all known public roads in the study area in order to accurately map the location of known and potential sites for the inventory. Mail and telephone surveys, door-to-door surveys, and personal interviews were not performed. For each physically located site, notes, photos, and GPS data were recorded.

5.3 Land Use

In addition to site-specific hazards identified by the PI report or the field survey, certain land uses present potential hazards.

5.3.1 Residential Land Use

Certain types of residential land use can form a potential hazard. Residential land use is found within and surrounding the City limits. This includes low-density to high-density housing. Residential homes within the City limits are typically connected to the City's sewer system and do not typically pose a threat to groundwater quality. However, residential homes outside City limits typically rely on septic systems for sewage treatment and dispersal, creating a recognized hazard to groundwater quality. As a result of the presence of septic systems, residential land use areas that are outside City limits and fall within the City's WHPAs pose a risk to the City's groundwater sources. Besides septic effluent, other pollutants found in residential land use areas that can have a negative affect on groundwater quality including herbicides, pesticides, and common household chemicals (introduced to the environment through improper disposal methods including dumping into a septic system).

5.3.2 Commercial and Industrial Land Use

Commercial and industrial land use can form a variety of potential hazards. Commercial and industrial land uses are generally limited to the center and eastern portions of the City. The highest pollution hazard results from the use of underground storage tanks (UST) to store fuels or other hazardous chemicals. There is a small industrial sector on the east side of the city. Most of the businesses in this area are manufacturing operations. These sites may store/use hazardous chemicals for manufacturing.

5.3.3 Agricultural Land Use

Agricultural land use can also present potential hazards. A large portion of the area surrounding the City of Enumclaw is zoned for agricultural land use. Within this land use area there are two sources of pollution in addition to the residences also present on some agricultural properties. One source of pollution originates from ranching and the other is from farming. Livestock ranching is a source of nitrogen loading into shallow soils, surface waterways, and groundwater. Farming typically relies on many different chemical pesticides and herbicides to protect crops. Fertilizers are also commonly applied to crops to increase

yields. These fertilizers typically contain nitrogen, phosphorous, and potassium as primary nutrients, as well as smaller amounts of other chemicals. Additionally, a typical farm or ranch uses tractors or other large equipment, requiring use and storage of petroleum products and other chemicals on site for maintenance and repair of the equipment.

5.3.4 Forest Land Use

The foothills of the Cascade Mountains rise up to the east of the City of Enumclaw. Portions of these foothills are zoned as forest land use. This land use presents a minimal, but possible, threat for pollution. Possible sources of pollution include vehicle accidents involving fuel or oil spills, illegal dumping of waste, and mechanical failure of logging equipment that result in the release of hydraulic fluids, lubricating oils, or fuel.

5.3.5 Undeveloped Areas

All of the delineated WHPAs are within officially zoned areas, but not all of these zoned areas are currently developed. Undeveloped areas in the WHPA are expected to have the lowest potential for contamination due to the nature and low impact of activities occurring there.

5.4 Methodology for Establishing Risk Priority

The methodology for prioritizing risks in the City's WHPA was partially based on the EPA Guidance document entitled "Managing Ground Water Contamination Sources in Wellhead Protection Areas: a Priority Setting Approach" (1991). The ranking effort was also based on the level of confidence in data and information that is currently available for known and potential contamination sites.

Each site was ranked according to three decision levels. The decision levels are listed below in Table 2 (Level I represents the highest hazard risk criteria, Level III is the lowest).

Table 2: Overall Risk Prioritization

Decision Level	Available Data and Information
I	Proximity of potential hazard to the WHPA
II	Type of contamination per DOE/EPA database or land use
III	Straight-line distance from the wells to the potential hazard

Each known or potential hazard was first scored and then ranked using decision level one. Sites with equal level one rankings were then further scored and ranked using decision level two. If sites were still equal in priority, they were further sub-prioritized under decision level three. Once sites were differentiated in priority, no further ranking was necessary. The criteria for scoring sites within each level are discussed below.

Decision Level I –Proximity to WHPA

For the first decision level, the sub-prioritization of contaminated sites was based on their location in the WHPA zones; the shorter the travel time, the higher the priority. Scores for each site and hazard category are summarized on Table 3.

Table 3: Decision Level I: Proximity to Source

Sub-Priority Score	Proximity to Source
1	½-year time-of-travel from the source, Zone 1
2	1-year time-of-travel from the source, Zone 2
3	5-year time-of-travel from the source, Zone 3
4	10-year time-of-travel from the source (no zone designation for Enumclaw)
5	Within the WHPA Buffer Zone, Zone 4

Decision Level II –Type of Contamination

For the second decision level, the sites were ranked as either known contamination or potential contamination sites. Known contamination sites were defined as those with known releases of contaminants according to the environmental database survey results. Potential contamination sites are sites or land areas that are used in ways that could pose a risk to the groundwater. This category's scoring is summarized on Table 4.

Table 4: Decision Level II: Type of Contamination

Sub-Priority Score	Known or Suspected Contamination	Type of Site	Assumption
1	Known	Confirmed and Suspected Contaminated Sites (CSCSL) and Comprehensive Environmental Response, Compensation, and Liability Information (CERCLIS)	As a worst case scenario, contamination is assumed to be comprised of the most toxic chemical identified for the site, based on information contained in the Ecology and EPA databases.
2	Known	Leaking Underground Storage Tanks (LUST)	All contamination sites assumed to contain petroleum products.
3	Known	Washington Independent Cleanup Report (WA ICR)	Since not confirmed as totally cleaned, assumes cleanup not 100% effective.
4	Potential	Septic Systems, Surface Impoundments, Land Applications of Biosolids	Nitrates and bacterial contamination are assumed to be health risks, along with potential chemical hazards, but it is not known whether there is likelihood to contaminate the City's groundwater sources.
5	Potential	Resource Conservation and Recovery Act Sites (RCRA)	It is assumed that hazardous chemicals may be stored on site, but contamination has not necessarily occurred. FINDS sites are included with this category.
6	Potential	Underground Storage Tanks (UST)	It is assumed that petroleum products are stored in underground storage tanks on site, but contamination is not imminent.
7	Potential	Accidental Spills	This category includes highways and railroad tracks that pass through the WHPA. The risk is based on the possibility of hazardous material spill (e.g., gasoline).
8	Potential	Pesticide Application	Pesticide use appears to be concentrated along transportation corridors and power lines, but may also occur in farmed areas.

Sub-Priority Score	Known or Suspected Contamination	Type of Site	Assumption
9	Potential	Storm Water	This category includes the potential release of lead, petroleum products, and/or solvents.
10	Potential	Fertilized Sites	This category is predominantly represented by fertilized lawns and farms.

Decision Level III – Straight–line Distance from Wells

For potentially hazardous sites with similar characteristics for prioritization decision levels I and II, the straight-line distance from the site to the closest City well or spring source was used to further rank the sites. Those sites closest to the wells or springs were given a higher priority.

5.5 Hazard Inventory

A total of eleven sites and land uses were identified as potential hazards. These sites are listed in ranking order on Table 5. Two listings represent sites of known contamination, these sites rank as the ninth and tenth top hazards. The remaining nine listings are identified as sites with potential contamination or are hazards related to land use.

Table 5: Reported and Potential Contamination Sites

Ranking/Map Reference Number	Site/Land Use	Address	Database	Hazard/Contaminant	WHPA Zone(s)
1	Residential land	n/a	n/a	septic tanks, pesticides	1, 2, 3
2	Land application of bio-solids	Branch Farm	n/a	nitrogen loading	1, 2
3	Dairy farms	n/a	n/a	nitrogen, animal waste	1,2
4	Highway 410	n/a	n/a	chemical/fuel spills, pesticides, herbicides	1, 4
5	Logging activities/Forest land use	n/a	n/a	fuel/chemical spills	1, 3, 4
6	Borrow pit (multiple locations)	n/a	n/a	reduced impedance to groundwater system, illegal dumping	1, 3, 4
7	Enumclaw Golf Course	45220 288th Avenue Southeast	n/a	fertilizers, pesticides, herbicides	1, 2
8	Agricultural land	n/a	n/a	fertilizers, pesticides, herbicides	1, 2, 3
9	King Co. Solid Waste Land Fill	SE 440th St	SWLF KING, RCRA	leachates	2
10	Weyerhaeuser Facility and mill pond (closed)	31002 Highway 410	RCRA SQG, CSCSL, UST	petroleum products	4
11	Corliss Resources gravel mine	29416 Highway 410	n/a	reduced impedance to groundwater system, fuel spills	4

5.5.1 Identified Contaminant Sources

There are only two confirmed contaminant sources located within or near the WPHA. These are the closed King County Solid Waste Land Fill and a closed Weyerhaeuser facility that lies outside the travel-time portion of the WHPA but within the buffer zone.

Ranked ninth, the closed King County landfill near Enumclaw reportedly began operations as early as 1939 and has been under investigation for groundwater contamination since 1983. Partial closure activities at the site were initiated in 1988; the landfill was completely closed in 1993. During the investigation of the landfill, a number of reports have been completed by the King County Department of Public Works Solid Waste Division. These reports present water quality information and gradients in the immediate vicinity of the landfill site. Despite some of the samples collected from monitor wells exceeding water quality standards, the monitoring reports reviewed for the preparation of this Wellhead Protection Plan suggest the overall trend in the contaminant concentrations has decreased during the last 25 years. The monitoring efforts should continue as planned per the recommendation of the King County Department of Natural Resources and Parks, Solid Waste Division, Engineering Services Section.

The closed Weyerhaeuser facility and former millpond area off Highway 410 is ranked tenth. This site has undergone considerable remediation due to surface and subsurface contamination from a number of chemicals that were formerly stored or used on site. The main operations area has been completely remediated and is no longer listed on a government database. However, during the remediation of the site, sediments at the bottom of the former millpond were determined to be contaminated with petroleum hydrocarbons. The contaminated sediments were removed from the millpond and mounded near where they were collected. The sediment mound was capped with layers of pit run, flume sand, HDPE, and construction fabric. With the contaminated sediments capped, the risk posed to ground and surface water by the potential of these chemicals leaching into the underlying soil is considered to be low. In addition, this site is outside the time-of-travel zones for all of the City's WHPAs, though still within the buffer zone. Weyerhaeuser has applied for a No Further Action letter from the Washington State Department of Ecology, but the application was denied due to insufficient documentation during the application process and the possibility that groundwater monitoring may be needed to monitor water quality around the site.

5.5.2 Potential Groundwater Concerns

For wellhead protection planning, it is important to understand the potential sources and types of contamination, as well as actual contamination sites. The potential contaminant sources were ranked in the same manner as the confirmed contamination sites.

A primary concern to the City's water system is the presence of septic systems in residential and agricultural land use areas. Septic systems are designed specifically to disperse wastewater directly into the ground. As such, this wastewater has a very high potential to reach groundwater systems. Wastewater from septic tanks carries nitrogen, bacteria, phosphorous, pharmaceuticals, as well as a number of other compounds of concern. However, it is the

nitrogen in the wastewater that has the potential to have the most negative impact on groundwater quality. When nitrogen in septic effluent is dispersed through a drain field, it is typically present as ammonium or ammonia. In the presence of soil bacteria and oxygen, it is rapidly converted into nitrate. Nitrate is highly soluble and remains mobile in groundwater systems. High levels of nitrate are detrimental to human health. Several factors control the rate of nitrogen contribution into the ground from septic systems. These factors include housing density of the area, the average number of people to a household for the area, the age of the septic systems, the types of septic systems, and whether or not the septic systems receive maintenance according to the manufacturer's specifications. The use of residential septic systems within Zone 1 makes residential land use the number one ranked hazard.

The use of pesticides and related chemicals in residential land use areas is of lesser concern compared to septic systems but still pose a risk to groundwater resources. Homeowners use pesticides to treat home gardens and lawns. Similarly, herbicides are used to kill weeds and nuisance plants in gardens and lawns. The City also uses these types of chemicals at city parks, schools, and municipal buildings. Furthermore, herbicides are applied along Highway 410 (ranked fourth) by the Department of Transportation to control vegetation along the shoulder of the highway.

Land application of biosolids is included on the list as item two. According to discussions with the City, Branch Farm, a property located near the corner of 424th street and 284th Ave, had biosolids applied as recently as 2005. This property falls within Zones 1 and 2 of the PC Johnson wellfield. Discussions with the City indicate that biosolids application has not occurred on this property since they were last applied in 2005. If applied at rates exceeding the soil's capacity to consume the nutrients present, biosolids may result in elevated nitrate concentrations in groundwater.

Dairy farms located in the six-month travel time zones are ranked third due to their location and types of contaminants. Dairy farms pose a risk because they are a potential source of nitrogen loading and bacterial contamination in groundwater. Typically, animal waste is stored on site in large above-ground ponds and then spray-applied to the land to water and fertilize the local grass crop that the cattle browse.

The Highway 410 corridor, ranked fourth, is the main east-west corridor through Enumclaw and a major highway to Crystal Mountain. Although it is not a major transportation corridor such as Interstate 5 with major industry centers situated upon it, it still carries the potential for a major spill due to an accident involving a tanker truck. Spills reaching Boise Creek have a potential to impact the Golf Course Replacement Production Well and Boise Spring, as Boise Creek flows through Zone 1 for the golf course well and the buffer zone for the spring.

The operation of logging equipment in the timber lands of the Cascade foothills requires refueling and servicing during logging operations. There is a potential for the release of fuels, lubricating oils, or hydraulic oils as a result of the operation and servicing of the equipment,

equipment malfunctions, or accidents. Recreational off-road driving is also a potential source of pollution. Unfortunately, illegal dumping is also commonplace in areas such as these and must be considered a threat, albeit low, to groundwater quality. For these reasons, logging and forest land use ranks fifth.

Locations that have been mined or excavated are considered a hazard to groundwater resources because they typically result in the formation of a closed or semi-closed depression that may also be a path of least resistance into the underlying soils. Several borrow pits (ranked sixth) and the Corliss Resources gravel mine (ranked eleventh) are examples of surface mining within or very near to the delineated WHPAs. Normally, liquids that are released onto a relatively undisturbed ground surface will run off the surface in a down-gradient direction or infiltrate into the surficial material and percolate through the vadose zone. Depending on the nature of the subsurface material, infiltrating liquids may reach groundwater. Areas where mining has removed the uppermost soils and created closed or semi-closed depressions can increase the rate of infiltration, increasing the risk to the aquifers. Further, borrow pits are often preferential locations for illegal dumping, though active operations such as the Corliss Resources facility do not typically have this issue.

The Enumclaw Golf Course is included on the potential contaminant source list (in the seventh spot) because of the use of fertilizers, pesticides, and herbicides to maintain the course. A significant portion of the Enumclaw Golf Course lies within Zone 1 for the Golf Course Replacement Production Well. While application rates are carefully monitored by golf course staff, the regular watering that the fairways and greens require may cause chemicals applied to the turf to filter down into soils at a greater rate than normal rainfall would produce. An old domestic well situated near the 14th hole tee box that is reported to be 60 feet deep was constructed for the original homestead (date unknown) that existed near the well before the golf course was expanded in 1973 and the residence was moved. The well has not been in use for many years and was not properly decommissioned when the course was constructed. Wells such as these present a serious risk to the groundwater system since they are a direct conduit to the aquifer.

One site that was not ranked is the former landfill located at the north end of the Enumclaw Golf Course. According to Seattle-King County Department of Public Health's April 30, 1985 *Abandoned Landfill Study in King County*, this landfill served the City and the surrounding area until 1939, the year the King County landfill on SE 440th Street opened. According to this study, the landfill was located to the south of 448th street and east of 288th street. Sampling completed in 1984 indicated low levels of methane gas in the soil and no evidence of leachate reaching Boise Creek. The landfill is not considered a significant threat to groundwater because it was closed before the time hazardous chemicals came into heavy production and widespread use (around the time of WWII) and because it does not fall within or directly upgradient of any of the WHPAs, though it is situated between the City's wellfields. If this site poses major concern to the City, the City could install a set of monitoring wells surrounding the location of the former landfill and monitor groundwater levels and quality.

5.6 Potential Contamination Pathways

It is important to understand the potential pathways for contaminant migration since these contaminant pathways can increase the vulnerability of an aquifer by decreasing travel time from a source to a wellhead. The following section will briefly summarize the main mechanisms for transport of contaminants to the subsurface.

Discharge onto the ground surface: Direct discharge to the ground surface occurs when products or waste materials are spilled onto the ground. With the help of rainfall infiltration, the materials percolate into the subsurface and, if a sufficient volume of material is released, they eventually reach the water table and migrate down gradient within the shallow aquifer. In large enough quantities, spills can even impact the relatively deep aquifer where the PC Johnson wells are completed.

Direct discharge to the subsurface: Discharge to the subsurface occurs from septic systems and dry wells. Discharge into the subsurface is a more direct mechanism for transport because contaminants are discharged closer to the water table and because subsurface discharge bypasses the upper layers of soil that have the ability to absorb and disperse many types of contaminants.

Abandoned wells: Old, improperly constructed, or improperly abandoned wells[4] can act as direct conduits for contaminant transport to the aquifer. In such wells, transport can occur between the ground surface and aquifer zones because of a lack of a well seal or inadequately constructed seal.

Stormwater runoff: Rainfall onto the ground either induces infiltration into the subsurface or occurs as runoff. The quality of the water that infiltrates or runs off is dependent on the type of land use and the potential presence of contaminants, which may be located on the ground surface. Stormwater infiltration issues are similar to those of discharge to the ground surface. Stormwater runoff is considered differently because it runs over the surface of the ground, picking up and dissolving potential contaminants and may eventually discharge these contaminants to groundwater via infiltration from ditches or ponds designed to percolate water or into nearby surface-water bodies.

The potential concerns due to water infiltration or runoff are diverse and reflect the land use activities in the area of interest. Paved roadways, parking areas, and residential developments can contribute heavy metals and petroleum hydrocarbons that originate primarily from vehicle-related emissions. Industrial and commercial operations commonly process and release a variety of organic pollutants (e.g., solvents, paints, and dry cleaning solutions), as well as petroleum products, which are potential hazards to WHPAs.

[4] Washington State has standards for construction and abandonment of wells, WAC 173-160.

6.0 Management Strategies and Implementation Tasks

The completion of wellhead protection planning provides no safeguards unless effective management strategies are implemented to prevent potential contamination of groundwater sources. The City of Enumclaw does not own or control all of the land within its WHPA. Maximum effectiveness can be achieved in implementing the WHPP through a cooperative effort between the City, neighboring property owners/residents, and state and local agencies which regulate potentially harmful activities within a WHPA. A key component to its management of the area will be the notification of the existence and extent of the management area to the proper agencies and to local property owners/residents.

6.1 Wellhead Protection Management Strategies

The following sections detail proposed strategies developed to protect the integrity of the City's water sources.

6.1.1 Long-Term Management and Cooperation

This WHPP program strategy is designed to be a continuing management activity to meet the City's future planning needs or to adapt to changes in the physical conditions of the aquifer system. As such, the management strategies and practices outlined within this study provide a general direction but will periodically need to be refined to fit specific conditions. Additional adaptations may be needed to address future activities and regulations or changes in current regulations that may affect the WHPAs.

6.1.2 WHPP Land Use Strategies

The City of Enumclaw has no authority to directly control land use for those areas of the WHPA that are outside the city limits. Therefore, the City must develop a cooperative relationship with those state and local agencies that administer land use management programs.

<u>Special Protection Area Designations:</u> At the present time, a recommended strategy for the City is to seek special designations for the WHPA from pertinent agencies. The City should evaluate and seek the different designations that may be most beneficial, including

- A *Special Protection Area* designation under the state groundwater quality standards (WAC-173-200),
- A *Special Use Area* by the Department of Agriculture, and
- An *Environmentally Sensitive Area* under various County-level programs

<u>Land Management Activities:</u> The City should seek to ensure that owners or agencies responsible for land parcels and developments use and monitor best management practices (BMP) for control, reduction, and restriction of potential contaminants into the WHPA.

6.1.3 WHPP Regulatory Strategies

This WHPP is designed to use the existing statutory rules and regulations to protect groundwater quality. The City, in coordination with state and local agencies having statutory

authority in the area, could monitor regulated activities within the WHPA. The following regulatory strategies are recommended.

Well Drilling inside the WHPA: The City should encourage more frequent well construction inspection than currently occurs and seek to ensure regulatory requirements are complied with.

Washington State Environmental Policy Act (SEPA)/Development Permits: The City should work to secure notification of all proposed SEPA/development permit actions within WHPAs from responsible agencies such as the King County Departments of Development and Environmental Services and Health. Depending upon the development proposal, the City may request that King County require hydrogeologic evaluations that specifically address impacts to groundwater quality and quantity parameters for any development within the WHPA.

Septic Systems: The City should obtain as-builts of all septic systems within the WHPAs and coordinate with King County to ensure proper inspection and maintenance occurs. Any septic systems that are deemed to pose unacceptable risk to the WHPAs should be identified and a plan of action developed for rectifying any concern. Currently, the City's municipal code Section 17.08.110.A gives the City Engineer authority to allow use of septic systems on short plat lots of over one acre if there is "acceptable percolation capabilities." As a policy, the City Engineer could not allow use of the septic system option within WHPAs unless a licensed geologist or hydrogeologist determines whether or not the site can safely utilize a septic system.

6.1.4 Planning Strategies

A substantial degree of future protection for the WHPA will be achieved through present-day planning and coordination. In order to accomplish the required level of future protection, the following strategies are recommended.

Comprehensive Land Use Planning: In October 2008, King County adopted an updated comprehensive land use plan for the county. The City should participate in future updates to seek the incorporation of policies, land use designations, and regulatory directives in the County comprehensive plan that help to protect the City's WHPAs.

Emergency Response: The City should notify the appropriate emergency response organizations of the location of the WHPA and establish formal communication protocols with the first-response emergency units.

6.1.5 Data Management Strategies

One of the principal goals of the WHPP is the development of a data collection network and analysis plan capable of providing the City with advance warning of contamination to the City's water supply. The following data management strategies seek to establish and maintain scientific data upon which future WHPP actions can be based.

Sentinel Wells: The City should consider the installation of sentinel monitoring wells up gradient of each wellhead or wellfield to provide early warnings regarding potential aquifer contamination, particularly for the shallow sources at Watercress, Boise Spring, and the golf course. Regular sampling of this network would provide time for the City to prepare to allocate additional water sources if one or more wells are required to be temporarily shut down due to aquifer impact. The most strategic locations to install the sentinel wells are the six-month and/or one-year zone boundary of the WHPAs for each water source. In addition, a small number of monitor wells could be installed down gradient of the Weyerhaeuser mill pond sediment mound to monitor groundwater quality.

Abandoned Well Inventory: The City could locate and inventory decommissioned, abandoned, and unused wells. Owners of these wells could be notified of the potential liability such wells cause and be educated on the benefits of well decommissioning.

Underground Storage Tanks Inventory: The City could inventory and locate underground storage tanks (USTs). Besides those presently identified by the current hazard inventory, this inventory should include new tanks placed after the hazard inventory was finished, residential home heating-oil USTs, and/or other tanks that were not previously identified.

Drywell and Storm Water Systems Monitoring: The City should encourage King County Water and Land Resources Division to develop an evaluation and monitoring plan for dry wells within the WHPA. The City, in coordination with the responsible agencies, should evaluate the adequacy of stormwater facilities including proper routing, retention, and detention. A balance should be found that allows optimum recharge of storm water to groundwater systems while adequately protecting the water quality of the aquifers.

6.1.6 Education Strategies

Education of the public and residential/non-residential occupants of the WHPA concerning groundwater protection is a critical portion of the WHPP. Through proper education, the degree and potential for future contamination can be greatly reduced; therefore, the following recommendations are made.

If not already in place, the City should develop educational programs regarding groundwater protection for the residents and businesses located near or within the City's WHPAs. Topics could include septic-tank maintenance, fuel-oil storage tank maintenance and abandonment, proper use of herbicides and pesticides, and hazardous material use, disposal and storage. The King County Health Department, the Washington Department of Health, and the United States Environmental Protection Agency all have programs in place to assist water purveyors with their WHPPs. These programs include educational materials that will support this process.

In addition to City-run programs, the City could participate in and support small-quantity waste disposal programs and actively work with state and local government in developing and creating public education programs concerning groundwater.

6.2 Wellhead Protection Implementation Tasks

In order to accomplish the protection of the WHPA, it is recommended that the City implement the WHP tasks listed below. These tasks have been ordered in their recommended priority of implementation. The City may institute all or a portion of these tasks, depending upon available funding, time, or other concerns.

1. Ensure that the City's Emergency Response Plan includes WHP planning. The City should also:
   A. Promote adoption of the WHPA into the Comprehensive Plan of King County,
   B. Focus the applicable state and local programs to the area,
   C. Review management strategies,
   D. Incorporate new data ,
   E. Evaluate new requirements,
   F. Oversee educational programs, and
   G. Evaluate new approaches to WHP.

2. Establish formal communication with first responders; send WHPA notification letter to first respondents.

3. The City should also notify the Health and Planning/Land-Use departments of the county of the existence of the City's WHPAs and seek designation of the WHPA as a special protection area. The City should request that:
   A. The County health department assist with wellhead protection by ensuring wells are properly constructed, and
   B. King County planning department consider the WHPAs in their designations of critical areas regulations, susceptibility mapping, and development permitting.

4. It is recommended that the City seek to create awareness of the wellhead protection area by posting metal "WATER SUPPLY PROTECTION AREA" signs at the borders of Zone 2 or Zone 3 of the PC Johnson, Watercress, and golf course WHPAs and along Highway 410 where it enters the Boise Spring Zone 4 WHPA.

5. Communicate the location of the WHPA, explain basic WHP concepts, and address specific WHP concerns to industrial/commercial site owners and local gravel mine owners.

6. Increase the public awareness regarding groundwater susceptibility and protection for residents living within the WHPA. This notification letter should be given to homeowners either at the time of service hookup or as part of property escrow. The letter could be sent to existing homeowners with the current billings or as a part of regular notifications.

   The City should deliver a copy of the wellhead protection plan to the King County library system and possibly post it on the City's website. This will allow interested residents to learn more about the wellhead protection program of the water system.

In addition, inform local residents of the WHPA through a press release sent to the Enumclaw Courier-Herald.

7. Promote public education programs concerning proper septic tank maintenance and proper hazardous waste disposal. The City could continue to regularly sponsor household hazardous waste disposal events and co-sponsor regular visits of the King County Solid Waste Division's Wastemobile to help prevent improper disposal of wastes in the WHPA. In addition, the City should require a licensed geologist or hydrogeologist to approve sites for the installation of new septic systems within the WHPA.

8. Assure that potential water quality and hydrogeologic impacts of surface development within WHPAs are adequately evaluated during the SEPA/development permitting process. Ensure appropriate regulations are in place outside the City limits to address the potential impact of storm water runoff and infiltration on WHPAs.

9. Request that King County include the City on the distribution list for any monitoring or cleanup reports for the closed King County Solid Waste Land Fill. Furthermore, request to have regular meetings with a scientist working on the monitoring project so they can debrief the City on the newest round of water quality sampling. This will allow the City to re-evaluate the risk the landfill poses to the water system every few years until it is deemed that the landfill no longer poses a risk to the City's water system.

10. Request that Weyerhaeuser and the Department of Ecology include the City on the distribution list for any monitoring or cleanup reports for the closed Weyerhaeuser Enumclaw Sawmill Site (located in Zone 4 for Boise Spring). This will allow the City to re-evaluate the risks to the City's Boise Spring source as new information becomes available.

11. The City has identified the location of a former residential well located on the golf course that was never properly abandoned when the residence it served was moved for the development of the golf course. This well and the original golf course irrigation well may both be direct avenues for surface water to reach the aquifer (since the condition of the surface seals is unknown and presumed to be compromised). These two wells should be properly retrofitted as monitoring locations or formally decommissioned as soon as reasonably possible.

12. On a semi-annual basis, review the CSCSL, LUST, and other significant environmental database listings within the WHPA for new listings.

13. The City should develop data on the number and size of exempt underground storage tanks within the 1-year WHPA (Zone 2). Also, the City could promote and coordinate public education programs concerning underground tank hazards, leak detection methods, and

proper removal and closure procedures. These programs should target owners of exempt underground tanks.

14. Encourage development and use of best management practices during the development and maintenance of property, including herbicide and pesticide use. This effort should emphasize transportation corridors and large land units including the City's golf course, Expo Center/parks, gravel mining operations, and forest parcels. Drywells and stormwater facilities should be mapped and evaluated for risk to the WHPAs.

15. Encourage thorough analysis of groundwater impacts for siting, operation, and reclamation of gravel quarries and mines. Seek to have the proper agencies require mine operators to install monitoring wells. These wells should be capable of monitoring for potential impacts from site operations for mines within and adjacent to the WHPA. Seek to have the owners document the use of hazardous materials in mining activities within and near the WHPA.

16. The City should inventory wells located in WHPA Zones 1 to 3 (six-month, one- and five-year time of travel). This inventory should include accurate location information, available Water Well Reports or construction information, and the current status of the well. In cases where the well has been decommissioned, abandoned, or is otherwise unused, the owners of these wells should be informed about proper well decommissioning procedures.

17. The City should consider installing sentinel monitoring wells up gradient of several of the City's wells. Sentinel wells should be considered at the following locations, in order of priority:
    1. Boise Spring, near east end of Zone 1 south of Highway 410
    2. Watercress, at Zone 1 border near 440th Street (down-gradient from the Landfill)
    3. Golf Course Replacement Well, at the southern end of Zone 2

18. Identify and update all City design standards and codes that relate to WHP. Ensure adequate inspection to verify compliance with requirements for WHP. Design standard updates may include special requirements for sewer pipe construction and stormwater infiltration and pretreatment.

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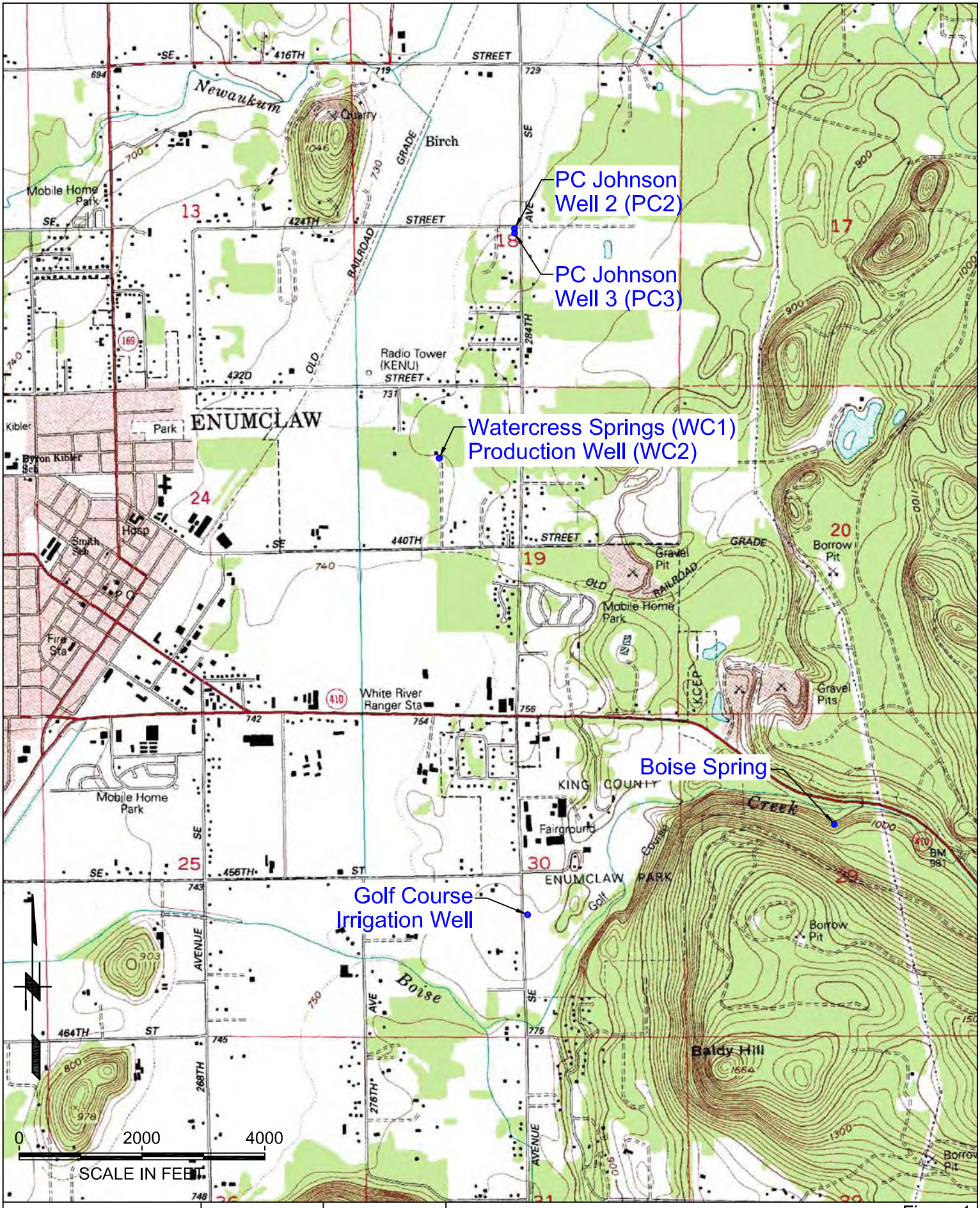
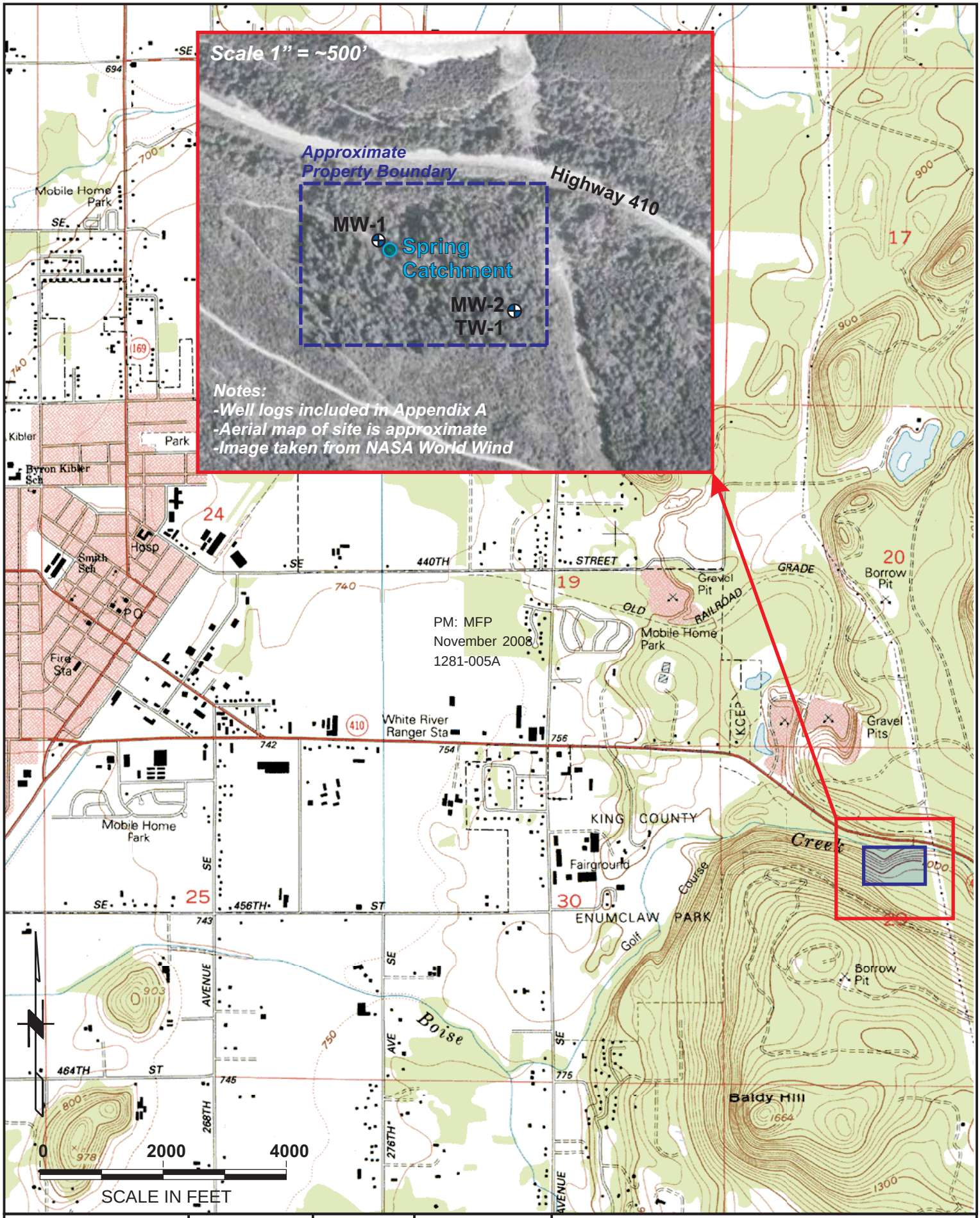
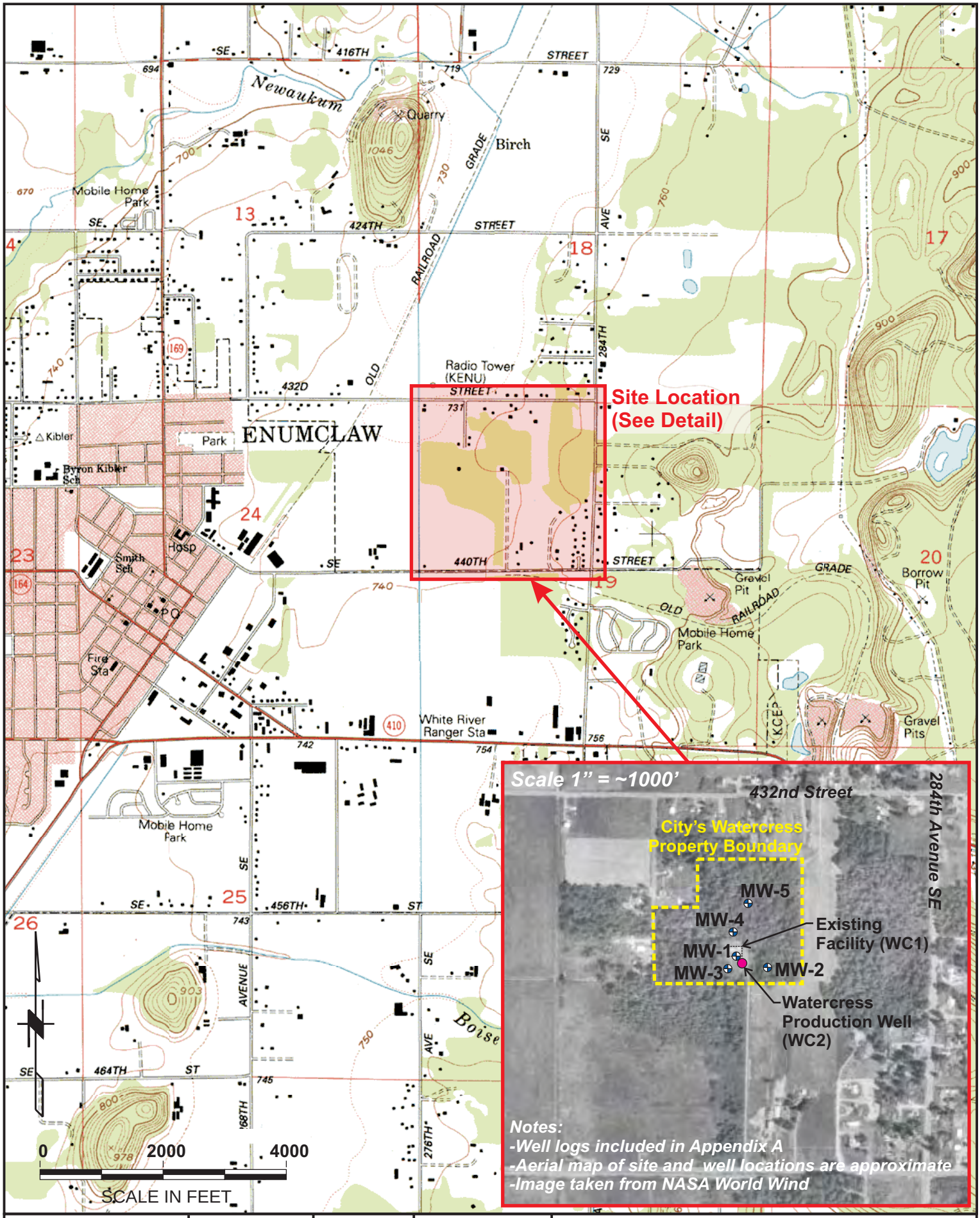
The statements, conclusions, and recommendations provided in this report are to be exclusively used within the context of this document. They are based upon generally accepted hydrogeologic and environmental practices and are the result of analysis by Robinson, Noble & Saltbush, Inc. staff. This report, and any attachments to it, is for the exclusive use of the City of Enumclaw. Unless specifically stated in the document, no warranty, expressed or implied, is made. We do not warrant the absence of non-visible mold and we do not accept any liability for the presence of mold, visible or otherwise.



ROBINSON NOBLE SALTBUSH INC. GROUNDWATER & ENVIRONMENTAL SCIENTISTS	PM: MFP October 2009 1281-005A	King County T 20 N/R 07 E Scale 1" = 2000'	Figure 1 Water Source Location Map City of Enumclaw: Wellhead Protection Plan



ROBINSON NOBLE SALTBUSH INC. GROUNDWATER & ENVIRONMENTAL SCIENTISTS	Note: Basemap taken from USGS Enumclaw Quad.	PM: MFP October 2009 1281-005A	King County T 20 N/R 07 E - 29 Scale 1" = 2000'	Figure 2 Boise Spring Detail Map City of Enumclaw: Wellhead Protection Plan



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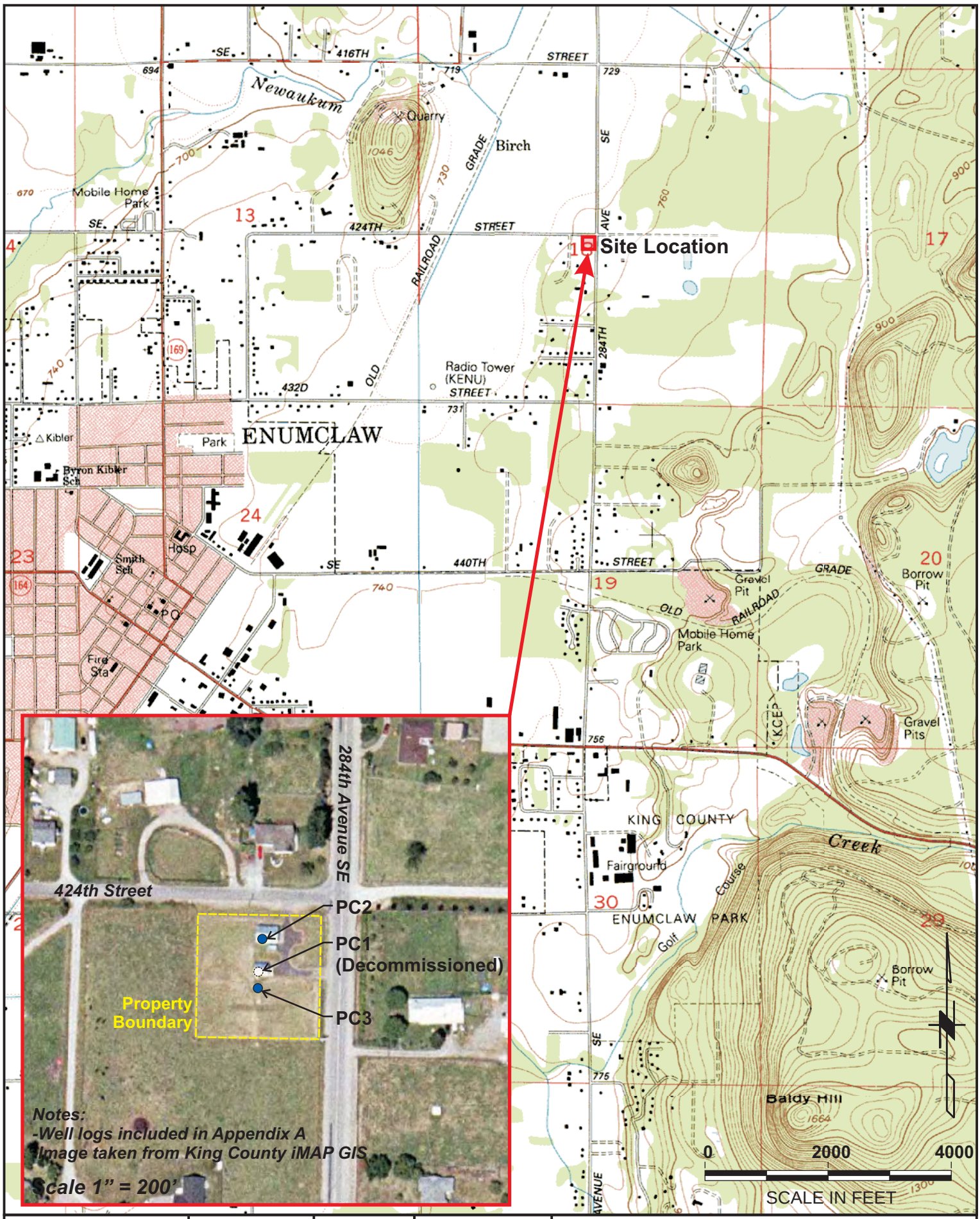

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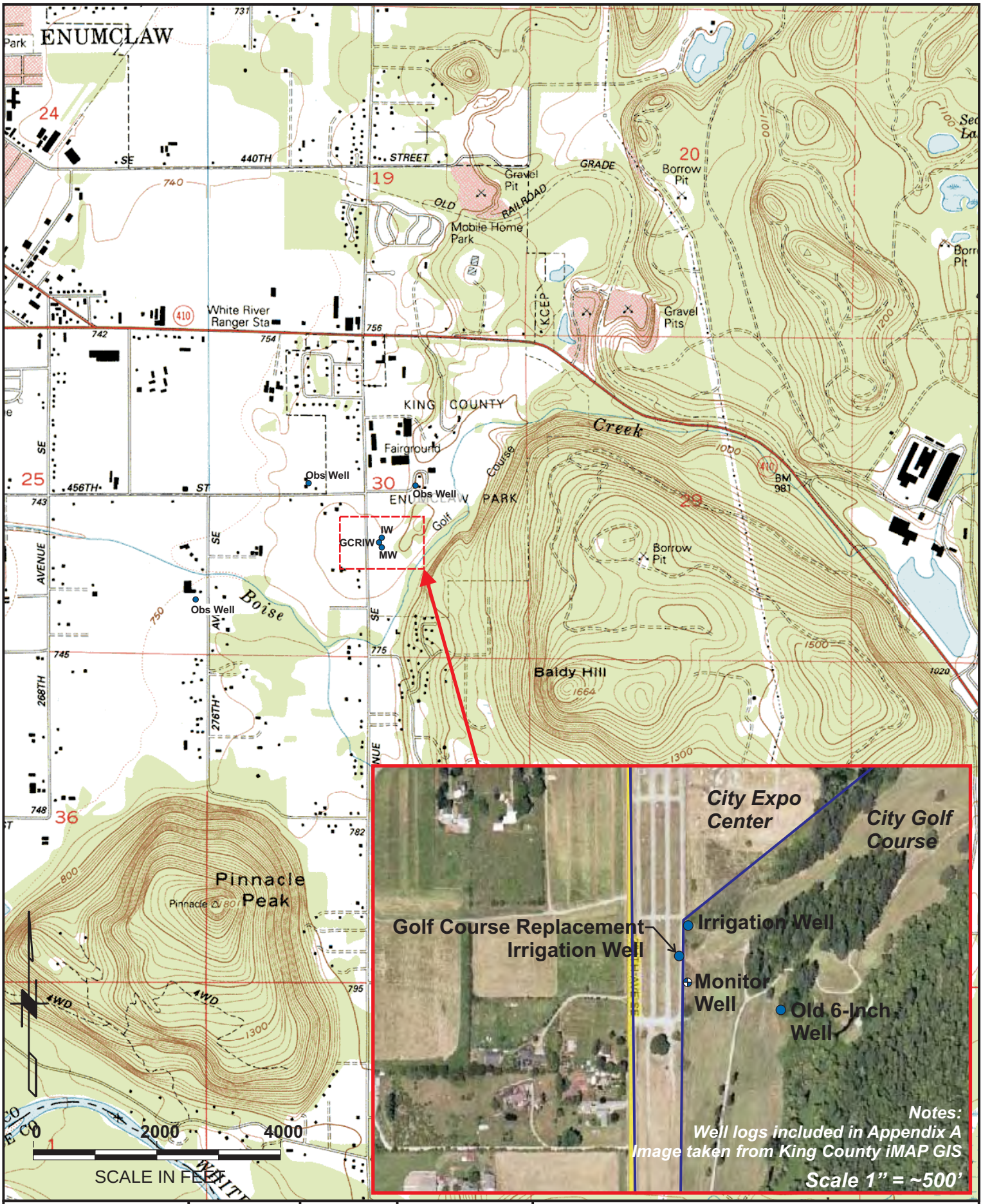
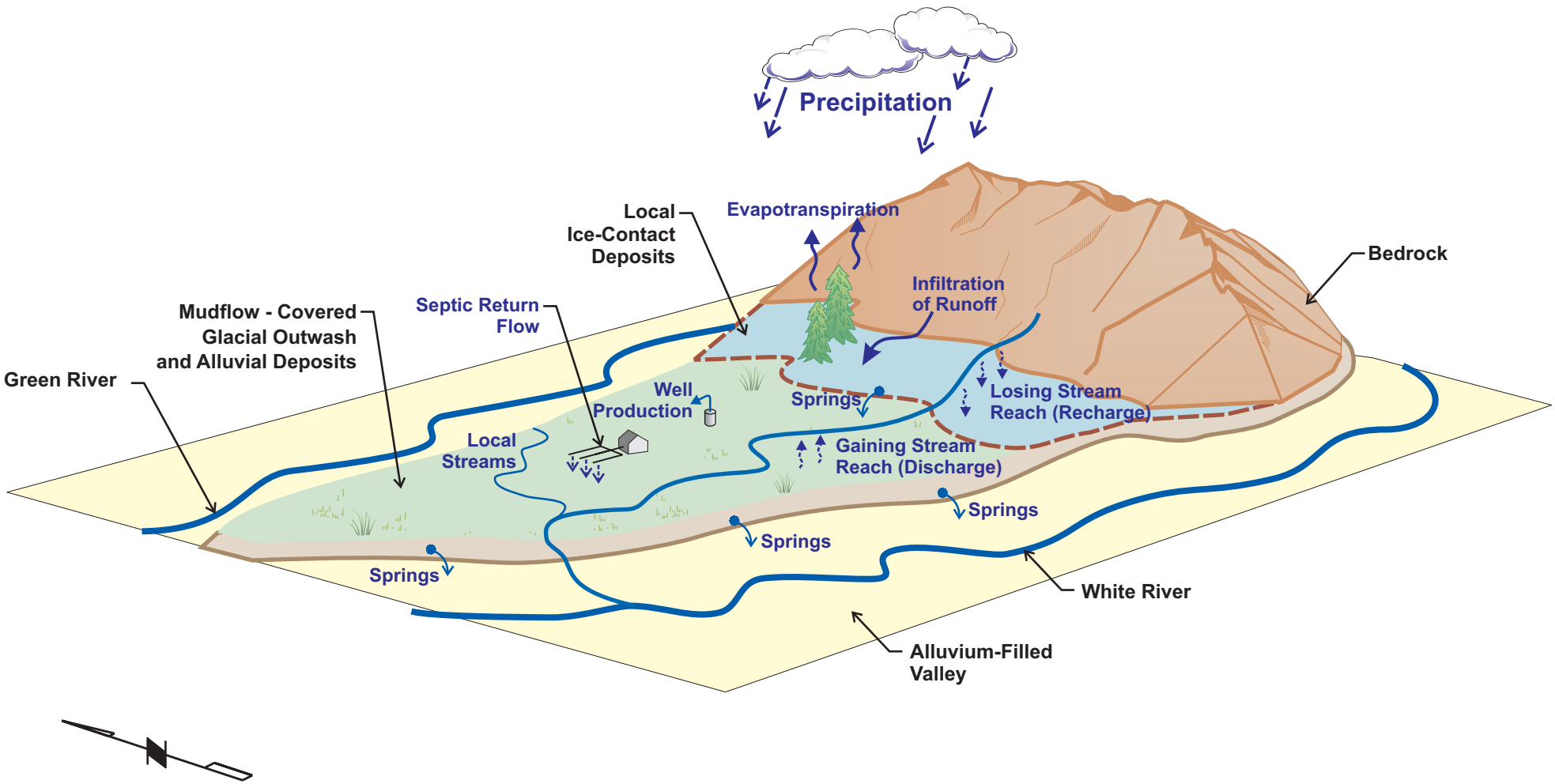
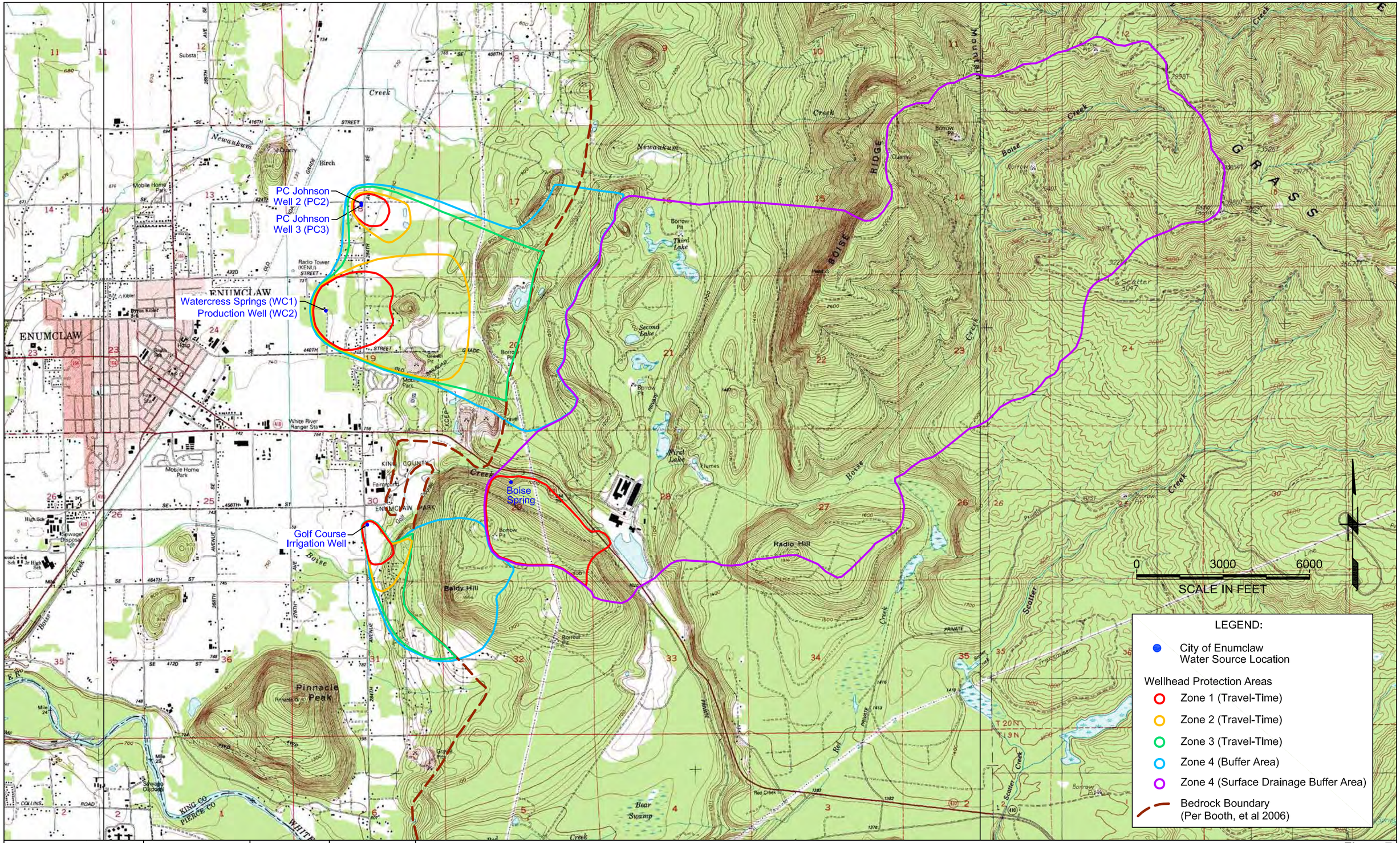


ROBINSON NOBLE SALTBUSH INC. GROUNDWATER & ENVIRONMENTAL SCIENTISTS	Note: Basemap from USGS Enumclaw Quad.	PM: MFP October 2009 1281-005A	King County T 20 N/R 07 E - 30 Scale 1 " = 2000'	Figure 5 Golf Course Irrigation Well Detail Map City of Enumclaw: Wellhead Protection Plan



ROBINSON NOBLE SALTBUSH INC. GROUNDWATER & ENVIRONMENTAL SCIENTISTS	PM: MFP October 2009 1281-005A	King County T 20 N/R 07 E Not To Scale	Figure 6 Conceptual Diagram City of Enumclaw: Wellhead Protection Plan



ROBINSON NOBLE SALTBUSH INC.
GROUNDWATER & ENVIRONMENTAL SCIENTISTS

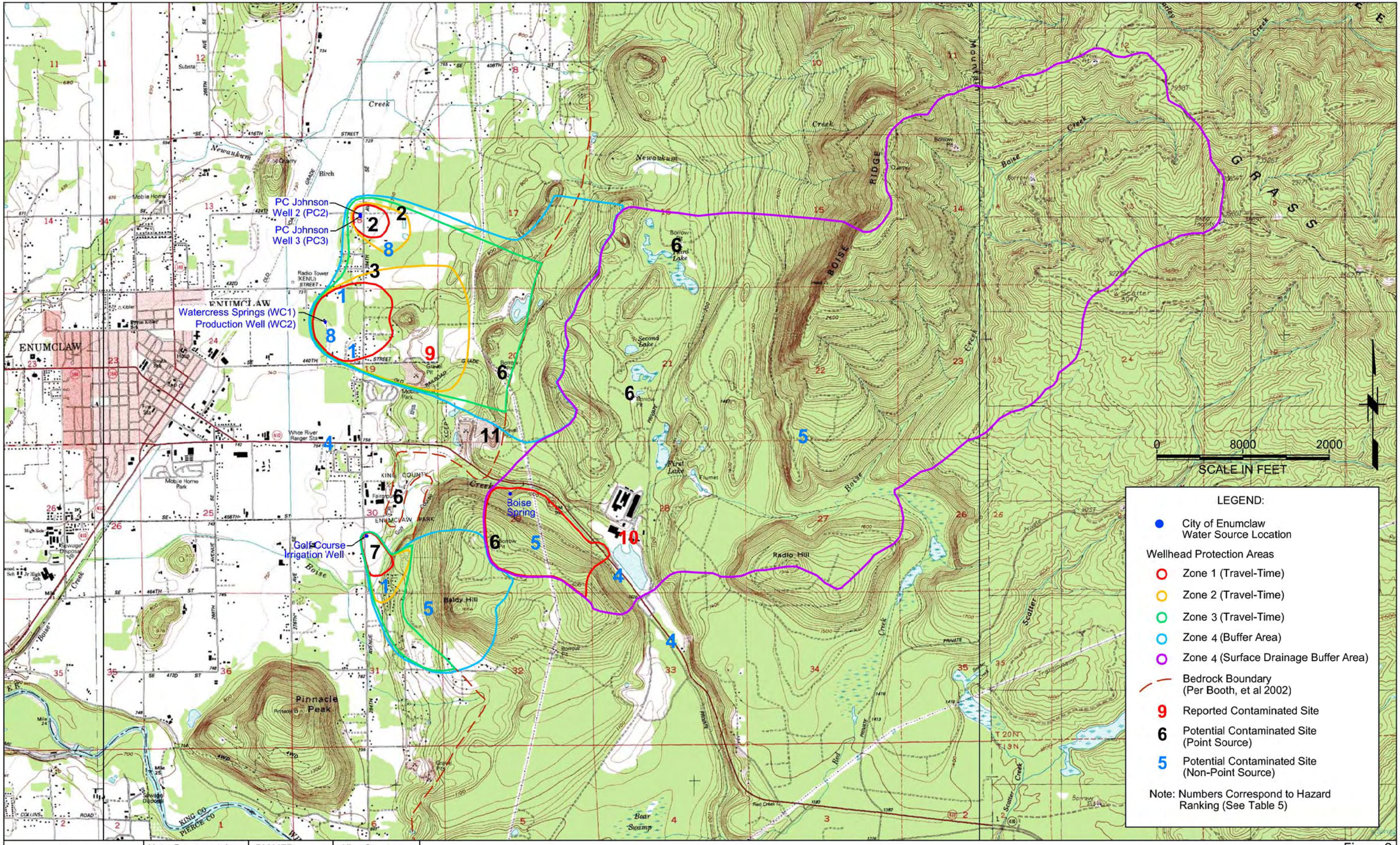
Note: Basemap taken from USGS Buckley, Enumclaw and Cyclone Creek Quads.

PM:MFP	King County
October 2009	T 20 N/R 07 E
1281-005A	Scale 1" = 3000'

Figure 7

Recommended Wellhead Protection Areas

City of Enumclaw: Wellhead Protection Plan



ROBINSON NOBLE SALTBUSH INC.
GROUNDWATER & ENVIRONMENTAL SCIENTISTS

Note: Basemap taken from USGS Buckley, Enumclaw and Cyclone Creek Quads.

PM:MFP
October 2009
1281-005A

King County
T 20 N/R 05 E
Scale 1" = 8000'

Figure 8
Hazard Inventory Map
City of Enumclaw: Wellhead Protection Plan

PC Johnson Well Logs

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....
Permit No. .....

(1) OWNER: Name Town of Enumclaw Address c/o Hart-Crowser

(2) LOCATION OF WELL: County KING — NW ¼ SW ¼ Sec 18 T 20N N., R 7E W.M.

Bearing and distance from section or subdivision corner

(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 12" to 8" inches.
Drilled 230'6" ft. Depth of completed well 230'6" ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 12" Diam. from 0 ft. to 104'8"
Threaded ☐ 8" Diam. from 104'8" ft. to 230'6"
Welded ☒ ..." Diam. from ... ft. to ... 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 Johnson
Type stainless steel Model No. ....
Diam. 8" Slot size 150 from 171' ft. to 230' ft.
Diam. ... Slot size ... from ... ft. to ... ft.

20' of & extension

Gravel packed: Yes ☐ No ☒ Size of gravel: ....
Gravel placed from ... ft. to ... ft.

Surface seal: Yes ☒ No ☐ To what depth? 18' ft.
Material used in seal Bentonite 500 lbs.
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? .... Depth of strata ....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name ....
Type: .... H.P. ....

(8) WATER LEVELS: Land-surface elevation above mean sea level .... ft.
Static level 42'6" ft. below top of well Date ....
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? H.P.D. co.
Yield: gal./min. with ft. drawdown after 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 60 gal./min. with -0- ft. drawdown after 1½ 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
Brown & gray silty gravely-sand	0	72
Color changing to silty gray	72	77
Less muddy here, still hard	77	83
Gray clay binder, gravel	83	88'6"
Brown color here, hard grvl.	88'6"	103
Boulders, stopped at 104'8"	103'	104'8"
*NW DRILLING CO. ROTERY RIG		
NW drilled through 30" boulder, then into material approx. the same as above material to 230'7" then hit bed rock. Drilled to 234' and quit. Harbor Pump installed screen and developed well, filled well up to 230'6".		230'6'

Work started June 12, 19 80 Completed July 30, 19 80

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 HARBOR PUMP & DRILLING CO., INC. (Person, firm, or corporation) (Type or print)

Address 11302 Burnham Dr. NW Gig Harbor, W

[Signed] Jim Miller (Well Driller) By: P. Mill

License No. 223-01-8455 #0311 Date Jan. 12, 19 81

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 060-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....

Permit No. ....

(1) OWNER: Name CITY OF ENUMCLAW Address 1339 GRIFFIN ENUMCLAW WA. 98022

(2) LOCATION OF WELL: County KING — NE ¼ SW ¼ Sec. 18 T. 20 N., R. 7E W.M.

Bearing and distance from section or subdivision corner APPROX 2500'E AND 2500'N OF SW COR SEC 18

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) PC JOHNSON WELL 2

New well ☒ Deepened ☐ Reconditioned ☐

Method: Dug ☐ Bored ☐ Cable ☒ Driven ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 16 inches.

Drilled 229 ft. Depth of completed well 227.2 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 16 " Diam. from +2.3 ft. to 203.2 ft.

Threaded ☐ " Diam. from ft. to ft.

Welded ☒ " Diam. from ft. to 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 JOHNSON

Type S.S. WATERMARK Model No.

Diam. 14 PS Slot size .125 from 203.6 ft. to 224 ft.

Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:

Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 50 ft.

Material used in seal NEAT CEMENT

Did any strata contain unusable water? Yes ☐ No ☒

Type of water? Depth of strata

Method of sealing strata off

(7) PUMP: Manufacturer's Name N.A.

Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level APPROX 745' ft.

Static level 42.65 ft. below top of well Date 4/11/86

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? ROBINSON + NOBLE

Yield: 1500 gal./min. with 95.05 ft. drawdown after 24 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
0	95.05	12	58.2	1533	44.23
1.2 min	68.45	30.5	56.1	1738	43.95
5	61.35	180	50.3		

Date of test 4/11-12/86

Bailer test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m. Date

Temperature of water 49 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
ALTERNATE LAYERS OF GRAY + BROWN CLAY WITH GRAVEL, WATER AT 23, 37, AND 45'.	0	58
BROWN AND GRAY CLAY WITH ANGULAR GRAVEL.	58	83
GRAY VOLCANIC ASH, BROWN + GRAY CLAY WITH GRAVEL.	83	105
BROWN SAND, GRAVEL, WITH LAYERS OF BROWN CLAY.	105	116
GREEN, GRAY AND BROWN CLAY WITH ANGULAR GRAVEL.	116	140
BROWN SAND AND GRAVEL, W.B.	140	156
GREEN SILTY CLAY AND GRAVEL.	156	163
GREEN, GRAY, AND BROWN SAND AND GRAVEL.	163	170
GREEN SILTY CLAY BOUND GRAVEL.	170	193
BROWN SAND AND GRAVEL, W.B.	193	198
GREEN SILTY CLAY BOUND GRAVEL	198	205
BROWN SAND AND GRAVEL, W.B.	205	210
GREEN SAND AND GRAVEL, W.B.	210	213
BROWN SAND AND GRAVEL, W.B.	213	228
YELLOW, GRAY AND BROWN CLAY WITH GRAVEL AND BOULDERS.	228	229

RECEIVED MAY 5 1986

PREPARED BY DEPARTMENT OF ECOLOGY NORTHWEST REGION

ROBINSON + NOBLE, INC.

MBS

Work started FEB 24, 1986 Completed APRIL 17, 1986

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 HOLT DRILLING (Person, firm, or corporation) (Type or print)

Address 12515 32nd Street East

[Signed] Randy Holt (Well Driller)

License No. 1099 Date 5-19, 1986

ORIGINAL SIGNED BY DRILLER

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

ENTERED

WELL REPORT
STATE OF WASHINGTON

Start Card No. W072125
UNIQUE WELL I.D. # ACS 963
Water Right Permit No. 20-7E-18L

(1) OWNER: Name City of Enumclaw Address 1309 Myrtle Ave

(2) LOCATION OF WELL: County King NE 1/4 SW 1/4 Sec 18 T. 20 N.R. 7 E.W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) PC Johnson Well 424th + 284th

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☒ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) PC Johnson #1
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 16" inches.
Drilled 230 feet. Depth of completed well 229 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 16" Diam. from +2 ft. to 196 ft.
Welded ☒ " Diam. from ft. to ft.
Liner Installed ☐ " Diam. from ft. to ft.
Threaded ☐

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 Johnson
Type 304 Stainless Model No.
Diam. 14 Slot size 125 from 225 ft. to 195 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 55 ft.
Material used in seal Cement Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 42 ft. below top of well Date
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? Holt
Yield: 820 gal./min. with 121 ft. drawdown after 24 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.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☒ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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 information.

MATERIAL	FROM	TO
Brown silty gravels	0	15
Gray silty gravels	15	24
Brown silty gravels	24	32
Brown silty gravels and sand weeping water	32	73
Brown silty gravel cobbles	73	174
Gray gravelly silty clay	174	181
Brown sand + gravel cobbles some silt water	181	230

RECEIVED
JUN 14 1999
DEPT OF ECOLOGY

Work Started 4-24-97, 19. Completed 7-10, 19 97

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Holt Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 10621 Todd Rd E
(Signed) [signature] (WELL DRILLER) License No. 1099
Contractor's Registration No. HOLDI*136OG Date 8-6-97, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93)

Watercress Spring Well Logs

1st Attempt

20-7E-19D

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission ("x" in circle) 281968

☒ Construction

○ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

CURRENT

Notice of Intent No. W238924

Unique Ecology Well ID Tag No. NA

Water Right Permit No. _____

Property Owner Name Enumclaw

Well Street Address 28014 SE 440th St.

City Enumclaw County King

Location NW 1/4-1/4 NW 1/4 Sec 19 Twn 20N R 7 (EWM) or WWM circle one

Lat/Long (s, t, r Still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

PROPOSED USE: ☐ Domestic ☐ Industrial ☒ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____

☐ New well ☐ Reconditioned ☐ Deepened

Method: ☐ Dug ☐ Bored ☐ Driven ☒ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 24 inches, drilled 34 ft.

Depth of completed well 0 ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded _____" Diam. from _____ ft. to _____ ft.

☐ Liner installed _____" Diam. from _____ ft. to _____ ft.

☐ Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____

Manufacturer's Name _____

Type _____ Model No. _____

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand _____

Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 34 ft.

Material used in seal Bentonite Chip

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name _____

Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.

Static level _____ ft. below top of well Date _____

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes, by whom? _____

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.

Yield: _____ gal./min. with _____ ft. drawdown after _____ 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.

Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water _____ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Fill	0	3
Silt Sand Gravels	3	34

RECEIVED
DEC 19 2007
DEPT. OF ECOLOGY

Start Date 3-29-07 Completed Date 4-4-07

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Wade Iversen

Driller/Engineer/Trainee Signature Wade Iversen

Driller or trainee License No. 0597

Drilling Company Boart Longyear

Address Po Box 1890

City, State, Zip Milton WA 98354

Contractor's Registration No. BOARTLCO55P2 Date 7-25-07

If TRAINEE, Driller's Licensed No. _____

Driller's Signature _____

Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 3/05) **The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.**

20-7E 19D

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission ("x" in circle) 269087

☒ Construction

○ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

CURRENT
Notice of Intent No. W 238924

Unique Ecology Well ID Tag No. ALK 139

Water Right Permit No. G1-9339C/6894-A

Property Owner Name City of Enumclaw

Well Street Address 28014 SE 440th St

City Enumclaw County King

Location NW 1/4-1/4 NW 1/4 Sec 19 Twn 20 R 7 E EWM or WWM (circle one)

Lat/Long (s, t, r Still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. 1920079028

PROPOSED USE: ☐ Domestic ☐ Industrial ☒ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____
☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 24 inches, drilled 52 ft.
Depth of completed well 50' ft.

CONSTRUCTION DETAILS
Casing Installed: ☒ Welded 20" Diam. from +2 ft. to 20 ft.
☐ Liner installed _____" Diam. from _____ ft. to _____ ft.
☐ Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No
Type of perforator used _____
SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☒ Yes ☐ No ☒ K-Pac Location _____
Manufacturer's Name _____
Type Johnson Model No. _____
Diam. 20 Slot size 100 from 40' ft. to 20' ft.
Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☒ Yes ☐ No ☒ Size of gravel/sand 3/8
Materials placed from 40 ft. to 52 ft.

Surface Seal: ☒ Yes ☐ No To what depth? _____ ft.
Material used in seal Benobite Chips
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 2' ft. below top of well Date _____
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom? _____
Yield: 4300 gal./min. with 14' ft. drawdown after 24 hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ 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.
Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Gray Cobbs Gravel & sand Silty	0	30
Brown Sand & Gravel water Bearing	20	40
Gray Till	40	52

RECEIVED
JUL 18 2007
DEPT. OF ECOLOGY

Start Date 3-29-07 Completed Date 5-2-07

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) Wade Iversen
Driller/Engineer/Trainee Signature [signature]
Driller or trainee License No. 0597

If TRAINEE,
Driller's Licensed No. _____
Driller's Signature _____

Drilling Company BOART ~~LONGYEAR~~ Longyear
Address PO Box 1890
City, State, Zip Milton WA 98354
Contractor's Registration No. BOARTLC055PZ Date 5-7-07

Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 3/05) **The Department of Ecology does NOT warranty the Data and/or Information on this Well Report.**

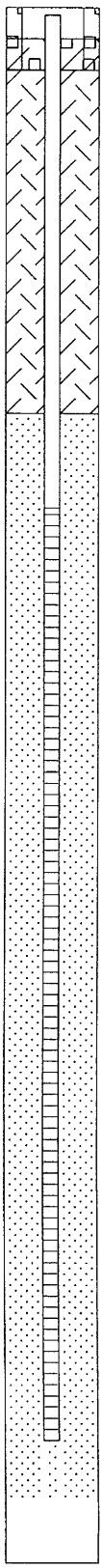
Monitoring Well 1

CONSTRUCTION DETAILS

SAMPLE NO.
BLOW COUNTS
SAMPLE RECOVERY

GEOLOGIC LOG

Flush Mount, No Stickup, top of casing 0.48' below top of monument



CONCRETE 0' - 2'

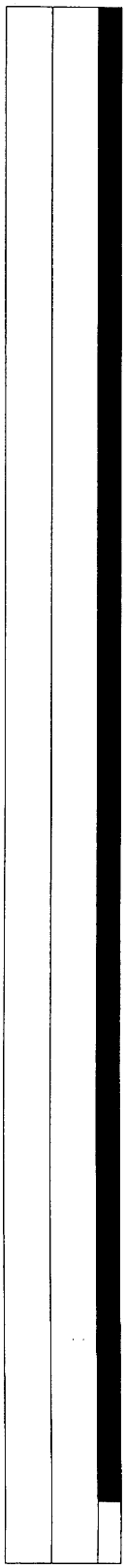
BENTONITE 2' - 13'

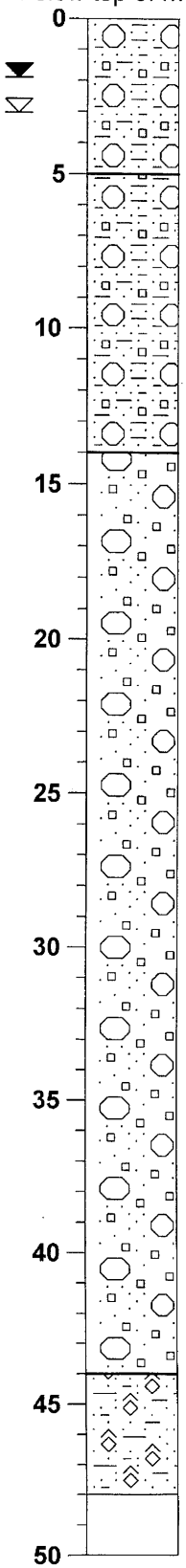
2 INCH PVC RISER 0.49' - 16'

10 X 20 COLORADO SILICA SAND 13' - 48'

2 INCH PVC SCREEN 16' - 46'

BOTTOM OF BOREHOLE 48 FEET BELOW GROUND





BROWN SILTY SANDY GRAVEL

(Static Water Level 1.91 feet below ground 5/18/2006)
(Max drawdown 1.60 feet, 3.05 feet below ground 6/1/2006)

5 GRAY SANDY SILT WITH GRAVEL (MOIST)

14 BROWN GRAVEL WITH SAND, WET

44 GRAVEL AND CLAY, BOUND/COMPACT (TILL)

48

Project:	**Enumclaw**	Drilling Info:	**Prosonic**	Total Depth:	**48 feet**
Location:	**Watercress Springs**		**Limited Access Sonic**	TOC Elevation:	**738.36**
Job Number:	**1281-002A**		**Continuous Sample**	Township/Range:	**20 N 7 E**
Date:	**5/9 - 5/11**	Logged By:	**MFP**	Section:	**19**

ROBINSON NOBLE SALTBUSH INC.
GROUNDWATER & ENVIRONMENTAL SCIENTISTS

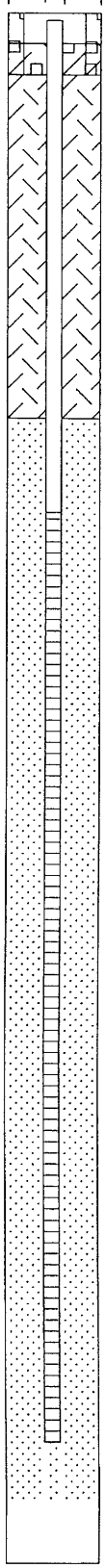
Monitoring Well 2

CONSTRUCTION DETAILS

SAMPLE NO.
BLOW COUNTS
SAMPLE RECOVERY

GEOLOGIC LOG

Monument Stickup 3.42', top of casing 0.38' below top of monument



CONCRETE 0' - 3'

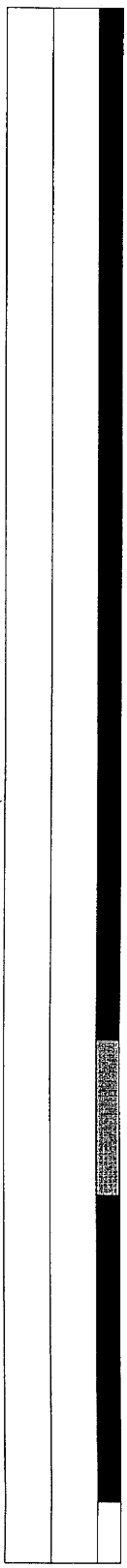
BENTONITE 3' - 13'

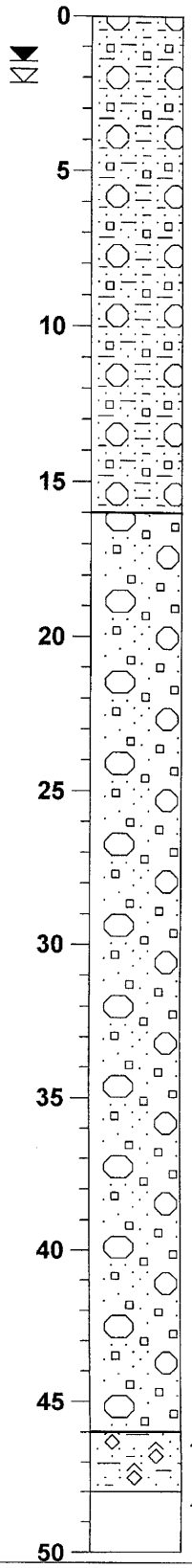
2 INCH PVC RISER 3.04' ABOVE GROUND - 16' BELOW

10 X 20 COLORADO SILICA SAND 13' - 48'

2 INCH PVC SCREEN 16' - 46'

BOTTOM OF BOREHOLE 48 FEET BELOW GROUND





BROWN-GRAY SILT WITH SAND AND GRAVEL

(Static Water Level 1.50 feet below ground 5/18/2006)

(Max drawdown 1.25 feet, 2.19 feet below ground 6/1/2006)

16 BROWN GRAVEL WITH SAND, WET

(No Recovery 33'-38')

46 GRAVEL AND CLAY, BOUND/COMPACT (TILL)

48

Project:	**Enumclaw**	Drilling Info:	**Prosonic**	Total Depth:	**48 feet**
Location:	**Watercress Springs**		**Limited Access Sonic**	TOC Elevation:	**741.77**
Job Number:	**1281-002A**		**Continuous**	Township/Range:	**20 N 7 E**
Date:	**5/9 - 5/11**	Logged By:	**MFP**	Section:	**19**

ROBINSON NOBLE SALTBUSH INC. Established 1947
GROUNDWATER & ENVIRONMENTAL SCIENTISTS

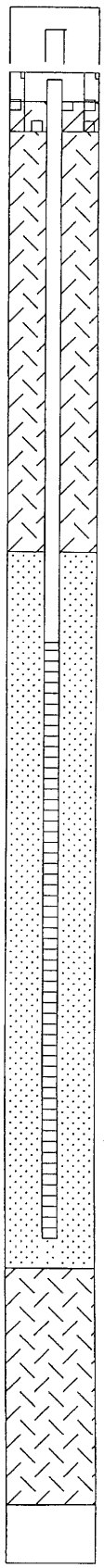
Monitoring Well 3

CONSTRUCTION DETAILS

SAMPLE NO.
BLOW COUNTS
SAMPLE RECOVERY

GEOLOGIC LOG

Monument Stickup 3.08', top of casing 0.40' below top of monument



CONCRETE 0' - 2'

BENTONITE 2' - 16'

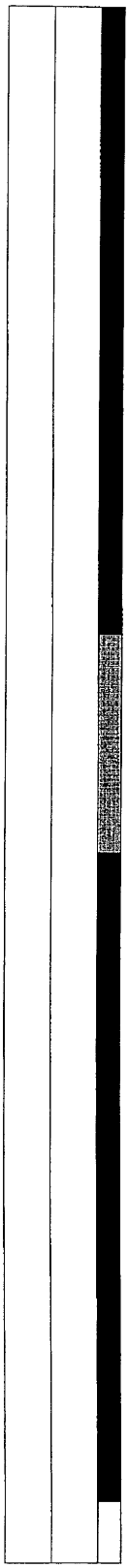
2 INCH PVC RISER 2.68' ABOVE GROUND - 19' BELOW

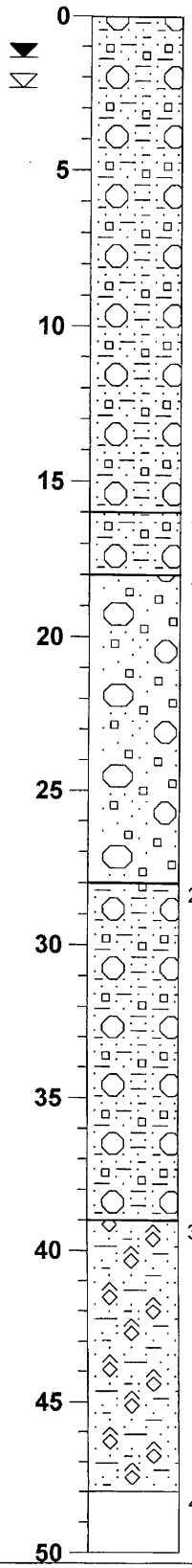
10 X 20 COLORADO SILICA SAND 16' - 40'

2 INCH PVC SCREEN 19' - 39'

BENTONITE 40' - 48'

BOTTOM OF BOREHOLE 48 FEET BELOW GROUND





BROWN-ORANGE SANDY GRAVELLY SILT

(Static Water Level 1.38 feet below ground 5/18/2006)
(Max drawdown 1.50 feet, 2.36 feet below ground 6/1/2006)

16 GRAY SANDY SILT WITH GRAVEL

18 SAND AND GRAVEL, WET

(No Recovery 20'-27')

28 GRAY SILT AND GRAVEL

39 GRAVEL AND CLAY, BOUND/COMPACT (TILL)

48

Project:	**Enumclaw**	Drilling Info:	**Prosonic**	Total Depth:	**48 feet**
Location:	**Watercress Springs**		**Limited Access Sonic**	TOC Elevation:	**740.99**
Job Number:	**1281-002A**		**Continuous**	Township/Range:	**20 N 7 E**
Date:	**5/9 - 5/11**	Logged By:	**CAF**	Section:	**19**

ROBINSON NOBLE SALTBUSH INC. Established 1947
GROUNDWATER & ENVIRONMENTAL SCIENTISTS

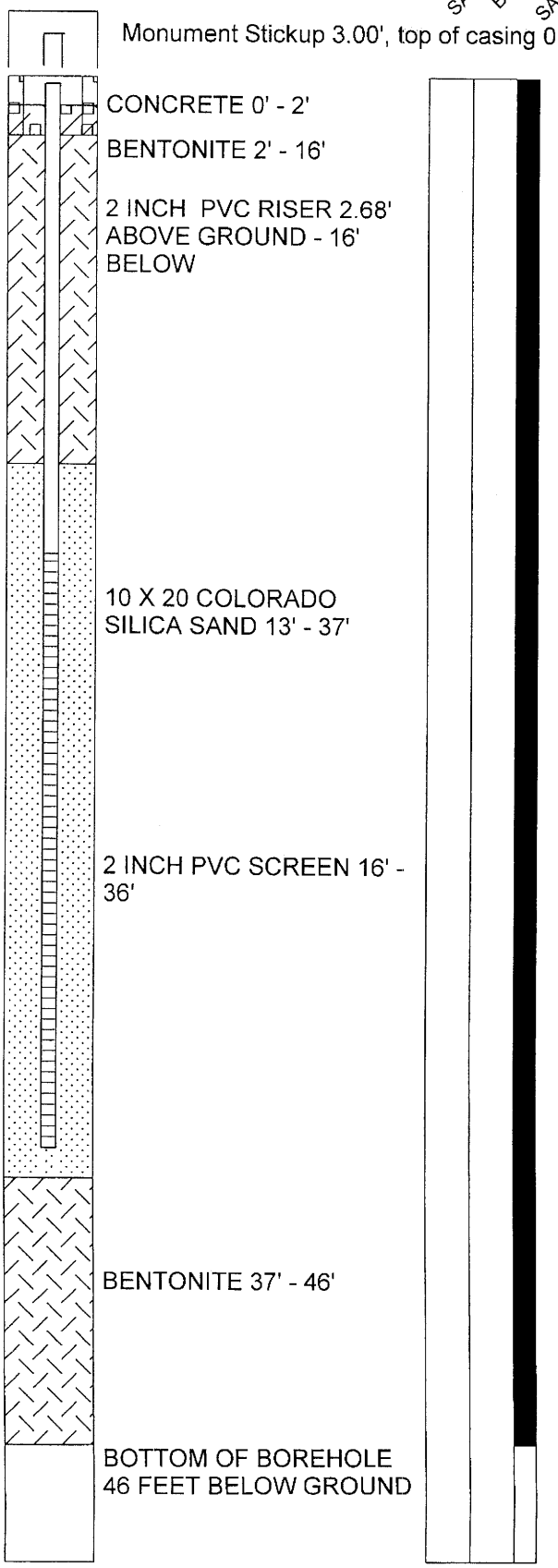
Monitoring Well 4

CONSTRUCTION DETAILS

SAMPLE NO.
BLOW COUNTS
SAMPLE RECOVERY

GEOLOGIC LOG

Monument Stickup 3.00', top of casing 0.32' below top of monument



CONCRETE 0' - 2'

BENTONITE 2' - 16'

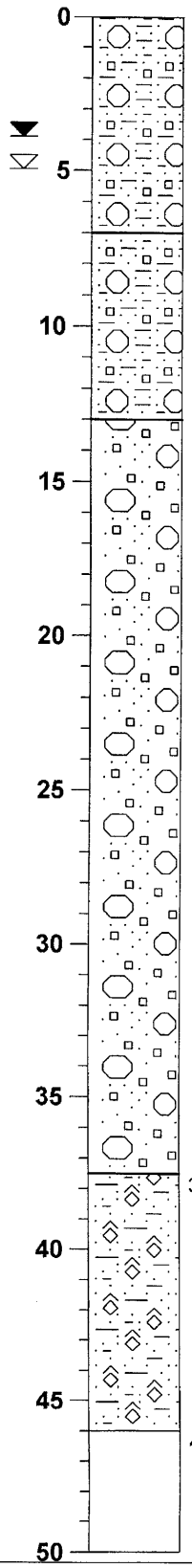
2 INCH PVC RISER 2.68' ABOVE GROUND - 16' BELOW

10 X 20 COLORADO SILICA SAND 13' - 37'

2 INCH PVC SCREEN 16' - 36'

BENTONITE 37' - 46'

BOTTOM OF BOREHOLE 46 FEET BELOW GROUND



0 — BROWN GRAVELLY SILT WITH SAND

(Static Water Level 3.91 feet below ground 6/1/2006)

(Max drawdown 1.51 feet, 4.97 feet below ground 5/18/2006)

7 — GRAY GRAVELLY SILT

13 — BROWN SAND AND GRAVEL, WET

37.5 — GRAVEL AND CLAY, BOUND/COMPACT (TILL)

46

5 10 15 20 25 30 35 40 45 50

Project:	**Enumclaw**	Drilling Info:	**Prosonic Limited Access Sonic Continuous**	Total Depth:	**46 feet**
Location:	**Watercress Springs**			TOC Elevation:	**743.35**
Job Number:	**1281-002A**			Township/Range:	**20 N 7 E**
Date:	**5/9 - 5/11**	Logged By:	**CAF**	Section:	**19**

ROBINSON NOBLE SALTBUSH INC. established 1967
GROUNDWATER & ENVIRONMENTAL SCIENTISTS

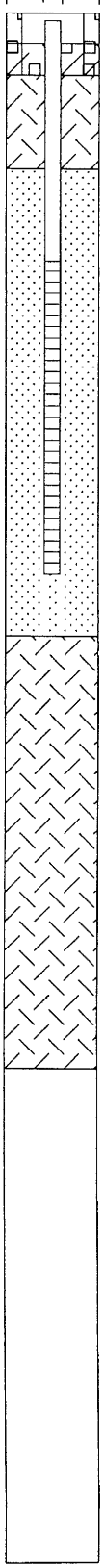
Monitoring Well 5

CONSTRUCTION DETAILS

SAMPLE NO.
BLOW COUNTS
SAMPLE RECOVERY

GEOLOGIC LOG

Monument Stickup 3.25 feet, top of casing 0.76 below top of monument



CONCRETE 0' - 2'

BENTONITE 2' - 5'

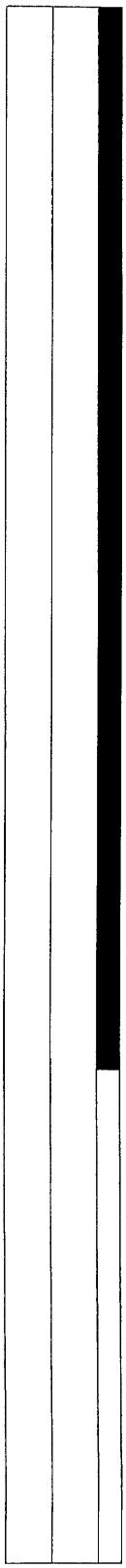
2 INCH PVC RISER 2.54' ABOVE GROUND - 16' BELOW

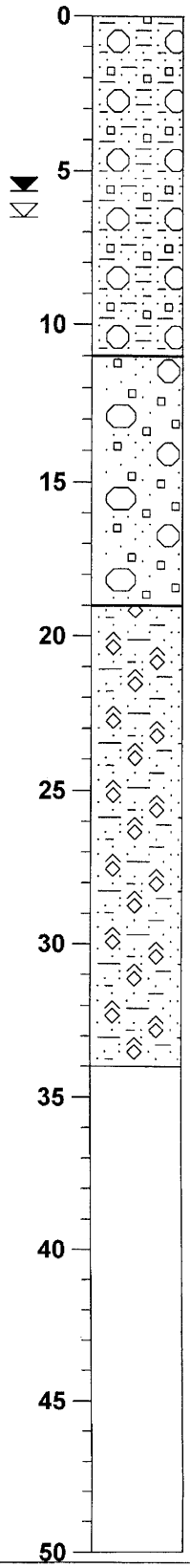
2 INCH PVC SCREEN 8' - 18'

10 X 20 COLORADO SILICA SAND 5' - 20'

BENTONITE 20' - 34'

BOTTOM OF BOREHOLE 34 FEET BELOW GROUND





BROWN SANDY SILT WITH GRAVEL

(Static Water Level 5.68 feet below ground 5/18/2006)

(Max drawdown 1.39 feet, 6.48 feet below ground 6/1/2006)

BROWN SAND AND GRAVEL, WET

GRAVEL AND CLAY, BOUND/COMPACT (TILL), DRY

Project:	**Enumclaw**	Drilling Info:	**Prosonic**	Total Depth:	**34 feet**
Location:	**Watercress Springs**		**Limited Access Sonic**	TOC Elevation:	**744.88**
Job Number:	**1281-002A**		**Continuous**	Township/Range:	**20 N 7 E**
Date:	**5/9 - 5/11**	Logged By:	**CAF**	Section:	**19**

ROBINSON NOBLE SALTBUSH INC.
GROUNDWATER & ENVIRONMENTAL SCIENTISTS

Watercress MW 1

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(slect one)*

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Consulting Firm Robinson Noble and Saltbush

Unique Ecology Well ID Tag No. ATN752

WELLCONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print) David Donnelly

Driller/Engineer /Trainee Signature _____

Driller or Trainee License No. _____

If trainee, licensed driller's Signature and License No. _____

CURRENT Notice of Intent No. RE01484

Type of Well *(select one)*

[X] Resource Protection

[ ] Geotech Soil Boring

Property Owner City of Enumclaw

Site Address SE 440th

City Enumclaw County King

Location NE 1/4-1/4 NW 1/4 Sec 19 Twn 20 R 17E Select One [ ] EWM [X] WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

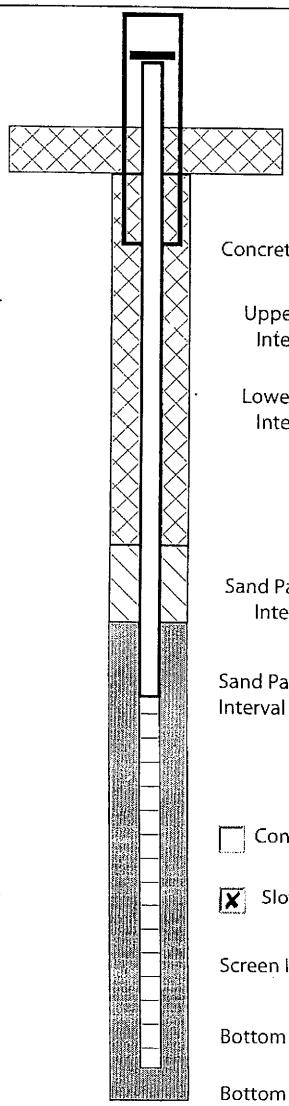
Tax Parcel No. _____

Cased or Uncased Diameter _____ Static Level 1.43 feet

Work/Decommission Start Date 5/9/06

Work/Decommission Completed Date 5/11/06

Construction/Design



[ ] Square [X] Round PAD

Concrete Depth 2'

Upper Seal Interval 2'-13'

Lower Seal Interval

Sand Pack Seal Interval

Sand Pack Interval 13'-48'

[ ] Continous Wire Wrap

[X] Slotted

Screen Interval 16'-46'

Bottom of Well 46'

Bottom of Hole 48'

Well Data

Monument Size	6"
Monument Stickup	
Pad Size	16"
Upper Surface Seal	Bentonite Chips
Lower Surface Seal	
Well Diameter	2"
Well Material	Sch 40 PVC
Filter Pack Seal	
Filter Pack Sand Size	10/20
Screen Slot Size	.020
Borehole Backfill Material	

Formation Description

0-14'	Silt
14'-44'	Sand & Gravels
44'-48'	Till

The Department of Ecology does NOT warranty the Data and/or Iformation on this Well Report

watercress MW2

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(slect one)*

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Consulting Firm Robinson Noble and Saltbush

Unique Ecology Well ID Tag No. ATN756

WELLCONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print) David Donnelly

Driller/Engineer /Trainee Signature _____

Driller or Trainee License No. _____

If trainee, licensed driller's Signature and License No. _____

CURRENT Notice of Intent No. RE01484

Type of Well *(select one)*

[X] Resource Protection

[ ] Geotech Soil Boring

Property Owner City of Enumclaw

Site Address 1309 Myrtle Avenue

City Enumclaw County King

Location NE 1/4-1/4 NW 1/4 Sec 19 Twn 20 R 17E Select One [ ] EWM [X] WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

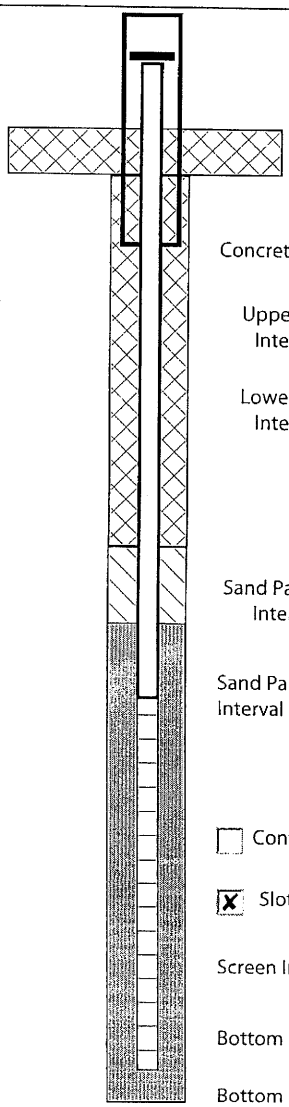
Tax Parcel No. _____

Cased or Uncased Diameter _____ Static Level .94 Feet

Work/Decommission Start Date 5/9/06

Work/Decommission Completed Date 5/11/06

Construction/Design



[ ] Square [X] Round PAD

Concrete Depth 2'

Upper Seal Interval 2' - 13'

Lower Seal Interval N/A

Sand Pack Seal Interval

Sand Pack Interval 13'-48'

[ ] Continous Wire Wrap

[X] Slotted

Screen Interval 16'-46'

Bottom of Well 46'

Bottom of Hole 48'

Well Data

Monument Size	6"
Monument Stickup	3.5
Pad Size	18"
Upper Surface Seal	Bentonite Chips
Lower Surface Seal	
Well Diameter	2"
Well Material	Sch 40 PVC
Filter Pack Seal	
Filter Pack Sand Size	10/20
Screen Slot Size	.010
Borehole Backfill Material	

Formation Description

0-15'	Silt
	Sand
15'-45'	Silt, Sand & Gravel
46'-48/	Till

The Department of Ecology does NOT warranty the Data and/or Iformation on this Well Report

watercress MW3

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(slect one)*

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Consulting Firm: Robinson Noble and Saltbush

Unique Ecology Well ID Tag No. ATN799

WELLCONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print) David Donnelly

Driller/Engineer /Trainee Signature _____

Driller or Trainee License No. _____

If trainee, licensed driller's Signature and License No. _____

CURRENT Notice of Intent No. RE01484

Type of Well *(select one)*

[X] Resource Protection

[ ] Geotech Soil Boring

Property Owner: City of Enumclaw

Site Address: 1309 Myrtle Avenue

City: Enumclaw County: King

Location NE 1/4-1/4 NW 1/4 Sec 19 Twn 20 R 17E Select One [ ] EWM [X] WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

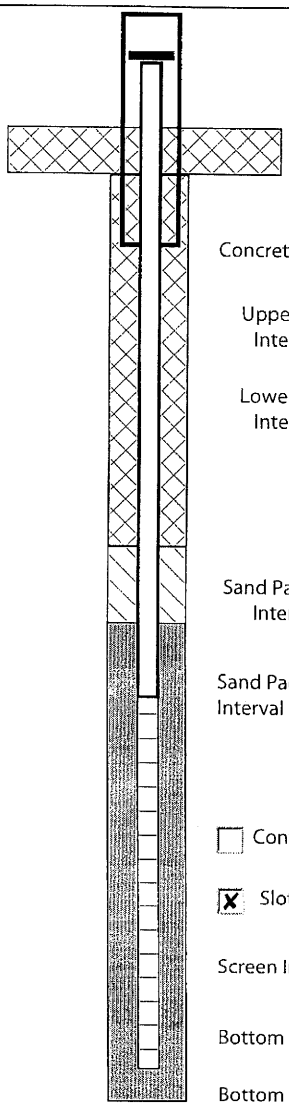
Tax Parcel No. _____

Cased or Uncased Diameter _____ Static Level 3 Feet

Work/Decommission Start Date 5/9/06

Work/Decommission Completed Date 5/11/06

Construction/Design



[ ] Square [X] Round PAD

Concrete Depth: 2'

Upper Seal Interval: 2' - 16'

Lower Seal Interval: N/A

Sand Pack Seal Interval

Sand Pack Interval: 16'-40'

[ ] Continous Wire Wrap

[X] Slotted

Screen Interval: 19'-39'

Bottom of Well: 39'

Bottom of Hole: 48'

Well Data

Monument Size	6"
Monument Stickup	3'
Pad Size	18"
Upper Surface Seal	Bentonite Chips
Lower Surface Seal	
Well Diameter	2"
Well Material	Sch 40 PVC
Filter Pack Seal	
Filter Pack Sand Size	10/20
Screen Slot Size	.020
Borehole Backfill Material	Bentonite Chips

Formation Description

0-15'	Silty-Sand
15'-39'	Silt, Sand & Gravel
39'-48/	Till

The Department of Ecology does NOT warranty the Data and/or Iformation on this Well Report

watercress MW4

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(slect one)*

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Consulting Firm Robinson Noble and Saltbush

Unique Ecology Well ID Tag No. ATN755

WELLCONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print) David Donnelly

Driller/Engineer /Trainee Signature _____

Driller or Trainee License No. _____

If trainee, licensed driller's Signature and License No. _____

CURRENT Notice of Intent No. RE01484

Type of Well *(select one)*

[X] Resource Protection

[ ] Geotech Soil Boring

Property Owner City of Enumclaw

Site Address 1309 Myrtle Avenue

City Enumclaw County King

Location NE 1/4-1/4 NW 1/4 Sec 19 Twn 20 R 17E Select One [ ] EWM [X] WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

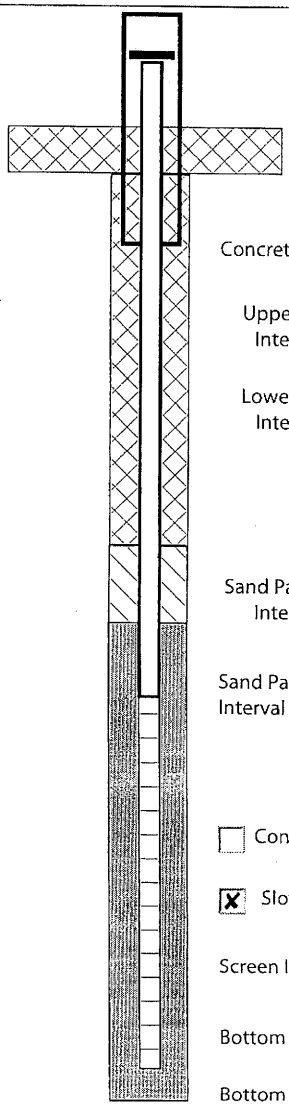
Tax Parcel No. _____

Cased or Uncased Diameter _____ Static Level 3 Feet

Work/Decommission Start Date 5/9/06

Work/Decommission Completed Date 5/11/06

Construction/Design



[ ] Square [X] Round PAD

Concrete Depth 2'

Upper Seal Interval 2' - 16'

Lower Seal Interval N/A

Sand Pack Seal Interval

Sand Pack Interval 13'-37'

[ ] Continous Wire Wrap

[X] Slotted

Screen Interval 16'-36'

Bottom of Well 36'

Bottom of Hole 46'

Well Data

Monument Size	6"
Monument Stickup	3'
Pad Size	18"
Upper Surface Seal	Bentonite Chips
Lower Surface Seal	
Well Diameter	2"
Well Material	Sch 40 PVC
Filter Pack Seal	
Filter Pack Sand Size	10/20
Screen Slot Size	.020
Borehole Backfill Material	Bentonite Chips

Formation Description

0-13'	Silty-Sand
13'-37.5'	Sand & Gravels
37.5'-48/	Till

The Department of Ecology does NOT warranty the Data and/or Iformation on this Well Report

Watercress MW5

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(slect one)*

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Consulting Firm Robinson Noble and Saltbush

Unique Ecology Well ID Tag No. ATN754

WELLCONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print) David Donnelly

Driller/Engineer /Trainee Signature _____

Driller or Trainee License No. _____

If trainee, licensed driller's Signature and License No. _____

CURRENT Notice of Intent No. RE01484

Type of Well *(select one)*

[X] Resource Protection

[ ] Geotech Soil Boring

Property Owner City of Enumclaw

Site Address 1309 Myrtle Avenue

City Enumclaw County King

Location NE 1/4-1/4 NW 1/4 Sec 19 Twn 20 R 17E Select One [ ] EWM [X] WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

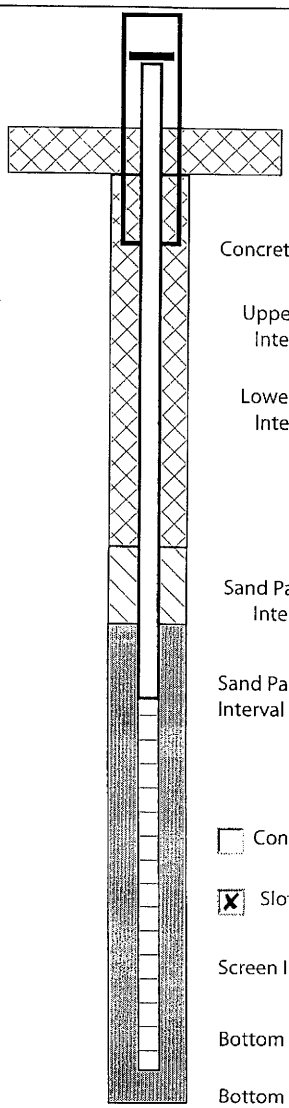
Tax Parcel No. _____

Cased or Uncased Diameter _____ Static Level 5 Feet

Work/Decommission Start Date 5/9/06

Work/Decommission Completed Date 5/11/06

Construction/Design



[ ] Square [X] Round PAD

Concrete Depth 2'

Upper Seal Interval 2' - 5'

Lower Seal Interval N/A

Sand Pack Seal Interval

Sand Pack Interval 5'-20'

[ ] Continous Wire Wrap

[X] Slotted

Screen Interval 8'-18'

Bottom of Well 18'

Bottom of Hole 34'

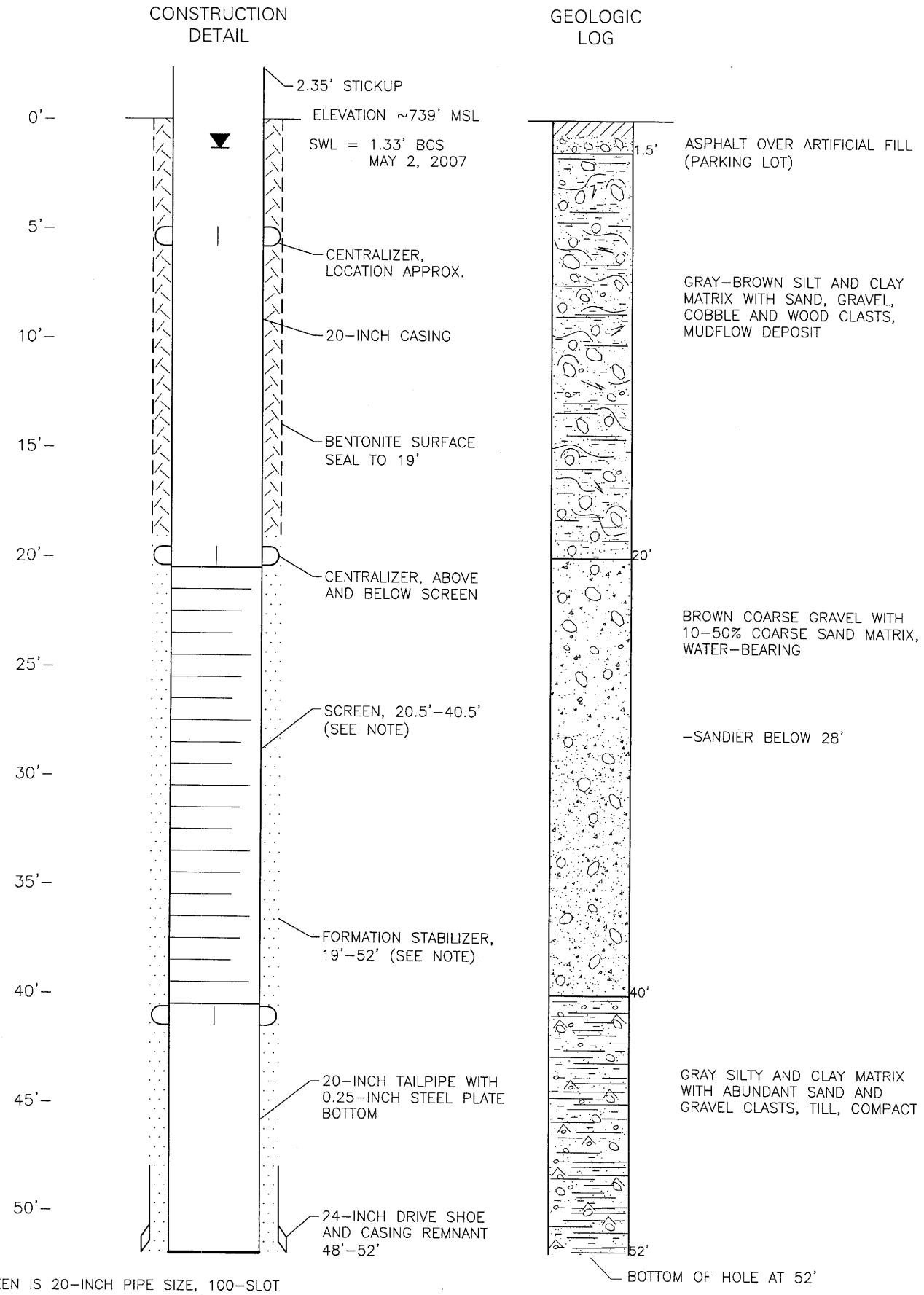
Well Data

Monument Size	6"
Monument Stickup	3'
Pad Size	18"
Upper Surface Seal	Bentonite Chips
Lower Surface Seal	
Well Diameter	2"
Well Material	Sch 40 PVC
Filter Pack Seal	
Filter Pack Sand Size	10/20
Screen Slot Size	.020
Borehole Backfill Material	Bentonite Chips

Formation Description

0-11'	Silty-Sand
11'-19'	Sand & Gravels
19'-34'	Till

The Department of Ecology does NOT warranty the Data and/or Iformation on this Well Report



NOTE: WELL SCREEN IS 20-INCH PIPE SIZE, 100-SLOT (0.100 OPENING) WIRE-WOUND STAINLESS STEEL. FORMATION STABILIZER IS COARSE PEA GRAVEL

ROBINSON NOBLE SALTBUSH INC.
GROUNDWATER & ENVIRONMENTAL SCIENTISTS
1947 60 Years 2007

PM: JEB
T 20 N/R 07 E - 19
1281-002B
JUNE 2007

Figure 2
Construction Detail and Geologic Log for Watercress Production Well
City of Enumclaw

Golf Course Well Logs

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy 20/7E/30/K

WATER WELL REPORT

STATE OF WASHINGTON WRC 34446

Application No. 20/07-30K
Permit No. 20/07-30K

(1) OWNER: Name KING COUNTY Address E-531 KING CO. COURTHOUSE, SEATTLE

(2) LOCATION OF WELL: County King — NW ¼ SE ¼ Sec. 30 T. 20 N., R. 7E W.M.

Bearing and distance from section or subdivision corner

(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 ☐ Deepened ☐ Reconditioned ☐

Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 60 ft. Depth of completed well ft.

(6) CONSTRUCTION DETAILS:

Casing installed: " Diam. from ft. to ft.
Threaded ☑ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☐
Type of perforator used Unknown
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 none
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to 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
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 48 ft. below top of well Date
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?
Yield: 115 gal./min. with ft. drawdown after 4 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
Old well - unknown		

Work started 4/11/73, 19 Completed, 19

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 Richardson Well Drilling Company (Person, firm, or corporation) (Type or print)

Address P.O. Box 44408, Tacoma, Wa. 98444

[Signed] [signature] (Well Driller)

License No. 223-02-0500 Date 12/20/, 19 73

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

20/7E/30/K

WATER WELL REPORT

STATE OF WASHINGTON WRC 34445

Application No. 20/07-20R

Permit No.

(1) OWNER: Name KING COUNTY Address KING CO. COURTHOUSE SEATTLE 98104

(2) LOCATION OF WELL: County King — NW ¼ SE ¼ Sec 30 T 20 N., R 7E W.M.

Bearing and distance from section or subdivision corner

(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 10 inches.
Drilled 109 ft. Depth of completed well 109 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: ..." Diam. from ... ft. to ... ft.
Threaded ☐ ..." Diam. from ... ft. to ... ft.
Welded ☑ ..." Diam. from ... ft. to ... 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 UOP Johnson
Type Stainless Model No.
Diam. 10 Slot size 40 from 89 ft. to 94 ft.
Diam. 10 Slot size 30 from 94 ft. to 109 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
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 34 ft. below top of well Date 5/3/73
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? Driller
Yield: 300 gal./min. with 22 ft. drawdown after 4 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
Old well - unknown 0 - 99'		
Fine & course sand	99	109

Work started 4/26/ 1973 Completed 5/4/ 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 Richardson Well Drilling Company (Person, firm, or corporation) (Type or print)

Address P.O. Box 44408, Tacoma, Wa. 98444

[Signed] (Well Driller)

License No. 223-02-6500 Date 12/20/ 1973

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(slect one)*

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Consulting Firm Robinson Noble and Saltbush

Unique Ecology Well ID Tag No. ATN752

WELLCONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[X] Driller [ ] Engineer [ ] Trainee Name (Print) David Donnelly

Driller/Engineer /Trainee Signature _____

Driller or Trainee License No. _____

If trainee, licensed driller's Signature and License No. _____

CURRENT Notice of Intent No. RE01485

Type of Well *(select one)*

[X] Resource Protection

[ ] Geotech Soil Boring

Property Owner City of Enumclaw

Site Address 284th ave. SE, South of 456th street

City Enumclaw County King

Location NE 1/4-1/4 NW 1/4 Sec 19 Twn 20 R 17E Select One [ ] EWM [X] WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

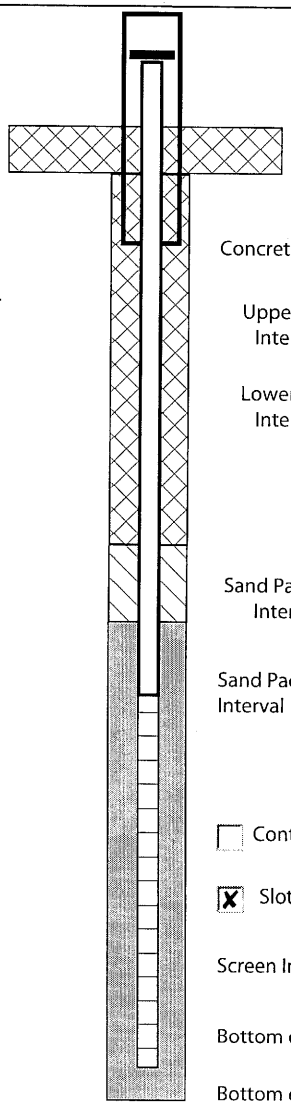
Tax Parcel No. _____

Cased or Uncased Diameter _____ Static Level 39.46 Feet

Work/Decommission Start Date 5/9/06

Work/Decommission Completed Date 5/11/06

Construction/Design



[ ] Square [X] Round PAD

Concrete Depth 2'

Upper Seal Interval 2'-103'

Lower Seal Interval

Sand Pack Seal Interval

Sand Pack Interval 103'-126.

[ ] Continous Wire Wrap

[X] Slotted

Screen Interval 106.5-126

Bottom of Well 126.5'

Bottom of Hole 137'

Well Data

Monument Size	6"
Monument Stickup	
Pad Size	1.5'
Upper Surface Seal	Cement
Lower Surface Seal	
Well Diameter	2"
Well Material	Sch 40 PVC
Filter Pack Seal	
Filter Pack Sand Size	10/20
Screen Slot Size	.020
Borehole Backfill Material	Bentonite Chips

Formation Description

0-2'	Top Soil
2'-12'	Sandy-Clay
12'-24'	Silty-Sand
24'-28'	Silt, Sand & Gravel
28'-45.5'	Silt, Sand & Gravel
45.5'-86'	Sand & Gravels
86'-101'	Sand
101'-126'	Sand Gravel&Cobbles
126'-135'	Silty-Sand
135'-137'	Sand Gravel&Cobbles

The Department of Ecology does NOT warranty the Data and/or Iformation on this Well Report

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

ECOLOGY

20-7E-30K

Construction/Decommission ("x" in circle)

☒ Construction 279970

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number _____

PROPOSED USE: ☐ Domestic ☐ Industrial ☒ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other _____

TYPE OF WORK: Owner's number of well (if more than one) GCPW

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☒ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 20 inches, drilled 136 ft. Depth of completed well _____ ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 20" Diam. from +1 ft. to 81 ft.
☐ Liner installed 16" Diam. from +2 ft. to 80 ft.
☐ Threaded _____" Diam. From _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used _____

SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☒ Yes ☐ No ☐ K-Pac Location _____

Manufacturer's Name Johnson

Type steel Model No. _____

Diam. 16 Slot size 0.040 from 80 ft. to 131 ft.

Diam. _____ Slot size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☒ Yes ☐ No Size of gravel/sand 8x12

Materials placed from 60 ft. to 136 ft.

Surface Seal: ☒ Yes ☐ No To what depth? 25 ft.

Material used in seal bentonite

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? _____ Depth of strata _____

Method of sealing strata off _____

PUMP: Manufacturer's Name N/A

Type: N/A H.P. N/A

WATER LEVELS: Land-surface elevation above mean sea level 780 ft.

Static level 39.61 ft. below top of well Date 10/23/07

Artesian pressure _____ lbs. per square inch Date _____

Artesian water is controlled by _____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☒ Yes ☐ No If yes, by whom? Hokkaido

Yield: 776 gal./min. with 3.74 ft. drawdown after 1 hrs.
Yield: 776 gal./min. with 3.99 ft. drawdown after 10 hrs.
Yield: 776 gal./min. with 4.15 ft. drawdown after 24 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
0	40.14	30	40.05	240	39.91
5	40.10	60	40.03	440	39.84
10	40.08	120	39.98	1440	39.72

Date of test Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.

Airtest _____ gal./min. with stem set at _____ ft. for _____ hrs.

Artesian flow _____ g.p.m. Date _____

Temperature of water 48 Was a chemical analysis made? ☒ Yes ☐ No

CURRENT

Notice of Intent No. WE06717

Unique Ecology Well ID Tag No. AFT 336

Water Right Permit No. 20890C

Property Owner Name City of Enumclaw

Well Street Address 45224 284th Avenue S

City Enumclaw County King

Location NW1/4-1/4 SE1/4 Sec 30 Twn 20 R 7E EWM ☒ Or WWM ☐

Lat/Long (s, t, r Still REQUIRED) Lat Deg N/A Min N/A Sec N/A Long Deg N/A Min N/A Sec N/A

Tax Parcel No. 3020079006

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Dry Brown Silty Sand and Gravel with Cobbles	0	8
Dry Gray Silty Gravel	8	16
Dry Gray Silty Gravel w/ Cobbles and Wood	16	21
Dry Gray-Brown Silty Gravel w/ Cobbles, tight, some bound	21	45
Water Bearing Brown Medium Sand w/ some F-C Sand and Gravel	45	59
Water Bearing Brown Gravel with Med. Sand, some F-C	59	84
Water Bearing Brown Fine to Medium Sand w/ occ. Gravel and wood organics	84	108
Water Bearing Dark Brown Coarse to Medium Sand and Gravel w/ wood organics	108	131
Gray Moist Clay-Bound Sand and Gravel	131	136.5

RECEIVED NOV 02 2007 DEPT. OF ECOLOGY

Start Date 5/29/07 Completed Date 10/25/07

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Driller or trainee License No. 1239

Name (Print Last, First) ROBERT B. CARPER

Driller/Engineer/Trainee Signature Robert B Carper

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company HOKKAIDO DRILLING, INC.

Address P.O. BOX 100

City, State, Zip GRAHAM, WA 98338

Contractor's Registration No. HOKKADI017M8 Date NOVEMBER 1, 2007

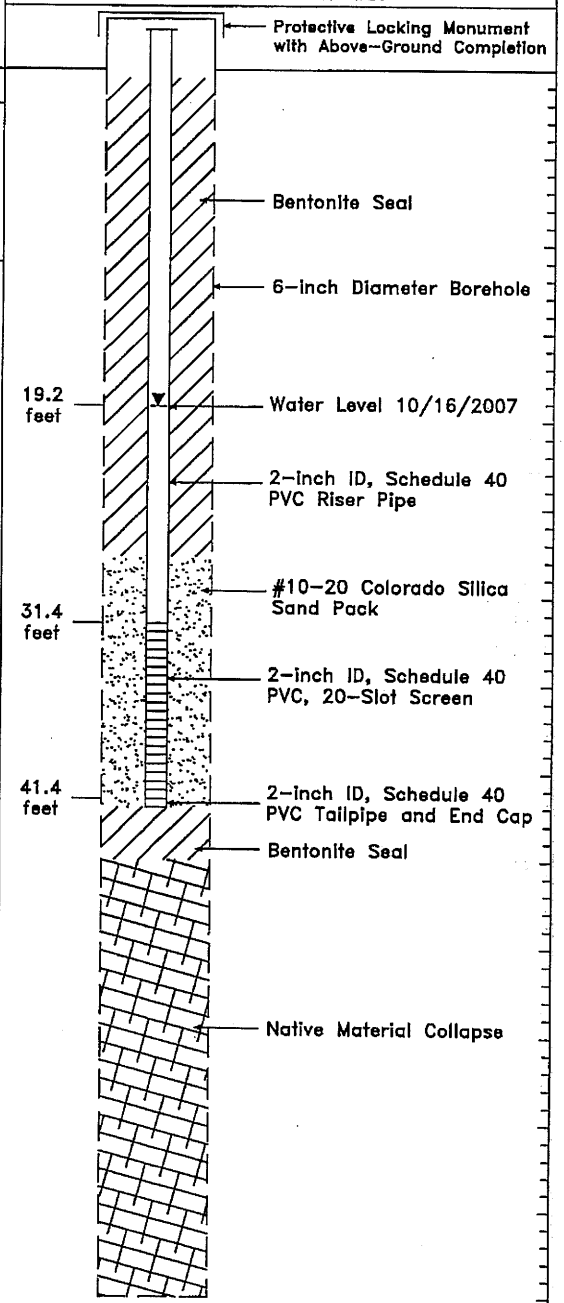
Boise Spring Well Logs

Figure 4 Well Log and As-Built for Boise Spring MW-1

DRAFT

DEPTH (ft)	GEOLOGIC LOG	UNIT
	Ground Surface Elevation: 920 ft (NGVD 29)	
0	Moist, brown, silty, very sandy, GRAVEL	Qvr
	Dry, orange/brown, sl. gravelly, silty, fine SAND	
5	Moist to wet, brown, gravelly, silty, fine SAND with cobbles up to 4-inches	
	Dry, gray, slightly gravelly, silty, fine SAND	Qvt
	Dry, brown, silty, fine SAND with trace gravel. Gap-graded, sub-angular gravel.	
10		
	Dry, brown, slightly gravelly, slightly silty, fine SAND. Increase in moisture and gravel at 13 feet.	
15		
	Interlayers of moist, brown, gravelly, very silty fine SAND and wet, brown, silty fine SAND. Layers 0.5 to 1.5 feet thick.	
20	Moist, brown, gravelly, silty, fine to coarse SAND	
25	Wet at 26 feet.	
	Wet, gray, gravelly, fine to coarse SAND with cobbles	Qva
30	Wet, brown, silty, very gravelly, fine to coarse SAND. Silt bound to outer gravel.	
35	Wet, gray, slightly silty, very gravelly, fine to coarse SAND	
	Moist, gravelly, silty, fine to coarse SAND. Lens of moist, black and white, fine to coarse SAND from 36.5 to 37 feet.	
40	Wet, gray, fine to coarse SAND with trace gravel	
45	Wet, brown, silty, gravelly, fine to coarse SAND with cobbles.	
50		
55	Wet, brown, slightly gravelly, fine to coarse SAND	
	Gray, slightly gravelly, clayey SILT with cobbles	
60	Dry, brown, very silty fine SAND with cored rock/boulder	
65	Black ANDESITE rock core up to 6-inches long in silty/clay matrix	Tb
	Dry, gray, sandy SILT	
70	Black ANDESITE rock core up to 5-inches long in silty matrix	
	Bottom of Boring 10/16/2007	
75		
80		

WELL CONSTRUCTION DETAILS



PROJECT NAME: Boise Spring Water Supply Evaluation
WELL IDENTIFICATION NUMBER: MW-1
LOCATION: SE ¼ NW ¼ Sec.29, T.20N., R.7E.
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Inger Jackson/Dan Matlock
WDOE NO: BAM 077

DEPTH TO WATER: 19.2 feet below ground
WATER LEVEL DATE: 10/16/2007
START CARD NO.: R70812
DRILLING METHOD: Sonic
DRILLER: Brian Owens
FIRM: Boart Longyear

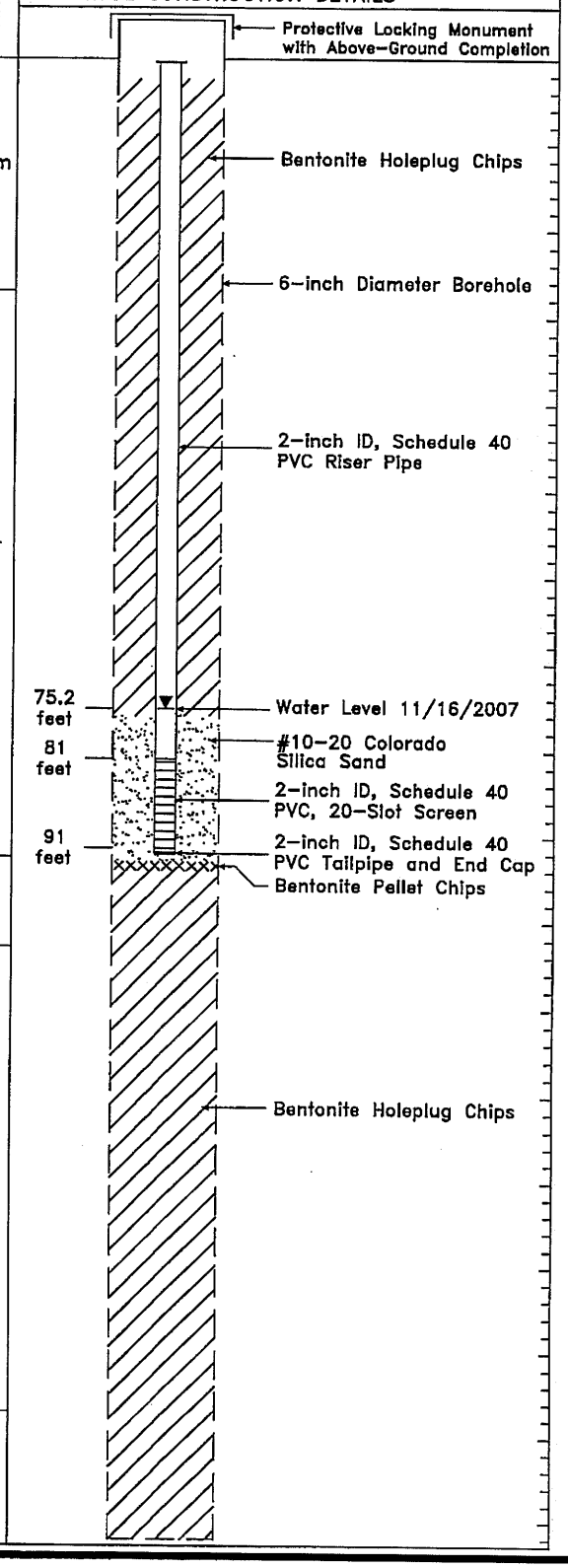
Confidential Attorney/Client Work Product Prepared in Anticipation of Litigation

PSG

Figure 5 Well Log and As-Built for Boise Spring MW-2

DRAFT

DEPTH (ft)	GEOLOGIC LOG	UNIT
	Ground Surface Elevation: 999 ft (NGVD 29)	
0	Dry, gray clay mixed with crushed road bed	
	Wet, brown with orange mottling, silty fine SAND with trace gravel. Cobble at 6 feet.	
10	Moist, gray, slightly gravelly, very silty, fine SAND. Cobbles at 11 feet.	Qom
	Dry, gray, slightly silty, gravelly, fine SAND	
20	Dry, brown, gravelly, fine SAND. Some coarse sand from 18 to 20 feet.	
	Dry, brown, very gravelly, fine SAND with cobbles	
30	Moist, gray, slightly gravelly, very silty, fine SAND	
	Dry, brown, silty, gravelly, fine SAND	
40	Dry, brown, slightly silty, gravelly, fine SAND with cobbles	
50		
60	Moist, brown, slightly silty, gravelly, fine SAND. Trace cobbles at 60 to 63 feet and 71 feet.	Qvr
70		
80	Water and medium to coarse SAND encountered at 75 feet.	
	Wet, brown, slightly silty, sandy, fine GRAVEL	
	Wet, brown, silty, sandy, fine GRAVEL	
90	Moist, brown, silty, very gravelly, fine to coarse SAND	
	Dry to moist, gray, compact, slightly gravelly, very silty, fine SAND	Qvt
100		
110	Brown, silty, gravelly, fine to medium SAND. Wet, slightly silty zone with cobbles from 105 to 108 feet	
	Moist, brown, silty, gravelly, fine SAND	
	Moist, brown, slightly gravelly, very sandy SILT	
120	Moist, gray, slightly gravelly, silty, fine SAND. Fine gravel decreases with depth. Cobbles at 124 feet	
130	Dry, gray, slightly gravelly, very sandy SILT	Qva
	Boulders	
140		
	Wet, silty, fine to medium SAND with trace gravel	
150	Wet, slightly silty, slightly gravelly, fine to medium SAND	
	Moist, slightly gravelly, silty SAND and sandy SILT layers. Hard below 151.5 feet.	
160	Boulders	
	Dry, sandy SILT/CLAY. Color changes with depth from red to blue to gray to orange/brown.	Tb
170	ANDESITE bedrock core	
	Bottom of Boring 11/16/2007	



PROJECT NAME: Boise Spring Water Supply Evaluation
WELL IDENTIFICATION NUMBER: MW-2
LOCATION: SW ¼ NE ¼ Sec.29, T.20N., R.7E.
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Inger Jackson
WDOE NO: BAM 232

DEPTH TO WATER: 75.2 feet below temporary top of casing/ground surface
WATER LEVEL DATE: 11/16/2007
START CARD NO.: R70817
DRILLING METHOD: Sonic
DRILLER: Ken Phillips
FIRM: Boart Longyear

PGG

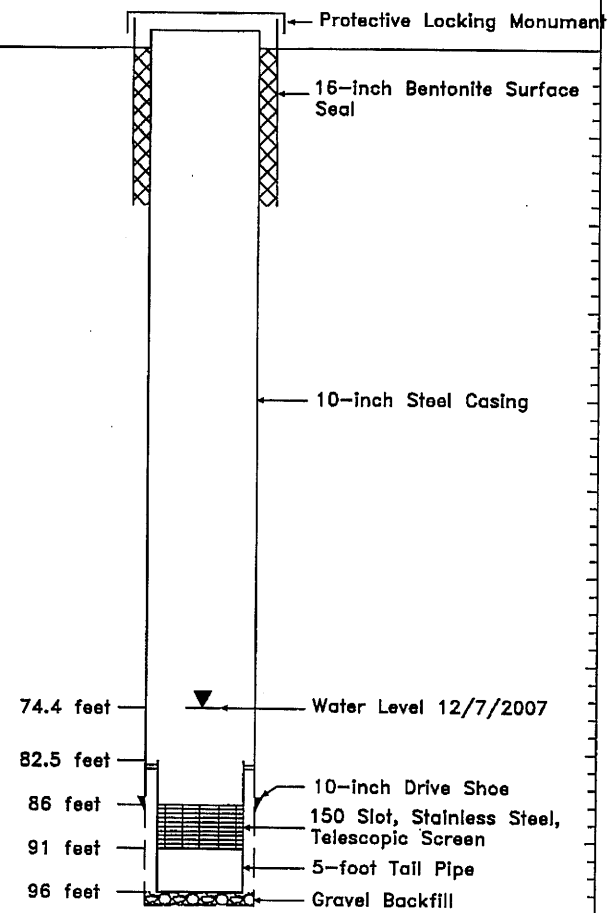
Confidential Attorney/Client Work Product Prepared in Anticipation of Litigation

Figure 6 Well Log and As-Built for Boise Spring TW-1

DRAFT

DEPTH (ft)	GEOLOGIC LOG	Sample Interval
0	Ground Surface Elevation: 999 ft (NGVD 29)	
	[Adding water during drilling 0–35 feet] Brown, slightly silty, gravelly, medium to coarse SAND	
10	Gray, sandy GRAVEL	
	Cobbles at 15 feet	
20	Dry, brown, slightly silty, gravelly, fine and medium SAND	
	Dry, gray, slightly (fine) sandy, fine GRAVEL	
30	Increase in coarse sand	
	Dry, gray, gravelly, medium to coarse SAND. Drilling action indicates cobbles at 36 feet.	
40		
	Wet, brown, slightly silty, gravelly, medium to coarse SAND. No binder observed.	
50	Moist, brown, very (medium to coarse) sandy, fine GRAVEL with trace silt. Decrease in medium sand at 55 feet.	
60	Dry, gray, slightly gravelly, medium SAND.	
	Brown, slightly silty, very sandy (medium to coarse), fine GRAVEL [adding water]	
70	(Washed) gray, gravelly, medium to coarse SAND [adding water]	
	Brown, very gravelly, medium to coarse SAND with trace silt. Wet at 80 feet.	
80	Wet, brown, sandy fine GRAVEL. Slightly silty at 87 feet.	
90	Wet, brown, sandy, fine GRAVEL (well-rounded, well-graded, 0.5–0.75 inches)	
	Large cobble/boulder at 95 feet. Wet, brown, slightly silty, gravelly, fine SAND	
100	—Bottom of Boring 12/7/2007—	
110		
120		
130		
140		
150		
160		
170		

WELL CONSTRUCTION DETAILS



PROJECT NAME: Boise Spring Water Supply Evaluation
WELL IDENTIFICATION NUMBER: TW-1
LOCATION: SW¼ NE¼ Sec.29, T.20N., R.7E.
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Inger Jackson
WDOE NO: ALN 186

DEPTH TO WATER: 74.4 feet below ground surface
WATER LEVEL DATE: 12/7/2007
DRILLING METHOD: Air Rotary
DRILLER: John Arfman
FIRM: Boart Longyear

PGG

Confidential Attorney/Client Work Product Prepared in Anticipation of Litigation

280285

BOART LONGYEAR

20-7E-29K

Resource Protection Well Report

Project Name: Springtest well

Date: 10/17/07

Well Identification #: Ban 077

County: King NW ¼ SE ¼

Drilling Method: Sonic

Section: 29 T. 20 N R. 7E

Driller: Brian Owens Thomas Craney

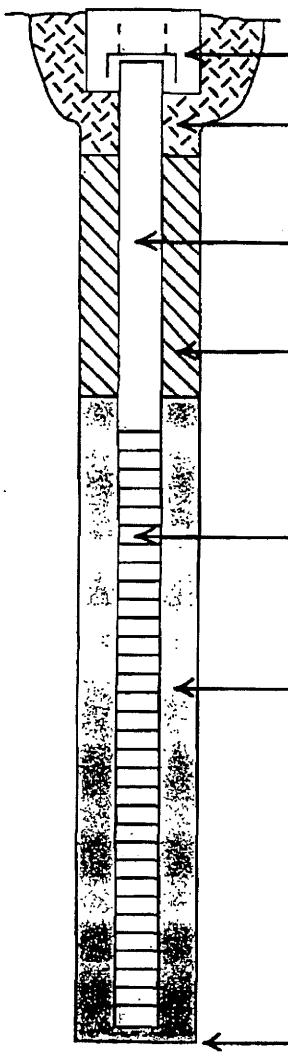
~~Street Address~~ N 47° 11.647 W 121° 56.593

License #: 2409

Start Card: R 70812

Consulting Firm: PGWG

AS-BUILT



WELL DATA

MONUMENT TYPE: above ground

CONCRETE SURFACE SEAL 0-2 ft.

PVC BLANK 2 "x 40'

BACKFILL 2-28 ft.

TYPE: 3/4 ben Chips

PVC SCREEN 2 "x 10 ft

SLOT SIZE: .20

TYPE: PVC tread together

GRAVEL PACK 28-41 ft.

MATERIAL: 10/20 Silica Sand

WELL DEPTH 41 ft.

FORMATION DESCRIPTION

0 - 15 ft. Rocky, Sand

15 - 60 ft. Rock, Sand, Silt

60 - 70 ft. bed rock

- ft.

REMARKS

RECEIVED

DEC 19 2007

DEPT. OF ECOLOGY

RECEIVED

DEC 19 2007

DEPT. OF ECOLOGY

Signature: Thomas W. Craney

VAV039.CDR

Ground Water Contamination
Susceptibility Assessment Survey Form
Version 2.1

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 Enumclaw

Water system name : City of Enumclaw

County: King

Water system number: 236001 Source number: ~~1~~ 2 01

Well depth: _____ (ft.) (*From WFI form*)

Source name: Boise Spring

WA well identification tag number: ___ ___ ___-___ ___ ___

_____ well not tagged

Number of connections: 4200 Population served: 10,000

Township: 20N Range: 7E

Section: 29 1/4 1/4 Section: SE ¼ NW ¼

Latitude/longitude (if available): _____/_____

How was lat./long. determined?

_____ global positioning device _____ survey _____ topographic map
____other: Water Right Permit

* 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: ___ / ___ /___ month/day/year Early 1900's

last reconstruction: ___ / ___ /___ month/day/year

X information unavailable

2) Well driller: _____

_____

_____

___ well driller unknown

3) Type of well:

___Drilled: ___ rotary ___ bored ___ cable (percussion) ___ Dug

___ Other: X spring(s) ___ lateral collector (Ranney)

___ driven ___ jetted ___ other: _____

Additional comments: _____

_____

4) Well report available? ___ YES (attach copy to form) X NO

If no well log is available, please attach any other records documenting well construction; e.g. boring logs, "as built" sheets, engineering reports, well reconstruction logs.

5) Average pumping rate: 540 (gallons/min)

Source of information: Metered

If not documented, how was pumping rate determined? _____

_____

___ Pumping rate unknown

6) Is this source treated?

If so, what type of treatment:

X disinfection ___ filtration ___ carbon filter ___ air stripper ___ other

Purpose of treatment (describe materials to be removed or controlled by treatment):

Chlorination for disinfection.

_____

7) If source is chlorinated, is a chlorine residual maintained: X YES ___ NO

Residual level: .30 *(At the point closest to the source.)*

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

___ < 20 ft ___ 20–50 ft ___ 50–100 ft ___ 100–200 ft ___ >200 ft

___ information unavailable ('< ' *means less than;* '> ' *means greater than*)

2) Depth to ground water (static water level):

___ < 20 ft ___ 20–50 ft ___ 50–100 ft ___ >100 ft

_X_ 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

UNKNOWN feet above wellhead

4) If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source: _X_ YES ___ NO

5) Wellhead elevation (height above mean sea level): 1000 (ft)

How was elevation determined? ___ topographic map _X_ Drilling/Well Log ___ altimeter

___ other: _____

___ 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.)

___ 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 top of the open interval? ___ YES ___ NO

_X_ information unavailable

7) Sanitary setback:

___ < 100 ft* ___ 100-120 ft ___ 120-200 ft X > 200 ft
* if less than 100 ft describe the site conditions:

8) Wellhead construction:

___ wellhead enclosed in a wellhouse

X controlled access (describe): Spring area fenced around catchment / app. 20 acre watershed.

___ other uses for wellhouse (describe): ___

___ no wellhead control

9) Surface seal:

___ 18 ft

___ < 18 ft (no Department of Ecology approval) (*'<' means less than*)

___ < 18 ft (Approved by Ecology, include documentation) (*'<' means less than*)

___ > 18 ft (*'>' means greater than*)

___ depth of seal unknown

___ no surface seal

10) Annual rainfall (inches per year):

___ < 10 in/yr ___ 10-25 in/yr X > 25 in/yr

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 375,438,592 (gallons)

How was this determined?

X meter

___ estimated: ___ pumping rate (_____)

___ pump capacity (_____)

___ other: _____

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)

6 month ground water travel time : 2,200 (ft)

1 year ground water travel time : 3,110 (ft)

5 year ground water travel time: 6,950 (ft)

10 year ground water travel time: 9,830 (ft)

Information available on length of screened/open interval?

___ YES X NO

Length of screened/open interval: _____(ft)

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? X YES ___ NO (mark and identify on map). Boise Creek

4) Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the 6 month time of travel boundary? ___ YES X 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:

	6 month	1 year	5 year	unknown
likely pesticide application	No	No	NO	
stormwater injection wells	No	No	No	
other injection wells	No	No	No	
abandoned ground water well	No	No	No	
landfills, dumps, disposal areas	No	No	Yes-Enumclaw Landfill	
known hazardous materials clean-up site	No	No	No	
water system(s) with known quality problems	No	No	No	
population density > 1 house/acre	No	No	Yes	
residences commonly have septic tanks	No	Yes	Yes	
Wastewater treatment lagoons	No	No	No	
sites used for land application of waste	No	No	Yes--Farm Use	

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.)

A. Nitrate: (Nitrate MCL = 10 mg/l)	YES	NO
Results greater than MCL	___	X
< 2 mg/liter nitrate	___	X
2–5 mg/liter nitrate	___	X
> 5 mg/liter nitrate	___	X
___ Nitrate sampling records unavailable		

B. VOCs: (VOC detection level 0.5 ug/l or 0.0005 mg/l.)	YES	NO
Results greater than MCL or SAL	___	X
VOCs detected at least once	___	X
VOCs never detected	___	X
___ VOC sampling records unavailable		

C. EDB/DBCP:	YES	NO
(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		
X EDB/DBCP tests not required		

D. Other SOCs (Pesticides):	YES	NO
Other SOCs detected (pesticides and other synthetic organic chemicals)	___	___
___ Other SOC tests performed but none detected (list test methods in comments		
X Other SOC tests not performed		

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: _____

_____

_____

_____

E. Bacterial contamination:

	YES	NO
Any bacterial detection(s) in the past 3 years in samples taken from the source (not distribution sampling records).	___	X
Has source (in past 3 years) had a bacteriological contamination problem found in distribution samples that was attributed to the source.	___	X

___ 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 theses 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?)

X YES ___ NO

Describe with references to map produced in Part IV:

Boise Spring is located in Cascade Foothills above the Enumclaw Plateau.

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 X 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 X 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 X 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.

Zone of contribution I believe is from the East of Spring in the Cascade Foothills. High Elevation.

Suggestions and Comments

Did you attend one of the susceptibility workshops? ___ YES X NO

Did you find it useful? ___ YES X NO

Did you seek outside assistance to complete the assessment? ___ YES X NO

This form and instruction packet are 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.

Ground Water Contamination
Susceptibility Assessment Survey Form
Version 2.1

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 Enumclaw

Water system name : City of Enumclaw

County: King

Water system number: 236001 Source number: 502

Well depth: _____ (ft.) (*From WFI form*)

Source name: Watercress Spring

WA well identification tag number: ___ ___ ___-___ ___ ___

_____ well not tagged

Number of connections: 4200 Population served: 10,000

Township: 20N Range: 7E

Section: NW½ 19 1/4 1/4 Section: NE¼ SW¼

Latitude/longitude (if available): _____/_____

How was lat./long. determined?

_____ global positioning device _____ survey X topographic 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: ___ / ___ /___ month/day/year Apx. 1953

last reconstruction: ___ / ___ /___ month/day/year

X information unavailable

2) Well driller: _____

_____

_____

__X__ well driller unknown

3) Type of well:

___Drilled: ___ rotary ___ bored ___ cable (percussion) ___ Dug

___ Other: __X__ spring(s) ___ lateral collector (Ranney)

___ driven ___ jetted ___ other: _____

Additional comments: _____

_____

4) Well report available? ___ YES (attach copy to form) __X__ NO

If no well log is available, please attach any other records documenting well construction; e.g. boring logs, "as built" sheets, engineering reports, well reconstruction logs.

5) Average pumping rate: 1735 (gallons/min)

Source of information: Metered

If not documented, how was pumping rate determined? _____

_____

___ Pumping rate unknown

6) Is this source treated?

If so, what type of treatment:

__X__ disinfection ___ filtration ___ carbon filter ___ air stripper ___ other

Purpose of treatment (describe materials to be removed or controlled by treatment):

Chlorination for disinfection

_____

7) If source is chlorinated, is a chlorine residual maintained: __X__ YES ___ NO

Residual level: .6 (*At the point closest to the source.*)

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

___ < 20 ft ___ 20–50 ft ___ 50–100 ft ___ 100–200 ft ___ >200 ft

_X_ information unavailable ('< ' *means less than;* '> ' *means greater than*)

2) Depth to ground water (static water level):

___ < 20 ft ___ 20–50 ft ___ 50–100 ft ___ >100 ft

_X_ 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

Unknown feet above wellhead

4) If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source: _X_ YES ___ NO

5) Wellhead elevation (height above mean sea level): 750 (ft)

How was elevation determined? ___ topographic map _X_ Drilling/Well Log ___ altimeter

___ other: _____

___ 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.)

___ 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 top of the open interval? ___ YES ___ NO

_X_ information unavailable

7) Sanitary setback:

___ < 100 ft* ___ 100–120 ft ___ 120–200 ft X > 200 ft
* if less than 100 ft describe the site conditions:

8) Wellhead construction:

___ wellhead enclosed in a wellhouse

X controlled access (describe): Catchment at pump house enclosed in 100'x100' fencing.

___ other uses for wellhouse (describe): ___

___ no wellhead control

9) Surface seal:

___ 18 ft

___ < 18 ft (no Department of Ecology approval) *('< ' means less than)*

___ < 18 ft (Approved by Ecology, include documentation) *('< ' means less than)*

___ > 18 ft *('> ' means greater than)*

___ depth of seal unknown

___ no surface seal

10) Annual rainfall (inches per year):

___ < 10 in/yr ___ 10–25 in/yr X > 25 in/yr

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:

	6 month	1 year	5 year	unknown
likely pesticide application	No	No	No	
stormwater injection wells	No	No	No	
other injection wells	No	No	No	
abandoned ground water well	Yes		Yes	
landfills, dumps, disposal areas	No	Yes	Yes	
known hazardous materials clean-up site	No	No	No	
water system(s) with known quality problems	No	No	No	
population density > 1 house/acre	Yes	Yes	Yes	
residences commonly have septic tanks	Yes	Yes	Yes	
Wastewater treatment lagoons	No	No	No	
sites used for land application of waste	No	No	No	

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:

_____

_____

_____

_____

_____

_____

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 454,855,268 (gallons)

How was this determined?

X meter

___ estimated: ___ pumping rate (_____)

___ pump capacity (_____)

___ other: _____

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)

6 month ground water travel time : 2,200 (ft)

1 year ground water travel time : 3,110 (ft)

5 year ground water travel time: 6,950 (ft)

10 year ground water travel time: 9,830 (ft)

Information available on length of screened/open interval?

___ YES X NO

Length of screened/open interval: _____ (ft)

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? X YES ___ NO (mark and identify on map).

Drainage ditch marked as DD No!

4) Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the 6 month time of travel boundary? ___ YES X NO (mark and identify on map).

Comments: _____

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.)

A. Nitrate: (Nitrate MCL = 10 mg/l)	YES	NO
Results greater than MCL	___	X
< 2 mg/liter nitrate	___	X
2–5 mg/liter nitrate	___	X
> 5 mg/liter nitrate	___	X
___ Nitrate sampling records unavailable		

B. VOCs: (VOC detection level 0.5 ug/l or 0.0005 mg/l.)	YES	NO
Results greater than MCL or SAL	___	X
VOCs detected at least once	___	X
VOCs never detected	___	X
___ VOC sampling records unavailable		

C. EDB/DBCP:	YES	NO
(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		
X EDB/DBCP tests not required		

D. Other SOCs (Pesticides):	YES	NO
Other SOCs detected (pesticides and other synthetic organic chemicals)	___	___
___ Other SOC tests performed but none detected (list test methods in comments		
X Other SOC tests not performed		

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: _____

_____

_____

_____

E. Bacterial contamination:

	YES	NO
Any bacterial detection(s) in the past 3 years in samples taken from the source (not distribution sampling records).	X	
Has source (in past 3 years) had a bacteriological contamination problem found in distribution samples that was attributed to the source.		X

___ 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 theses 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:

Boise & Newaukum creeks, Cascade Foothills to the East.

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 Log Unavailable

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 Log Unavailable

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.)

X 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	___	___	___
6 month–1 year travel time	X	___	___
1–5 year travel time	X	P.C.	Wells
5–10 year travel time	X	I	& II

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.

I believe the zone of contribution for this source is primarily from the East and Northeast, flowing from the Cascade Foothills.

Suggestions and Comments

Did you attend one of the susceptibility workshops? ___ YES X NO

Did you find it useful? ___ YES ___ NO

Did you seek outside assistance to complete the assessment? ___ YES X NO

This form and instruction packet are 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.

Ground Water Contamination
Susceptibility Assessment Survey Form
Version 2.1

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 Enumclaw

Water system name : City of Enumclaw

County: King

Water system number: 236001 Source number: ~~504~~ New 505

Well depth: 229.2 (ft.) (*From WFI form*)

Source name: P.C. Johnson II

WA well identification tag number: ___ ___ ___-___ ___ ___

_____ well not tagged

Number of connections: _____ Population served: _____

Township: T.20N Range: R.7E

Section: 18 1/4 1/4 Section: _____

Latitude/longitude (if available): _____/_____

How was lat./long. determined?

_____ global positioning device _____ survey _____ topographic 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: 3 / 15 / 86 month/day/year

last reconstruction: ___ / ___ /___ month/day/year

_____ information unavailable

2) Well driller: Holt Drilling

___ well driller unknown

3) Type of well:

_X_ Drilled: ___ rotary ___ bored _X_ cable (percussion) ___ Dug

___ Other: ___ spring(s) ___ lateral collector (Ranney)

___ driven ___ jetted ___ other: _____

Additional comments: _____

4) Well report available? _X_ YES (attach copy to form) ___ NO

If no well log is available, please attach any other records documenting well construction; e.g. boring logs, "as built" sheets, engineering reports, well reconstruction logs.

5) Average pumping rate: 1250 (gallons/min)

Source of information: Metered

If not documented, how was pumping rate determined? _____

___ Pumping rate unknown

6) Is this source treated?

If so, what type of treatment:

_X_ disinfection ___ filtration ___ carbon filter ___ air stripper ___ other

Purpose of treatment (describe materials to be removed or controlled by treatment):

7) If source is chlorinated, is a chlorine residual maintained: _X_ YES ___ NO

Residual level: .47 (*At the point closest to the source.*)

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

___ < 20 ft ___ 20–50 ft ___ 50–100 ft ___ 100–200 ft _X_ >200 ft

___ information unavailable (*'< ' means less than; '> ' means greater than*)

2) Depth to ground water (static water level):

___ < 20 ft _X_ 20–50 ft ___ 50–100 ft ___ >100 ft

___ flowing well/spring (artesian)

How was water level determined?

_X_ 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): _745_(ft)

How was elevation determined? ___ topographic map _X_ Drilling/Well Log ___ altimeter

___ other: _____

___ 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 top of the open interval? _X_ YES ___ NO

___ information unavailable

7) Sanitary setback:

___ < 100 ft* ___ 100–120 ft ___ 120–200 ft ___ > 200 ft
* if less than 100 ft describe the site conditions:

8) Wellhead construction:

X wellhead enclosed in a wellhouse

X controlled access (describe): Well House inside chain link fence.

___ other uses for wellhouse (describe): ___

___ no wellhead control

9) Surface seal:

___ 18 ft

X < 18 ft (no Department of Ecology approval) ('< ' *means less than*)

___ < 18 ft (Approved by Ecology, include documentation) ('< ' *means less than*)

___ > 18 ft ('> ' *means greater than*)

___ depth of seal unknown

___ no surface seal

10) Annual rainfall (inches per year):

___ < 10 in/yr ___ 10–25 in/yr X > 25 in/yr

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 74,645,333 (gallons) 1993

How was this determined?

X meter

___ estimated: ___ pumping rate (_____)

___ pump capacity (_____)

___ other: _____

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)

6 month ground water travel time : 620 (ft)

1 year ground water travel time : 880 (ft)

5 year ground water travel time: 1,970 (ft)

10 year ground water travel time: 2,780 (ft)

Information available on length of screened/open interval?

X YES ___ NO

Length of screened/open interval: 20 (ft)

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 X 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:

	6 month	1 year	5 year	unknown
likely pesticide application	~~No~~	~~No~~	~~No~~	
stormwater injection wells	No	No	No	
other injection wells	No	No	No	
abandoned ground water well	Yes	Yes		
landfills, dumps, disposal areas	No	No	No	
known hazardous materials clean-up site	No	No	No	
water system(s) with known quality problems	No	No	No	
population density > 1 house/acre	~~No~~	~~No~~	~~No~~	
residences commonly have septic tanks	Yes	Yes	Yes	
Wastewater treatment lagoons	No	No	No	
sites used for land application of waste	No	No	No	

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:

I belive zone of contribution is primarily from the East.

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.)

A. Nitrate: (Nitrate MCL = 10 mg/l)	YES	NO
Results greater than MCL	___	X
< 2 mg/liter nitrate	___	___
2–5 mg/liter nitrate	___	___
> 5 mg/liter nitrate	___	___
___ Nitrate sampling records unavailable		

B. VOCs: (VOC detection level 0.5 ug/l or 0.0005 mg/l.)	YES	NO
Results greater than MCL or SAL	___	___
VOCs detected at least once	___	X
VOCs never detected	___	___
___ VOC sampling records unavailable		

C. EDB/DBCP:	YES	NO
(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		
X EDB/DBCP tests not required		

D. Other SOCs (Pesticides):	YES	NO
Other SOCs detected (pesticides and other synthetic organic chemicals)	___	___
___ Other SOC tests performed but none detected (list test methods in comments		
X Other SOC tests not performed		

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: _____

_____

_____

_____

E. Bacterial contamination:

	YES	NO
Any bacterial detection(s) in the past 3 years in samples taken from the source (not distribution sampling records).	___	X
Has source (in past 3 years) had a bacteriological contamination problem found in distribution samples that was attributed to the source.	___	X

___ 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 theses 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 X 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 X 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 X 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.

~~I believe the zone of contribution is primarily from the~~ East.

Suggestions and Comments

Did you attend one of the susceptibility workshops? ___ YES X_ NO

Did you find it useful? ___ YES ___ NO

Did you seek outside assistance to complete the assessment? ___ YES X_ NO

This form and instruction packet are 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.

SOURCE- 06

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 Enumclaw

Water system name: City of Enumclaw

County: *King*

Water system number: 236001 Source number: *503R (replacement well)*

Well depth: 230 (ft.) (From WFI form)

Source name: P.C. Johnson Well No. 1

WA well identification tag number: ACS 963

_____ well not tagged

Number of connections: *4200* Population served: 10,000

Township: *20N* Range: *7E*

Section: 18 1/4 1/4 Section: NE SW *(WM)*

Latitude/longitude (if available): _____ / _____

How was lat./long. determined?

_____ global positioning device ____ survey ____ topographic 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: 6/25/97 month/day/year

last reconstruction: __/__/__ month/day/year

____ information unavailable

2) Well driller: *Holt Drilling, Inc.*
10621 Todd Rd. E, Puyallup, WA 98372
St. Contr. Reg. # 1099

_____ well driller unknown

3) Type of well:

__ Drilled: ____ rotary *(Air)* __ bored ✓ cable (percussion) Dug

__ Other: ___ spring(s) __ lateral collector (Ranney)

___ driven __ jetted __ other:

Additional comments: _____

_____

4) Well report available? ✓ YES (attach copy to form) __ NO

If no well log is available, please attach any other records documenting well construction; e.g. boring logs, "as built" sheets, engineering reports, well reconstruction logs.

4) Average pumping rate: 820 (gallons/min) *(will only be pumped at 550 gpm per water right restriction)*

Source of information: *aquifer pumping test, (free discharge through pipe orifice tables)*

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):

** Source will be treated with Cl for bacteria. No planned additional treatment for well.*

7) If source is chlorinated, is a chlorine residual maintained: ✓ YES __ NO

Residual level: *0.45 ppm* (At the point closest to the source.)

PART III: Hydrogeologic Information

1) Depth to top of open interval (screen): [check one]

__ <20 ft __ 20--50 ft ___ 50--100 ft ✓ 100--200 ft ___>200 ft

__ information unavailable ('<' means less than: '>' means greater than)

2) Depth to ground water (static water level):

__<20 ft ✓ 20--50 ft __ 50--100 ft __ > 100 ft

__ flowing well/spring (artesian)

How was water level determined?

__ well log ✓ other: *electrical conductivity water level indicator and Hermit data logger, model 2000.*

__ 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 *N/A*
_____ 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 *N/A.*

5) Wellhead elevation (height above mean sea level): 745 (ft)

How was elevation determined? ___ topographic map __ Drilling/Well log ___ altimeter

✓other: Elevation of P.C. Johnson Well No. II which is 80 feet north of newly constructed P.C. 1 replacement well

__ 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.)

___*Yes*___ evidence of a confining layer *in Kleinfelder lithologic log and previous logs*

_____ no evidence of a confirming 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

7) Sanitary setback:

✓ <100 ft __ 100--120 ft __ 120--200 ft __ > 200 ft

* If less than 100 ft describe the site conditions:

The sanitary setback north, east, and west of the well is at least 100 feet. The sanitary setback south of the well is 80 feet. The owners of the property to the south would not lease or sell the portion of their land within the 100 foot sanitary control radius of the well to the City, or provide the City with restrictive covenants for that portion of land. Cattle occasionally graze on this portion of land. However, based on the results of the pumping test (confined aquifer), the depth of the sanitary seal, and the absence of coliform bacteria in the water samples, we do not believe the 20 foot reduction in sanitary setback distance constitutes a threat to human health.

8) Wellhead construction:

__ wellhead enclosed in a wellhouse

✓ controlled access (describe): *The new well is constructed with a pitless adapter, Baker Monitor PS unit, approved by the Washington State Department of Health. The pump station hardware and appurtenances are located approximately 20 feet north of the well in the old P.C. Johnson Well No. 1 pumphouse. The well site is secured with a chain-link fence.*

__ other uses for wellhouse (describe): _____

__ no wellhead control

9) Surface seal:

__ 18 ft

__ < 18 ft (no Department of Ecology approval) ('<' means less than)

__ < 18 ft (Approved by Ecology, include the documentation) ('<' means less than)

✓ > 18 ft *(50')* ('>' means greater than)

__ 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: *0* (gallons)

How was this determined? This is an emergency replacement well which will not be used unless P.C. Johnson Well No. II becomes inoperable. The original P.C. Johnson Well No. I has been abandoned.

___ meter

__ estimated __ pumping rate

__ pump capacity (_____)

__ other

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet) *based on calculated sustained yield of 550 (water right) and 820 gpm, and a constant pumping rate, 365 days/yr, in the event P.C. Johnson Well No. II becomes inoperable. See Plate 2*

	550 gpm	*820 gpm*
6 month ground water travel time:	*966 ft*	*1,179 ft*
1 year ground water travel time:	*1,366 ft*	*1,667 ft*
5 year ground water travel time:	*3,054 ft*	*3,729 ft*
10 year ground water travel time:	*4,319 ft*	*5,273 ft*

Information available on length of screened/open interval?

✓ YES __NO

Length of screened/open interval: *30* (ft)

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? __YES ✓ NO.

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).

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:

	6 month	1 year	5 year	unknown
likely pesticide application	N	N	N	
stormwater injection wells	N	N	N	
other injection wells	N	N	N	
abandoned ground water well	Y	Y	Y	
landfills, dumps, disposal areas	N	N	N	
known hazardous materials clean-up site	N	N	N	
water system(s) with known quality problems	N	N	N	
population density > 1 house/acre	N	N	Y	
residences commonly have septic tanks	Y	Y	Y	
Wastewater treatment lagoons	N	N	N	
sites used for land application of waste	N	N	N	

Mark and identify on map any of the risks listed above which are located within the 6 month time of travel boundary. (Plate 2 is a map of the wellhead and time of travel areas. Locations of homes, streets, driveways, etc. are shown on the map.)

If other recorded or potential sources of groundwater contamination exist within the ten year time of travel circular zone around your water supply, please describe: None known.

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.)

A. **Nitrate:** (Nitrate MCL = 10 mg/l)	YES
Results greater than MCL	____
<2 mg/liter nitrate	✓
2--5 mg/liter nitrate	____
>5 mg/liter nitrate	____
Nitrate sampling records unavailable	____

B. **VOCs** (VOC detection level 0.5 ug/l or 0.0005 mg/l)	YES
Results greater than MCL or SAL	____
VOCs detected at least once	____
VOCs never detected	✓
VOC sampling records unavailable	____

C. **EDB/DBCP:**	YES
(EDG 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	✓

D. **Other SOCs (Pesticides):**	YES
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	✓

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:

Existing P.C. Johnson Well No. 1 has only been tested for inorganic compounds, bacteria, and VOCs to our knowledge.

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E. **Bacterial Contamination:** YES

Any bacterial contamination detection(s) in the past 3 years in samples taken from the source (not distribution sampling records).	*No*
Has source (in past 3 years) had a bacteriological contamination problem found in distribution samples that was attributed to the source.	*No*
Source sampling tests 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:

- *Drilling conditions and the aquifer pumping test results indicate this aquifer is confined and is therefore not influenced by surface water.*
- *Steep hillsides exist to the northwest and east within the 10-year T-O-T. However, the aquifer potentiometric surface likely does not mimic surface topography.*
- *A Wellhead Protection Program is currently being developed for the City by another consultant.*

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 the 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

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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?

✓ YES ___ NO

a) Presence of ground water extraction wells removing more than approximately 500 gal/min within...

	YES	NO	unknown
< 6 month travel time	✓		
6 month--1 year travel time		✓	
1--5 year travel time		✓	
5--10 year travel time		✓	

b) Presence of ground water recharge wells (dry wells) or heavy irrigation within...

	YES	NO	unknown
< 1 year travel time		✓	
1--5 year travel time		✓	
5--10 year travel time		✓	

Please identify or describe hydrologic or geographic conditions that you believe may affect the shape of the zone of contribution for this source. Where possible, reference them to location on the map produced in Part IV.

The primary recharge zone is to the southeast.

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 are 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

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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.

_____

_____

_____

_____

_____

_____

_____

_____

_____

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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 Enumclaw

Water system name : Enumclaw Water Dept

County: King

Water system number: 236001 Source number: S08 (new)

Well depth: 52 (ft.) (*From WFI form*)

Source name: Watercress

WA well identification tag number: ___ ___ ALK–139 ___ ___

_____ well not tagged

Number of connections: 5340 Population served: 15,900

Township: 20N Range: 7 E

Section: 19 1/4 1/4 Section: NW of NW

Latitude/longitude (if available): _____/_____

How was lat./long. determined?

_____ global positioning device _____ survey _____ topographic 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: 5 / 7 / 07 month/day/year

last reconstruction: __ / __ /__ month/day/year

_____ information unavailable

2) Well driller: Boart Longyear

__ well driller unknown

3) Type of well:

__Drilled: __ rotary __ bored _x_ cable (percussion)__ Dug

__ Other: __ spring(s) __ lateral collector (Ranney)

__ driven __ jetted __ other:

Additional comments: _____

4) Well report available? _x_ YES (attach copy to form) __ NO

If no well log is available, please attach any other records documenting well construction; e.g. boring logs, "as built" sheets, engineering reports, well reconstruction logs. **See Attachments 1 & 2.**

5) Average pumping rate: 4,300 test (gallons/min)

Source of information: Water Well Report and Well Construction Report

If not documented, how was pumping rate determined? _____

__ Pumping rate unknown

6) Is this source treated?

If so, what type of treatment:

_x_ disinfection __ filtration __ carbon filter __ air stripper __ other

Purpose of treatment (describe materials to be removed or controlled by treatment):

Provide contact time of 6 mg/l-min because of shallow aquifer

7) If source is chlorinated, is a chlorine residual maintained: _x_ YES __ NO

Residual level: _____0.5 mg/1_____ (*At the point closest to the source.*)

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

__ < 20 ft _x_ 20–50 ft __ 50–100 ft __ 100–200 ft __ >200 ft

__ information unavailable ('<' *means less than;* '>' *means greater than*)

2) Depth to ground water (static water level):

_x_ < 20 ft __ 20–50 ft __ 50–100 ft __ >100 ft

__ flowing well/spring (artesian)

How was water level determined?

_x_ 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): _741.5 NGVD 1929__ (ft)

How was elevation determined? __ topographic map __ Drilling/Well Log __ altimeter

_X_ other: __Field survey_____

__ 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 _x_ NO

__ information unavailable

7) Sanitary setback:

__ < 100 ft* _x_ 100–120 ft __ 120–200 ft __ > 200 ft

* if less than 100 ft describe the site conditions:

_____

_____

_____

_____

8) Wellhead construction:

_x_ wellhead enclosed in a wellhouse

_x_ controlled access (describe): _Gate at access to public right-of-way and_

6′ chain link fence topped w/ barbed wire on outward angled arms around well area

__ other uses for wellhouse (describe): _____

_____

__ no wellhead control

9) Surface seal:

__ 18 ft

__ < 18 ft (no Department of Ecology approval) ('<' *means less than*)

__ < 18 ft (Approved by Ecology, include documentation)('<' *means less than*)

_x_ > 18 ft ('>' *means greater than*)

__ depth of seal unknown

__ no surface seal

10) Annual rainfall (inches per year):

__ < 10 in/yr __ 10–25 in/yr _x_ > 25 in/yr

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: ave 419,000,000 last 10 years (gallons)

How was this determined?

_x_ meter

__ estimated: __ pumping rate (_____)

__ pump capacity (_____)

__ other: _____

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)

6 month ground water travel time : 1,335 (ft)

1 year ground water travel time : 2,700 per 1998 Wellhead Plan (ft)

5 year ground water travel time: 7,000 at foothill bedrock barrier (ft)

10 year ground water travel time: 7,000 at foothill bedrock barrier (ft)

Information available on length of screened/open interval?

_x_ YES __ NO

Length of screened/open interval: 20 (ft)

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? _x_ YES __ NO (mark and identify on map). **See Attachment 3.**

Watercress Creek is shown on the Attachment 3 map. A branch of the creek originates on the City property where the subject replacement well is located.

4) Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the 6 month time of travel boundary? __ YES _x_ 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:

	6 month	1 year	5 year	unknown
likely pesticide application.....	___x__	__x__	__x__	_____
stormwater injection wells	_____	_____	_____	__x__
other injection wells	_____	_____	_____	__x__
abandoned ground water well	_____	_____	_____	__x__
landfills, dumps, disposal areas	_____	_____	__x__	_____
known hazardous materials clean-up site	_____	_____	_____	__x__
water system(s) with known quality problems	_____	_____	_____	__x__
population density > 1 house/acre.....	__x__	__x__	_____	_____
residences commonly have septic tanks	__x__	__x__	__x__	_____
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.*) **See notes below**

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:

See page 30 excerpt from the 1998 Wellhead Protection Plan (Attachment 4). The aboveground fuel storage tank noted in the text has been removed. Any update to the 1998 plan is in progress.

The wellhead protection area map (Attachment 3) is excerpted from the City of Enumclaw Comprehensive Water System Plan. Many of the underlying parcels within the time of travel have a single family home on them that have septic tanks and may use pesticides. Only a few of these parcels are small lots less than 1 acre in size. The landfill is labeled on the map.

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.)

A. Nitrate: (Nitrate MCL = 10 mg/l)	YES
Results greater than MCL	____
< 2 mg/liter nitrate	____
2–5 mg/liter nitrate	_x__
> 5 mg/liter nitrate	____
Nitrate sampling records unavailable	____

B. VOCs: (VOC detection level 0.5 ug/l or 0.0005 mg/l.)	YES
Results greater than MCL or SAL	____
VOCs detected at least once	____
VOCs never detected	_x__
VOC sampling records unavailable	____

C. EDB/DBCP:	YES
(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__

D. Other SOCs (Pesticides):	YES
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: _____

_____

_____

_____

E. Bacterial contamination: YES

Any bacterial detection(s) in the past 3 years in samples taken from the source (not distribution sampling records)....._x__

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 theses 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?)

_x_ YES __ NO

Describe with references to map produced in Part IV:

According to the 1998 Wellhead Protection Plan, the bedrock of the foothills to the east

of the source forms a barrier of the zone of contribution

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 _x_ 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?

_x_ 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.)

_x_ 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... **The City operates Watercress Spring (DOH source S02) about 80 feet away from the subject replacement well that is reviewed in this assessment. The affect of the replacement well on the existing facility is discussed in the well construction and testing report by Robinson Noble & Saltbush attached to this assessment.**

	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 _x_ NO

Did you find it useful? __ YES __ NO

Did you seek outside assistance to complete the assessment? __ YES _x_ NO

- -

This form and instruction packet are 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.

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 Enumclaw

Water system name : Enumclaw Water Dept

County: King

Water system number: 236001 Source number: S09 (new)

Well depth: 136 (ft.) (*From WFI form*)

Source name: Zone 888/1002 Well

WA well identification tag number:_ ___ AFT_–336 ___ ___

_____ well not tagged

Number of connections: 5340 Population served: 15,900

Township: 20N Range: 7 E

Section: 30 1/4 1/4 Section: NW of SE

Latitude/longitude (if available): _____/_____

How was lat./long. determined?

_____ global positioning device _____ survey _____ topographic 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: 10 / 25 / 07 month/day/year

last reconstruction: __ / __ /__ month/day/year

_____ information unavailable

2) Well driller: Hokkaido Drilling, Inc

PO Box 100

Graham, WA 98338

__ well driller unknown

3) Type of well:

__Drilled: __ rotary __ bored _x_ cable (percussion) __ Dug

__ Other: __ spring(s) __ lateral collector (Ranney)

__ driven __ jetted __ other:

Additional comments: _____

4) Well report available? _x_ YES (attach copy to form) __ NO

If no well log is available, please attach any other records documenting well construction; e.g. boring logs, "as built" sheets, engineering reports, well reconstruction logs. See Attachment 1 for the Water Well Report. Construction and testing of the well are described in a separate detailed report by Robinson Noble & Saltbush dated December 2007 submitted concurrently with this assessment.

5) Average pumping rate: 776 test (gallons/min)

Source of information: Water Well Report and Well Construction Report

If not documented, how was pumping rate determined? _____

__ Pumping rate unknown

6) Is this source treated?

If so, what type of treatment:

_x_ disinfection __ filtration __ carbon filter __ air stripper __ other

Purpose of treatment (describe materials to be removed or controlled by treatment):

Ensure disinfection residual maintained in water system

7) If source is chlorinated, is a chlorine residual maintained: _x_ YES __ NO

Residual level: _____+/- 0.5 mg/l__ (*At the point closest to the source.*)

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

__ < 20 ft __ 20–50 ft _x_ 50–100 ft __ 100–200 ft __ >200 ft

__ information unavailable ('<' *means less than;* '>' *means greater than*)

2) Depth to ground water (static water level):

__ < 20 ft _x_ 20–50 ft __ 50–100 ft __ >100 ft

__ flowing well/spring (artesian)

How was water level determined?

_x_ 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): __780 NGVD 1929__ (ft)

How was elevation determined? __ topographic map __ Drilling/Well Log __ altimeter

_X_ other: __Field survey_____

__ 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 _x_ NO

__ information unavailable

7) Sanitary setback:

_x_ < 100 ft* __ 100–120 ft __ 120–200 ft __ > 200 ft

* if less than 100 ft describe the site conditions:

The wellhead is located along the boundary between the City's Exposition Center and Golf Course properties. Thus, the properties for a minimum of ~180 feet from the well are under City ownership and control. It is not believed necessary to restrict access and land use activities of the Exposition Center and Golf Course to 100 feet from the well because of the surface seal at the well of 25 feet and the low permeability sediments present from land surface down to a depth of 45 feet below ground. The well is also located at the very upper end of the surficial drainage divide between the Newaukum Creek and Boise Creek drainages, with the well being in the Newaukum Creek drainage even though it is only about 700 feet from Boise Creek at its closest point.

8) Wellhead construction:

_x_ wellhead enclosed in a wellhouse

_x_ controlled access (describe): Gate in fence around building. Fence 6' tall topped w/ barbed wire on outward angled arms

__ other uses for wellhouse (describe): _____

__ no wellhead control

9) Surface seal:

__ 18 ft

__ < 18 ft (no Department of Ecology approval) ('<' *means less than*)

__ < 18 ft (Approved by Ecology, include documentation)('<' *means less than*)

_x_ > 18 ft ('>' *means greater than*)

__ depth of seal unknown

__ no surface seal

10) Annual rainfall (inches per year):

__ < 10 in/yr __ 10–25 in/yr _x_ > 25 in/yr

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 100,000,000 (gallons)

How was this determined?

__ meter

__ estimated: __ pumping rate (_____)

__ pump capacity (_____)

_x_ other: 2007 Comp Water System Plan Pg 7-26 and estimated irrigation usage

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet) The CFR travel times are not mapped. See Preliminary Wellhead Protection Area mapped in Attachment 2.

6 month ground water travel time: 408 (ft)

1 year ground water travel time: 578 (ft)

5 year ground water travel time: 1,292 (ft)

10 year ground water travel time: 1,827 (ft)

Information available on length of screened/open interval?

_x_ YES __ NO

Length of screened/open interval: 50 (ft)

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? _x_ YES __ NO (mark and identify on map).

Boise Creek runs through the easterly portion of the 6-month time of travel per Attachments 2 and 3.

4) Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the 6 month time of travel boundary? __ YES _x_ 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:

	6 month	1 year	5 year	unknown
likely pesticide application.....	__x__	_____	_____	_____
stormwater injection wells	_____	_____	_____	__x__
other injection wells	_____	_____	_____	__x__
abandoned ground water well	_____	_____	_____	__x__
landfills, dumps, disposal areas	_____	_____	_____	__x__
known hazardous materials clean-up site	_____	_____	_____	__x__
water system(s) with known quality problems	_____	_____	_____	__x__
population density > 1 house/acre.....	_____	__x__	_____	_____
residences commonly have septic tanks	_____	__x__	_____	_____
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*.) See notes below

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:

The golf course may apply pesticides/fungicide to greens, but not to fairways or tees.

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.)

A. Nitrate: (Nitrate MCL = 10 mg/l)	YES
Results greater than MCL	____
< 2 mg/liter nitrate	_x__
2–5 mg/liter nitrate	____
> 5 mg/liter nitrate	____
Nitrate sampling records unavailable	____

B. VOCs: (VOC detection level 0.5 ug/l or 0.0005 mg/l.)	YES
Results greater than MCL or SAL	____
VOCs detected at least once	____
VOCs never detected	_x__
VOC sampling records unavailable	____

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.)	YES
EDB/DBCP detected below MCL at least once	____
EDB/DBCP detected above MCL at least once	____
EDB/DBCP never detected	_x__
EDB/DBCP tests required but not yet completed	____
EDB/DBCP tests not required	____

D. Other SOCs (Pesticides):	YES
Other SOCs detected (pesticides and other synthetic organic chemicals)	____
Other SOC tests performed but none detected (list test methods in comments)	_x__
Other SOC tests not performed	____

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: _____

EDB/DBCP and SOC tests completed at the existing golf course irrigation well approximately 127 feet northeast of the new well. SOC test methods used included EPA 531.2, 515.1, 525.2, and 504.2 .

E. Bacterial contamination: YES

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 theses 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?)

_x_ YES __ NO

Describe with references to map produced in Part IV:

Surficial runoff from the bedrock to the east (Baldy Hill) contributes to the groundwater source and the capture zone boundary extends to the surface water divide as shown in Attachment 2.

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 _x_ 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?

_x_ 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.)

_x_ 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... The City operates an existing irrigation well approximately 127 feet northeast of the new well. The existing well will be decommissioned per regulations.

	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...
The golf course property next to the well will be irrigated from the water that the well will supply.

	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 _x_ NO

Did you find it useful? ___ YES __ NO

Did you seek outside assistance to complete the assessment? _x_ YES __ NO

- -

This form and instruction packet are 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.

Attachment 1

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

ECOLOGY

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number ____

PROPOSED USE: ☐ Domestic ☐ Industrial ☒ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ____

TYPE OF WORK: Owner's number of well (if more than one) GCPW

☒ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☒ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 20 inches, drilled 136 ft.

Depth of completed well ____ ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 20" Diam. from +1 ft. to 81 ft.

☐ Liner installed 16" Diam. from +2 ft. to 80 ft.

☐ Threaded ____" Diam. From ____ ft. to ____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used ____

SIZE of perfs ____ in. by ____ in. and no. of perfs ____ from ____ ft. to ____ ft.

Screens: ☒ Yes ☐ No ☐ K-Pac Location ____

Manufacturer's Name Johnson

Type steel Model No. ____

Diam. 16 Slot size 0.040 from 80 ft. to 131 ft.

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☒ Yes ☐ No Size of gravel/sand 8x12

Materials placed from 60 ft. to 136 ft.

Surface Seal: ☒ Yes ☐ No To what depth? 25 ft.

Material used in seal bentonite

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? ____ Depth of strata ____

Method of sealing strata off ____

PUMP: Manufacturer's Name N/A

Type: N/A H.P. N/A

WATER LEVELS: Land-surface elevation above mean sea level 780 ft.

Static level 39.61 ft. below top of well Date 10/23/07

Artesian pressure ____ lbs. per square inch Date ____

Artesian water is controlled by ____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☒ Yes ☐ No If yes, by whom? Hokkaido

Yield: 776 gal./min. with 3.74 ft. drawdown after 1 hrs.

Yield: 776 gal./min. with 3.99 ft. drawdown after 10 hrs.

Yield: 776 gal./min. with 4.15 ft. drawdown after 24 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
0	40.14	30	40.05	240	39.81
5	40.10	60	40.03	440	39.84
10	40.08	120	39.98	1440	39.72

Date of test Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.

Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.

Artesian flow ____ g.p.m. Date ____

Temperature of water 48 Was a chemical analysis made? ☒ Yes ☐ No

CURRENT

Notice of Intent No. WE06717

Unique Ecology Well ID Tag No. AFT 336

Water Right Permit No. 20890C

Property Owner Name City of Enumclaw

Well Street Address 45224 284th Avenue S

City Enumclaw County King

Location NW1/4-1/4 SE1/4 Sec 30 Twn 20 R 7E

EWM ☒ Or WWM ☐

Lat/Long (s, t, r Still REQUIRED) Lat Deg N/A Min N/A Sec N/A Long Deg N/A Min N/A Sec N/A

Tax Parcel No. 3020079006

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Dry Brown Silty Sand and Gravel with Cobbles	0	8
Dry Gray Silty Gravel	8	16
Dry Gray Silty Gravel w/ Cobbles and Wood	16	21
Dry Gray-Brown Silty Gravel w/ Cobbles, tight, some bound	21	45
Water Bearing Brown Medium Sand w/ some F-C Sand and Gravel	45	59
Water Bearing Brown Gravel with Med. Sand, some F-C	59	84
Water Bearing Brown Fine to Medium Sand w/ occ. Gravel and wood organics	84	108
Water Bearing Dark Brown Coarse to Medium Sand and Gravel w/ wood organics	108	131
Gray Moist Clay-Bound Sand and Gravel	131	136.5

Start Date 5/29/07 Completed Date 10/25/07

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Driller or trainee License No. 1239

Name (Print Last, First) ROBERT B. CARPER

Driller/Engineer/Trainee Signature Robert B Carper

IF TRAINEE: Driller's License No: ____

Driller's Signature: ____

Drilling Company HOKKAIDO DRILLING, INC.

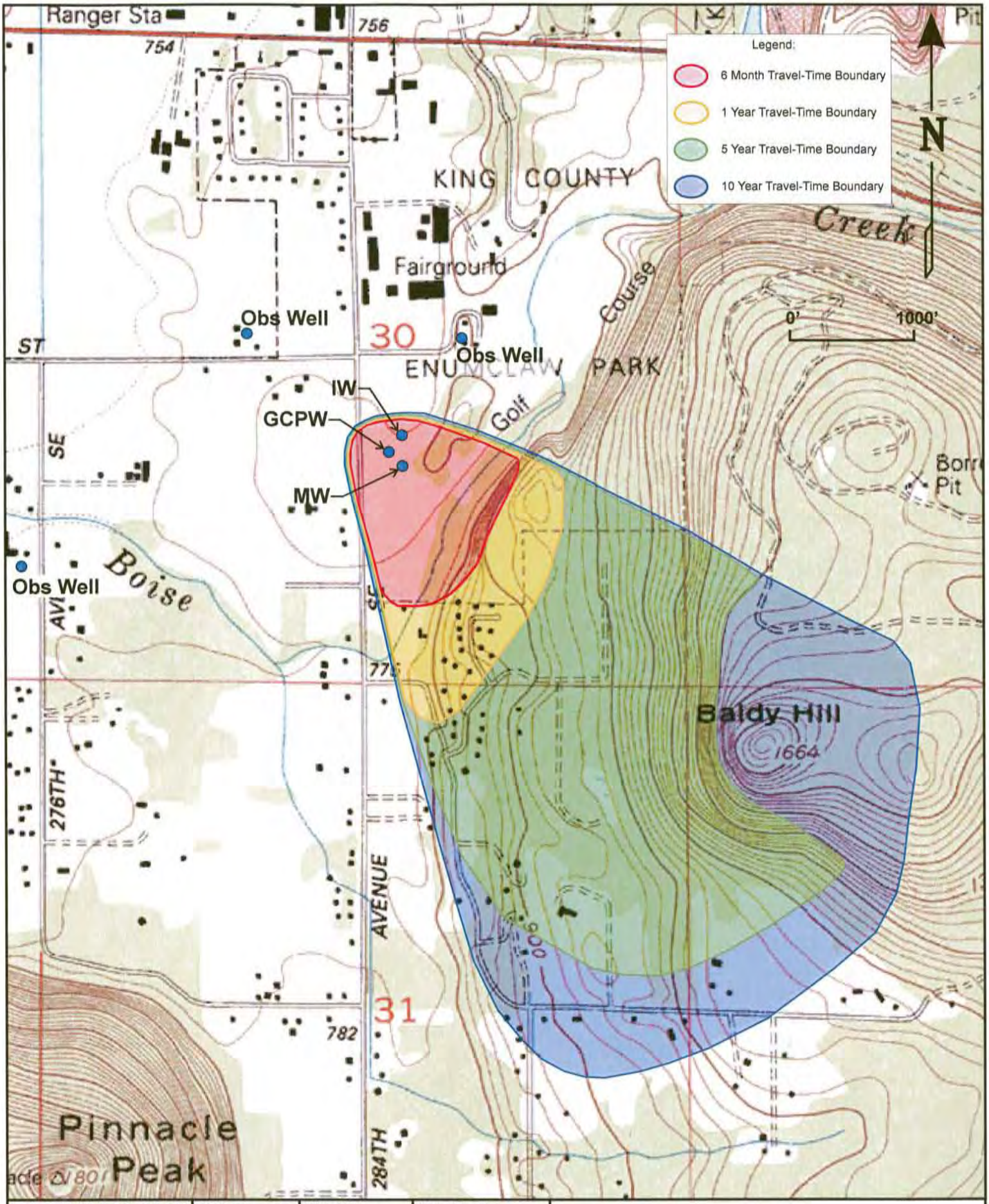
Address P.O. BOX 100

City, State, Zip GRAHAM, WA 98338

Contractor's Registration No. HOKKADI017M8 Date NOVEMBER 1, 2007

ECY 050-1-20 (Rev 7/06)

Ecology is an Equal Opportunity Employer



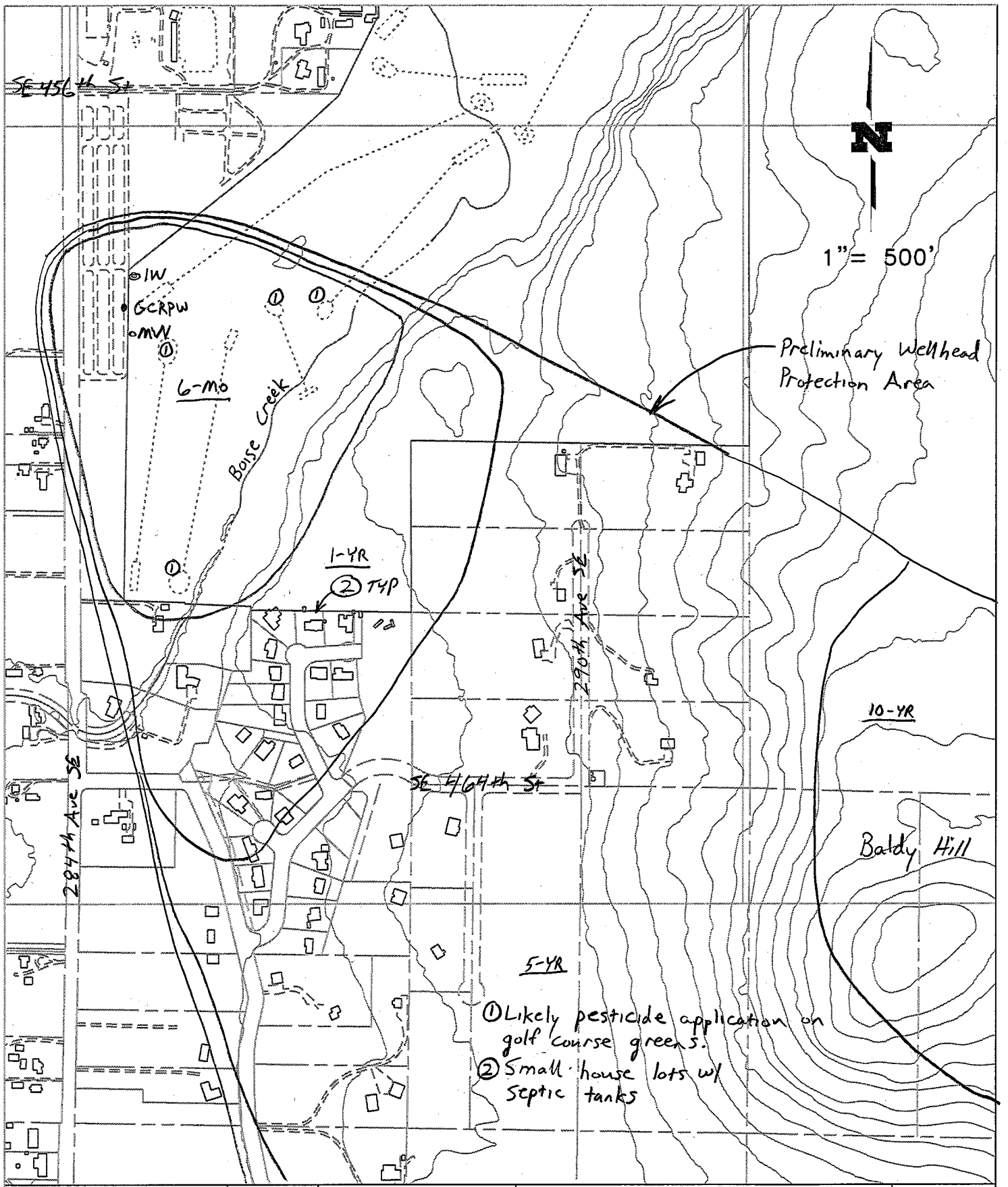
ROBINSON NOBLE SALTBUSH INC.
GROUNDWATER & ENVIRONMENTAL SCIENTISTS
1947 60 Years 2007

Note: Basemap from USGS Enumclaw Quadrangle.

PM: JEB
1281-004B
December 2007

King County
T 20 N/R 07 E - 30
Scale 1" = 1000'

Attachment 2
Preliminary Wellhead Protection Areas
City of Enumclaw: Golf Course Production Well



REVISIONS	DATE:
DRAWN BY:	CHECKED BY:

City of Enumclaw

Attachment 3
Sources of Risk

DWG. NO.

PARCEL INSIGHT

INCORPORATED

Parcel Insight Radius Map Report

Report ID: 275
Date: 11/8/2007

Enumclaw, WA

28750 SE 452ND ST
ENUMCLAW, WA 98022

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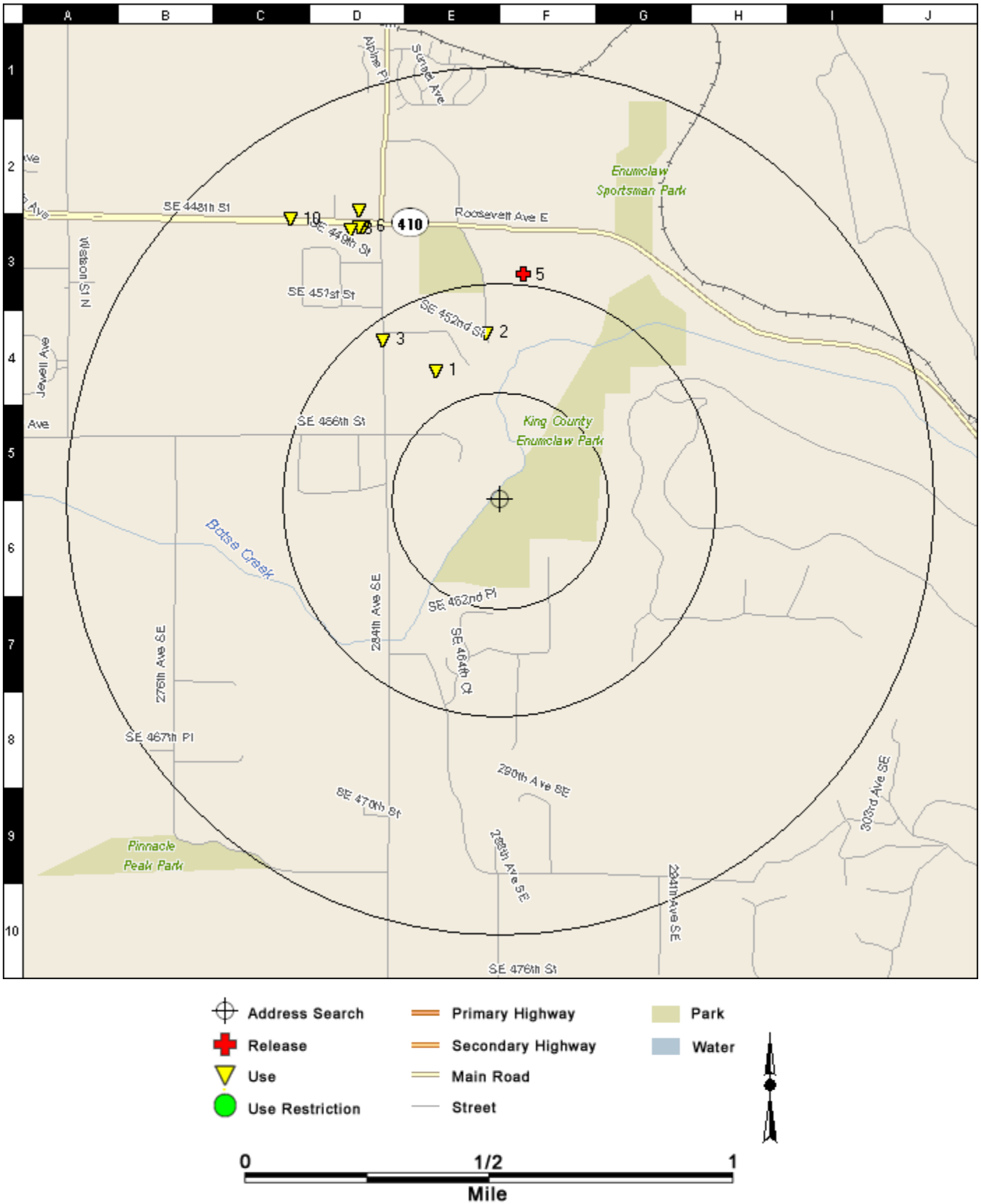
Exact Match Summary	*5*
Exact Match Details	*6*
Disclaimer	*12*
Government Record Tracking	*13*

1/4 Mile Detail Map

Overview Map



Non-Exact Match Map

Tabular Summary of Findings

RELEASE	+	*A site listed in a database that documents a release of hazardous material(s).*
USE	∇	*A site listed in a database that documents the use of hazardous material(s), but not a release of hazardous material(s).*
USE RESTRICTION	O	*A site listed in a database that documents a restriction on the use of the site related to a release of a hazardous material(s) or a formal oversight decision from a government agency.*

Map Class		Subject Property	Distance					Total by Map Class
			0.00 to 0.25 M	0.25 to 0.50 M	0.50 to 0.75 M	0.75 to 1.00 M	1.00+ M	
RELEASE	+				1			1
USE	∇			4	4	1		9
USE RESTRICTION	O							

Database		Search Radius	Subject Property	Distance					Total by Database Type
				0.00 to 0.25 M	0.25 to 0.50 M	0.50 to 0.75 M	0.75 to 1.00 M	1.00+ M	
NPL	+	1.00 M							
RCRA CORRACTS	+	1.00 M							
RCRA TSD	∇	1.00 M							
CERCLIS	+	1.00 M							
CERCLIS NFRAP	+	1.00 M							
ERNS	+	1.00 M							
RCRA LQG	∇	1.00 M							
RCRA SQG	∇	1.00 M							
RCRA CESQG	∇	1.00 M			1				1
LUST ACTIVE TRIBAL	+	1.00 M							
LUST INACTIVE TRIBAL	+	1.00 M							
BROWNFIELDS	O	1.00 M							
INST ENG CONTROLS	O	1.00 M							
HMIRS	+	1.00 M							
TRIS	+	1.00 M							
CSCSL	+	1.00 M							
CSCSL HSL	+	1.00 M							
CSCSL NFA	+	1.00 M							
SWLF STATE	+	1.00 M							
LUST	+	1.00 M							
UST	∇	1.00 M			2	2			4
SWLF SEA	+	1.00 M							
SWLF KING	+	1.00 M				1			1
SWLF STATE	+	1.00 M							
DECISIONS	O	1.00 M							
INST ENG CONTROLS	O	1.00 M							
RCRA ND	∇	1.00 M			1	3	1		5
Totals by Distance			0	0	0	0	0	0	0

Exact Match Summary

				MAP CLASS		
				+	▽	○
MAP ID GRID	SITE NAME ADDRESS	PI ID # DISTANCE DIRECTION	DATABASES	RELEASE	USE	USE RESTRICTION
1 E4	FARMAN BROTHERS PICKLES 1243 ROOSEVELT E BOX 457, ENUMCLAW	53025530 0.33444 N	UST		X	
2 E4	KING COUNTY PARKS & RECREATION MAINT 45220 288TH AVE SE, ENUMCLAW	53006742 0.38997 N	UST		X	
3 D4	KING CNTY NATURAL RESOURCES PA 45224 284TH AVE SE, ENUMCLAW	53015299 0.45795 NW	RCRA CESQG		X	
4 D4	WA AGR KING 3 45224B 284TH AVE SE, ENUMCLAW	53003951 0.45795 NW	RCRA ND		X	
5 F3	ENUMCLAW SOUTHEAST OF 284TH AVENUE SE AND SE 448TH STREET, ENUMCLAW	53034548 0.52538 N	SWLF KING	X		
6 D3	WA DNR ENUMCLAW 28329 SE 448TH ST, ENUMCLAW	53023260 0.70518 NW	RCRA ND UST		X	
7 D3	TEXACO REFINING MARKETING IN ENUMCLAW 230 ROOSEVELT E, ENUMCLAW	53028017 0.71058 NW	RCRA ND		X	
8 D3	WILLIAM G BISHOP 120 ROOSEVELT AVE EAST, ENUMCLAW	53016439 0.71393 NW	UST		X	
9 D2	WEYERHAEUSER WHITE RIVER TREE FARM T19 R9E S25, GREENWATER	53006705 0.74456 NW	RCRA ND		X	
10 C3	US FS WHITE RIVER RANGER DIST 857 ROOSEVELT AVE E, ENUMCLAW	53006262 0.80700 NW	RCRA ND		X	

Exact Match Details

Map ID 1 0.334 M N	GRID E4	PI ID # 53025530	LAT: 47.19427	LON: -121.96095	USE
	Site Name	FARMAN BROTHERS PICKLES		Databases: UST	
	Address	1243 ROOSEVELT E BOX 457 ENUMCLAW, WA 980229237			

UST **Underground Storage Tanks**

Site: FARMAN BROS. PICKLE CO. INC. 1243 ROOSEVELT E BOX 457 ENUMCLAW, WA 98022
Facility Site Id: 83478496
County: King
Unit: NW

Tank ID	Tank Name	Status	Inst. Date	Capacity	Cmpt./ID	Substance
10090	1	Removed	12/31/1964	111 TO 1,100 Gallons	1/10257	Leaded Gasoline

Map ID 2 0.390 M N	GRID E4	PI ID # 53006742	LAT: 47.19553	LON: -121.95847	USE
	Site Name	KING COUNTY PARKS & RECREATION MAINT		Databases: UST	
	Address	45220 288TH AVE SE ENUMCLAW, WA 980229255			

UST **Underground Storage Tanks**

Site: ENUMCLAW GOLF COURSE 45220 288TH SE ENUMCLAW, WA 98022
Facility Site Id: 12755755
County: King
Unit: NW

Tank ID	Tank Name	Status	Inst. Date	Capacity	Cmpt./ID	Substance
455666	001	Operational	06/01/1988		1/455713	Unleaded Gasoline

Map ID 3 0.458 M NW	GRID D4	PI ID # 53015299	LAT: 47.19530	LON: -121.96355	USE
	Site Name	KING CNTY NATURAL RESOURCES PA		Databases: RCRA CESQG	
	Address	45224 284TH AVE SE ENUMCLAW, WA 980229275			

RCRA CESQG **RCRA Conditionally Exempt Small Quantity Generator**

Site: KING CNTY NATURAL RESOURCES PA 45224 284TH AVE SE ENUMCLAW, WA 98022
HANDLER ID: WAD981763873
NAICS DESC: Janitorial Services
CONTACT NAME: KEN CROY
TSD ACTIVITY: N

Report Submission History

Category	Report Date
LQG	
SQG	
CESQG	04/20/1988
RCRA ND	

Last Report Details:

Exact Match Details

Map ID 3 0.458 M NW	GRID D4	PI ID # 53015299	LAT: 47.19530	LON: -121.96355	USE ∇
	Site Name	KING CNTY NATURAL RESOURCES PA		Databases:	
	Address	45224 284TH AVE SE ENUMCLAW, WA 980229275		RCRA CESQG	

Site Name: KING CNTY NATURAL RESOURCES PA
Seq Number: 1
Received Date: 04/20/1988
Transfer Facility:
Federal Waste Generator: Conditionally Exempt Small Quantity Generator
State Waste Generator: Small Quantity Generator

Map ID 4 0.458 M NW	GRID D4	PI ID # 53003951	LAT: 47.19530	LON: -121.96355	USE ∇
	Site Name	WA AGR KING 3		Databases:	
	Address	45224B 284TH AVE SE ENUMCLAW, WA 980229275		RCRA ND	

RCRA ND **RCRA No Designation**

Site: WA AGR KING 3 45224B 284TH AVE SE ENUMCLAW, WA 98022
HANDLER ID: WAH000019158
NAICS DESC: Regulation of Agricultural Marketing and Commodities
CONTACT NAME: JOE HOFFMAN
TSD ACTIVITY: N

Report Submission History

Category	Report Date
LQG	09/11/2002, 02/28/2003
SQG	
CESQG	
RCRA ND	12/31/2003, 12/31/2005, 02/11/2004, 02/28/2005, 01/24/2006

Last Report Details:

Site Name: WA AGR KING 3
Seq Number: 5
Received Date: 01/24/2006
Transfer Facility:
Federal Waste Generator: N
State Waste Generator: N

Map ID 5 0.525 M N	GRID F3	PI ID # 53034548	LAT: 47.19746	LON: -121.95674	RELEASE +
	Site Name	ENUMCLAW		Databases:	
	Address	SOUTHEAST OF 284TH AVENUE SE AND SE 448TH STREET ENUMCLAW, WA		SWLF KING	

SWLF KING **King County Abandoned Landfills**

Site: ,
Site_ID: KC07
Site_Name: Enumclaw
Site_Address: Southeast of 284th Avenue SE and SE 448th Street
Site_City: Enumclaw
Site_State: WA
PILAT: 47°11'50.87"N

Exact Match Details

Map ID 5 0.525 M N	GRID F3	PI ID # 53034548	LAT: 47.19746	LON: -121.95674	RELEASE +
	Site Name	ENUMCLAW		Databases:	
	Address	SOUTHEAST OF 284TH AVENUE SE AND SE 448TH STREET ENUMCLAW, WA		SWLF KING	

PILON: 121˚57'24.27"W
Buffer Miles: 0.150

Map ID 6 0.705 M NW	GRID D3	PI ID # 53023260	LAT: 47.19906	LON: -121.96451	USE ∇
	Site Name	WA DNR ENUMCLAW		Databases:	
	Address	28329 SE 448TH ST ENUMCLAW, WA 980229203		UST RCRA ND	

UST **Underground Storage Tanks**

Site: WASH. ST. DEPT. OF NATURAL RESOURCES 28329 S.E. 448TH STREET ENUMCLAW, WA 98022
Facility Site Id: 74593866
County: King
Unit: NW

Tank ID	Tank Name	Status	Inst. Date	Capacity	Cmpt./ID	Substance
40124	2	Unknown	12/31/1964		1/40686	Unleaded Gasoline
40176	1	Unknown	12/31/1964		1/40741	Leaded Gasoline

RCRA ND **RCRA No Designation**

Site: WA DNR ENUMCLAW 28329 SE 448TH ST ENUMCLAW, WA 98022
HANDLER ID: WAD988473518
NAICS DESC: Other General Government Support
CONTACT NAME: NA NA
TSD ACTIVITY: N

Report Submission History

Category	Report Date
LQG	
SQG	
CESQG	02/27/1995
RCRA ND	06/02/1997

Last Report Details:

Site Name: WA DNR ENUMCLAW
Seq Number: 2
Received Date: 06/02/1997
Transfer Facility:
Federal Waste Generator: N
State Waste Generator: N

Exact Match Details

Map ID 7 0.711 M NW	GRID D3	PI ID # 53028017	LAT: 47.19908	LON: -121.96471	USE
	Site Name	TEXACO REFINING MARKETING IN ENUMCLAW		Databases: RCRA ND	
	Address	230 ROOSEVELT E ENUMCLAW, WA 98022			

RCRA ND **RCRA No Designation**

Site: TEXACO REFINING MARKETING IN ENUMCLAW 230 ROOSEVELT E ENUMCLAW, WA 98022
HANDLER ID: WAD988480851
NAICS DESC: Gasoline Stations with Convenience Stores
CONTACT NAME: NA NA
TSD ACTIVITY: N

Report Submission History

Category	Report Date
LQG	
SQG	12/31/1993
CESQG	
RCRA ND	03/11/2003

Last Report Details:

Site Name: TEXACO REFINING MARKETING IN ENUMCLAW
Seq Number: 2
Received Date: 03/11/2003
Transfer Facility:
Federal Waste Generator: N
State Waste Generator: N

Map ID 8 0.714 M NW	GRID D3	PI ID # 53016439	LAT: 47.19897	LON: -121.96516	USE
	Site Name	WILLIAM G BISHOP		Databases: UST	
	Address	120 ROOSEVELT AVE EAST ENUMCLAW, WA 980229240			

UST **Underground Storage Tanks**

Site: WILLIAM G BISHOP 120 ROOSEVELT AVE EAST ENUMCLAW, WA 98022
Facility Site Id: 48395887
County: King
Unit: NW

Tank ID	Tank Name	Status	Inst. Date	Capacity	Cmpt./ID	Substance
33691	1	Removed	12/31/1964		1/34186	Leaded Gasoline
33825	3	Removed	12/31/1964		1/34320	Unleaded Gasoline
33834	2	Removed	12/31/1964		1/34330	Unleaded Gasoline

Exact Match Details

Map ID 9 0.745 M NW	GRID D2	PI ID # 53006705	LAT: 47.19962	LON: -121.96472	USE
	Site Name	WEYERHAEUSER WHITE RIVER TREE FARM		Databases: RCRA ND	
	Address	T19 R9E S25 GREENWATER, WA 98022			

RCRA ND **RCRA No Designation**

Site: WEYERHAEUSER WHITE RIVER TREE FARM T19 R9E S25 GREENWATER, WA 98022
HANDLER ID: WAH000006155
CONTACT NAME: STEVE KETZ
TSD ACTIVITY: N

Report Submission History

Category	Report Date
LQG	09/03/1999
SQG	09/01/1998
CESQG	
RCRA ND	04/26/2000, 12/13/2000, 12/13/2000

Last Report Details:

Site Name: WEYERHAEUSER WHITE RIVER TREE FARM
Seq Number: 5
Received Date: 12/13/2000
Transfer Facility:
Federal Waste Generator: N
State Waste Generator: N

Map ID 10 0.807 M NW	GRID C3	PI ID # 53006262	LAT: 47.19932	LON: -121.96805	USE
	Site Name	US FS WHITE RIVER RANGER DIST		Databases: RCRA ND	
	Address	857 ROOSEVELT AVE E ENUMCLAW, WA 980229239			

RCRA ND **RCRA No Designation**

Site: US FS WHITE RIVER RANGER DIST 857 ROOSEVELT AVE E ENUMCLAW, WA 98022
HANDLER ID: WA5122300184
NAICS DESC: Support Activities for Forestry
CONTACT NAME: NA NA
TSD ACTIVITY: N

Report Submission History

Category	Report Date
LQG	
SQG	
CESQG	10/25/1995
RCRA ND	01/01/1994, 01/24/1997, 04/03/1998, 01/27/1999, 02/14/2000

Last Report Details:

Site Name: US FS WHITE RIVER RANGER DIST
Seq Number: 6
Received Date: 02/14/2000
Transfer Facility:

Exact Match Details

Map ID 10 0.807 M NW	GRID C3	PI ID # 53006262	LAT: 47.19932	LON: -121.96805	USE
	Site Name	US FS WHITE RIVER RANGER DIST		Databases:	
	Address	857 ROOSEVELT AVE E ENUMCLAW, WA 980229239		RCRA ND	

Federal Waste Generator: N
State Waste Generator: N

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Database: *Brownfields Grant Sites*
Map Class: *Use Restriction*
Contact Number:
Web Page: *http://www.epa.gov/brownfields/index.html*
Date of Database: *2007-04-15T00:00:00*

The Brownfields Management System (BMS) is the official U.S. Environmental Protection Agency (EPA0 database of the Brownfields Program. It is designed to assist EPA in collecting, tracking, and updating information, as well as reporting on the major activities and accomplishments of the various Brownfields grant programs. BMS captures data on grantee activities (assessment, cleanup and redevelopment), funding, job training, and details on cooperative partners and leveraging efforts - a central objective of the Brownfields Program.

Database: *CERCLIS No Further Remedial Action Planned*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/superfund/sites/cursites/index.htm*
Date of Database: *2006-12-15T00:00:00*

The No Further Remedial Action Planned (NFRAP) or "Archived" designation means that, to the best of the EPA's knowledge, Superfund has completed its assessment at a site, and has determined no further steps to list this site on the NPL will be taken unless information indicating this decision was not appropriate or other considerations make a recommendation for listing appropriate at a later time. The U.S. Environmental Protection Agency (EPA) may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available and in these cases, the Archive designation is removed and the site is returned to the CERCLIS inventory if more sustentative assessment and/or any cleanup work is necessary under the Federal Superfund program. An archive decision does not necessarily mean that there is no hazard associated with a given site; it means only that based upon available information, the location is not judged to be a potential NPL site. Sites are archived as historical records so EPA does not needlessly repeat the investigations in the future. The States will coordinate with EPA to determine if any sites should be returned to CERCLIS because of newly identified contamination problems at the site. It is important to note the sites on CERCLIS and the archived list will change as the sites are being investigated or if new information becomes available.

Database: *Comprehensive Environmental Response, Compensation, and Liability Information System*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/superfund/sites/siteinfo.htm*
Date of Database: *2007-03-15T00:00:00*

The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) list contains information on hazardous waste sites, potentially hazardous waste sites and remedial activities. CERCLIS is a database used by the U.S. Environmental Protection Agency (EPA) to track activities conducted under its Superfund program. Specific information is tracked for each individual site. The database includes sites that are on the National Priorities List (NPL) or being considered for the NPL. The CERCLIS Database displays site information for NPL sites (i.e., sites proposed to the NPL, currently on the final NPL or deleted from the final NPL. NPL Sites are listed separately on the

NPL data set. Once a site is added to CERCLIS, the next step in evaluating the potential problem is the completion of a preliminary assessment (PA). The purpose of the PA is to determine whether the site warrants further Superfund investigation. The PA is typically an information gathering phase for which sampling does not take place. A PA is usually completed within one year of a site being listed in CERCLIS. Based on the conclusions of the PA, a site could be recommended for a) no further action under the EPA Superfund program; b) a sampling site investigation to collect data for further evaluation and possible nomination to the NPL; or c) an emergency or time-critical removal (short-term cleanup). Active CERCLIS sites are sites at which site assessment, removal, remedial, enforcement, cost recovery, or oversight activities are being planned or conducted under the Superfund program. CERCLIS excludes sites which EPA has assessed and designated "No Further Remedial Action Planned", or archive, sites. EPA is aware that the CERCLIS inventory is often used as a resource in assessing property. People conducting such assessments should not misinterpret the meaning of a site being contained in CERCLIS. Such sites are not necessarily contaminated, and sites not in CERCLIS are not necessarily contaminant-free.

Database: *Confirmed and Suspected Contaminated Sites List No Further Action*

Map Class: *Release*

Contact Number:

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*

Date of Database: *2007-01-01T00:00:00*

No Further Action Site List This data set contains information about sites previously on the Confirmed and Suspected Contaminated Sites list (above) that have received a No Further Action (NFA) determination. Because it is necessary to maintain historical records of sites that have been investigated and cleaned up, sites are not deleted from the database when cleanup activities are completed. Instead, a No Further Action code is entered based upon the type of NFA determination the site received. The NFA code lists the basis for the NFA determination.

Database: *Confirmed and Suspected Contaminated Sites List*

Map Class: *Release*

Contact Number:

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*

Date of Database: *2007-07-15T00:00:00*

The data set contains information about sites that are undergoing cleanup and sites that are awaiting further investigation and/or cleanup by the Department of Ecology Toxics Cleanup Program. Sites on the Hazardous Sites List (i.e., those that have been ranked using the Washington Ranking Model) are included in this data set. Within 90 days of learning of a potentially contaminated site, the Department of Ecology conducts an initial investigation of each site. If the initial investigation shows that further action is needed, the site will appear in the Confirmed & Suspected Contaminated Sites (CSCS) Report. Once remedial action has been completed, the Toxics Cleanup Program's management determines the removal of a site from the CSCS Report. The Hazardous Sites List is a subset of the CSCS Report. It contains those sites that have been ranked using the Washington Ranking Method. Site owners and operators do not necessarily agree with Ecology's determination of site status.

Database: *Confirmed and Suspected Contaminated Sites List Hazardous Site List*

Map Class: *Release*

Contact Number:

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

The Hazardous Sites List (HSL) is required by law 173-340-330 WAC. It includes all sites which have been assessed and ranked using the Washington Ranking Method (WARM). Also listed are National Priorities List (NPL) sites. The categories of evaluation are linear and include several steps. The Initial Investigation (II) is a brief investigation conducted within 90 days of receiving a site discovery report. The II step provides enough information to determine if the site needs further investigation, emergency cleanup, or no further action. If further action is required, early notice letters are sent to site owners, operators, etc. inviting them to work cooperatively with us to resolve any contamination problems, AND the site proceeds to the next step. The Site Hazard Assessment (SHA) is an assessment to confirm the presence of hazardous substances and to determine the relative risk the site poses to human health and the environment. (Note: Some SHAs are conducted by Ecology staff while others are conducted by local health districts / departments.) The Hazard Ranking (WARM Score) includes the results of the Site Hazard Assessment step that are used in the Washington Ranking Method (WARM) to yield a WARM score. The WARM score is a number between 1 and 5, where a score of 1 represents the highest level of risk and 5 indicates the lowest assessed risk. A zero indicates that the site is either on the federal National Priorities List (NPL) or is a sub-site or operable unit of an NPL site. NPL sites are ranked under the federal Hazard Ranking System (HRS). This WARM score is not removed at the time of a No Further Action determination as it is kept for historical purposes.

Database: *Ecology Digest 26 (Catalog of Formal Oversight Decision Documents, Orders and Decrees)*
Map Class: *Use Restriction*
Contact Number:
Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/DIGEST%2026.pdf*
Date of Database:

The Toxics Cleanup Program maintains a list of all formal oversight decision documents under the Model Toxics Control Act that have been agreed to and signed by the Program's manager or designee. These decision documents include all Consent Decrees, Prospective Purchaser Consent Decrees, Agreed Orders, and Enforcement Orders under the Model Toxics Control Act.

Database: *Emergency Response Notification System*
Map Class: *Release*
Contact Number:
Web Page: *http://www.nrc.uscg.mil/wdbcgi/wdbcgi.exe/WWWUSER/WEBDB.foia_query.show_parms*
Date of Database: *2007-01-15T00:00:00*

The Emergency Response Notification System (ERNS) is a national computer data base used to store information on releases of oil and hazardous substances. ERNS supports the Emergency Response and the Title III program. The ERNS program is a cooperative effort among EPA Headquarters, the Department of Transportation (DOT), National Transportation Systems Center (NTSC), the ten EPA Regions, the U.S. Coast Guard (USCG), and the National Response Center (NRC). ERNS provides the most comprehensive data compiled on release notifications of oil and hazardous substances in the United States. When a release report is submitted to Federal authorities (e.g., NRC or Regional offices), the individual reporting is asked a series of questions regarding the release (e.g., type, location, volume). Information concerning all releases originally reported to the NRC or EPA Regional offices is entered into local

computers and transmitted electronically from the NRC or EPA Regional office to the NTSC, where it becomes part of the ERNS national data base. The procedures for maintaining the initial reports differs between the NRC and the EPA Regions. The NRC maintains electronic copies of all spill reports as they were initially received and does not make any changes to spill reports once they have been entered into the system. Reports received by the NRC contain information that may be valuable to the on-scene coordinators, as well as to enforcement personnel. The information received by the NRC is sent to the Regional offices through the Volpe National Transportation Systems Center (VNTSC). Since these reports may be used in enforcement actions, it is necessary to maintain a copy of the spill report as it was originally reported. Each EPA Region maintains its own Region-specific data base, which is a subset of the national data base. Initial spill reports made directly to an EPA Region are maintained as hard copies and kept in the individual Regional office. When additional information on a release notification is obtained, it is also entered at the Regional level and electronically transmitted to the national system. An initial and modified copy of each report is maintained at VNTSC to preserve data integrity.

Database: *Hazardous Materials Information Reporting System*
Map Class: *Release*
Contact Number:
Web Page: *http://hazmat.dot.gov/pubs/inc/hmisframe.htm*
Date of Database: *2007-01-01T00:00:00*

The Hazardous Materials Incident Reporting System (HMIRS) contains data on spills, releases, or other incidents involving hazardous materials during the course of transportation. All modes of transportation are included except pipeline and bulk marine transportation. The data set contains the Incident Report Form 5800.1 data submitted under the requirements of Title 49 CFR 171.15 and 171.16. HMIRS of the Pipeline and Hazardous Materials Safety Administration (PHMSA) was established in 1971 to fulfill the requirements of the federal hazardous materials transportation law. Part 171 of Title 49, Code of Federal Regulations (49 CFR) contains the incident reporting requirements of carriers of hazardous materials. An unintentional release of hazardous materials meeting the criteria set forth in Section 171.16, 49 CFR must be reported on U.S. Department of Transportation (DOT) Form 5800.1, and data from the reports received are subsequently entered in the HMIRS database. All spills meeting the following criteria to be reported to PHMSA: 1) As a direct result of hazardous materials a person is killed or receives injuries requiring hospitalization, estimated property damage exceeds $50,000, an evacuation of the general public lasts for one or more hours, a major transportation artery or facility is closed for one or more hours, or the operational flight pattern or routing of an aircraft is altered, 2) Fire, breakage, spillage, or suspected contamination occurs involving shipment of radioactive materials or infectious substances, 3) There has been a release of a marine pollutant exceeding 450 L or 400 kg, or 4) Any hazardous material is unintentionally released from a package or any quantity of hazardous waste is discharged during transportation.

Database: *Institutional and Engineering Controls*
Map Class: *Use Restriction*
Contact Number:
Web Page: *http://www.epa.gov/superfund/index.htm*
Date of Database: *2007-03-15T00:00:00*

This data set identifies RCRA and NPL sites with institutional and/or engineering controls in place.

Database: *Institutional and Engineering Controls*
Map Class: *Use Restriction*
Contact Number:

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

This data set is a subset of CSCSL and identifies sites where a remedial action was conducted, residual contamination was left on site and on-going institutional controls required.

Database: *King County Abandoned Landfills*
Map Class: *Release*
Contact Number:
Web Page: *http://www.spl.org/*
Date of Database:

Abandoned landfill study in King County by Seattle-King County Dept. of Public Health. Environmental Health Division, 1985.

Database: *Leaking Underground Storage Tanks*
Map Class: *Release*
Contact Number:
Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

The LUST data file contains information on UST Cleanup sites and cleanup history. Sites that have been cleaned up and sites currently being cleaned up are included in the data set. Sites are categorized based on the activities taken. Awaiting Cleanup means the site has been discovered or reported release, yet no active cleanup measures taken or Site check (identified the source) begun or completed, yet no active cleanup measures taken or site characterization begun or completed, yet no active cleanup measures taken. Cleanup Started means responsible party has initiated physical, biological, or chemical management of release, e.g. soil excavated, groundwater pumped, vapors extracted, free product removed, oxygen added, etc., site investigations and emergency responses (e.g. venting explosive vapors, providing bottled water) do not qualify as activities under cleanup started. Monitoring means groundwater monitoring is the only activity occurring at the site or site has been characterized, only low levels of soil and/or groundwater contamination remain, and natural attenuation is the chosen cleanup method or conformational monitoring following active cleanup measures. Reported Cleaned Up means owner or consultant reports that contamination has been cleaned up and/or some soil contamination may remain under existing structures or in otherwise inaccessible areas if groundwater is not threatened and there has been no migration of contamination into the structure and cleanup report has not been formally reviewed by Ecology. A formal review could determine that the site has not been cleaned up to MTCA standards. No Further Action means the cleanup report has been formally reviewed by Ecology under the fee-based Voluntary Cleanup Program and resulted in a No Further Action status and Institutional controls may have been required due to soil contamination that may remain under existing structures or in otherwise inaccessible areas.

Database: *National Priority List*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/superfund/index.htm*
Date of Database: *2007-04-23T00:00:00*

The National Priorities List (NPL) is an information and management tool that is a part of the Superfund cleanup process. The NPL serves primarily informational purposes, identifying for the States and the public those sites or other releases that appear to warrant remedial actions. The identification of a site for the NPL is intended primarily to guide the U.S. Environmental Protection Agency (EPA) in: determining which sites warrant further investigation to assess the nature and extent of the human health and environmental risks associated with a site; identifying what Comprehensive Environmental Response Compensation and Liability Act (CERCLA)-financed remedial actions may be appropriate; notifying the public of sites EPA believes warrant further investigation; and serving notice to potentially responsible parties that EPA may initiate CERCLA-financed remedial action. Inclusion of a site on the NPL does not in itself reflect a judgment of the activities of its owner or operator, it does not require those persons to undertake any action, nor does it assign liability to any person. Section 105(a)(8)(B) of CERCLA, as amended, requires that the statutory criteria provided by the Hazard Ranking System (HRS) be used to prepare a list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States. The NPL list is also known as Appendix B of the National Contingency Plan. The Federal Register (FR) Notices for NPL Updates page provides a list of FR Notices for proposed and final NPL Updates. The Superfund cleanup process begins with site discovery or notification to EPA of possible releases of hazardous substances. Sites are discovered by various parties, including citizens, State agencies, and EPA Regional offices. Once discovered, sites are entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), EPA's computerized inventory of potential hazardous substance release sites (view Superfund Site Information). EPA then evaluates the potential for a release of hazardous substances from the site through these steps in the Superfund cleanup process. Superfund was created in 1980 when Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to clean up the nation's uncontrolled hazardous waste sites. Under the Superfund program, abandoned, accidentally spilled, or illegally dumped hazardous wastes that pose a current or future threat to human health or the environment are cleaned up. EPA works closely with communities, potentially responsible parties, scientists, researchers, contractors, and state, local, tribal, and federal authorities on site cleanup. Together with these groups, EPA identifies hazardous waste sites, tests the conditions of the sites, develops cleanup plans, and cleans up the sites.

Database: *RCRA Conditionally Exempt Small Quantity Generator*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

Conditionally Exempt Small Quantity Generators (CESQG) generate 100 kilograms or less per month of hazardous waste, or 1 kilogram or less per month of acutely hazardous waste. Requirements for CESQG's include (see also 40 CFR 261.5). CESQG's must identify all the hazardous waste generated. CESQG's may not accumulate more than 1,000 kilograms of hazardous waste at any time. CESQG's must ensure that hazardous waste is delivered to a person or facility who is authorized to manage it.

Database: *RCRA Corrective Action Report*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/hazwaste/ca/index.htm*
Date of Database: *2007-07-15T00:00:00*

The Resource Conservation and Recovery Act (RCRA) Corrective Action (CORRACTS) list is a summary of those facilities where corrective action is occurring. The RCRA Corrective Action Program, run by EPA and 41 authorized states and territories, compels responsible parties to address the investigation and cleanup of hazardous releases themselves.

RCRA Corrective Action differs from Superfund in that Corrective Action sites generally have viable operators and on-going operations. RCRA grants EPA and authorized states the authority to regulate hazardous waste management facilities that treat, store, or dispose of hazardous waste. Although EPA guidelines are designed to prevent toxic releases at RCRA facilities, accidents or other activities have sometimes released pollutants into soil, ground water, surface water and air. By the year 2020, EPA and the authorized states plan to have largely completed the work of implementing final remedies at all facilities requiring Corrective Action. (See Goal 3 of the Office of Solid Waste's 2020 Vision for more details.) While working toward the 2020 goal, EPA decided to ensure that sites presenting the greatest risk to human health and the environment are dealt with first. Accordingly, the Corrective Action Program has pledged to select a final remedy at 30% and put a final remedy in place at 20% of 1,968 highest-priority sites by 2008.

Database: *RCRA Large Quantity Generator*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

Large Quantity Generators (LQG) generate 1,000 kilograms per month or more of hazardous waste, or more than 1 kilogram per month of acutely hazardous waste. LQG's may only accumulate waste on site for 90 days, but certain exceptions apply. LQG's do not have a limit on the amount of hazardous waste accumulated on site. There must always be at least one employee available to respond to an emergency. This employee is the emergency coordinator responsible for coordinating all emergency response measures. LQG's must have detailed, written contingency plans for handling emergencies. LQG's must submit a biennial hazardous waste report.

Database: *RCRA No Designation*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

RCRA sites that are identified as having a RCRA generator identified number but that are not identified as a large quantity generator, small quantity generator, conditionally exempt small quantity generator, treatment storage or disposal (TSD) facility, or RCRA corrective action sites.

Database: *RCRA Non Corracts TSD*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/tsds.htm*
Date of Database: *2007-07-15T00:00:00*

Through the Resource Conservation and Recovery Act (RCRA), Congress directed EPA to create regulations to manage hazardous waste from "the cradle to the grave." Under this mandate, EPA developed strict requirements for all aspects

of hazardous waste management including the treatment, storage, and disposal (TSD) of hazardous waste. TSDS include those facilities that treat, store, and/or dispose hazardous waste. TSDS are the last link in the cradle to the grave waste management system. The requirements for TSDS are found in 40 CFR Parts 264 and 265 and are more extensive than those that apply to hazardous waste generators or transporters.

Database: *RCRA Small Quantity Generator*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

Small Quantity Generators (SQG) generate more than 100 kilograms, but less than 1,000 kilograms, of hazardous waste per month. SQG's may accumulate hazardous waste on site for 180 days without a permit (or 270 days if shipping a distance greater than 200 miles). The quantity of hazardous on site waste must never exceed 6,000 kilograms. There must always be at least one employee available to respond to an emergency. This employee is the emergency coordinator responsible for coordinating all emergency response measures. SQG's are not required to have detailed, written contingency plans.

Database: *Seattle Abandoned Landfills*
Map Class: *Release*
Contact Number:
Web Page: *http://www.spl.org/*
Date of Database: *1984-07-30T00:00:00*

Abandoned landfill study in the City of Seattle by Seattle-King County Dept. of Public Health. Environmental Health Division, 1984.

Database: *Solid Waste Facility Database*
Map Class: *Release*
Contact Number:
Web Page: *http://www.ecy.wa.gov/biblio/0407019.html*
Date of Database: *2007-01-01T00:00:00*

The solid waste facility database contains disposal information for landfills, incinerators, and transfer facilities. The types of facilities included are those that are permitted under chapter 173-350 WAC, Minimum Functional Standards for Solid Waste Handling and chapter 173-351 WAC, Criteria for Municipal Solid Waste Landfills. Information in the solid waste facility database is obtained through annual reporting forms sent to all landfill types (municipal, inert/demolition, limited purpose/special use, and wood waste landfills) and to waste-to-energy/incinerators.

Database: *Toxic Chemical Release Inventory*
Map Class: *Release*

Contact Number:

Web Page: http://www.epa.gov/tri/index.htm

Date of Database: 2007-01-01T00:00:00

The Toxics Release Inventory (TRI) contains information on releases of nearly 650 chemicals and chemical categories from industries including manufacturing, metal and coal mining, electric utilities, and commercial hazardous waste treatment, among others. The Emergency Planning and Community Right-to-Know Act (EPCRA) primary purpose is to inform communities and citizens of chemical hazards in their areas. Sections 311 and 312 of EPCRA require businesses to report the locations and quantities of chemicals stored on-site to state and local governments in order to help communities prepare to respond to chemical spills and similar emergencies. EPCRA Section 313 requires EPA and the States to annually collect data on releases and transfers of certain toxic chemicals from industrial facilities, and make the data available to the public in the Toxics Release Inventory (TRI). In 1990 Congress passed the Pollution Prevention Act which required that additional data on waste management and source reduction activities be reported under TRI. The goal of TRI is to empower citizens, through information, to hold companies and local governments accountable in terms of how toxic chemicals are managed. EPA compiles the TRI data each year and makes it available. The TRI program has expanded significantly since its inception in 1987. The Agency has issued rules to roughly double the number of chemicals included in the TRI to approximately 650. Seven new industry sectors have been added to expand coverage significantly beyond the original covered industries, i.e. manufacturing industries. Most recently, the Agency has reduced the reporting thresholds for certain persistent, bioaccumulative, and toxic (PBT) chemicals in order to be able to provide additional information to the public on these chemicals.

Database: Tribal Leaking Underground Storage Tanks Active

Map Class: Release

Contact Number:

Web Page: http://www.epa.gov/oust/directiv/od961015.htm

Date of Database: 2006-11-01T00:00:00

The list contains information about "active" leaking underground storage tanks (LUST) sites on federally recognized Native American tribal lands. The sites are considered active because they are still subject to future investigation and/or remediation by the U.S. Environmental Protection Agency. The tribes are sovereign entities subject to federal laws. Underground storage tanks located on tribal lands generally are not subject to state laws. As a result, unless a state acts as a tribe's agent pursuant to a formal agreement with a tribe, EPA and the tribe are responsible for implementing and enforcing the UST program on tribal lands.

Database: Tribal Leaking Underground Storage Tanks Inactive

Map Class: Release

Contact Number:

Web Page: http://www.epa.gov/OUST/directiv/d961015a.htm

Date of Database: 2006-11-01T00:00:00

The list contains information about "inactive" leaking underground storage tanks (LUST) sites on federally recognized Native American tribal lands. The sites are considered inactive because they have been investigated and/or remediated and the U.S. Environmental Protection Agency has concurred with the inactive status. The tribes are sovereign entities subject to federal laws. Underground storage tanks located on tribal lands generally are not subject to state laws. As a result, unless a state acts as a tribe's agent pursuant to a formal agreement with a tribe, EPA and the tribe are responsible for implementing and enforcing the UST program on tribal lands.

Database: *Underground Storage Tanks*
Map Class: *Use*
Contact Number:
Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

The UST list contains information for UST sites and tanks in Washington. Both operational and closed USTs are on the list. USTs that are excluded from the list include those that have not been registered with the Washington Department of Ecology. Non-registered tanks generally include farm or residential tanks of 1,100 gallons or less capacity storing motor fuel for noncommercial purposes; tanks storing heating oil for use on the premises where stored; Septic tanks; Pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws; Surface impoundments, pits, ponds, or lagoons; Storm water or waste water collection systems; Flow-through process tanks; Liquid traps or associated gathering lines directly related to oil or gas production and gathering operations; Tanks on or above the floor of underground areas, such as basements or tunnels; Tanks with a capacity of 110 gallons or less. The substances covered under the notification requirements apply to USTs.

Database: *Washington Unauthorized Tire Piles*
Map Class: *Release*
Contact Number:
Web Page: *http://www.ecy.wa.gov/biblio/0507043.html*
Date of Database: *2005-11-15T00:00:00*

The Washington Department of Ecology (Ecology) conducted a study of unauthorized tire piles in Washington. The legislature required this study to be completed and submitted by Ecology to the appropriate standing committees of the legislature by November 15, 2005. The report and appendices present a detailed discussion of how this information was collected and assembled. This study identified 54 sites statewide with unauthorized accumulations of scrap tires. Site mapping was completed and the number of scrap tires was estimated. One site (Goldendale-Tire Shredders) accounts for more than two-thirds of the calculated scrap tires and more than half of the total estimated cleanup costs. Of the 54 sites, only five require more than 10 estimated on-site days to complete the individual cleanups.

PARCEL INSIGHT

INCORPORATED

Parcel Insight Radius Map Report

Report ID: 276
Date: 11/8/2007

Enumclaw, WA

28750 SE 452ND ST
ENUMCLAW, WA 98022

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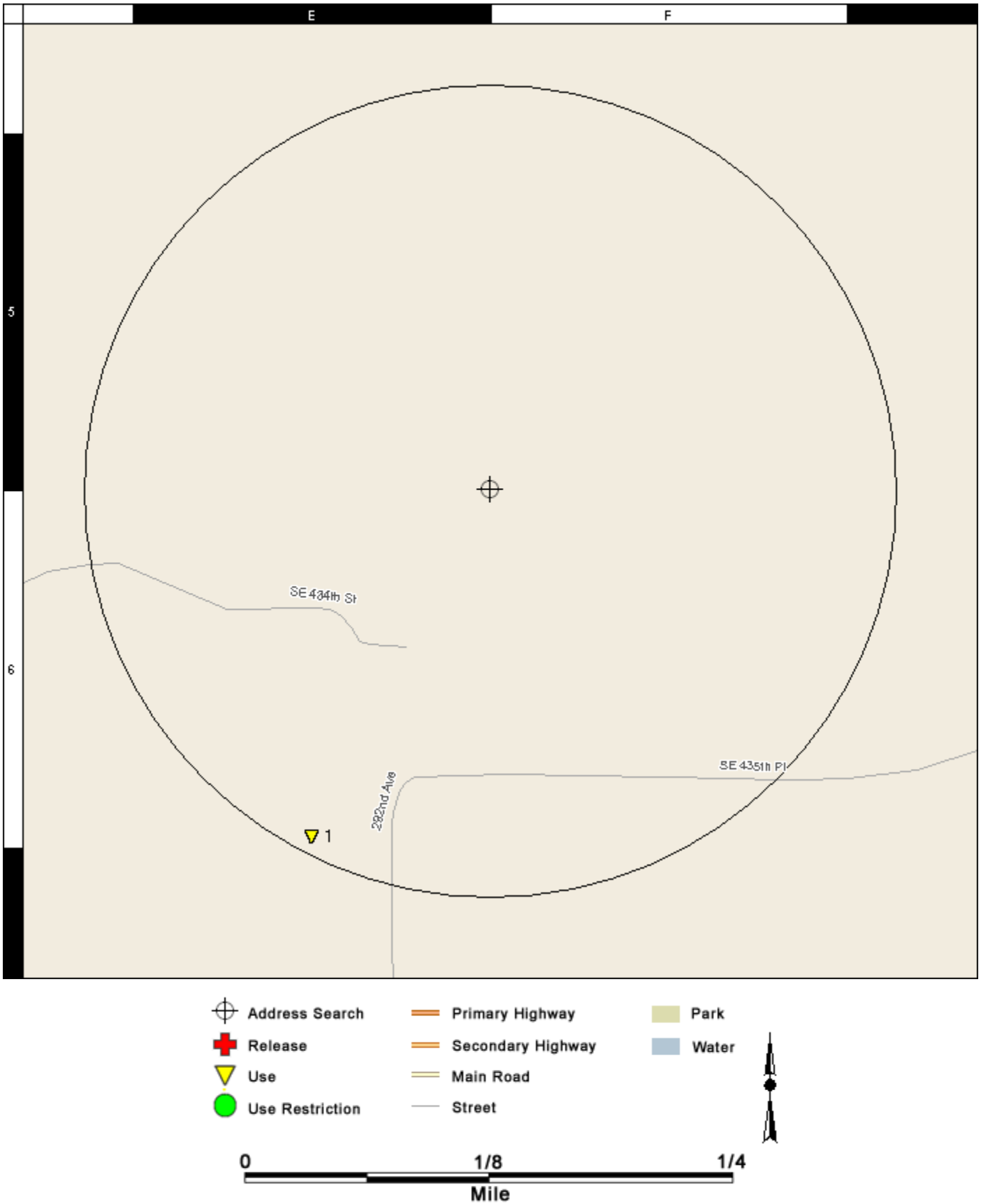
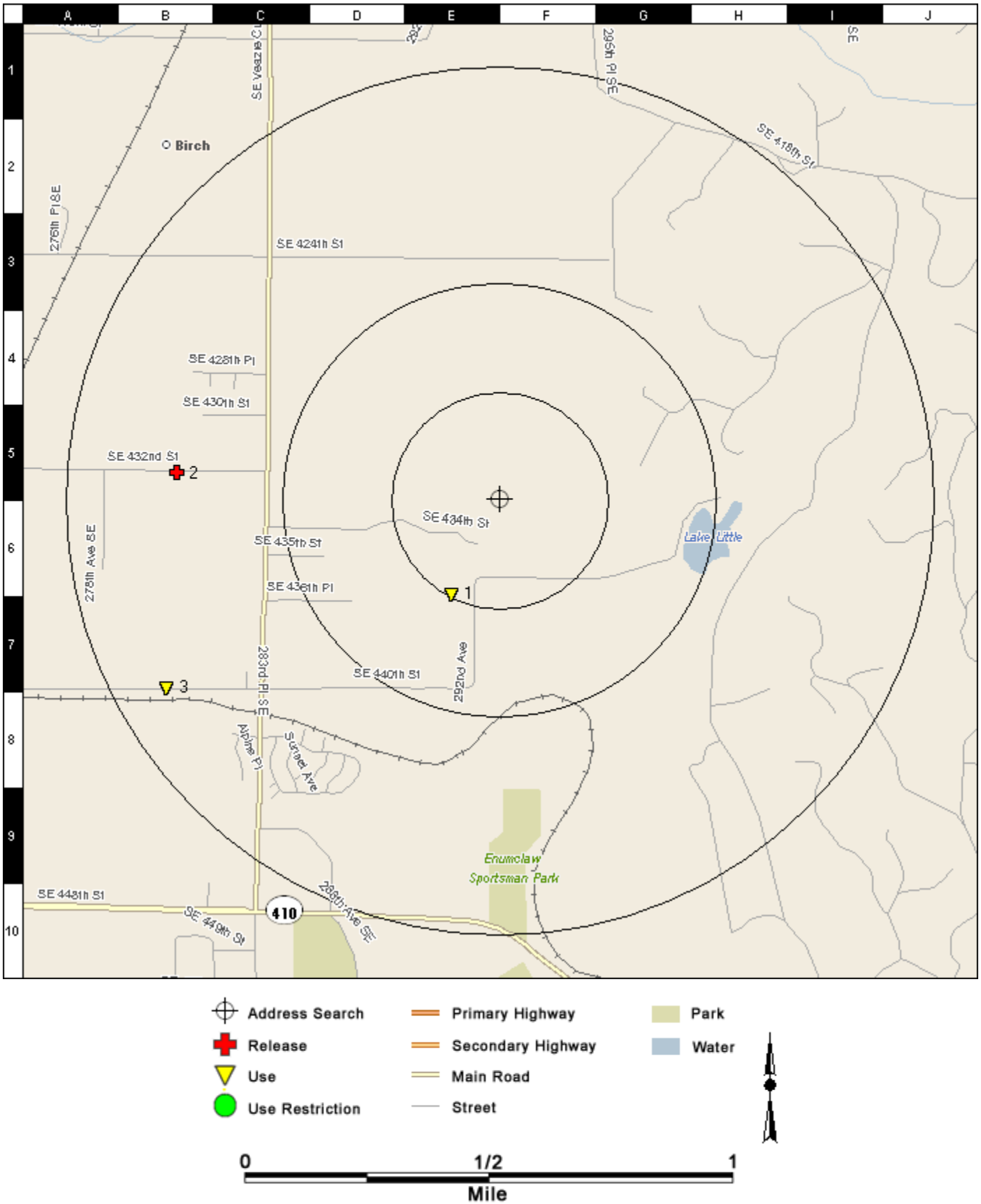
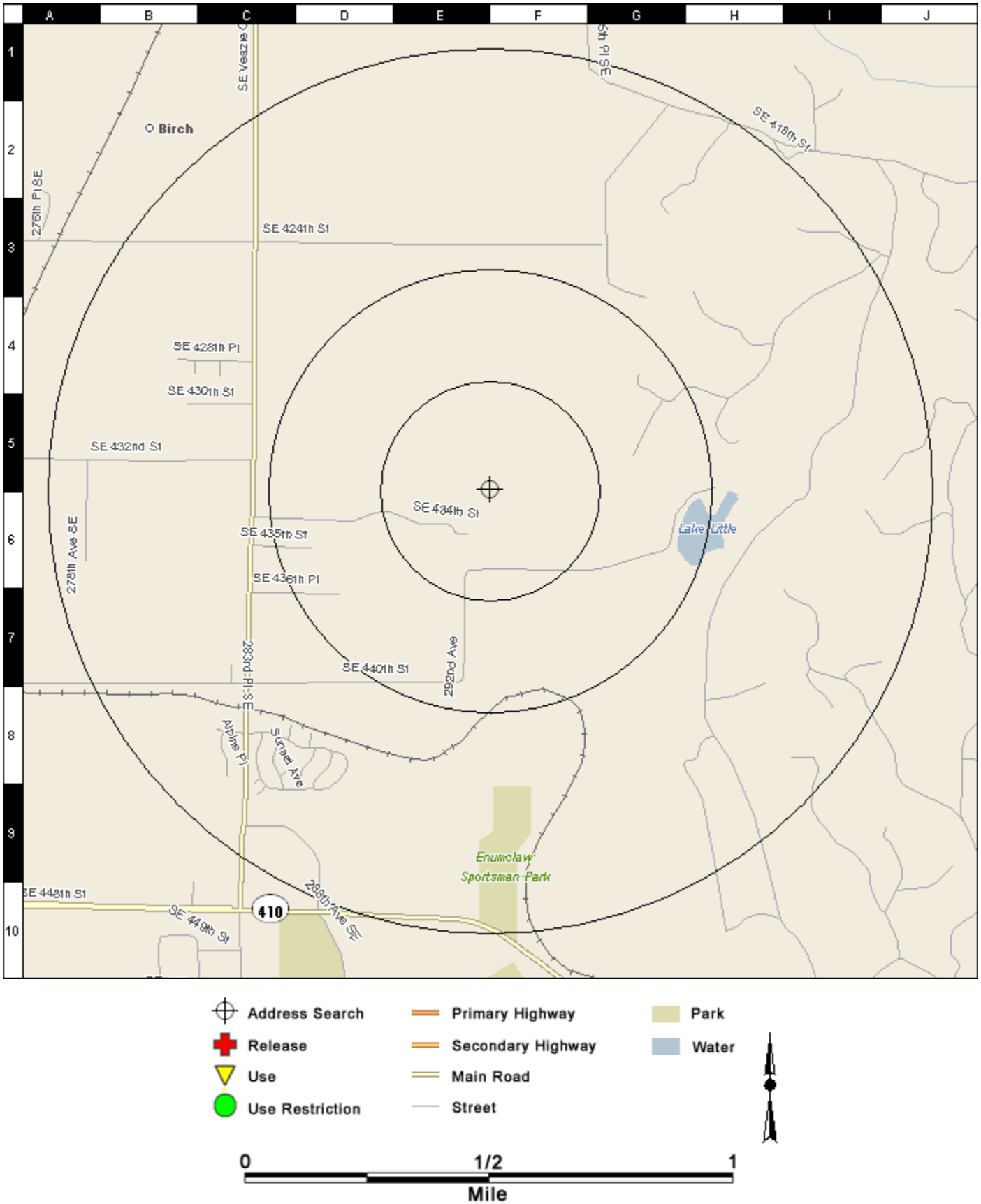
1/4 Mile Detail Map



Overview Map



Non-Exact Match Map



Tabular Summary of Findings

RELEASE	+	*A site listed in a database that documents a release of hazardous material(s).*
USE	∇	*A site listed in a database that documents the use of hazardous material(s), but not a release of hazardous material(s).*
USE RESTRICTION	O	*A site listed in a database that documents a restriction on the use of the site related to a release of a hazardous material(s) or a formal oversight decision from a government agency.*

Map Class		Subject Property	Distance					Total by Map Class
			0.00 to 0.25 M	0.25 to 0.50 M	0.50 to 0.75 M	0.75 to 1.00 M	1.00+ M	
RELEASE	+				1			1
USE	∇		1			1		2
USE RESTRICTION	O							

Database		Search Radius	Subject Property	Distance					Total by Database Type
				0.00 to 0.25 M	0.25 to 0.50 M	0.50 to 0.75 M	0.75 to 1.00 M	1.00+ M	
NPL	+	1.00 M							
RCRA CORRACTS	+	1.00 M							
RCRA TSD	∇	1.00 M							
CERCLIS	+	1.00 M							
CERCLIS NFRAP	+	1.00 M				1			1
ERNS	+	1.00 M							
RCRA LQG	∇	1.00 M							
RCRA SQG	∇	1.00 M							
RCRA CESQG	∇	1.00 M							
LUST ACTIVE TRIBAL	+	1.00 M							
LUST INACTIVE TRIBAL	+	1.00 M							
BROWNFIELDS	O	1.00 M							
INST ENG CONTROLS	O	1.00 M							
HMIRS	+	1.00 M							
TRIS	+	1.00 M							
CSCSL	+	1.00 M							
CSCSL HSL	+	1.00 M							
CSCSL NFA	+	1.00 M							
SWLF STATE	+	1.00 M							
LUST	+	1.00 M							
UST	∇	1.00 M					1		1
SWLF SEA	+	1.00 M							
SWLF KING	+	1.00 M							
SWLF STATE	+	1.00 M							
DECISIONS	O	1.00 M							
INST ENG CONTROLS	O	1.00 M							
RCRA ND	∇	1.00 M		1					1
Totals by Distance			0	0	0	0	0	0	0

Exact Match Summary

				MAP CLASS		
				+	▽	○
MAP ID GRID	SITE NAME ADDRESS	PI ID # DISTANCE DIRECTION	DATABASES	RELEASE	USE	USE RESTRICTION
1 E6	KING CNTY SOLID WASTE DIV ENUMCLAW TRANS 1650 BATTERSBY AVE E, ENUMCLAW	53022761 0.23807 SW	RCRA ND		X	
2 B5	BALLESTRASSE LOGGING 28015 SE 432ND ST, ENUMCLAW	53032321 0.74429 W	CERCLIS NFRAP	X		
3 B7	ENUMCLAW WATER DEPT WATERCREST SPRING 28014 SE 440TH ST, ENUMCLAW	53035278 0.87667 SW	UST		X	

Exact Match Details

Map ID 1 0.238 M SW	GRID E6	PI ID # 53022761	LAT: 47.20975	LON: -121.95400	USE
	Site Name	KING CNTY SOLID WASTE DIV ENUMCLAW TRANS		Databases: RCRA ND	
	Address	1650 BATTERSBY AVE E ENUMCLAW, WA 98022			

RCRA ND **RCRA No Designation**

Site: KING CNTY SOLID WASTE DIV ENUMCLAW TRANS 1650 BATTERSBY AVE E ENUMCLAW, WA 98022
HANDLER ID: WAD980639777
NAICS DESC: All Other Waste Management Services
CONTACT NAME: NA NA
TSD ACTIVITY: N

Report Submission History

Category	Report Date
LQG	
SQG	
CESQG	02/27/1996, 03/03/1997
RCRA ND	12/31/2003, 12/31/2005, 03/02/1998, 02/26/1999, 03/01/2000, 02/16/2001, 02/22/2002, 03/03/2003, 03/30/2004, 02/16/2005, 02/21/2006

Last Report Details:

Site Name: KING CNTY SOLID WASTE DIV ENUMCLAW TRANS
Seq Number: 11
Received Date: 02/21/2006
Transfer Facility:
Federal Waste Generator: N
State Waste Generator: N

Map ID 2 0.744 M W	GRID B5	PI ID # 53032321	LAT: 47.21378	LON: -121.96747	RELEASE
	Site Name	BALLESTRASSE LOGGING		Databases: CERCLIS NFRAP	
	Address	28015 SE 432ND ST ENUMCLAW, WA 98022			

CERCLIS NFRAP **CERCLIS No Further Remedial Action Planned**

Site: BALLESTRASSE LOGGING 28015 SE 432ND ST ENUMCLAW, WA 98022
County: KING
Region: 10
EPA ID: WAD044606945
FIPS Code: 53033

OU ID: 00
Action Code: DS
Action Name: DISCVRY
Action Code ID: 001
Action Lead Type: EPA Fund
Action Completion Date: 1979-07-01T00:00:00
Action_Template_Order: 10
Non_NPL_Status: NFRAP

OU ID: 00
Action Code: PA
Action Name: PA
Action Code ID: 001
Action Lead Type: State (Fund)
Action Start Date: 1984-12-20T01:01:01

Exact Match Details

Map ID 2 0.744 M W	GRID B5	PI ID # 53032321	LAT: 47.21378	LON: -121.96747	RELEASE +
	Site Name	BALLESTRASSE LOGGING		Databases:	
	Address	28015 SE 432ND ST ENUMCLAW, WA 98022		CERCLIS NFRAP	

Action Completion Date: 1985-04-30T00:00:00
Action_Template_Order: 130
Non_NPL_Status: NFRAP

OU ID: 00
Action Code: SI
Action Name: SI
Action Code ID: 001
Action Lead Type: EPA Fund
Action Start Date: 1986-02-28T01:01:01
Action Completion Date: 1986-03-12T00:00:00
Action_Template_Order: 160
Non_NPL_Status: NFRAP

OU ID: 00
Action Code: SI
Action Name: SI
Action Code ID: 002
Action Lead Type: EPA Fund
Action Start Date: 1988-07-26T01:01:01
Action Completion Date: 1988-07-26T00:00:00
Action_Template_Order: 160
Non_NPL_Status: NFRAP

OU ID: 00
Action Code: VS
Action Name: ARCH SITE
Action Code ID: 001
Action Lead Type: EPA In-House
Action Completion Date: 1988-07-26T00:00:00
Action_Template_Order: 1500
Non_NPL_Status: NFRAP

Map ID 3 0.877 M SW	GRID B7	PI ID # 53035278	LAT: 47.20663	LON: -121.96798	USE ∇
	Site Name	ENUMCLAW WATER DEPT WATERCREST SPRING		Databases:	
	Address	28014 SE 440TH ST ENUMCLAW, WA 98022		UST	

UST **Underground Storage Tanks**

Site: ENUMCLAW WATER DEPT WATERCREST SPRING 28014 SE 440TH ST ENUMCLAW, WA 98022
Facility Site Id: 44564942
County: King
Unit: NW

Tank ID	Tank Name	Status	Inst. Date	Capacity	Cmpt./ID	Substance
619407	1	Closure in Process		111 TO 1,100 Gallons	1/593770	Diesel

Disclaimer

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Database: *Brownfields Grant Sites*
Map Class: *Use Restriction*
Contact Number:
Web Page: *http://www.epa.gov/brownfields/index.html*
Date of Database: *2007-04-15T00:00:00*

The Brownfields Management System (BMS) is the official U.S. Environmental Protection Agency (EPA0 database of the Brownfields Program. It is designed to assist EPA in collecting, tracking, and updating information, as well as reporting on the major activities and accomplishments of the various Brownfields grant programs. BMS captures data on grantee activities (assessment, cleanup and redevelopment), funding, job training, and details on cooperative partners and leveraging efforts - a central objective of the Brownfields Program.

Database: *CERCLIS No Further Remedial Action Planned*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/superfund/sites/cursites/index.htm*
Date of Database: *2006-12-15T00:00:00*

The No Further Remedial Action Planned (NFRAP) or "Archived" designation means that, to the best of the EPA's knowledge, Superfund has completed its assessment at a site, and has determined no further steps to list this site on the NPL will be taken unless information indicating this decision was not appropriate or other considerations make a recommendation for listing appropriate at a later time. The U.S. Environmental Protection Agency (EPA) may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available and in these cases, the Archive designation is removed and the site is returned to the CERCLIS inventory if more sustentative assessment and/or any cleanup work is necessary under the Federal Superfund program. An archive decision does not necessarily mean that there is no hazard associated with a given site; it means only that based upon available information, the location is not judged to be a potential NPL site. Sites are archived as historical records so EPA does not needlessly repeat the investigations in the future. The States will coordinate with EPA to determine if any sites should be returned to CERCLIS because of newly identified contamination problems at the site. It is important to note the sites on CERCLIS and the archived list will change as the sites are being investigated or if new information becomes available.

Database: *Comprehensive Environmental Response, Compensation, and Liability Information System*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/superfund/sites/siteinfo.htm*
Date of Database: *2007-03-15T00:00:00*

The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) list contains information on hazardous waste sites, potentially hazardous waste sites and remedial activities. CERCLIS is a database used by the U.S. Environmental Protection Agency (EPA) to track activities conducted under its Superfund program. Specific information is tracked for each individual site. The database includes sites that are on the National Priorities List (NPL) or being considered for the NPL. The CERCLIS Database displays site information for NPL sites (i.e., sites proposed to the NPL, currently on the final NPL or deleted from the final NPL. NPL Sites are listed separately on the

NPL data set. Once a site is added to CERCLIS, the next step in evaluating the potential problem is the completion of a preliminary assessment (PA). The purpose of the PA is to determine whether the site warrants further Superfund investigation. The PA is typically an information gathering phase for which sampling does not take place. A PA is usually completed within one year of a site being listed in CERCLIS. Based on the conclusions of the PA, a site could be recommended for a) no further action under the EPA Superfund program; b) a sampling site investigation to collect data for further evaluation and possible nomination to the NPL; or c) an emergency or time-critical removal (short-term cleanup). Active CERCLIS sites are sites at which site assessment, removal, remedial, enforcement, cost recovery, or oversight activities are being planned or conducted under the Superfund program. CERCLIS excludes sites which EPA has assessed and designated "No Further Remedial Action Planned", or archive, sites. EPA is aware that the CERCLIS inventory is often used as a resource in assessing property. People conducting such assessments should not misinterpret the meaning of a site being contained in CERCLIS. Such sites are not necessarily contaminated, and sites not in CERCLIS are not necessarily contaminant-free.

Database: *Confirmed and Suspected Contaminated Sites List No Further Action*

Map Class: *Release*

Contact Number:

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*

Date of Database: *2007-01-01T00:00:00*

No Further Action Site List This data set contains information about sites previously on the Confirmed and Suspected Contaminated Sites list (above) that have received a No Further Action (NFA) determination. Because it is necessary to maintain historical records of sites that have been investigated and cleaned up, sites are not deleted from the database when cleanup activities are completed. Instead, a No Further Action code is entered based upon the type of NFA determination the site received. The NFA code lists the basis for the NFA determination.

Database: *Confirmed and Suspected Contaminated Sites List*

Map Class: *Release*

Contact Number:

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*

Date of Database: *2007-07-15T00:00:00*

The data set contains information about sites that are undergoing cleanup and sites that are awaiting further investigation and/or cleanup by the Department of Ecology Toxics Cleanup Program. Sites on the Hazardous Sites List (i.e., those that have been ranked using the Washington Ranking Model) are included in this data set. Within 90 days of learning of a potentially contaminated site, the Department of Ecology conducts an initial investigation of each site. If the initial investigation shows that further action is needed, the site will appear in the Confirmed & Suspected Contaminated Sites (CSCS) Report. Once remedial action has been completed, the Toxics Cleanup Program's management determines the removal of a site from the CSCS Report. The Hazardous Sites List is a subset of the CSCS Report. It contains those sites that have been ranked using the Washington Ranking Method. Site owners and operators do not necessarily agree with Ecology's determination of site status.

Database: *Confirmed and Suspected Contaminated Sites List Hazardous Site List*

Map Class: *Release*

Contact Number:

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

The Hazardous Sites List (HSL) is required by law 173-340-330 WAC. It includes all sites which have been assessed and ranked using the Washington Ranking Method (WARM). Also listed are National Priorities List (NPL) sites. The categories of evaluation are linear and include several steps. The Initial Investigation (II) is a brief investigation conducted within 90 days of receiving a site discovery report. The II step provides enough information to determine if the site needs further investigation, emergency cleanup, or no further action. If further action is required, early notice letters are sent to site owners, operators, etc. inviting them to work cooperatively with us to resolve any contamination problems, AND the site proceeds to the next step. The Site Hazard Assessment (SHA) is an assessment to confirm the presence of hazardous substances and to determine the relative risk the site poses to human health and the environment. (Note: Some SHAs are conducted by Ecology staff while others are conducted by local health districts / departments.) The Hazard Ranking (WARM Score) includes the results of the Site Hazard Assessment step that are used in the Washington Ranking Method (WARM) to yield a WARM score. The WARM score is a number between 1 and 5, where a score of 1 represents the highest level of risk and 5 indicates the lowest assessed risk. A zero indicates that the site is either on the federal National Priorities List (NPL) or is a sub-site or operable unit of an NPL site. NPL sites are ranked under the federal Hazard Ranking System (HRS). This WARM score is not removed at the time of a No Further Action determination as it is kept for historical purposes.

Database: *Ecology Digest 26 (Catalog of Formal Oversight Decision Documents, Orders and Decrees)*
Map Class: *Use Restriction*
Contact Number:
Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/DIGEST%2026.pdf*
Date of Database:

The Toxics Cleanup Program maintains a list of all formal oversight decision documents under the Model Toxics Control Act that have been agreed to and signed by the Program's manager or designee. These decision documents include all Consent Decrees, Prospective Purchaser Consent Decrees, Agreed Orders, and Enforcement Orders under the Model Toxics Control Act.

Database: *Emergency Response Notification System*
Map Class: *Release*
Contact Number:
Web Page: *http://www.nrc.uscg.mil/wdbcgi/wdbcgi.exe/WWWUSER/WEBDB.foia_query.show_parms*
Date of Database: *2007-01-15T00:00:00*

The Emergency Response Notification System (ERNS) is a national computer data base used to store information on releases of oil and hazardous substances. ERNS supports the Emergency Response and the Title III program. The ERNS program is a cooperative effort among EPA Headquarters, the Department of Transportation (DOT), National Transportation Systems Center (NTSC), the ten EPA Regions, the U.S. Coast Guard (USCG), and the National Response Center (NRC). ERNS provides the most comprehensive data compiled on release notifications of oil and hazardous substances in the United States. When a release report is submitted to Federal authorities (e.g., NRC or Regional offices), the individual reporting is asked a series of questions regarding the release (e.g., type, location, volume). Information concerning all releases originally reported to the NRC or EPA Regional offices is entered into local

computers and transmitted electronically from the NRC or EPA Regional office to the NTSC, where it becomes part of the ERNS national data base. The procedures for maintaining the initial reports differs between the NRC and the EPA Regions. The NRC maintains electronic copies of all spill reports as they were initially received and does not make any changes to spill reports once they have been entered into the system. Reports received by the NRC contain information that may be valuable to the on-scene coordinators, as well as to enforcement personnel. The information received by the NRC is sent to the Regional offices through the Volpe National Transportation Systems Center (VNTSC). Since these reports may be used in enforcement actions, it is necessary to maintain a copy of the spill report as it was originally reported. Each EPA Region maintains its own Region-specific data base, which is a subset of the national data base. Initial spill reports made directly to an EPA Region are maintained as hard copies and kept in the individual Regional office. When additional information on a release notification is obtained, it is also entered at the Regional level and electronically transmitted to the national system. An initial and modified copy of each report is maintained at VNTSC to preserve data integrity.

Database: *Hazardous Materials Information Reporting System*
Map Class: *Release*
Contact Number:
Web Page: *http://hazmat.dot.gov/pubs/inc/hmisframe.htm*
Date of Database: *2007-01-01T00:00:00*

The Hazardous Materials Incident Reporting System (HMIRS) contains data on spills, releases, or other incidents involving hazardous materials during the course of transportation. All modes of transportation are included except pipeline and bulk marine transportation. The data set contains the Incident Report Form 5800.1 data submitted under the requirements of Title 49 CFR 171.15 and 171.16. HMIRS of the Pipeline and Hazardous Materials Safety Administration (PHMSA) was established in 1971 to fulfill the requirements of the federal hazardous materials transportation law. Part 171 of Title 49, Code of Federal Regulations (49 CFR) contains the incident reporting requirements of carriers of hazardous materials. An unintentional release of hazardous materials meeting the criteria set forth in Section 171.16, 49 CFR must be reported on U.S. Department of Transportation (DOT) Form 5800.1, and data from the reports received are subsequently entered in the HMIRS database. All spills meeting the following criteria to be reported to PHMSA: 1) As a direct result of hazardous materials a person is killed or receives injuries requiring hospitalization, estimated property damage exceeds $50,000, an evacuation of the general public lasts for one or more hours, a major transportation artery or facility is closed for one or more hours, or the operational flight pattern or routing of an aircraft is altered, 2) Fire, breakage, spillage, or suspected contamination occurs involving shipment of radioactive materials or infectious substances, 3) There has been a release of a marine pollutant exceeding 450 L or 400 kg, or 4) Any hazardous material is unintentionally released from a package or any quantity of hazardous waste is discharged during transportation.

Database: *Institutional and Engineering Controls*
Map Class: *Use Restriction*
Contact Number:
Web Page: *http://www.epa.gov/superfund/index.htm*
Date of Database: *2007-03-15T00:00:00*

This data set identifies RCRA and NPL sites with institutional and/or engineering controls in place.

Database: *Institutional and Engineering Controls*
Map Class: *Use Restriction*
Contact Number:

Government Record Tracking

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

This data set is a subset of CSCSL and identifies sites where a remedial action was conducted, residual contamination was left on site and on-going institutional controls required.

Database: *King County Abandoned Landfills*
Map Class: *Release*
Contact Number:
Web Page: *http://www.spl.org/*
Date of Database:

Abandoned landfill study in King County by Seattle-King County Dept. of Public Health. Environmental Health Division, 1985.

Database: *Leaking Underground Storage Tanks*
Map Class: *Release*
Contact Number:
Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

The LUST data file contains information on UST Cleanup sites and cleanup history. Sites that have been cleaned up and sites currently being cleaned up are included in the data set. Sites are categorized based on the activities taken. Awaiting Cleanup means the site has been discovered or reported release, yet no active cleanup measures taken or Site check (identified the source) begun or completed, yet no active cleanup measures taken or site characterization begun or completed, yet no active cleanup measures taken. Cleanup Started means responsible party has initiated physical, biological, or chemical management of release, e.g. soil excavated, groundwater pumped, vapors extracted, free product removed, oxygen added, etc., site investigations and emergency responses (e.g. venting explosive vapors, providing bottled water) do not qualify as activities under cleanup started. Monitoring means groundwater monitoring is the only activity occurring at the site or site has been characterized, only low levels of soil and/or groundwater contamination remain, and natural attenuation is the chosen cleanup method or conformational monitoring following active cleanup measures. Reported Cleaned Up means owner or consultant reports that contamination has been cleaned up and/or some soil contamination may remain under existing structures or in otherwise inaccessible areas if groundwater is not threatened and there has been no migration of contamination into the structure and cleanup report has not been formally reviewed by Ecology. A formal review could determine that the site has not been cleaned up to MTCA standards. No Further Action means the cleanup report has been formally reviewed by Ecology under the fee-based Voluntary Cleanup Program and resulted in a No Further Action status and Institutional controls may have been required due to soil contamination that may remain under existing structures or in otherwise inaccessible areas.

Database: *National Priority List*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/superfund/index.htm*
Date of Database: *2007-04-23T00:00:00*

The National Priorities List (NPL) is an information and management tool that is a part of the Superfund cleanup process. The NPL serves primarily informational purposes, identifying for the States and the public those sites or other releases that appear to warrant remedial actions. The identification of a site for the NPL is intended primarily to guide the U.S. Environmental Protection Agency (EPA) in: determining which sites warrant further investigation to assess the nature and extent of the human health and environmental risks associated with a site; identifying what Comprehensive Environmental Response Compensation and Liability Act (CERCLA)-financed remedial actions may be appropriate; notifying the public of sites EPA believes warrant further investigation; and serving notice to potentially responsible parties that EPA may initiate CERCLA-financed remedial action. Inclusion of a site on the NPL does not in itself reflect a judgment of the activities of its owner or operator, it does not require those persons to undertake any action, nor does it assign liability to any person. Section 105(a)(8)(B) of CERCLA, as amended, requires that the statutory criteria provided by the Hazard Ranking System (HRS) be used to prepare a list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States. The NPL list is also known as Appendix B of the National Contingency Plan. The Federal Register (FR) Notices for NPL Updates page provides a list of FR Notices for proposed and final NPL Updates. The Superfund cleanup process begins with site discovery or notification to EPA of possible releases of hazardous substances. Sites are discovered by various parties, including citizens, State agencies, and EPA Regional offices. Once discovered, sites are entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), EPA's computerized inventory of potential hazardous substance release sites (view Superfund Site Information). EPA then evaluates the potential for a release of hazardous substances from the site through these steps in the Superfund cleanup process. Superfund was created in 1980 when Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to clean up the nation's uncontrolled hazardous waste sites. Under the Superfund program, abandoned, accidentally spilled, or illegally dumped hazardous wastes that pose a current or future threat to human health or the environment are cleaned up. EPA works closely with communities, potentially responsible parties, scientists, researchers, contractors, and state, local, tribal, and federal authorities on site cleanup. Together with these groups, EPA identifies hazardous waste sites, tests the conditions of the sites, develops cleanup plans, and cleans up the sites.

Database: *RCRA Conditionally Exempt Small Quantity Generator*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

Conditionally Exempt Small Quantity Generators (CESQG) generate 100 kilograms or less per month of hazardous waste, or 1 kilogram or less per month of acutely hazardous waste. Requirements for CESQG's include (see also 40 CFR 261.5). CESQG's must identify all the hazardous waste generated. CESQG's may not accumulate more than 1,000 kilograms of hazardous waste at any time. CESQG's must ensure that hazardous waste is delivered to a person or facility who is authorized to manage it.

Database: *RCRA Corrective Action Report*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/hazwaste/ca/index.htm*
Date of Database: *2007-07-15T00:00:00*

The Resource Conservation and Recovery Act (RCRA) Corrective Action (CORRACTS) list is a summary of those facilities where corrective action is occurring. The RCRA Corrective Action Program, run by EPA and 41 authorized states and territories, compels responsible parties to address the investigation and cleanup of hazardous releases themselves.

RCRA Corrective Action differs from Superfund in that Corrective Action sites generally have viable operators and on-going operations. RCRA grants EPA and authorized states the authority to regulate hazardous waste management facilities that treat, store, or dispose of hazardous waste. Although EPA guidelines are designed to prevent toxic releases at RCRA facilities, accidents or other activities have sometimes released pollutants into soil, ground water, surface water and air. By the year 2020, EPA and the authorized states plan to have largely completed the work of implementing final remedies at all facilities requiring Corrective Action. (See Goal 3 of the Office of Solid Waste's 2020 Vision for more details.) While working toward the 2020 goal, EPA decided to ensure that sites presenting the greatest risk to human health and the environment are dealt with first. Accordingly, the Corrective Action Program has pledged to select a final remedy at 30% and put a final remedy in place at 20% of 1,968 highest-priority sites by 2008.

Database: *RCRA Large Quantity Generator*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

Large Quantity Generators (LQG) generate 1,000 kilograms per month or more of hazardous waste, or more than 1 kilogram per month of acutely hazardous waste. LQG's may only accumulate waste on site for 90 days, but certain exceptions apply. LQG's do not have a limit on the amount of hazardous waste accumulated on site. There must always be at least one employee available to respond to an emergency. This employee is the emergency coordinator responsible for coordinating all emergency response measures. LQG's must have detailed, written contingency plans for handling emergencies. LQG's must submit a biennial hazardous waste report.

Database: *RCRA No Designation*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

RCRA sites that are identified as having a RCRA generator identified number but that are not identified as a large quantity generator, small quantity generator, conditionally exempt small quantity generator, treatment storage or disposal (TSD) facility, or RCRA corrective action sites.

Database: *RCRA Non Corracts TSD*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/tsds.htm*
Date of Database: *2007-07-15T00:00:00*

Through the Resource Conservation and Recovery Act (RCRA), Congress directed EPA to create regulations to manage hazardous waste from "the cradle to the grave." Under this mandate, EPA developed strict requirements for all aspects

of hazardous waste management including the treatment, storage, and disposal (TSD) of hazardous waste. TSDS include those facilities that treat, store, and/or dispose hazardous waste. TSDS are the last link in the cradle to the grave waste management system. The requirements for TSDS are found in 40 CFR Parts 264 and 265 and are more extensive than those that apply to hazardous waste generators or transporters.

Database: *RCRA Small Quantity Generator*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

Small Quantity Generators (SQG) generate more than 100 kilograms, but less than 1,000 kilograms, of hazardous waste per month. SQG's may accumulate hazardous waste on site for 180 days without a permit (or 270 days if shipping a distance greater than 200 miles). The quantity of hazardous on site waste must never exceed 6,000 kilograms. There must always be at least one employee available to respond to an emergency. This employee is the emergency coordinator responsible for coordinating all emergency response measures. SQG's are not required to have detailed, written contingency plans.

Database: *Seattle Abandoned Landfills*
Map Class: *Release*
Contact Number:
Web Page: *http://www.spl.org/*
Date of Database: *1984-07-30T00:00:00*

Abandoned landfill study in the City of Seattle by Seattle-King County Dept. of Public Health. Environmental Health Division, 1984.

Database: *Solid Waste Facility Database*
Map Class: *Release*
Contact Number:
Web Page: *http://www.ecy.wa.gov/biblio/0407019.html*
Date of Database: *2007-01-01T00:00:00*

The solid waste facility database contains disposal information for landfills, incinerators, and transfer facilities. The types of facilities included are those that are permitted under chapter 173-350 WAC, Minimum Functional Standards for Solid Waste Handling and chapter 173-351 WAC, Criteria for Municipal Solid Waste Landfills. Information in the solid waste facility database is obtained through annual reporting forms sent to all landfill types (municipal, inert/demolition, limited purpose/special use, and wood waste landfills) and to waste-to-energy/incinerators.

Database: *Toxic Chemical Release Inventory*
Map Class: *Release*

Contact Number:

Web Page: http://www.epa.gov/tri/index.htm

Date of Database: 2007-01-01T00:00:00

The Toxics Release Inventory (TRI) contains information on releases of nearly 650 chemicals and chemical categories from industries including manufacturing, metal and coal mining, electric utilities, and commercial hazardous waste treatment, among others. The Emergency Planning and Community Right-to-Know Act (EPCRA) primary purpose is to inform communities and citizens of chemical hazards in their areas. Sections 311 and 312 of EPCRA require businesses to report the locations and quantities of chemicals stored on-site to state and local governments in order to help communities prepare to respond to chemical spills and similar emergencies. EPCRA Section 313 requires EPA and the States to annually collect data on releases and transfers of certain toxic chemicals from industrial facilities, and make the data available to the public in the Toxics Release Inventory (TRI). In 1990 Congress passed the Pollution Prevention Act which required that additional data on waste management and source reduction activities be reported under TRI. The goal of TRI is to empower citizens, through information, to hold companies and local governments accountable in terms of how toxic chemicals are managed. EPA compiles the TRI data each year and makes it available. The TRI program has expanded significantly since its inception in 1987. The Agency has issued rules to roughly double the number of chemicals included in the TRI to approximately 650. Seven new industry sectors have been added to expand coverage significantly beyond the original covered industries, i.e. manufacturing industries. Most recently, the Agency has reduced the reporting thresholds for certain persistent, bioaccumulative, and toxic (PBT) chemicals in order to be able to provide additional information to the public on these chemicals.

Database: Tribal Leaking Underground Storage Tanks Active

Map Class: Release

Contact Number:

Web Page: http://www.epa.gov/oust/directiv/od961015.htm

Date of Database: 2006-11-01T00:00:00

The list contains information about "active" leaking underground storage tanks (LUST) sites on federally recognized Native American tribal lands. The sites are considered active because they are still subject to future investigation and/or remediation by the U.S. Environmental Protection Agency. The tribes are sovereign entities subject to federal laws. Underground storage tanks located on tribal lands generally are not subject to state laws. As a result, unless a state acts as a tribe's agent pursuant to a formal agreement with a tribe, EPA and the tribe are responsible for implementing and enforcing the UST program on tribal lands.

Database: Tribal Leaking Underground Storage Tanks Inactive

Map Class: Release

Contact Number:

Web Page: http://www.epa.gov/OUST/directiv/d961015a.htm

Date of Database: 2006-11-01T00:00:00

The list contains information about "inactive" leaking underground storage tanks (LUST) sites on federally recognized Native American tribal lands. The sites are considered inactive because they have been investigated and/or remediated and the U.S. Environmental Protection Agency has concurred with the inactive status. The tribes are sovereign entities subject to federal laws. Underground storage tanks located on tribal lands generally are not subject to state laws. As a result, unless a state acts as a tribe's agent pursuant to a formal agreement with a tribe, EPA and the tribe are responsible for implementing and enforcing the UST program on tribal lands.

Government Record Tracking

Database: *Underground Storage Tanks*
Map Class: *Use*
Contact Number:
Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

The UST list contains information for UST sites and tanks in Washington. Both operational and closed USTs are on the list. USTs that are excluded from the list include those that have not been registered with the Washington Department of Ecology. Non-registered tanks generally include farm or residential tanks of 1,100 gallons or less capacity storing motor fuel for noncommercial purposes; tanks storing heating oil for use on the premises where stored; Septic tanks; Pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws; Surface impoundments, pits, ponds, or lagoons; Storm water or waste water collection systems; Flow-through process tanks; Liquid traps or associated gathering lines directly related to oil or gas production and gathering operations; Tanks on or above the floor of underground areas, such as basements or tunnels; Tanks with a capacity of 110 gallons or less. The substances covered under the notification requirements apply to USTs.

Database: *Washington Unauthorized Tire Piles*
Map Class: *Release*
Contact Number:
Web Page: *http://www.ecy.wa.gov/biblio/0507043.html*
Date of Database: *2005-11-15T00:00:00*

The Washington Department of Ecology (Ecology) conducted a study of unauthorized tire piles in Washington. The legislature required this study to be completed and submitted by Ecology to the appropriate standing committees of the legislature by November 15, 2005. The report and appendices present a detailed discussion of how this information was collected and assembled. This study identified 54 sites statewide with unauthorized accumulations of scrap tires. Site mapping was completed and the number of scrap tires was estimated. One site (Goldendale-Tire Shredders) accounts for more than two-thirds of the calculated scrap tires and more than half of the total estimated cleanup costs. Of the 54 sites, only five require more than 10 estimated on-site days to complete the individual cleanups.

PARCEL INSIGHT

INCORPORATED

Parcel Insight Radius Map Report

Report ID: 277
Date: 11/13/2007

Enumclaw

CHINOOK PASS HWY
ENUMCLAW, WA 98022

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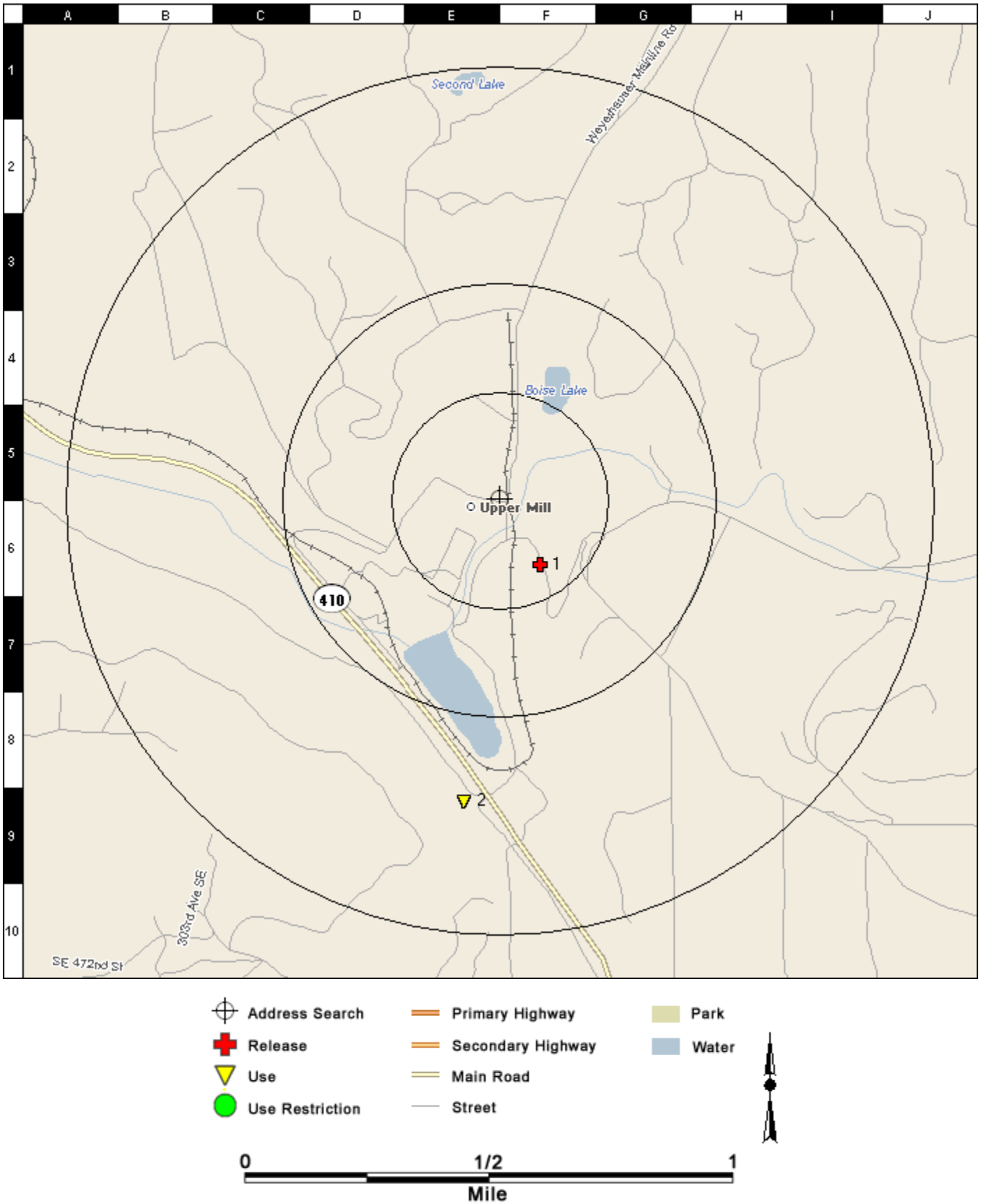
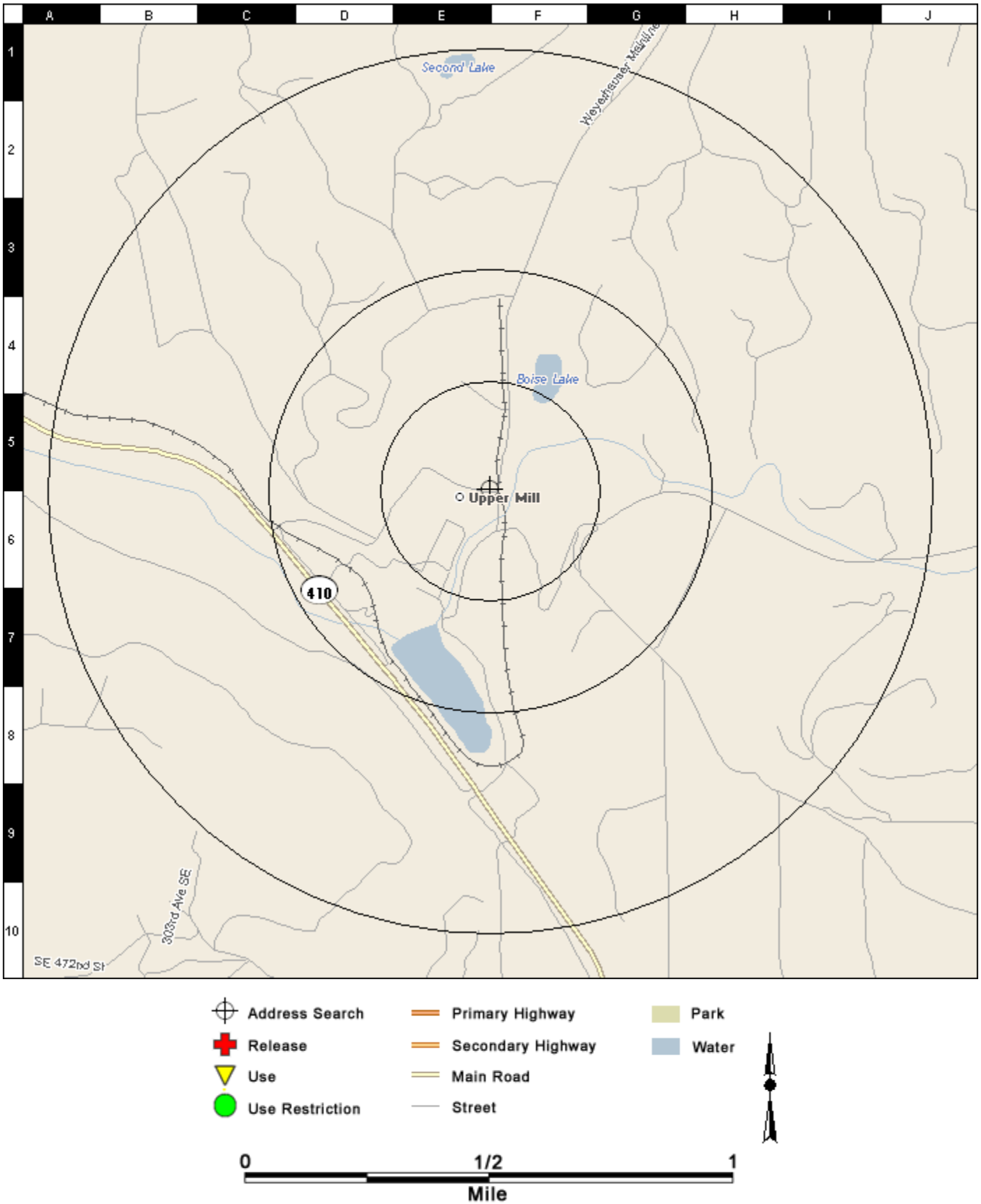
1/4 Mile Detail Map

Overview Map



Non-Exact Match Map



Tabular Summary of Findings

RELEASE	+	*A site listed in a database that documents a release of hazardous material(s).*
USE	∇	*A site listed in a database that documents the use of hazardous material(s), but not a release of hazardous material(s).*
USE RESTRICTION	O	*A site listed in a database that documents a restriction on the use of the site related to a release of a hazardous material(s) or a formal oversight decision from a government agency.*

Map Class		Subject Property	Distance					Total by Map Class
			0.00 to 0.25 M	0.25 to 0.50 M	0.50 to 0.75 M	0.75 to 1.00 M	1.00+ M	
RELEASE	+		1					1
USE	∇				1			1
USE RESTRICTION	O							

Database		Search Radius	Subject Property	Distance					Total by Database Type
				0.00 to 0.25 M	0.25 to 0.50 M	0.50 to 0.75 M	0.75 to 1.00 M	1.00+ M	
NPL	+	1.00 M							
RCRA CORRACTS	+	1.00 M							
RCRA TSD	∇	1.00 M							
CERCLIS	+	1.00 M							
CERCLIS NFRAP	+	1.00 M							
ERNS	+	1.00 M							
RCRA LQG	∇	1.00 M							
RCRA SQG	∇	1.00 M		1					1
RCRA CESQG	∇	1.00 M							
LUST ACTIVE TRIBAL	+	1.00 M							
LUST INACTIVE TRIBAL	+	1.00 M							
BROWNFIELDS	O	1.00 M							
INST ENG CONTROLS	O	1.00 M							
HMIRS	+	1.00 M							
TRIS	+	1.00 M							
CSCSL	+	1.00 M		1					1
CSCSL HSL	+	1.00 M							
CSCSL NFA	+	1.00 M							
SWLF STATE	+	1.00 M							
LUST	+	1.00 M							
UST	∇	1.00 M		1		1			2
SWLF SEA	+	1.00 M							
SWLF KING	+	1.00 M							
SWLF STATE	+	1.00 M							
DECISIONS	O	1.00 M							
INST ENG CONTROLS	O	1.00 M							
RCRA ND	∇	1.00 M							
Totals by Distance			0	0	0	0	0	0	0

Exact Match Summary

				MAP CLASS		
				+	▽	○
MAP ID GRID	SITE NAME ADDRESS	PI ID # DISTANCE DIRECTION	DATABASES	RELEASE	USE	USE RESTRICTION
1 F6	WEYERHAEUSER ENUMCLAW MILLPOND 31002 CHINOOK PASS HWY, ENUMCLAW	53001088 0.17177 SE	RCRA SQG CSCSL UST	X	X	
2 E9	WA PARKS FEDERATION FOREST STATE PARK 49201 ENUMCLAW-CHINOOK PASS RD, ENUMCLAW	53021023 0.69211 S	UST		X	

Exact Match Details

Map ID 1 0.172 M SE	GRID F6	PI ID # 53001088	LAT: 47.19165	LON: -121.92239	RELEASE +
	Site Name	WEYERHAEUSER ENUMCLAW MILLPOND	Databases: RCRA SQG CSCSL UST		
	Address	31002 CHINOOK PASS HWY ENUMCLAW, WA 98022			

RCRA SQG **RCRA Small Quantity Generator**

Site: WEYERHAEUSER ENUMCLAW MILLPOND 31002 CHINOOK PASS HWY ENUMCLAW, WA 98022
HANDLER ID: WAD009270885
NAICS DESC: Sawmills and Wood Preservation
CONTACT NAME: NA NA
TSD ACTIVITY: N

Report Submission History

Category	Report Date
LQG	
SQG	12/31/2003, 02/26/2003, 03/03/2004
CESQG	03/05/1996, 03/04/1997, 03/10/1998, 03/01/1999, 03/13/2000, 03/01/2001, 01/17/2002, 05/13/2005
RCRA ND	01/01/1995, 12/31/1990, 12/31/2005, 02/28/2006

Last Report Details:

Site Name: WEYERHAEUSER ENUMCLAW MILLPOND
Seq Number: 12
Received Date: 02/28/2006
Transfer Facility:
Federal Waste Generator: N
State Waste Generator: N

CSCSL **Confirmed and Suspected Contaminated Sites List**

Site: Weyerhaeuser Enumclaw Millpond 31002 CHINOOK PASS HWY ENUMCLAW, WA 98022
Facility Site Id: 2259
County Name: KING
Responsible Unit: NW
Ecology Status Code: Idependent Remedial Action
Program Plan Code: VCP Site
Independent Status Code: Final Independent RA Report received

Affected Id: 3000 (Surface Water / Confirmed)

Confirmed Contaminates	Suspected Contaminates
EPA Priority Pollutants - Metals and Cyanide Metals - Other	

Affected Id: 2999 (Sediment / Confirmed)

Confirmed Contaminates	Suspected Contaminates
EPA Priority Pollutants - Metals and Cyanide Metals - Other Polychlorinated biPhenyles (PCBs) Petroleum Products Phenolic Compounds Polynuclear Aromatic Hydrocarbons (PAH)	Non-Halogenated Solvents

Affected Id: 2998 (Soil / Confirmed)

Confirmed Contaminates	Suspected Contaminates
EPA Priority Pollutants - Metals and Cyanide	Non-Halogenated Solvents

Exact Match Details

Map ID 1 0.172 M SE	GRID F6	PI ID # 53001088	LAT: 47.19165	LON: -121.92239	RELEASE +
	Site Name	WEYERHAEUSER ENUMCLAW MILLPOND	Databases: RCRA SQG CSCSL UST		
	Address	31002 CHINOOK PASS HWY ENUMCLAW, WA 98022			

Polychlorinated biPhenyles (PCBs) Petroleum Products Phenolic Compounds Polynuclear Aromatic Hydrocarbons (PAH)	

Affected Id: 2997 (Groundwater / Confirmed)

Confirmed Contaminates	Suspected Contaminates
EPA Priority Pollutants - Metals and Cyanide Polychlorinated biPhenyles (PCBs) Petroleum Products Phenolic Compounds Polynuclear Aromatic Hydrocarbons (PAH)	Non-Halogenated Solvents

UST *Underground Storage Tanks*

Site: WEYERHAEUSER COMPANY 31002 CHINOOK PASS HWY ENUMCLAW, WA 98022
Facility Site Id: 2259
County: King
Unit: NW

Tank ID	Tank Name	Status	Inst. Date	Capacity	Cmpt./ID	Substance
36212	107	Removed	12/31/1964		1/36727	Unleaded Gasoline
36258	109	Removed	12/31/1964		1/36775	Leaded Gasoline
36335	108	Removed	12/31/1964		1/36852	
12284	1	Temporarily Closed	04/12/1993	10,000 to 19,999 Gallons	1/12474	Diesel
12190	2	Temporarily Closed	04/12/1993	10,000 to 19,999 Gallons	1/12379	Diesel
12399	3	Temporarily Closed	04/12/1993	2,001 to 4,999 Gallons	1/12591	Unleaded Gasoline
12102	4	Temporarily Closed	07/08/1993		1/12291	Used Oil/Waste Oil

Map ID 2 0.692 M S	GRID E9	PI ID # 53021023	LAT: 47.18378	LON: -121.92606	USE ∇
	Site Name	WA PARKS FEDERATION FOREST STATE PARK	Databases: UST		
	Address	49201 ENUMCLAW-CHINOOK PASS RD ENUMCLAW, WA 980228015			

UST *Underground Storage Tanks*

Site: FEDERATION FOREST STATE PARK 49201 ENUMCLAW-CHINOOK PASS RD ENUMCLAW, WA 98022
Facility Site Id: 65697134
County: King
Unit: NW

Exact Match Details

Map ID 2 0.692 M S	GRID E9	PI ID # 53021023	LAT: 47.18378	LON: -121.92606	USE
	Site Name	WA PARKS FEDERATION FOREST STATE PARK		Databases: UST	
	Address	49201 ENUMCLAW-CHINOOK PASS RD ENUMCLAW, WA 980228015			

Tank ID	Tank Name	Status	Inst. Date	Capacity	Cmpt./ID	Substance
11958	1	Removed	01/01/1975	111 TO 1,100 Gallons	1/12147	Unleaded Gasoline

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Database: *Brownfields Grant Sites*
Map Class: *Use Restriction*
Contact Number:
Web Page: *http://www.epa.gov/brownfields/index.html*
Date of Database: *2007-04-15T00:00:00*

The Brownfields Management System (BMS) is the official U.S. Environmental Protection Agency (EPA0 database of the Brownfields Program. It is designed to assist EPA in collecting, tracking, and updating information, as well as reporting on the major activities and accomplishments of the various Brownfields grant programs. BMS captures data on grantee activities (assessment, cleanup and redevelopment), funding, job training, and details on cooperative partners and leveraging efforts - a central objective of the Brownfields Program.

Database: *CERCLIS No Further Remedial Action Planned*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/superfund/sites/cursites/index.htm*
Date of Database: *2006-12-15T00:00:00*

The No Further Remedial Action Planned (NFRAP) or "Archived" designation means that, to the best of the EPA's knowledge, Superfund has completed its assessment at a site, and has determined no further steps to list this site on the NPL will be taken unless information indicating this decision was not appropriate or other considerations make a recommendation for listing appropriate at a later time. The U.S. Environmental Protection Agency (EPA) may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available and in these cases, the Archive designation is removed and the site is returned to the CERCLIS inventory if more sustentative assessment and/or any cleanup work is necessary under the Federal Superfund program. An archive decision does not necessarily mean that there is no hazard associated with a given site; it means only that based upon available information, the location is not judged to be a potential NPL site. Sites are archived as historical records so EPA does not needlessly repeat the investigations in the future. The States will coordinate with EPA to determine if any sites should be returned to CERCLIS because of newly identified contamination problems at the site. It is important to note the sites on CERCLIS and the archived list will change as the sites are being investigated or if new information becomes available.

Database: *Comprehensive Environmental Response, Compensation, and Liability Information System*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/superfund/sites/siteinfo.htm*
Date of Database: *2007-03-15T00:00:00*

The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) list contains information on hazardous waste sites, potentially hazardous waste sites and remedial activities. CERCLIS is a database used by the U.S. Environmental Protection Agency (EPA) to track activities conducted under its Superfund program. Specific information is tracked for each individual site. The database includes sites that are on the National Priorities List (NPL) or being considered for the NPL. The CERCLIS Database displays site information for NPL sites (i.e., sites proposed to the NPL, currently on the final NPL or deleted from the final NPL. NPL Sites are listed separately on the

NPL data set. Once a site is added to CERCLIS, the next step in evaluating the potential problem is the completion of a preliminary assessment (PA). The purpose of the PA is to determine whether the site warrants further Superfund investigation. The PA is typically an information gathering phase for which sampling does not take place. A PA is usually completed within one year of a site being listed in CERCLIS. Based on the conclusions of the PA, a site could be recommended for a) no further action under the EPA Superfund program; b) a sampling site investigation to collect data for further evaluation and possible nomination to the NPL; or c) an emergency or time-critical removal (short-term cleanup). Active CERCLIS sites are sites at which site assessment, removal, remedial, enforcement, cost recovery, or oversight activities are being planned or conducted under the Superfund program. CERCLIS excludes sites which EPA has assessed and designated "No Further Remedial Action Planned", or archive, sites. EPA is aware that the CERCLIS inventory is often used as a resource in assessing property. People conducting such assessments should not misinterpret the meaning of a site being contained in CERCLIS. Such sites are not necessarily contaminated, and sites not in CERCLIS are not necessarily contaminant-free.

Database: *Confirmed and Suspected Contaminated Sites List No Further Action*

Map Class: *Release*

Contact Number:

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*

Date of Database: *2007-01-01T00:00:00*

No Further Action Site List This data set contains information about sites previously on the Confirmed and Suspected Contaminated Sites list (above) that have received a No Further Action (NFA) determination. Because it is necessary to maintain historical records of sites that have been investigated and cleaned up, sites are not deleted from the database when cleanup activities are completed. Instead, a No Further Action code is entered based upon the type of NFA determination the site received. The NFA code lists the basis for the NFA determination.

Database: *Confirmed and Suspected Contaminated Sites List*

Map Class: *Release*

Contact Number:

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*

Date of Database: *2007-07-15T00:00:00*

The data set contains information about sites that are undergoing cleanup and sites that are awaiting further investigation and/or cleanup by the Department of Ecology Toxics Cleanup Program. Sites on the Hazardous Sites List (i.e., those that have been ranked using the Washington Ranking Model) are included in this data set. Within 90 days of learning of a potentially contaminated site, the Department of Ecology conducts an initial investigation of each site. If the initial investigation shows that further action is needed, the site will appear in the Confirmed & Suspected Contaminated Sites (CSCS) Report. Once remedial action has been completed, the Toxics Cleanup Program's management determines the removal of a site from the CSCS Report. The Hazardous Sites List is a subset of the CSCS Report. It contains those sites that have been ranked using the Washington Ranking Method. Site owners and operators do not necessarily agree with Ecology's determination of site status.

Database: *Confirmed and Suspected Contaminated Sites List Hazardous Site List*

Map Class: *Release*

Contact Number:

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

The Hazardous Sites List (HSL) is required by law 173-340-330 WAC. It includes all sites which have been assessed and ranked using the Washington Ranking Method (WARM). Also listed are National Priorities List (NPL) sites. The categories of evaluation are linear and include several steps. The Initial Investigation (II) is a brief investigation conducted within 90 days of receiving a site discovery report. The II step provides enough information to determine if the site needs further investigation, emergency cleanup, or no further action. If further action is required, early notice letters are sent to site owners, operators, etc. inviting them to work cooperatively with us to resolve any contamination problems, AND the site proceeds to the next step. The Site Hazard Assessment (SHA) is an assessment to confirm the presence of hazardous substances and to determine the relative risk the site poses to human health and the environment. (Note: Some SHAs are conducted by Ecology staff while others are conducted by local health districts / departments.) The Hazard Ranking (WARM Score) includes the results of the Site Hazard Assessment step that are used in the Washington Ranking Method (WARM) to yield a WARM score. The WARM score is a number between 1 and 5, where a score of 1 represents the highest level of risk and 5 indicates the lowest assessed risk. A zero indicates that the site is either on the federal National Priorities List (NPL) or is a sub-site or operable unit of an NPL site. NPL sites are ranked under the federal Hazard Ranking System (HRS). This WARM score is not removed at the time of a No Further Action determination as it is kept for historical purposes.

Database: *Ecology Digest 26 (Catalog of Formal Oversight Decision Documents, Orders and Decrees)*
Map Class: *Use Restriction*
Contact Number:
Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/DIGEST%2026.pdf*
Date of Database:

The Toxics Cleanup Program maintains a list of all formal oversight decision documents under the Model Toxics Control Act that have been agreed to and signed by the Program's manager or designee. These decision documents include all Consent Decrees, Prospective Purchaser Consent Decrees, Agreed Orders, and Enforcement Orders under the Model Toxics Control Act.

Database: *Emergency Response Notification System*
Map Class: *Release*
Contact Number:
Web Page: *http://www.nrc.uscg.mil/wdbcgi/wdbcgi.exe/WWWUSER/WEBDB.foia_query.show_parms*
Date of Database: *2007-01-15T00:00:00*

The Emergency Response Notification System (ERNS) is a national computer data base used to store information on releases of oil and hazardous substances. ERNS supports the Emergency Response and the Title III program. The ERNS program is a cooperative effort among EPA Headquarters, the Department of Transportation (DOT), National Transportation Systems Center (NTSC), the ten EPA Regions, the U.S. Coast Guard (USCG), and the National Response Center (NRC). ERNS provides the most comprehensive data compiled on release notifications of oil and hazardous substances in the United States. When a release report is submitted to Federal authorities (e.g., NRC or Regional offices), the individual reporting is asked a series of questions regarding the release (e.g., type, location, volume). Information concerning all releases originally reported to the NRC or EPA Regional offices is entered into local

computers and transmitted electronically from the NRC or EPA Regional office to the NTSC, where it becomes part of the ERNS national data base. The procedures for maintaining the initial reports differs between the NRC and the EPA Regions. The NRC maintains electronic copies of all spill reports as they were initially received and does not make any changes to spill reports once they have been entered into the system. Reports received by the NRC contain information that may be valuable to the on-scene coordinators, as well as to enforcement personnel. The information received by the NRC is sent to the Regional offices through the Volpe National Transportation Systems Center (VNTSC). Since these reports may be used in enforcement actions, it is necessary to maintain a copy of the spill report as it was originally reported. Each EPA Region maintains its own Region-specific data base, which is a subset of the national data base. Initial spill reports made directly to an EPA Region are maintained as hard copies and kept in the individual Regional office. When additional information on a release notification is obtained, it is also entered at the Regional level and electronically transmitted to the national system. An initial and modified copy of each report is maintained at VNTSC to preserve data integrity.

Database: *Hazardous Materials Information Reporting System*
Map Class: *Release*
Contact Number:
Web Page: *http://hazmat.dot.gov/pubs/inc/hmisframe.htm*
Date of Database: *2007-01-01T00:00:00*

The Hazardous Materials Incident Reporting System (HMIRS) contains data on spills, releases, or other incidents involving hazardous materials during the course of transportation. All modes of transportation are included except pipeline and bulk marine transportation. The data set contains the Incident Report Form 5800.1 data submitted under the requirements of Title 49 CFR 171.15 and 171.16. HMIRS of the Pipeline and Hazardous Materials Safety Administration (PHMSA) was established in 1971 to fulfill the requirements of the federal hazardous materials transportation law. Part 171 of Title 49, Code of Federal Regulations (49 CFR) contains the incident reporting requirements of carriers of hazardous materials. An unintentional release of hazardous materials meeting the criteria set forth in Section 171.16, 49 CFR must be reported on U.S. Department of Transportation (DOT) Form 5800.1, and data from the reports received are subsequently entered in the HMIRS database. All spills meeting the following criteria to be reported to PHMSA: 1) As a direct result of hazardous materials a person is killed or receives injuries requiring hospitalization, estimated property damage exceeds $50,000, an evacuation of the general public lasts for one or more hours, a major transportation artery or facility is closed for one or more hours, or the operational flight pattern or routing of an aircraft is altered, 2) Fire, breakage, spillage, or suspected contamination occurs involving shipment of radioactive materials or infectious substances, 3) There has been a release of a marine pollutant exceeding 450 L or 400 kg, or 4) Any hazardous material is unintentionally released from a package or any quantity of hazardous waste is discharged during transportation.

Database: *Institutional and Engineering Controls*
Map Class: *Use Restriction*
Contact Number:
Web Page: *http://www.epa.gov/superfund/index.htm*
Date of Database: *2007-03-15T00:00:00*

This data set identifies RCRA and NPL sites with institutional and/or engineering controls in place.

Database: *Institutional and Engineering Controls*
Map Class: *Use Restriction*
Contact Number:

Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

This data set is a subset of CSCSL and identifies sites where a remedial action was conducted, residual contamination was left on site and on-going institutional controls required.

Database: *King County Abandoned Landfills*
Map Class: *Release*
Contact Number:
Web Page: *http://www.spl.org/*
Date of Database:

Abandoned landfill study in King County by Seattle-King County Dept. of Public Health. Environmental Health Division, 1985.

Database: *Leaking Underground Storage Tanks*
Map Class: *Release*
Contact Number:
Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

The LUST data file contains information on UST Cleanup sites and cleanup history. Sites that have been cleaned up and sites currently being cleaned up are included in the data set. Sites are categorized based on the activities taken. Awaiting Cleanup means the site has been discovered or reported release, yet no active cleanup measures taken or Site check (identified the source) begun or completed, yet no active cleanup measures taken or site characterization begun or completed, yet no active cleanup measures taken. Cleanup Started means responsible party has initiated physical, biological, or chemical management of release, e.g. soil excavated, groundwater pumped, vapors extracted, free product removed, oxygen added, etc., site investigations and emergency responses (e.g. venting explosive vapors, providing bottled water) do not qualify as activities under cleanup started. Monitoring means groundwater monitoring is the only activity occurring at the site or site has been characterized, only low levels of soil and/or groundwater contamination remain, and natural attenuation is the chosen cleanup method or conformational monitoring following active cleanup measures. Reported Cleaned Up means owner or consultant reports that contamination has been cleaned up and/or some soil contamination may remain under existing structures or in otherwise inaccessible areas if groundwater is not threatened and there has been no migration of contamination into the structure and cleanup report has not been formally reviewed by Ecology. A formal review could determine that the site has not been cleaned up to MTCA standards. No Further Action means the cleanup report has been formally reviewed by Ecology under the fee-based Voluntary Cleanup Program and resulted in a No Further Action status and Institutional controls may have been required due to soil contamination that may remain under existing structures or in otherwise inaccessible areas.

Database: *National Priority List*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/superfund/index.htm*
Date of Database: *2007-04-23T00:00:00*

The National Priorities List (NPL) is an information and management tool that is a part of the Superfund cleanup process. The NPL serves primarily informational purposes, identifying for the States and the public those sites or other releases that appear to warrant remedial actions. The identification of a site for the NPL is intended primarily to guide the U.S. Environmental Protection Agency (EPA) in: determining which sites warrant further investigation to assess the nature and extent of the human health and environmental risks associated with a site; identifying what Comprehensive Environmental Response Compensation and Liability Act (CERCLA)-financed remedial actions may be appropriate; notifying the public of sites EPA believes warrant further investigation; and serving notice to potentially responsible parties that EPA may initiate CERCLA-financed remedial action. Inclusion of a site on the NPL does not in itself reflect a judgment of the activities of its owner or operator, it does not require those persons to undertake any action, nor does it assign liability to any person. Section 105(a)(8)(B) of CERCLA, as amended, requires that the statutory criteria provided by the Hazard Ranking System (HRS) be used to prepare a list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States. The NPL list is also known as Appendix B of the National Contingency Plan. The Federal Register (FR) Notices for NPL Updates page provides a list of FR Notices for proposed and final NPL Updates. The Superfund cleanup process begins with site discovery or notification to EPA of possible releases of hazardous substances. Sites are discovered by various parties, including citizens, State agencies, and EPA Regional offices. Once discovered, sites are entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), EPA's computerized inventory of potential hazardous substance release sites (view Superfund Site Information). EPA then evaluates the potential for a release of hazardous substances from the site through these steps in the Superfund cleanup process. Superfund was created in 1980 when Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to clean up the nation's uncontrolled hazardous waste sites. Under the Superfund program, abandoned, accidentally spilled, or illegally dumped hazardous wastes that pose a current or future threat to human health or the environment are cleaned up. EPA works closely with communities, potentially responsible parties, scientists, researchers, contractors, and state, local, tribal, and federal authorities on site cleanup. Together with these groups, EPA identifies hazardous waste sites, tests the conditions of the sites, develops cleanup plans, and cleans up the sites.

Database: *RCRA Conditionally Exempt Small Quantity Generator*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

Conditionally Exempt Small Quantity Generators (CESQG) generate 100 kilograms or less per month of hazardous waste, or 1 kilogram or less per month of acutely hazardous waste. Requirements for CESQG's include (see also 40 CFR 261.5). CESQG's must identify all the hazardous waste generated. CESQG's may not accumulate more than 1,000 kilograms of hazardous waste at any time. CESQG's must ensure that hazardous waste is delivered to a person or facility who is authorized to manage it.

Database: *RCRA Corrective Action Report*
Map Class: *Release*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/hazwaste/ca/index.htm*
Date of Database: *2007-07-15T00:00:00*

The Resource Conservation and Recovery Act (RCRA) Corrective Action (CORRACTS) list is a summary of those facilities where corrective action is occurring. The RCRA Corrective Action Program, run by EPA and 41 authorized states and territories, compels responsible parties to address the investigation and cleanup of hazardous releases themselves.

RCRA Corrective Action differs from Superfund in that Corrective Action sites generally have viable operators and on-going operations. RCRA grants EPA and authorized states the authority to regulate hazardous waste management facilities that treat, store, or dispose of hazardous waste. Although EPA guidelines are designed to prevent toxic releases at RCRA facilities, accidents or other activities have sometimes released pollutants into soil, ground water, surface water and air. By the year 2020, EPA and the authorized states plan to have largely completed the work of implementing final remedies at all facilities requiring Corrective Action. (See Goal 3 of the Office of Solid Waste's 2020 Vision for more details.) While working toward the 2020 goal, EPA decided to ensure that sites presenting the greatest risk to human health and the environment are dealt with first. Accordingly, the Corrective Action Program has pledged to select a final remedy at 30% and put a final remedy in place at 20% of 1,968 highest-priority sites by 2008.

Database: *RCRA Large Quantity Generator*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

Large Quantity Generators (LQG) generate 1,000 kilograms per month or more of hazardous waste, or more than 1 kilogram per month of acutely hazardous waste. LQG's may only accumulate waste on site for 90 days, but certain exceptions apply. LQG's do not have a limit on the amount of hazardous waste accumulated on site. There must always be at least one employee available to respond to an emergency. This employee is the emergency coordinator responsible for coordinating all emergency response measures. LQG's must have detailed, written contingency plans for handling emergencies. LQG's must submit a biennial hazardous waste report.

Database: *RCRA No Designation*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

RCRA sites that are identified as having a RCRA generator identified number but that are not identified as a large quantity generator, small quantity generator, conditionally exempt small quantity generator, treatment storage or disposal (TSD) facility, or RCRA corrective action sites.

Database: *RCRA Non Corracts TSD*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/tsds.htm*
Date of Database: *2007-07-15T00:00:00*

Through the Resource Conservation and Recovery Act (RCRA), Congress directed EPA to create regulations to manage hazardous waste from "the cradle to the grave." Under this mandate, EPA developed strict requirements for all aspects

of hazardous waste management including the treatment, storage, and disposal (TSD) of hazardous waste. TSDS include those facilities that treat, store, and/or dispose hazardous waste. TSDS are the last link in the cradle to the grave waste management system. The requirements for TSDS are found in 40 CFR Parts 264 and 265 and are more extensive than those that apply to hazardous waste generators or transporters.

Database: *RCRA Small Quantity Generator*
Map Class: *Use*
Contact Number:
Web Page: *http://www.epa.gov/epaoswer/osw/gen_trans/generate.htm#pagecontents*
Date of Database: *2007-07-15T00:00:00*

Small Quantity Generators (SQG) generate more than 100 kilograms, but less than 1,000 kilograms, of hazardous waste per month. SQG's may accumulate hazardous waste on site for 180 days without a permit (or 270 days if shipping a distance greater than 200 miles). The quantity of hazardous on site waste must never exceed 6,000 kilograms. There must always be at least one employee available to respond to an emergency. This employee is the emergency coordinator responsible for coordinating all emergency response measures. SQG's are not required to have detailed, written contingency plans.

Database: *Seattle Abandoned Landfills*
Map Class: *Release*
Contact Number:
Web Page: *http://www.spl.org/*
Date of Database: *1984-07-30T00:00:00*

Abandoned landfill study in the City of Seattle by Seattle-King County Dept. of Public Health. Environmental Health Division, 1984.

Database: *Solid Waste Facility Database*
Map Class: *Release*
Contact Number:
Web Page: *http://www.ecy.wa.gov/biblio/0407019.html*
Date of Database: *2007-01-01T00:00:00*

The solid waste facility database contains disposal information for landfills, incinerators, and transfer facilities. The types of facilities included are those that are permitted under chapter 173-350 WAC, Minimum Functional Standards for Solid Waste Handling and chapter 173-351 WAC, Criteria for Municipal Solid Waste Landfills. Information in the solid waste facility database is obtained through annual reporting forms sent to all landfill types (municipal, inert/demolition, limited purpose/special use, and wood waste landfills) and to waste-to-energy/incinerators.

Database: *Toxic Chemical Release Inventory*
Map Class: *Release*

Contact Number:

Web Page: http://www.epa.gov/tri/index.htm

Date of Database: 2007-01-01T00:00:00

The Toxics Release Inventory (TRI) contains information on releases of nearly 650 chemicals and chemical categories from industries including manufacturing, metal and coal mining, electric utilities, and commercial hazardous waste treatment, among others. The Emergency Planning and Community Right-to-Know Act (EPCRA) primary purpose is to inform communities and citizens of chemical hazards in their areas. Sections 311 and 312 of EPCRA require businesses to report the locations and quantities of chemicals stored on-site to state and local governments in order to help communities prepare to respond to chemical spills and similar emergencies. EPCRA Section 313 requires EPA and the States to annually collect data on releases and transfers of certain toxic chemicals from industrial facilities, and make the data available to the public in the Toxics Release Inventory (TRI). In 1990 Congress passed the Pollution Prevention Act which required that additional data on waste management and source reduction activities be reported under TRI. The goal of TRI is to empower citizens, through information, to hold companies and local governments accountable in terms of how toxic chemicals are managed. EPA compiles the TRI data each year and makes it available. The TRI program has expanded significantly since its inception in 1987. The Agency has issued rules to roughly double the number of chemicals included in the TRI to approximately 650. Seven new industry sectors have been added to expand coverage significantly beyond the original covered industries, i.e. manufacturing industries. Most recently, the Agency has reduced the reporting thresholds for certain persistent, bioaccumulative, and toxic (PBT) chemicals in order to be able to provide additional information to the public on these chemicals.

Database: Tribal Leaking Underground Storage Tanks Active

Map Class: Release

Contact Number:

Web Page: http://www.epa.gov/oust/directiv/od961015.htm

Date of Database: 2006-11-01T00:00:00

The list contains information about "active" leaking underground storage tanks (LUST) sites on federally recognized Native American tribal lands. The sites are considered active because they are still subject to future investigation and/or remediation by the U.S. Environmental Protection Agency. The tribes are sovereign entities subject to federal laws. Underground storage tanks located on tribal lands generally are not subject to state laws. As a result, unless a state acts as a tribe's agent pursuant to a formal agreement with a tribe, EPA and the tribe are responsible for implementing and enforcing the UST program on tribal lands.

Database: Tribal Leaking Underground Storage Tanks Inactive

Map Class: Release

Contact Number:

Web Page: http://www.epa.gov/OUST/directiv/d961015a.htm

Date of Database: 2006-11-01T00:00:00

The list contains information about "inactive" leaking underground storage tanks (LUST) sites on federally recognized Native American tribal lands. The sites are considered inactive because they have been investigated and/or remediated and the U.S. Environmental Protection Agency has concurred with the inactive status. The tribes are sovereign entities subject to federal laws. Underground storage tanks located on tribal lands generally are not subject to state laws. As a result, unless a state acts as a tribe's agent pursuant to a formal agreement with a tribe, EPA and the tribe are responsible for implementing and enforcing the UST program on tribal lands.

Government Record Tracking

Database: *Underground Storage Tanks*
Map Class: *Use*
Contact Number:
Web Page: *http://www.ecy.wa.gov/programs/tcp/sites/SiteLists.htm*
Date of Database: *2007-07-15T00:00:00*

The UST list contains information for UST sites and tanks in Washington. Both operational and closed USTs are on the list. USTs that are excluded from the list include those that have not been registered with the Washington Department of Ecology. Non-registered tanks generally include farm or residential tanks of 1,100 gallons or less capacity storing motor fuel for noncommercial purposes; tanks storing heating oil for use on the premises where stored; Septic tanks; Pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws; Surface impoundments, pits, ponds, or lagoons; Storm water or waste water collection systems; Flow-through process tanks; Liquid traps or associated gathering lines directly related to oil or gas production and gathering operations; Tanks on or above the floor of underground areas, such as basements or tunnels; Tanks with a capacity of 110 gallons or less. The substances covered under the notification requirements apply to USTs.

Database: *Washington Unauthorized Tire Piles*
Map Class: *Release*
Contact Number:
Web Page: *http://www.ecy.wa.gov/biblio/0507043.html*
Date of Database: *2005-11-15T00:00:00*

The Washington Department of Ecology (Ecology) conducted a study of unauthorized tire piles in Washington. The legislature required this study to be completed and submitted by Ecology to the appropriate standing committees of the legislature by November 15, 2005. The report and appendices present a detailed discussion of how this information was collected and assembled. This study identified 54 sites statewide with unauthorized accumulations of scrap tires. Site mapping was completed and the number of scrap tires was estimated. One site (Goldendale-Tire Shredders) accounts for more than two-thirds of the calculated scrap tires and more than half of the total estimated cleanup costs. Of the 54 sites, only five require more than 10 estimated on-site days to complete the individual cleanups.

Overall Rank & Reference No.	Site/Land Use	Address	Capture Zone	Cat. I Rank	Cat. II Rank	Cat. III Rank
1	Residential Land	--	1	1	4	1
2	Bio-soild application	--	1	1	4	2
3	Dairy	--	1	1	4	3
4	HWY 410	--	1	1	7	1
5	Logging	--	1	1	7	2
6	Borrow Pits	--	1	1	7	3
7	Golfcourse	45220 288th Ave SE	1	1	8	1
8	Agricultural Land	--	1	1	8	2
9	Landfill	SE 440th St	2	2	1	
10	Weyerhaeuser Site	31002 Highway 410	5	5	1	
11	Corliss Resources Gravel Mine	29416 Highway 410	5	5	7	1

CITY OF ENUMCLAW
SPILL RESPONSE PLAN
MARCH 2009

Introduction

The purpose of this section is to outline and evaluate spill response procedures and capabilities for jurisdictions within the City of Enumclaw's Wellhead Protection Areas as defined in the City of Enumclaw Wellhead Protection Plan, March 2009. To conduct this evaluation, we reviewed the City's Emergency Response Plan as presented in the 2007 update to the City's Water Comprehensive Plan.

The Emergency Response Plan includes detailed contact information for the City Water Department and the Department of Public Works, as well as other response agencies. The primary function of the Emergency Response Plan is to maintain or restore water service in the event of an interruption. The Spill Response Plan, presented here, provides additional guidance for the proper handling of spills of hazardous materials within the City's Wellhead Protection Areas.

Spill events vary in size and severity. Events may occur under conditions where the spill is easily contained or where cleanup time is plentiful, or they can occur where surface water, waterways, or ground water are under immediate threat. This range of possibilities has prompted a spill response (and emergency response) system which is nationwide in scope and can involve federal agencies, yet is designed to handle the more common, small-scale (yet potentially dangerous) spills. This assessment takes into account this range of possible spills and responses.

The ability of the City of Enumclaw (City) to affect the protocols and procedures of the national and state response systems is limited. However, the majority of spills that take place are small. Small spills generally require a well-coordinated local response with responders that are aware of local concerns. Therefore, for the purposes of this effort, focus is given to local response capabilities and to the needs associated with these local response systems.

Spill Response in the Wellhead Protection Areas

Given the City's reliance on ground water from wells and springs as their source of water supply, hazardous spills could potentially affect the groundwater supply. Should a spill occur within the City's defined WHPAs, a 911 call should be made immediately. The 911 operator will question the caller concerning the location and nature of the spill and dispatch the appropriate units per defined Response Plans. Use of the 911 system will ensure that spill response calls will be appropriately responded to in a timely manner.

State and Regional Support for Local Spill Response Capability

Spill response planning has been ongoing throughout Washington State and within the region for many years. As a result, there are many Response Plans in existence, each focusing on a specific geographical area or type of substance. In addition, organizations involved in the storage and transportation of hazardous materials have been required to develop contingency plans and must conform to a variety of regulations. Accordingly, this assessment of spill response capability and

recommendations for enhanced response is intended to be consistent with existing spill response plans and regulations for the area and the state.

The foundation for systems and procedures outlined in this section are described in documents such as the Northwest Area Contingency Plan – NWACP (2007), and the Washington State Comprehensive Emergency Management Plan – CEMP (2003).

The NWACP serves as both the Area Contingency Plan and the Regional Contingency Plan for the northwest states of Washington, Oregon, and Idaho, two U.S. Coast Guard Captains of the Port Zones (Puget Sound and Portland), and the U.S. Environmental Protection Agency's (EPA's) Inland Zone. The NWACP has been adopted as the state's Oil and Hazardous Substance Spill Prevention and Response Plan as required by statute (Chapter 90.56.060 RCW). The Plan provides spill responders and key agency staff with the information and procedural guidelines necessary to effectively respond to spills. These procedures include such items as enforcement protocols and the best management practices (BMPs).

The following are the spill response plans in effect in Washington State which cover inland (non-marine) areas such as wellhead protection areas and aquifer recharge areas:

- National Oil and Hazardous Substances Pollution and Contingency Plan (NCP) prepared by the EPA.
- Oil and Hazardous Substance Pollution Contingency Plan for Federal Region 10 (RCP) - prepared by Region 10 of EPA.
- Northwest Area Contingency Plan (NWACP) – prepared and developed by EPA Region 10 Regional Response Team and the Northwest Area Committee (RRT/NWAC).
- Local Emergency Response Plans - prepared by city governments.

Spill Response Terminology

Contingency planning for the purpose of this section should be construed to mean "spill response contingency" plans.

In the various contingency plans applicable to Washington State, there are repeated references to an "Incident Commander" (IC) and an "On-Scene (Site) Coordinator" (OSC). The IC is the person who is in command of an incident during its emergency phase and OSC is the person who is in charge of spill or release management and cleanup. While there is an IC in charge of the situation, the OSC takes direction from this person. After the emergency response is complete, the authority is transferred to the OSC for final cleanup.

Spill Response Organizations

Depending on the magnitude of the spill event, numerous organizations at all levels of government, the private sector, and some voluntary organizations, can have a role in spill response and cleanup. Each of the plans mentioned above describes the relationship and roles of these organizations in terms of the particular concern. Listed below are a few of the organizations which might be, depending on the size and nature of the release, involved in a spill response in a wellhead protection area or ground water recharge area.

The Local Response Team (LRT) consists of state and local government agencies, industry personnel, academic organizations, and other private interests that may assist the OSC in pollution response and planning. The composition and level of participation in the LRT is dependent upon the area involved, the hazard posed, and the type of assistance required. Normally, the LRT will consist of the state environmental response agency and clean-up contractors.

The Ecology Spill Response Team consists of Washington State Department of Ecology regional office personnel. This team is responsible for determining the source, cause, and responsible party, as well as initiating appropriate enforcement action. Additional responsibilities include ensuring containment, cleanup, and disposal are carried out adequately. The team coordinates its actions with other state, federal, and local agencies.

The Regional Response Team (RRT) consists of representatives from selected federal and state agencies. The RRT is the regional body responsible for planning and preparedness before spill occurs and provides advice to the OSC following such incidents.

The EPA's Superfund Technical Assessment & Response Team Contracts (START) program combines the previously separate support activities of the Field Investigation Team (FIT) and Technical Assistance Team (TAT) into a single contract. The START contracts provide technical support which includes gathering and analyzing technical information, preparing technical reports on oil and hazardous substance investigation and technical support for cleanup efforts.

The National Response Team (NRT) consists of representatives from the various federal agencies (such as EPA, the US Coast Guard (USCG), Fish and Wildlife Service, etc). It serves as the national body for planning and preparedness actions prior to a spill and as an emergency advisory center when a spill occurs.

The Environmental Response Team (ERT), based in Edison, New Jersey, was established to advise the OSC and Regional Response Team (RRT) on environmental issues surrounding spill containment, cleanup, and damage assessment. ERT personnel have expertise in areas such as treatment technology, biology, chemistry, hydrology, geology, and engineering.

Roles and Responsibilities

Spill response plans stress that for spill response procedures to be effectively executed, each party must be fully aware of their specific roles and responsibilities. Moreover, there must be an understanding of the roles of other parties involved in response activities, as well as effective coordination, cooperation, and communication among responding agencies, organizations, and individuals. This section describes the specific roles and responsibilities of the key parties, including:

- Responsible party or spiller
- Federal and state agencies
- Local government
- Facility owners
- Contractors

The Responsible Party

The primary responsibility for assessing, responding to, and containing an oil spill or hazardous discharge falls upon the individual, agency, or company responsible for the spill incident. The responsible party (RP), whether there is an approved contingency plan or not, is responsible for containment and cleanup of the spill, disposal of contaminated debris, restoration of the environment, and payment of damages. State and federal law specifically require that the removal of a discharge of oil or hazardous substance should be immediate.

Environmental Protection Agency

The EPA has primary responsibility for spills that occur on land and on inland U.S. waters not under USCG jurisdiction. As directed by the NCP, the EPA is pre-designated as OSC for spills occurring in these areas.

Department of Ecology

The Department of Ecology provides an important function in spill management and cleanup. They are not generally considered a "first response" agency, but because of their regional offices and their environmental protection responsibilities, they can provide clean-up or containment advice and services (though usually through contractors). Ecology is the lead state agency for environmental pollution response within the State of Washington. As such, it serves as an advisor to the OSC and the IC for many spills occurring in state jurisdiction. Ecology is the state-designated OSC for all oil spills in water. In the event of a spill occurring on a state highway, Ecology coordinates with the Washington State Patrol, which assumes responsibility as IC and Ecology acts as the lead agency responsible for clean-up activities.

State Patrol

The State Patrol acts as the designated Incident Command agency for incidents on interstate and state highways, and other roads and jurisdictions as delegated.

Washington Military Department Emergency Management Division (EMD)

The State Emergency Management Division (EMD) is tasked with receiving and recording verbal emergency toxic chemical release reports through its 24-hour duty officer system and making appropriate notifications. It activates the State Emergency Operations Center (EOC) as needed to coordinate state resource identification and acquisition in support of Ecology response. The EMD also assists and provides guidance to local emergency planning commissions for preparation of their emergency response plans.

Washington Department of Fish and Wildlife (WDFW)

The WDFW is a state agency with trustee responsibilities for wildlife, game fish, food fish, non-game fish, shellfish, and their associated habitats. The agency is also responsible for state facilities (hatcheries, properties, launching ramps, and related facilities) and assorted equipment. The WDFW Oil Spill Team (OST) provides round-the-clock oil spill response capability to address the needs of fish and wildlife resources. The WDFW may be a participant on the LRT or RRT depending on the location and nature of the incident. WDFW also provides support services for Natural Resources Damage Assessment (NRDA).

Department of Health (DOH)

DOH has the responsibility for beach closures for human health and safety purposes, public health concerns from contaminated food supply (e.g. shellfish), and general health-related matters for the safety of the public. In addition, DOH is to render all appropriate laboratory support and services to the OSC. Health is a participant in the NRDA team.

Department of Transportation (DOT)

The DOT may provide traffic control, equipment, and personnel for non-hazardous clean-up activities on state and interstate highways. The DOT may provide and mobilize equipment necessary in a major spills incident.

Local Responders

The City of Enumclaw Fire Department is the primary local department with responsibility for emergency spill responses. The Fire Department is responsible to provide for immediate protection of health, property, and the environment. It is the Enumclaw Fire Department who determines the need for additional assistance and mobilization of the additional resources mentioned in this section, and will do so based on policies and procedures.

Local Emergency Planning and Emergency Management

Local governments have a duty to be prepared for all disaster emergencies. The Office of Emergency Management Division of King County is charged with establishing local Emergency Planning Committees (LEPC) to facilitate the local planning efforts.

LEPCs have the responsibility to create local emergency response plans. General requirements for local response plans are contained in Title III of SARA (Superfund Amendments & Reauthorization of 1986). Generally, local agencies, particularly fire services and law enforcement agencies, can be activated to provide emergency response services when there is a threat to life and property. Emergency response services may include: fire and explosion controls, investigation and documentation, perimeter control, evacuation, traffic controls, and initial containment or even removal of materials, depending on the nature of the incident. The Enumclaw Police Department is the lead department for Emergency Management within the City of Enumclaw.

Incident Response Management

The party responsible (RP) for a spill is required by state law to notify the National Response Team (NRT) and the state EMD. The RP is also encouraged to contact the nearest appropriate regional office of Ecology. The following is a list of phone numbers for agency notification.

AGENCY	PHONE NUMBER
National Response Center	800-424-8802
Washington State Emergency Management Division	800-258-5990 800-OILS-911
Washington State Department of Ecology Northwest Office - Bellevue Headquarters - Tumwater	 425-649-7000 360-407-6000
City of Enumclaw Fire Department	911
City of Enumclaw Police	911

AGENCY	PHONE NUMBER
City of Enumclaw Police/Fire Dispatch Center (non-emergency)	360-825-3505
Washington State Patrol	253-536-6210
Environmental Protection Agency Region 10- Seattle	206-553-1263

In most spill response situations, the initial call is to a local emergency response agency such as the local fire department or district, local police, or others. The use of a 911 system will activate the local response, as well as ensure that appropriate first responders are dispatched to the scene of the incident. The 911 system is monitored continuously. The first responders provide the initial on-scene control, and manage the scene under the Incident Command System described below.

State Incident Command System

The State of Washington's spill response is organized and managed under a National Incident Management System (NIMS). NIMS is an incident management system that was mandated through a Presidential Directive following the attacks on 9-11-01. Formally the State and local jurisdictions used a similar system named Incident Command System (ICS). It is very similar to NIMS; however NIMS was implemented to standardize terminology and systems throughout the Nation.

Specifically, the system will operate in the following scenarios:

- Single Jurisdiction/Single Agency
- Single Jurisdiction/Multi-Agency
- Multi-Jurisdiction/Multi-Agency

The NIMS concept is built upon teamwork coordination and cooperation between all entities involved (or potentially involved) in a spill response. Teamwork is encouraged throughout all phases of incident management including the preparedness, mitigation, response, and recovery phases for spills of any type or size. Ecology has taken steps to ensure there is effective teamwork, coordination, and participation in the NIMS by appropriate state and local agencies in addition to the USCG and the EPA.

Unified Command Structure

In Washington State, the NIMS will operate using a Unified Command Structure involving representatives of the Ecology, federal government (USCG/EPA), industry, and in some circumstances local government. A Unified Command Structure is called for when the spill is multi-jurisdictional in nature, e.g., when public safety and welfare, as well as environmental damage, is imminent.

Under the Unified Command Structure, the three key On-Site Coordinators (OSC) -- federal, state, and industry -- will share decision-making authority in the command post and consult with each other regarding spill response and clean-up, management issues. Participation in the Unified Command Structure does not mean that agencies such as the USCG, EPA, and Ecology, which have roles and responsibilities set by federal and state statute, are relinquishing or surrendering their authority. Emergency situations, however, may require some actions to be taken outside of the normal permitting process.

The Unified Command Structure is a consistent, systematic means of organizing a variety of agencies having jurisdictional responsibilities surrounding an incident, into one concerted effort. The concept offers uniform and traceable procedures that enable all emergency response agencies to perform their roles effectively, yet in unison. A Unified Command is located as close to the site of the spill as practicable, without interfering in the actual spill response activities.

Organization and Staffing Principles of NIMS

The NIMS organization is functionally oriented around four major areas: command, planning, logistics, and administration. The flexibility to expand this organization as situations dictate is designed within the NIMS, without the need to conduct major organizational changes or a cumbersome transition into a different operational system during a spill response. For example, in a minor incident a single person may serve as the OSC and perform all functions. In a major incident, the command may consist of a united command with federal and state representatives, the RP, the OSC, a staff, and a group of sections and functional units. Participants in the Unified Command/Command Post and the OSCs are normally pre-designated, any remaining sections or functions are assigned as needed.

It is important for those parties and agencies participating in NIMS to understand that the key to its effective operation is the acknowledgment that the IC is in charge of the entire operation, the OSC is in charge of spill cleanup during the incident, while the section chiefs and functional unit leaders are in charge of their units or sections. As a rule, sections should have a single individual in charge with the authority to make decisions and to give orders. Without this authority, the system will fail. Accordingly, it is a maxim of NIMS that section chiefs should be selected based on their experience and qualifications, not rank or seniority within their relative agency or organization.

The staffing requirements of the NIMS should be viewed as a dynamic activity, not one based upon maintaining a precisely defined level. Flexibility is a key element of NIMS, allowing the command structure to be as large and sophisticated, or as small and compact, as the spill event requires. As long as common sense is used, the system can be modified to fit any incident. The size of the NIMS will be determined by the IC.

Recommended Spill Response Improvements

Update Wellhead Protection Area Maps

The Wellhead Protection Area map (Figure 1) in the Emergency Response Plan in the City's Water Comprehensive Plan should be updated with the current map. Additionally, first responders should be made aware of the updates to the City's Wellhead Protection Areas. Additional discussions with first responders regarding wellhead protection concerns should take place once the updated maps have been provided.

Complete Mutual Aid Agreements

The Enumclaw Fire Department currently maintains mutual aid and automatic aid agreements for HAZMAT response. Response scenarios involving other potential first responders (such as the State Patrol or others) should be reviewed to assure that the response protocols are clearly understood and the response system is as streamlined as possible.

Establish Responder Group

As part of the implementation of this plan, a spill responder group (consisting of local fire, police, emergency management, and water department) should be established to discuss spill response in the WHPA. Efforts should be made to communicate the extent of capture zones to the first responder organizations. This "forum" for discussion of WHP issues could take the form of a sub-group of Emergency Management, or could be developed independently.

Discuss Wellhead Precautions

Through a local "responders" group, discussion should focus not only on the locations of the capture zones, but also on specific protocols and procedures for response in the zones. For example, certain types of responses may be more protective than others, depending on the chemical, the location within the zones, and the tradeoffs affecting immediate public health and safety.

APPENDIX K

CONSUMER CONFIDENCE REPORT

Drinking Water Quality Report
For Calendar Year 2012

The City of Enumclaw Water Utility is pleased to provide this report on the quality of the drinking water the City delivered in 2012. We want to keep you informed about the City's water service and the on-going efforts made to provide a safe and dependable supply of drinking water.

Water Sources

The City owns and operates three water sources to the east of the City: Boise Springs, Watercress Spring and Well, and PC Johnson Wellfield. The City also has an emergency intertie connection to the Tacoma Water pipeline that passes through the City. This connection has not been used since 2003. The City plans to incorporate the Enumclaw Golf Course well into the municipal water system as an additional supply. According to the Washington State Department of Health, the Boise and Watercress sources have a high susceptibility to potential sources of contamination while the wellfield has low rating. To protect the health of our customers all the City sources are treated with chlorine for disinfection. The City of Enumclaw does not add fluoride to its sources. The City does raise the pH of the Boise and Watercress sources to reduce the potential for the water to corrode metal piping.

Water Quality

The City's drinking water is safe and meets or exceeds all federal and state requirements. Water quality sampling is conducted on a routine basis to monitor for contaminants and ensure the safety of the water. Items detected in the City of Enumclaw water system in 2012 are listed in the Summary Table on the following page.

Explanation of Expected Contaminants

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive materials, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in untreated source water include:

- Microbiological contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally occurring or result from urban storm runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- Pesticides and herbicides, which may come from a variety of sources such as forestry, agriculture, urban storm water runoff, and residential uses.
- 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 storm water runoff, and septic systems.
- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, the federal Environmental Protection Agency (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 that must provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least a trace 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 can be obtained by calling the EPA's Safe Drinking Water Hotline at 800-426-4791.

Summary Table of Water Quality Detections

Substance	Highest Level Allowed (MCL or MRDL)	Highest Level Detected	Range of Level Detected or # Exceed AL	Ideal Goals (MCLG)	Potential Sources of Contaminant
Regulated at Treatment Plant/Distribution System					
Chlorine	4 ppm	0.93 ppm	0.21 - 0.93 ppm	Not applicable	Treatment disinfectant additive
Total Trihalomethane	80 ppb	8.0 ppb	3.7 – 8.0 ppb	0	By-product of drinking water chlorination
Nitrate	10 ppm	2.0 ppm	0.8 – 2.0 ppm	10 ppm	Natural deposits. Runoff from fertilizer use. Leaching from septic tanks/sewage.
Regulated at Consumer's Tap (1)					
Lead	15 ppb AL	3.0 ppb	0 sites exceed AL	0	Household plumbing
Copper	1.3 ppm AL	0.48 ppm	0 sites exceed AL	1.3 ppm	Household plumbing

Notes:

(1) See Definitions for explanation of abbreviations used in the table. Data presented in the table are from 2012 or the most recent testing done in accordance with the regulations. Many other substances were tested for, but not detected.

Notes from the EPA

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-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, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA and Center for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are available from the Safe Drinking Water Hotline at 800-426-4791.

City of Enumclaw Water System Facts:
Number of Connections: 5,600
Miles of Water Mains: 143
Total Reservoir Storage: 4.74 million gallons
Water Department Staff: 8.0 Full Time Equivalents

Definitions

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

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.

Action Level (AL): The concentration of a contaminant which, when exceeded, triggers treatment or other requirements which a water system must follow. Action Level is reported at 90th percentile.

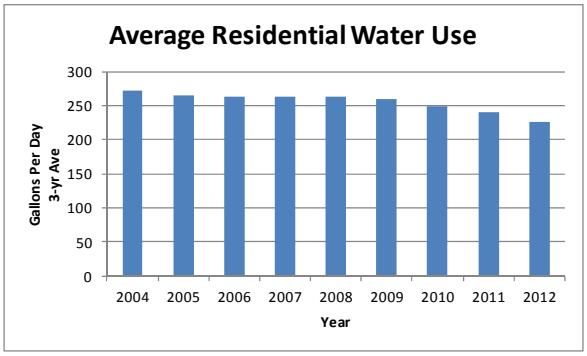
ppm: Parts per million or milligrams per liter

ppb: Parts per billion or micrograms per liter

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Commitment to Using Water Efficiently

The City is committed to conserving water to help meet future growth and comply with state law requirements for improving water use efficiency. The City's 2007 Comprehensive Water System Plan targeted a 5 percent reduction in average residential water usage by the year 2012 with the base year of 2004. As of the end of 2012 City-wide average residential water use has dropped by 17 percent from 2004 based on a 3-year average, representing a savings of nearly 240,000 gallons a day. Customer efforts continue to make a difference. The City will continue reporting on water use efficiency efforts annually.



As required by state law, the City recently re-evaluated its water use efficiency goals as part of its 2013 Comprehensive Water System Plan update. The newly adopted goals are as follows:

Goal #1. Maintain a three year running annual average of less than 200 gallons per connection per day (gpcd) for single family residential usage.
Goal #2. Reduce the yearly ratio of maximum to average day demand so that by 2017 and thereafter it does not exceed 1.8.

Customers and the public are invited to participate and comment on the goals throughout the CWSP review process until final CWSP adoption, anticipated sometime in October 2013. See cityofenumclaw.net (search 'efficiency goal') for a copy of the City's Water Use Efficiency Program.

Request for Voluntary Participation in Coordinated Outdoor Watering Scheduling Program
One of the measures approved by the City Council to help achieve Water Efficiency Program Goal #2 noted above was implementation of a coordinated outdoor watering scheduling program. Under this program, customers are requested to restrict their outdoor water usage (lawn irrigation, car washing, garden watering, etc) to odd/even days in accordance with their street address. For example if your address is 2401 Railroad Street you would only use water outdoors on odd calendar days, whereas if your address is 2402 Railroad Street you would only use water outdoors on even calendar days. In theory this could reduce the summertime peak water demand by as much as 50%. Compliance would be voluntary. If monitoring indicates low participation levels the measure would be re-evaluated to determine if it should be revised to be mandatory compliance with enforcement or if a different measure needs to be selected.

Water Service Shutoff / Leak Adjustment
City code prohibits tampering with a meter. If you need your water service shutoff for repairs please call the City Shops at 360-825-5541. The Water Department encourages all customers to install their own shutoff valve on the house side of the meter. This can facilitate a quick shutoff and prevent wasted water and possible flooding. The City Code includes a provision for leak credits for residential customers. For information on the leak credit process, please call Utility Billing at 360-825-3591. For information on how to read your water meter and determine whether you have a leak, see cityofenumclaw.net (search 'read your meter').

Informational Statement From the EPA About Lead in Drinking Water and Its Effects on Children
If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City of Enumclaw is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for thirty seconds to two minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 800-426-4791 or at http://www.epa.gov/safewater/lead.

Cross Connection Control Program: Protecting Our Water System From Contamination
A cross connection is a connection between a water pipe and a source of contamination. Examples include most hose-end spray applicators, irrigation systems, boiler make-up water lines, and hose ends submerged in pools, stock tanks, hot tubs or buckets. Cross connections are dangerous because they provide opportunities for contaminated fluids to be pulled back into the water system. To protect our water supply, avoid using hose-end sprayers and maintain an air gap by keeping the hose end above the water surface when filling containers. Irrigation systems are required to have a backflow assembly. Backflow assemblies require a plumbing permit, must be inspected by a cross connection specialist, and must be tested by a certified tester when installed and yearly thereafter.

Hose Bib Vacuum Breaker

2013 Comprehensive Water System Plan
Every six years the City is required to submit a comprehensive water system plan (CWSP) for review and approval by the Washington State Department of Health (WDOH) meeting the requirements of WAC 246-290-100. The City's latest CWSP plan was completed in 2007 and approved by WDOH on October 19, 2007. On March 11, 2013, the City Council solicited input on water use efficiency goals in a public hearing and approved a draft 2013 CWSP. The draft 2013 CWSP has been distributed for review by adjacent cities, water districts, King County, and state Departments of Ecology and Health. The public and customers are invited to participate and comment on the efficiency goals and draft CWSP throughout the CWSP review process until final plan adoption, anticipated for sometime in October 2013. To review the current draft of the CWSP, see cityofenumclaw.net (search 'CWSP) for more information.

Reporting Suspicious Activity or Water Main Leaks
As a customer of a publicly-owned water system you are also an owner and have an additional vested interest in seeing your water supply kept safe and in good operating order. Similar to a neighborhood watch program you are encouraged to be aware of your water system and be alert to anything that seems unusual, such as seeing a water truck connected to a fire hydrant or water flowing out of the ground where you haven't seen it before. To report any such observation or anything unusual pertaining to the water system, please call 360-825-5541 during normal business hours or 360-825-3505 at other times.

Pending Construction Projects
The City has applied for two low-interest state loans of $3.5 million each for the following improvements identified in the 2013 CWSP.

- Upgrade the master telemetry computer and complete other select upgrades of the control system.
- Evaluate the City's reservoirs sites and implement safety and sanitary measures identified in the evaluation.
- Replace the City's 2 million gallon (MG) reservoir at 1835 Roosevelt Ave E and complete site improvements.
- Construct a new well facility with booster pump station and related appurtenances to utilize the City's golf course well for potable water supply. Demolish the existing well building and decommission the well along with another nearby inactive well.
- Demolish the Lower Fairway Hills BPS and expand Zone 1002 with approximately 5000 feet of various sized pipe and related appurtenances.
- Expand Zone 1175 with approximately 600 feet of various sized pipe and related appurtenances.
- Construct replacement Upper Fairway Hills booster pump station with related appurtenances and site improvements.

2.0 MG Reservoir

Lower Fairway Hills Booster Pump Station

Thermal Expansion Protection for Customer Plumbing
To provide a measure of protection against backflow of water into the City water main and to facilitate meter maintenance, a check valve is installed at every water meter. The check valve prevents relief of thermal expansion pressure from the customer's hot water system into the City main. If not relieved, the pressure could shorten the life of the hot water tank or cause other damage to the plumbing. It is the customer's responsibility to ensure that their plumbing system complies with current codes, including a properly installed and maintained temperature-pressure relief valve and expansion tank on the hot water heater.

Landscaping Around Water Meters
Spring and summer spur a lot of plant growth. Excessive growth, however, may make it difficult to access and read your water meter. The Water Department encourages you to locate your meter and if plant growth is infringing, please trim and cut back to allow the meter reader access for accurate reading. Try to maintain a 2-foot perimeter around the meter if possible. On all untrimmed areas, the Water Department will cut back as necessary.

Questions and Contact
City of Enumclaw Water Utility staff works hard to provide quality water to each and every tap. We ask that all our customers help us protect our water, which is the heart of our community, our way of life, and our future. If you have any questions about this report or concerning your water utility and/or want to know how you can be involved, please contact Scott Woodbury at swoodbury@ci.enumclaw.wa.us or at 360-615-5728. You can also find information about the water utility at the City's website cityofenumclaw.net. Regulation and policy decisions relating to the utility are made by City Council at their regular meetings on the second and fourth Monday of every month at 7:30 PM in the City Hall Council Chambers at 1339 Griffin Ave. Any water customer or interested individual is welcome to attend. Also available for water utility customers is a toll-free hotline at 1-877-8NSF-HELP.

APPENDIX L

MONITORING PLANS

Coliform Monitoring Plan for: Enumclaw Water Dept

A. System Information

Water System Name Enumclaw Water Dept	County King	System I.D. Number 23600 1
Attach copy of current WFI		
Number of Routine Samples Required Monthly by Regulation: 15	Number of Sample Sites Needed to Represent the Distribution System: 15	

B. Routine and Repeat Sample Locations

Note: The City is required under the Groundwater Rule (GWR) to conduct Triggered Source Monitoring, meaning that source samples must be collected at the same time that Repeat samples would be collected from the distribution system if there is an unsatisfactory Routine sample. Thus, a raw source sample must be collected from both Watercress and Boise springs and the PC Johnson Wellfield if it was in use at the time of an unsatisfactory Routine sample.

Location/Address for Routine Sample Sites	Location/Address for Repeat Sample Sites
1. 46310 290th Ave. SE	1-1. 46310 290th Ave. SE
	1-2. 46223 290th Ave. SE
	1-3. 46423 288th Ave. SE
2. 27321 SE 403rd St.	2-1. 27321 SE 403rd St.
	2-2. 27304 SE 403rd St.
	2-3. 27454 SE 403rd St.
3. 2342 Paramount Drive	3-1. 2342 Paramount Drive
	3-2. 2410 Paramount Drive
	3-3. 843 Harmony Lane

Location/Address for <u>Routine</u> Sample Sites	Location/Address for <u>Repeat</u> Sample Sites
4. 23602 SE 473rd St.	**4-1. 23602 SE 473rd St.**
	4-2. 23616 SE 473rd St.
	4-3. 25530 SE 473rd St.
5. 45010 228th Ave. SE	**5-1. 45010 228th Ave. SE**
	5-2. 44823 228th Ave. SE
	5-3. 22826 SE 452nd St.
6. 39626 224th Ave. SE	**6-1. 39626 224th Ave. SE**
	6-2. 39606 224th Ave. SE
	6-3. 22410 SE 399th St.
7. 18805 SE 416th St.	**7-1. 18805 SE 416th St.**
	7-2. 18725 SE 416th St.
	7-3. 19311 SE 416th St
8. 41313 213th Ave. SE	**8-1. 41313 SE 213th Ave. SE**
	8-2. 41303 SE 213th Ave. SE
	8-3. 21216 SE 414th St.
9. 43017 234th Ave. SE	**9-1. 43017 234th Ave. SE**
	9-2. 43103 234th Ave. SE
	9-3. 43005 234th Ave. SE

Location/Address for Routine Sample Sites	Location/Address for Repeat Sample Sites
10. 39520 254th Ave. SE	10-1. 39520 254th Ave. SE
	10-2. 39414 254th Ave. SE
	10-3. 39612 254th Ave. SE
11. 2620 Perry Court	11-1. 2620 Perry Ct.
	11-2. 2702 Perry Ct.
	11-3. 3165 Florence St.
12. 47501 260th Ave. SE	12-1. 47501 260th Ave. SE
	12-2. 47219 260th Ave. SE
	12-3. 47614 260th Ave. SE
13. 2047 Roosevelt Ave. E	13-1. 2047 Roosevelt Ave. E
	13-2. 1835 Roosevelt Ave. E
	13-3. 29410 Chinook Highway E
14. 28303 SE 472nd St.	14-1. 28303 SE 472nd St.
	14-2. 46921 284th Ave. SE
	14-3. 28128 SE 472nd St.
15. 19104 SE 440th St.	15-1. 19104 SE 440th St.
	15-2. 19023 SE 440th St.
	15-3. 44004 196th Ave. SE

C. Routine Sample Rotation Schedule

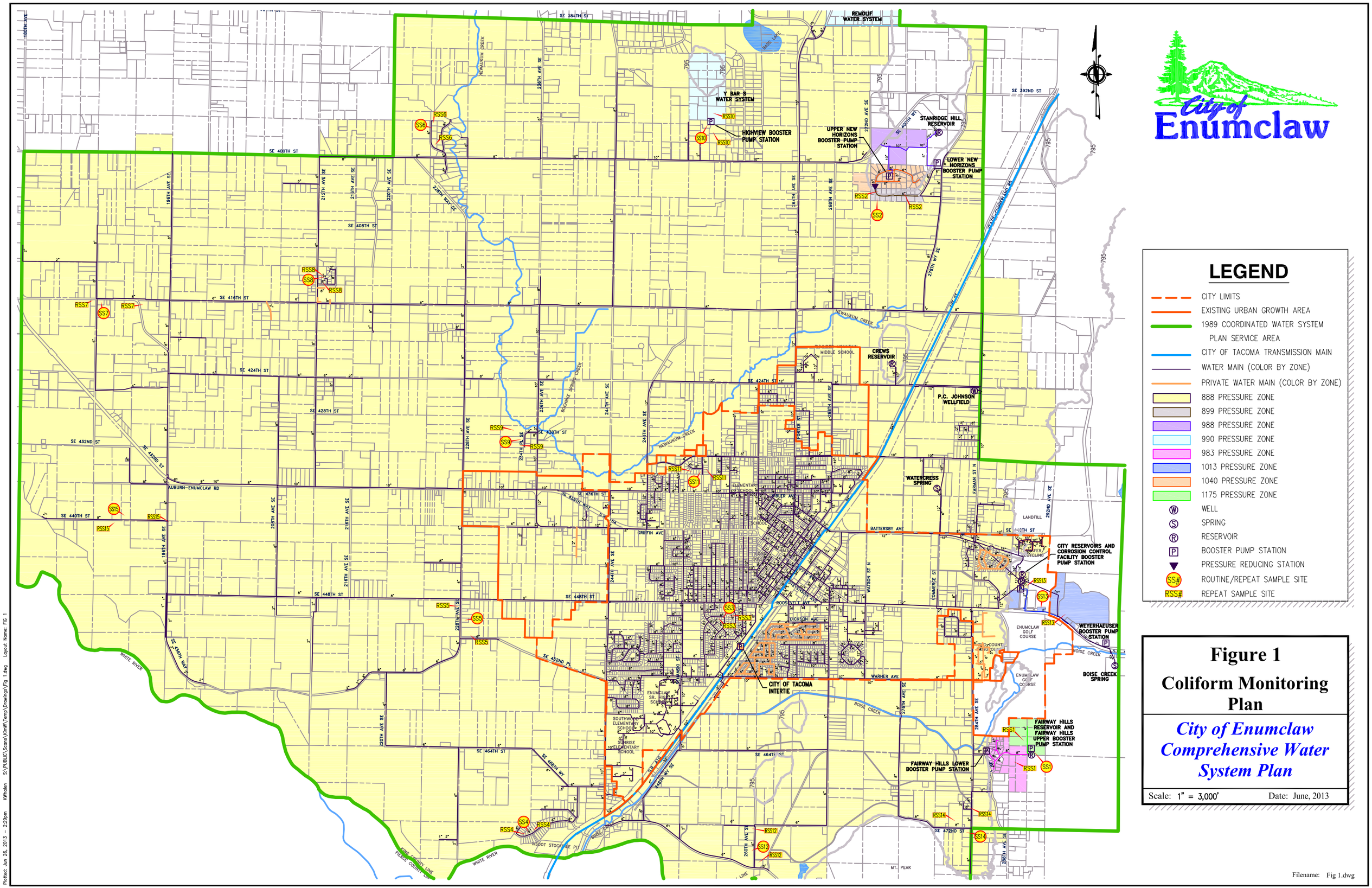
Month	Routine Site(s)	Month	Routine Site(s)
January	1 – 15	July	1 – 15
February	1 – 15	August	1 – 15
March	1 – 15	September	1 – 15
April	1 – 15	October	1 – 15
May	1 – 15	November	1 – 15
June	1 – 15	December	1 – 15

D. Month Following Unsatisfactory Samples – Same as Section B

E. Preparation Information

System Name Enumclaw Water Dept		Date Plan Completed 10-19-12	Dates Modified
Name of Plan Preparer Scott Woodbury, P.E., System Certified Water Operator/Asst City Engr	Position		Daytime Phone # (253)261-1937
State Reviewer		Date Last Review	

F. System Map


City of Enumclaw
LEGEND
CITY LIMITS
EXISTING URBAN GROWTH AREA
1989 COORDINATED WATER SYSTEM PLAN SERVICE AREA
CITY OF TACOMA TRANSMISSION MAIN
WATER MAIN (COLOR BY ZONE)
PRIVATE WATER MAIN (COLOR BY ZONE)
888 PRESSURE ZONE
899 PRESSURE ZONE
988 PRESSURE ZONE
990 PRESSURE ZONE
983 PRESSURE ZONE
1013 PRESSURE ZONE
1040 PRESSURE ZONE
1175 PRESSURE ZONE
WELL
SPRING
RESERVOIR
BOOSTER PUMP STATION
PRESSURE REDUCING STATION
SS# ROUTINE/REPEAT SAMPLE SITE
RSS# REPEAT SAMPLE SITE
REMOUF WATER SYSTEM
Y BAR S WATER SYSTEM
HIGHVIEW BOOSTER PUMP STATION
UPPER NEW HORIZONS BOOSTER PUMP STATION
STANRIDGE HILL RESERVOIR
LOWER NEW HORIZONS BOOSTER PUMP STATION
CREWS RESERVOIR
P.C. JOHNSON WELLFIELD
WATERCRESS SPRING
CITY RESERVOIRS AND CORROSION CONTROL FACILITY BOOSTER PUMP STATION
WEYERHAEUSER BOOSTER PUMP STATION
BOISE CREEK SPRING
CITY OF TACOMA INTERTIE
FAIRWAY HILLS RESERVOIR AND FAIRWAY HILLS UPPER BOOSTER PUMP STATION
FAIRWAY HILLS LOWER BOOSTER PUMP STATION
NEWAUKUM CREEK
BOISE CREEK
WHITE RIVER
SE 400TH ST
SE 408TH ST
SE 416TH ST
SE 424TH ST
SE 428TH ST
SE 432ND ST
SE 440TH ST
SE 448TH ST
SE 464TH ST
SE 472ND ST
SE 392ND ST
AUBURN-ENUMCLAW RD
BATTERSBY AVE
WARNER AVE
GRIFFIN AVE
ROOSEVELT AVE
DICKSON AVE
FARMAN ST N
WATSON ST N
COMMERCE ST
LANDFILL
ENUMCLAW GOLF COURSE
ENUMCLAW SR. HIGH SCHOOL
SOUTHWOOD ELEMENTARY SCHOOL
SUNRISE ELEMENTARY SCHOOL
ELEMENTARY SCHOOL
MIDDLE SCHOOL
WSDOT STOCKPILE PIT
MT. PEAK
KING COUNTY LINE
PIERCE COUNTY LINE
Figure 1
Coliform Monitoring Plan
City of Enumclaw Comprehensive Water System Plan
Scale: 1" = 3,000'
Date: June, 2013
Filename: Fig 1.dwg
Plotted: Jun 26, 2013 - 2:29pm KWhalen S:\PUBLIC\Scora\Kimk\Temp\Drawings\Fig 1.dwg Layout Name: FIG 1

Stage 2 DBP Monitoring Plan - Groundwater (Routine Monitoring)

DOH 331-464 Updated July 2013

System Name	Enumclaw Water Dept
PWSID#	236001
Date	08/27/2013
Completed by	Scott Woodbury
Population	15283

Initial Stage 2 Sampling Period First sampling period following **October 1, 2013**

Number of Samples Required 4 Dual Sample Sets per Quarter

	Stage 2 Compliance Monitoring Site ID	Projected Sampling Date (Date or week)			
		Period 1	Period 2	Period 3	Period 4
Highest TTHM	3 - 39626 224th Ave	1st wk Nov	1st wk Feb	1st wk May	1st wk Aug
Highest HAA5	1 - 23602 SE 473rd St	1st wk Dec	1st wk March	1st wk June	1st wk Sept
	2 - 19104 SE 440th St	1st wk Dec	1st wk March	1st wk June	1st wk Sept
	4 - 2620 Perry Court	1st wk Nov	1st wk Feb	1st wk May	1st wk Aug

Determining Compliance for TTHM and HAA5

Our system is required to monitor quarterly. Each quarter we will calculate a locational running annual average (LRAA) for TTHM and HAA5 at each monitoring location. Compliance will be achieved it the TTHM and the HAA5 LRAA at each monitoring location for the four most recent quarters is less than or equal to 0.080 mg/L for TTHM and less than or equal to 0.060 mg/l for HAA5.

Chlorine residuals must be measured at the same time and place as routine or repeat coliform samples
MRDL for chlorine and chloramines = 4.0 mg/l as Cl_2

Determining Compliance for disinfectant residuals

Compliance is based on the running annual average (RAA) of 12 consecutive months
Daily residual measurements will / will not be included in the compliance calculations (circle one)

Attach a distribution map with sample locations (see comments below)

Comments
Sample locations are at sites SS4, SS6, SS11, and SS16 as shown on the Enumclaw Coliform Monitoring Plan.

You will need to print a hard copy for your records and make it available upon request. You do not need to submit a copy to DOH.

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.

APPENDIX M

EMERGENCY RESPONSE PLAN

CITY OF ENUMCLAW

Emergency Response Plan

INTRODUCTION

This plan provides basic information useful in responding to potential water system emergencies and contains the following elements:

- An overview of the existing water system.
- Water system personnel responsible for making decisions in emergency situations.
- Procedures for notification of water-related emergencies to water customers, the public, local health department, and the State Department of Health.
- Overview of the City's Vulnerability Assessment Plan.
- Contingency operation plan for responding to emergency events.
- Recommendations.

A separate, more detailed plan prepared using guidance published by EPA in 2004, the "Emergency Response Plan Guidance for Small and Medium Community Water Systems to Comply with the Public Health Security and Bioterrorism Preparedness and Response Act of 2002", is distributed on a need-to-know basis to department personnel and other emergency response team members.

The use and success of these plans depends upon the accuracy of the information. These plans are working tools that must be maintained and updated regularly as changes in the water system occur.

OVERVIEW OF EXISTING SYSTEM

The City provides service to approximately 5,600 customer connections within the City's existing water service area, which extends beyond the city limits. The city limits comprise an area of approximately 5.3 square miles, and the existing water service area is approximately 37.8 square miles. The 2010 population within the city limits was 10,669, while water service was provided to an estimated 4,500 people outside of the city limits and within the existing water service area.

Two springs, Boise Spring and Watercress Spring and a wellfield, P.C. Johnson Wellfield, provide water supply to the City. The City also has an emergency intertie with the City of Tacoma. All water that is produced by the City's wellfield and two spring sources is chlorinated. Sodium hydroxide is also added to the spring sources to increase pH of the water, thereby reducing the potential for pipeline corrosion. Water supply from Tacoma is chlorinated and fluoridated. Water storage is provided by five reservoirs that have a total maximum capacity of

4.74 million gallons (MG). In addition, the City's water system has nine pressure zones with one pressure reducing station, seven booster pump stations, and approximately 143 miles of water main.

EMERGENCY RESPONSE PERSONNEL

When emergencies are reported to the City of Enumclaw 911 dispatch center, Water Utility on-call staff is contacted. Water worker personnel are on a call-out list Mondays through Thursdays and on a standby call-out list on a rotating basis Fridays through Sundays, as well as holidays. The worker responding to the call will assess the situation and notify the Certified Operator and/or other Water Department and City personnel to respond as necessary, depending on the severity of the emergency situation. The Public Works Director may also be contacted to direct the efforts to respond to the emergency situation. A list of these water system personnel and others responsible for making decisions in emergency situations is shown in **Table 1**.

Table 1
Enumclaw Water System Personnel Emergency Call-Up List

Contact Person (Name/Job Title)	Personnel Responsibilities	Cell Phone	Working Hours	Non-Working Hours
Chris Searcy Public Works Director	Final decision authority on Public Works matters. Coordinate with other department heads (police, fire, emergency operations center).	253 261-1938		
Scott Woodbury Certified Operator	Designated water system operator. Reports to Director. Coordinate with WDOH.	253 261-1937		
Warren Wieland Lead Water Worker	Recommend actions and implement them. Reports to Certified Operator. Oversees other water workers.	253 350-3430	360 825-5541	360 825-3505
Darren Breault Water Worker	Recommend actions and implement them. Reports to Lead Water Work/Certified Operator.	253 261-6919	360 825-5541	360 825-3505
Doug Nelson Water Worker	Recommend actions and implement them. Reports to Lead Water Work/Certified Operator.	253 261-6895	360 825-5541	360 825-3505

The Public Works Department may require outside assistance to properly respond to an emergency situation. For example, the City may need to hire construction contractors to assist in repairing affected facilities. Coordination with Puget Sound Energy or the City of Tacoma may be required if the emergency is large enough to affect other water sources. A list of these and other support personnel that can assist the City during an emergency event is shown in **Table 2**.

Table 2
Water System Support Services Call-Up List

The following is a list of organizations that can assist the City during an emergency event.

Organization/ Contact Person	Type of Service	Address	Phone No.
Agencies			
WA Dept of Health *Hotline*	Emergency Response		877 481-4901
Tacoma Public Utilities	Headworks		253 502-8346
Tacoma Public Utilities	Control Center		253-502-8344
Telemetry and Computer Services			
S & B Inc. *Randy Stead - 206 963-0102*	Telemetry System Contractor	13200 SE 30th Bellevue, WA 98005	425 644-1700
Technical Systems Inc.	Process and Control	2303 196th St SW Lynnwood, WA 98036	800 509-4357
Material and Equipment Suppliers and/or Services			
H.D. Fowler Co. Inc. *Ryan Huff - 206 255-4314*	Materials, Pipe, Valves, Etc.	1417 Thornton Ave SW Pacific, WA 98047	253 863-8600 800 487-5290
Ferguson NW Waterworks	Materials, Pipe, Valves, Etc.	2042 S 112th St Tacoma, WA 98444	253 538-8275 800 878-0962
HD Supply Waterworks, Inc. *Craig Freshour*	Materials, Pipe, Valves, Etc.	602 Valley Ave NE Puyallup, WA 98372	253 840-5505 800 422-2038
Trident Waterworks	Materials, Pipe, Valves, Etc.	2203 Inter Ave, Ste A Puyallup, WA 98372	253 848-9337
GC Systems *Carol Wells*	Control Valve Service	2310 Inter Ave Puyallup, WA 98372	253 939-8322 800 525-9425
Ryan Herco	CL2 & NaOH Piping / Valves	22405 72nd S Kent, WA 98032	800 848-1141
TMG Services *Brian Yarnell - 253 606-2576*	CL2 & NaOH Equipment and Service	3216 E. Portland Ave Tacoma, WA 98404	800 562-2310
PumpTech *Tom Long / Mike Dunn*	Well Equipment and Service	12020 32nd St E Bellevue, WA 98005-4121	425 644-8501
Triangle Pump & Equipment *Ray Cook - 541 915-2685*	Pump Equipment and Service	7509 South 5th Street Ridgefield, WA 98642	360 887-9530
Paramount Electric *Bill Hayes - 253 761-6817*	Electrician	3911 Pacific Hwy E Fife, WA 98424	800 521-9338
Lucas Industrial Electric *Eric Johnson - 253 377-0645*	Electrician		360 829-0645

Table continued next page

Table 2 (continued)
Water System Support Services Call-Up List

Table continued

Organization/ Contact Person	Type of Service	Address	Phone No.
Contractors and Consultants			
Cedarock Consultants *Carl Hadley*	Fisheries Consultant	19609 244th Ave NE Woodinville, WA 98077	425 788-0961
Thomas Mortimer	Legal Counsel	1325 Fourth Avenue, Suite 940 Seattle WA 98101	206 447-9036
Olympic Fence *Susan Baker - 253 709-0274*	Fence Contractor		253 833-9367
Hoffman Construction *Randy Hoffman - 206 423-1261*	Utility Contractor		360 825-9797
McDonald & Co *Steve McDonald*	Utility Contractor		206 730-1585
Stafford Excavating *Aaron Stafford*	Utility Contractor		253 569-3311
Watterson Excavating *Reed Watterson - 253 332-1109*	Utility Contractor	1875 Lois Lane Enumclaw, WA 98022	360 825-6333
Other			
Water Management Laboratory	Water Quality Testing	1515 80th St E Tacoma, WA 98404	253 531-3121
Cummins NW, Inc.	Generator Equipment and Service	811 SW Grady Way Renton, WA 98055	425 235-3400
Associated Petroleum Products	Propane and Diesel	2320 Milwaukee Way Tacoma, WA 98421	800 929-5243
Ferrell Gas	Propane	3611 A St SE Auburn, WA 98002	253 833-1641
Jones Chemical *James Groh - 253 405-3075*	Chlorine & Caustic Soda	1919 Marine View Drive Tacoma, WA 98422	253 274-0104

NOTIFICATION PROCEDURES

Water customers, the public, local health department, State Department of Health, and others may be notified during an emergency depending on the type and severity of the emergency situation. A list of organizations that may be contacted during an emergency is shown in **Table 3**. Following this table is a summary of the procedures for notification during an emergency event.

Table 3
Emergency Notification Contact List

The following is a list of organizations that may need to be notified in the event of a City emergency.

Agency	Contact Person	Location	Phone No.
Fire District 28	Operator	Enumclaw	911 or 360 825-5544
Fire District 44	Operator	Auburn	253 735-0284
Enumclaw Police Department	Operator	Enumclaw	911 or 360 825-3505
King County Police Department	Operator	Maple Valley	206 296-3883
King County Office of Emergency Management	Operator	Renton	206 396-3830
King County Dept of Public Health	Water Program	Bellevue	206 296-4932
King County Utility Inspection	Ryan Harris	Seattle	206 296-8122
Washington State Dept of Health	Page Igoe	Kent	253 395-6764
Washington State Dept of Ecology - NW Region	Receptionist	Bellevue	425 649-7000
KSTW 11 Television	Receptionist	Tacoma	866 313-5789
KCPQ 13 Television	Receptionist	Tacoma	206 674-1313
KCTS 9 Television	Receptionist	Seattle	206 728-6463
KIRO 7 TV / KIRO 710 AM	Receptionist	Seattle	206 728-7777
KING 5 Television	Receptionist	Seattle	206 448-5555
KOMO 4 TV / KOMO 1000 AM	Receptionist	Seattle	888 477-5666
Seattle Post-Intelligencer (Newspaper)	Receptionist	Seattle	206 448-8030
The Seattle Times (Newspaper)	Receptionist	Seattle	206 464-2200

Customers

Customers and the general public will be notified in the event of an emergency situation that affects either the quantity or quality of water supply. The customers will be notified of an

emergency situation and how it affects them. If the emergency situation affects water quality, customers may be asked to boil water prior to drinking or cooking. If the emergency situation affects water quantity, customers may be asked to conserve water to prevent depletion of a potentially limited quantity of emergency supply.

Priority Customers

Priority customers that require uninterrupted water service will be notified directly. These customers could include home care kidney dialysis patients, medical facilities, and commercial customers that are especially vulnerable to loss of water service. A list of priority customers is shown in **Table 4**.

Table 4
Priority Customers Contact List

The following is a list of customers that require an uninterrupted supply of water and may need to be notified during an emergency event.

Person/Organization	Need for priority water service	Address	Phone
Frank Rodarte	Kidney dialysis	40727 264th Ave SE	360 802-0280
St. Elizabeth Hospital	Medical	1455 Battersby Ave	360 802-8800
Enumclaw Medical Center	Medical	3021 Griffin Ave	360 825-6511
Enumclaw School District	Schools	2929 McDougall Ave	360 825-0377
Angel's Haven	Adult care facility	42421 264th Ave SE	360 825-7244
Cascade Caregivers	Adult care facility	2885 Elmont Ave	360 825-4514
Cascade House	Adult care facility	2000 Mt View Dr	360 802-0177
Evergreen Healthcare & Rehab	Adult care facility	2323 Jensen St	360 825-2541
Expressions at Enumclaw	Adult care facility	2454 Cole St	360 825-4565
Highpoint Village	Adult care facility	1777 Highpoint St	360 825-7780
Living Court	Adult care facility	2229 Jensen St	360 825-0280

Health Departments

The local health department and State Department of Health will be contacted directly if there are water quality problems, water shortage concerns, or any other emergency situations where public health is threatened.

Police and Fire

Police or fire personnel will be notified in the event of a fire or human safety emergency

situation. The emergency phone number for these types of emergency situations is 911.

VULNERABILITY ASSESSMENT

In 2004 the City prepared a Vulnerability Assessment Plan in accordance with the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (H.R. 3448). Updated in 2012, the plan contains an evaluation of the impact on water system facilities from different types of emergency events, which included both natural and man-made disasters. The results of the assessment were utilized to prepare a schedule of proposed water system improvements to alleviate the impacts of emergency events on the City's ability to provide a safe and reliable supply of water to its customers.

CONTINGENCY OPERATION PLAN

The following section contains contingency operation plans for responding to potential emergency conditions for each of the major system components.

Sources

Emergency Condition: Aquifer Contamination

Impact on System: Major impact is possible with water not suitable for potable use resulting in a major loss of supply. The City sources use water from three aquifers: pre-Vashon deposits (PC Johnson), Vashon Recessional Outwash (Watercress), and perched Vashon Recessional Outwash (Boise).

Emergency Response

1. Shut down the well or spring that uses the aquifer.
2. Notify DOH of the aquifer contamination.
3. Notify all affected customers of the problem and instruct whether to boil the water prior to use or to not use the water at all, depending upon the contamination.
4. Analyze the quality of water within reservoirs and dispose of properly if contaminated.
5. Disinfect and/or flush reservoirs and water mains, as necessary, to remove contaminated residuals.
6. Adjust control of system facilities, as necessary, to provide supply from storage facilities if water within them is not contaminated.
7. Monitor water quality at the affected aquifer and investigate cause of contamination.
8. Implement water use reduction measures, as necessary, to ensure an adequate supply of water until the contamination event has been rectified and normal operations restored.

Emergency Condition: Power Outage

Impact on System: Impact should be moderate depending on length of outage, area affected by the outage, and level of system demand.

Emergency Response

1. Contact Puget Sound Energy to restore power.
2. Check the well and spring sites to ensure engine generator sets are functioning properly.
3. Supply water demand from reservoirs and any of the other sources not affected by the power outage.
4. Contact DOH if emergency supply from the Tacoma intertie is required.
5. Implement water use reduction measures, as necessary, to ensure an adequate supply of water until normal conditions are restored.

Reservoirs

Emergency Condition: Structural Damage

Impact on System: Potentially major impact depending on the reservoir(s) damaged because of the loss of storage and reduced fire flow.

Emergency Response

1. Isolate the reservoir from the water system.
2. Notify police and nearby residents of potential danger and notify local fire districts of reduced fire fighting capabilities in areas served by the reservoir.
3. Drain reservoir, as necessary, to reduce level of damage and threat to local residents. Adjust control of other system facilities to operate system without the damaged reservoir.
4. Contact DOH if emergency supply from the Tacoma intertie is required.
5. Determine the extent of damage.
6. Implement water use reduction measures, as necessary, to ensure an adequate supply of water. Once repairs are completed return to normal operation and notify all parties previously contacted that normal operation is restored.

Emergency Condition: Power Outage

Impact on System: There is a minor impact to staff if reservoir level data transfer is lost because pumps that supply the reservoirs must be run manually. Batteries may keep telemetry equipment sending data for generally from 6 to 12 hours after power is lost.

Emergency Response: Contact Puget Sound Energy to restore power. Exchange batteries as needed with another facility that hasn't lost power. This will maintain data transfer and recharge drained batteries until power is restored.

Pump Stations and Facilities

Emergency Condition: Power Outage

Impact on System: Moderate to severe impact depending on length and level of system demand. Pressure will be reduced in the 1040 Zone until power is restored to the Upper New Horizons Booster Pump Station and there will be no supply to the 1175 Zone until an emergency generator is delivered to the Upper Fairway Hills Booster Pump Station. The 1245 Zone will not have any supply until power is restored since there is no provision for connecting a generator at the Weyerhaeuser Booster Pump Station.

Emergency Response

1. Contact Puget Sound Energy to restore power.
2. Ensure standby emergency generators are operating properly.
3. Connect the 5 kW portable generator to the Upper Fairway Hills Booster Pump Station. As needed, connect the 200 kW portable generator to Well 2 or 3 at the PC Johnson Wellfield and connect the Wastewater Department's 40 kW portable generator to the Lower Fairway Hills and Lower New Horizons Booster Pump Stations.

Transmission and Distribution Mains

Emergency Condition: Water Main Break

Impact on System: Depending on severity and/or location of the break, the impact may range from minor to potentially major with loss of water from reservoirs, reduction or loss of fire protection capability, disruption of water service to customers, and potential damage to adjacent property.

Emergency Response

1. Close valves to isolate and stop loss of water from the main break while minimizing the extent of the shutdown. If possible, keep the main pressurized just enough to prevent contamination of the main. Open a fire hydrant at the upper end of the area to be isolated, if necessary, to let in air and avoid negative pressure in the main. Involve law enforcement if

the break appears to have been intentional to preserve crime evidence. If the break is in a small pressure zone it may be necessary to shut the pump station down. If one of the major transmission mains must be shut down, adjustments to the control and operation of other facilities may be necessary.

2. Notify affected customers of the shutdown. Notify police dispatch and local fire districts of reduced fire fighting capabilities in areas served by the reservoir.

3. Complete repair of the main and disinfect as the situation warrants. Turn on additional sources if needed to replenish reservoirs. As necessary, notify customers prior to the restoration of service regarding whether to boil water or other use restrictions. While repair is on-going to return the system back to normal, ensure that the cause of the damage is well documented and that any collateral damage is also documented and repaired. After the necessary disinfection contact time has passed, restore water service into the isolated area in a manner that removes air and allows unidirectional flushing. Once flushing is completed open all remaining valves. If the main had to be disinfected, keep the unidirectional flow scheme in operation until lab results confirm no contamination is present and then open all remaining valves.

Emergency Condition: Water System Contamination Due to a Backflow Incident

Impact on System: Potentially major impact with water not being suitable for potable use and/or loss of supply.

Emergency Response

1. Notify the City's Cross Connection Control Specialist of the incident immediately and DOH within 24 hours.

2. Shut down the affected mains to contain the affected contaminants and notify affected customers of the problem and the need to boil water for consumption and cooking if necessary.

3. Flush affected water mains to remove contaminants and disinfect as necessary. After the necessary disinfection contact time has passed, restore water service into the isolated area in a manner that removes air and allows unidirectional flushing. Take samples for water quality analysis in the affected mains and in other parts of the distribution system as necessary to ensure that all contaminants were removed. Keep the unidirectional flow scheme in operation until receipt of acceptable test results and concurrence from DOH to return to the system to normal operation. Ensure all valves are opened. Notify all parties previously contacted that normal operation is restored.

RECOMMENDATIONS

Safety Preparations

It is critical that a reliable communication system be available to the staff for emergency

functions of the City. Maintenance of the City's emergency radio system is necessary to assure communication if mobile or hard wire phone networks systems are down. Staff members should call in or automatically report to work following an emergency. Emergency supplies and equipment should be kept on hand in the event of an emergency.

Since it is very likely that both power and telephone service will be incapacitated in a major earthquake, customers should be provided with emergency instructions in advance of the event of water supply loss. These instructions could be in the form of a billing insert or separate mailer. Power outages would prevent boiling of water for purification at most households. Alternative methods should be fully explained and described in sufficient detail with emergency instructions. Other necessary information might include volume and type of emergency food and water to store and other items customers should have on hand, such as a fire extinguisher, battery-operated radio, first aid kit, flashlight, and wrench for turning off gas or water service lines, if necessary. Directions for the aftermath of the earthquake should cover how and when to shut off gas, water services, and electricity, and where to go for emergency medical services, food, water, and shelter.

Design Criteria for Future Improvements

Redundancy and reliability are critical throughout all parts of the water system, including sources, storage, and distribution. The following factors should be considered in future designs for minimizing Enumclaw's vulnerability to earthquakes and other catastrophic events.

Reservoirs: Flexible piping connections, adequate anchorage and foundation.

Distribution System: Ductile iron piping generally performs much better in an earthquake than more brittle materials, such as asbestos cement and cast iron. Frequent and well-located isolation valves are beneficial in preventing damage or water loss due to leaks or breaks. Backpressure sustaining valves in pressure reducing stations reduce "draining" of upper pressure zones and subsequent low pressures when main breaks occur downstream of pressure reducing stations. Strategically placed air valves help prevent main collapse due to a water main break or prevent air binding at high points during fire flow events.

Power: Backup power to wells, springs, pump stations, and other electrically powered facilities, including emergency response stations, is critical. Power loss is expected in large earthquakes and major storms. Ideally all critical facilities would be equipped with a standby emergency generator and automatic transfer switch, but at a minimum they should be equipped with an emergency generator connection and manual transfer switch for use with a portable engine generator set.

APPENDIX N

WATER MODEL CALIBRATION

DEPARTMENT OF PUBLIC WORKS

TO: **File**

FROM: **Scott Woodbury, P.E. / Assistant City Engineer**

DATE: **June 10, 2013**

SUBJECT: **Water Model Calibration Addendum**
Change in Fairway Hills Reservoir Zone From Zone 1002 to Zone 983

Since the draft March 2013 Comprehensive Water System Plan was prepared it was discovered that the overflow elevation of the Fairway Hill Reservoir Zone 1002 was incorrect. Based on a 2008 topographic survey that included the reservoir site, the overflow elevation of the reservoir, and hence the zone elevation, is 983 feet (NGVD 1929 datum).

In rechecking the calibration of the water model for the revised Zone 983, other node elevations in the zone were also found to be in error and were corrected using 2007 King County contour data. Since the reservoir elevation is lower than previously thought, the model calibration was rechecked against the field flow data for the test location in Zone 983. The previous model results indicated a flow of 1395 gpm at the test location compared to 1330 gpm for the field test results, all measured at 20 psi. Thus the model over predicted the flow by 4.9%. The updated model output indicated a flow of 1274 gpm or 4.2% below the field test. Thus, the model calibration for the 983 Zone is still considered to be within accepted tolerance.

DEPARTMENT OF PUBLIC WORKS

TO: **File**

FROM: **Scott Woodbury, P.E. / Assistant City Engineer**

DATE: **January 9, 2013**

SUBJECT: **Water Model Calibration**

Introduction

This memo summarizes the work of updating the City's water model as part of the Comprehensive Water System Plan (CWSP) update.

Model Description

The City uses EPANet Version 2.0 for its water model. The current model has 894 junctions (nodes) and 1049 pipes. All reservoirs, sources, and pump stations are included in the model. The City's water system inventory map can be added as a background to the model and is helpful for verifying that the model setup is complete.

Flow Tests

Fire hydrants at 12 locations around the water system were flowed to obtain pressure and flow data for checking and updating the calibration of the water model. The locations and test results are included in Appendix 1. Tests were conducted using the following equipment:

- Akron Water Flow Test Kit Style 9015
- 4-1/2" Hose Monster
- 2" Hose Monster
- Handheld Pitot Gage

Tests prior to January 2013 were plotted on semi-log paper to project the flow available at 20 psi residual. The plotted flow estimate was compared against that calculated using the following formula from AWWA Manual M17:

Flow at 20 psi = Test Flow x ((static pressure – 20 psi) / (static – test residual pressure))^0.54

The calculated flow using the AWWA formula agreed quite well with the plotted flow projection and was used for the comparison against model results. The January 2013 tests solely used the AWWA formula.

Model Changes

The following changes were made as part of the water model calibration update:

1. Adjusted system-wide demands downward to 2013 projections.
2. Adjusted all C 140 roughness to 130 and C130 to 125.
3. Reviewed individual pipe roughness and adjusted pipes of similar age to similar roughness, i.e., 1) 1936 CI had varying roughness of 120 to 80 - adjusted to consistent C value, 2) 1983 DI on Wells St had C of 70 – adjusted to 120, 3) AC on Washington had C of 90 – adjusted to 135.

4. Adjusted pump curves for 988 and 1002 zone pumps.
5. Added a pressure reducing valves on the Highview BPS to simulate the function of the VFD at maintaining pressure.
6. Added demands of top water users and reduced system-wide demands to offset added demand.
7. Adjusted elevations in vicinity of Sunrise, Southwood, High School, Warner Ave/Semanski St.
8. Increased roughness for 8" pipes around high school and for 10" pipe from Sunrise School north and east to Warner Ave to 128.4.
9. Checked diameters in the entire model. Corrected three erroneous segments, all on dead ends.
10. Increased C factors globally by 5% except for New Horizons and Fairway Hills.
11. Made final check of roughness values and adjusted as deemed appropriate for consistency.

Analysis

Several model scenarios were run in the process of updating the model calibration. Results from some of the scenarios are summarized in Appendix 2. Initial model results for fire flows at 20 psi versus field flow tests showed model flows exceeding field test results in the City's main pressure zone by up to 31%. Several model changes and scenario runs were attempted to try and reduce the flows predicted by the model, but were rejected. It was concluded that repeat field tests be conducted at greater flows and pressure drops to verify if previous tests were underestimating flows.

Repeat tests were completed on January 4 and 7, 2013, at 8 of the test locations. Previous flow tests used one or two 2.5" ports at a single hydrant. The repeat tests utilized the main hydrant port at the test location, and if more flow was wanted, a second hydrant nearby was flowed using its 2.5" ports. At all locations flows increased 23% to 69% higher than previously tested and exceeded model predicted flows at all main zone locations. Additional model changes were made to increase model flows, resulting in good calibration at the locations in the City core but model flows fell short of field tests results by 12% to 29% in the farther outlying areas. Final adjustments to roughness values has little effect on model results and further changes to try and get better correlation with outlying main zone area were rejected because they would create inconsistencies in the roughness of similar aged pipe in the model. Model results in the outlying main zone area fall between the initial flows tests results and the January 2013 flow tests.

Conclusion

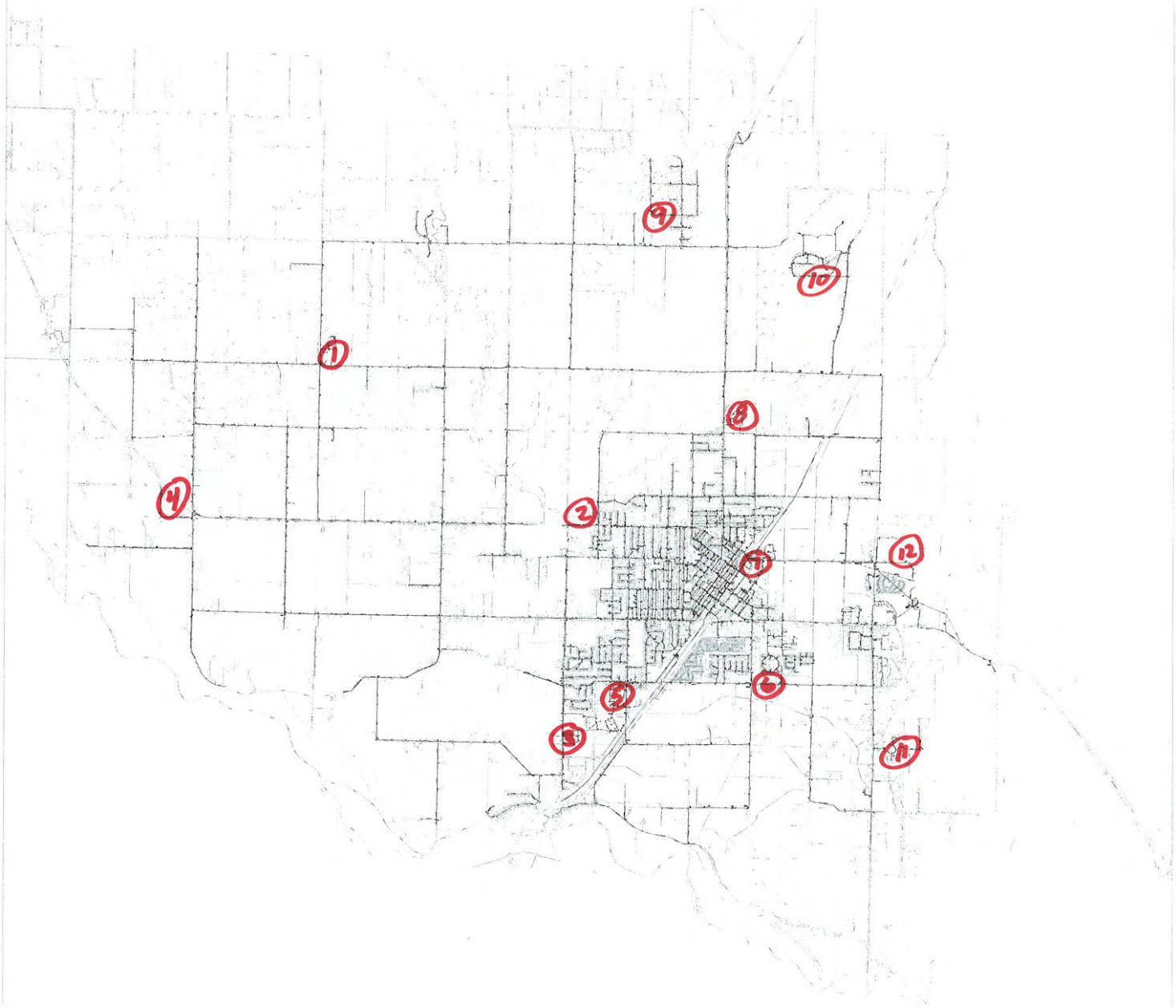
The calibration is considered satisfactory for the following reasons:

- Model results are within 6% of field test results in the City core and are generally under predicting flows so fire flow projections and sizing of future pipe segments will tend to be conservative.
- Field test results can be highly variable due to fluctuating of the pressure gages reading during the test. A difference read of 2 to 3 psi can make a large difference in projected flow at 20 psi when the drop in pressure is close to 10 psi or even less.
- Test location 12 is closest to the City reservoirs and is not given much weight since the pressure differential on the test was only 2 psi. This area is too close to the reservoir for even a two hydrant test to produce much pressure drop so it was decided not to retest at that location.
- The retest at location 4 may not have been run long enough for pressures to stabilize. Actual field test flow is likely between the retest flow of 2435 gpm and the prior test flow of 1675 gpm..

Appendix 1
Flow Test Data

Flow Test
Locations

Dec 2012 – Jan 2013



N

Flow Charts for Test Devices

The HOSE MONSTER®

FLOW CHART

PSI	DIAMETER ORIFICE 4"	4-1/2"
10	1074	1047
11	1126	1098
12	1177	1147
13	1225	1194
14	1271	1239
15	1315	1282
16	1359	1324
17	1400	1365
18	1441	1405
19	1480	1443
20	1519	1481
21	1556	1517
22	1593	1553
23	1629	1588
24	1664	1622
25	1698	1656
26	1732	1688
27	1765	1720
28	1797	1752
29	1829	1783
30	1860	1814
31	1891	1843
32	1921	1873
33	1951	1902
34	1980	1931
35	2009	1959
36	2038	1987
37	2066	2014
38	2094	2041
39	2121	2068
40	2148	2094
41	2175	2120
42	2201	2146

PSI	DIAMETER ORIFICE 4"	4-1/2"
43	2227	2171
44	2253	2196
45	2278	2221
46	2303	2246
47	2328	2270
48	2353	2294
49	2377	2318
50	2402	2341
51	2425	2365
52	2449	2388
53	2473	2410
54	2496	2433
55	2519	2456
56	2542	2478
57	2564	2500
58	2587	2522
59	2609	2543
60	2631	2565
61	2653	2586
62	2674	2607
63	2696	2628
64	2717	2649
65	2738	2669
66	2759	2690
67	2780	2710
68	2801	2730
69	2821	2750
70	2842	2770
71	2862	2790
72	2882	2809
73	2902	2829
74	2922	2848
75	2941	2867

HYDRO FLOW PRODUCTS, INC.

Hydro Flow Products, Inc.

888/202-9987 Toll free
847/434-0101
847/434-0073 Fax
service@flowtest.com
www.HoseMonster.com

11/29/2011 db

2"
Pitotless Nozzle™ GRV
FLOW CHART

FM APPROVED

HOSE MONSTER

10 - 40 PSI	Little Hose Monster	Open Atmosphere
PSI	GPM	GPM
10	493	529
11	517	555
12	540	579
13	562	603
14	584	626
15	604	648
16	624	669
17	643	689
18	662	709
19	680	729
20	698	748
21	715	766
22	732	784
23	748	802
24	764	819
25	780	836
26	795	853
27	811	869
28	825	885
29	840	900
30	854	916
31	869	931
32	882	946
33	896	960
34	910	975
35	923	989
36	936	1003
37	949	1017
38	962	1031
39	974	1044
40	987	1057

41 - 70 PSI	Little Hose Monster	Open Atmosphere
PSI	GPM	GPM
41	999	1071
42	1011	1084
43	1023	1096
44	1035	1109
45	1046	1122
46	1058	1134
47	1069	1146
48	1081	1158
49	1092	1170
50	1103	1182
51	1114	1194
52	1125	1206
53	1136	1217
54	1146	1229
55	1157	1240
56	1167	1251
57	1178	1262
58	1188	1273
59	1198	1284
60	1208	1295
61	1218	1306
62	1228	1317
63	1238	1327
64	1248	1338
65	1258	1348
66	1267	1358
67	1277	1369
68	1286	1379
69	1296	1389
70	1305	1399

Key Flow Test Points	Little Hose Monster	Open Atmosphere
GPM	PSI	PSI
500	10.7	9.1
562.5	13.0	11.3
750	23.1	20.1
1000	41.1	35.8
1125	52.0	45.3
1500	92.5	80.5

The readings on this chart are based on which device the Pitotless Nozzle is connected to.
It is the user's responsibility to verify that the correct chart and column is being used.

- **Little Hose Monster™ (HML).** Use this column when the Pitotless Nozzle is connected to a Little Hose Monster.
- **Open Atmosphere.** Use this column when the Pitotless Nozzle is connected directly to a test header or hydrant flowing openly to atmosphere.

This chart is FM Approved for flow rate accuracy. Please call us or instruct the Authority Having Jurisdiction to call us if there are any questions. Additional copies of flow charts are available at: www.hosemonster.com/literature.html

Updated Feb. 2011

U. S. Patent # 6,874,375

HYDRO FLOW PRODUCTS, INC.

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Pollard
Since 1837
Underground Utility Products

AKRON BRASS

DISCHARGE TABLE FOR WATER FLOW TEST KIT—STYLE 9015

PRESSURE–PSI FLOW–GPM

$y = 8.5186x + 413.1$
$R^2 = 0.9989$

CAUTION—BE SURE TO READ INSTRUCTIONS MANUAL BEFORE USING.

PITOT PRESSURE PSI	TIP DIAMETER FLOW–U.S. GALLONS PER MINUTE									
	3/4"	*15/16"	*1"	1-1/8"	*1-1/4"	1-1/2"	1-3/4"	*1-7/8"	2"	2-1/4"
40	106	166	187	237	294	422	575	661	752	954
42	109	170	192	243	301	432	589	677	770	978
44	111	174	196	248	308	442	603	693	788	1000
46	114	178	200	254	315	452	617	709	806	1021
48	116	181	205	259	322	462	630	724	824	1043
50	118	185	209	265	329	472	643	739	841	1065
52	121	189	213	270	336	481	656	753	857	1087
54	123	192	217	280	342	490	668	768	873	1108
56	125	196	221	285	348	499	680	782	889	1129
58	128	199	225	290	354	508	692	796	905	1149
60	130	203	229	295	360	517	704	809	920	1167
62	132	206	233	299	366	525	716	823	936	1187
64	134	209	237	304	372	533	727	836	951	1206
66	136	213	240	308	378	542	738	849	965	1224
68	138	216	244	313	383	550	750	862	980	1242
70	140	219	247	318	389	558	761	874	994	1260
72	142	222	251	322	394	566	771	886	1008	1278
74	144	225	254	326	400	574	782	899	1023	1296
76	146	228	258	330	405	582	792	911	1036	1313
78	148	231	261	335	410	589	803	923	1050	1330
80	150	234	264	339	416	596	813	934	1063	1347
82	152	237	268	343	421	604	823	946	1076	1364
84	154	240	271	345	426	611	833	957	1089	1380
86	155	243	274	347	431	618	843	969	1102	1396
88	157	245	277	351	436	626	853	980	1115	1412
90	159	248	280	355	441	633	862	991	1128	1429
92	161	251	283	359	446	640	872	1002	1140	1445
94	162	254	286	363	450	647	881	1013	1152	1460
96	164	256	289	367	455	654	890	1024	1164	1476
98	166	259	292	370	460	660	900	1034	1176	1491
100	168	262	295	374	465	667	909	1045	1189	1506
105	172	268	303	383	476	683	932	1070	1218	1542
110	176	274	310	392	487	699	954	1096	1247	1579
115	180	280	317	401	498	715	975	1120	1475	1615
120	183	286	324	410	509	730	996	1144	1303	1649

* Tips not part of standard unit. Only tips in standard units are U.L. Classified.

NOTE: "Accurate to ±3% at tested values in accordance with the classification scope."

ASSUMED COEFFICIENT OF DISCHARGE = .987, .99, .99, .995, .995, .997, .997
PITOT SIZES 15/16", 1-1/4" and 1-7/8" NOT CALCULATED USING COEFFICIENT
PREFERRED TEST RANGE IS 50 TO 100 PSI

Use this discharge table ONLY for the Water Flow Test Kit and the tips supplied with the kit.
Do NOT apply these values to other nozzles and pitot gauges unless their coefficient of discharge is known.

07-07-328

DISCHARGE TABLE FOR CIRCULAR OUTLETS

Outlet pressure measured by pitot gauge.

Outlet Pres. in lbs. per sq. in.	OUTLET DIAMETER, IN INCHES							
	2¼	2 5/16	2⅜	2 7/16	2½	2 9/16	2⅝	2 11/16
	Gallons per Minute							
¼	70	70	80	80	80	90	90	100
½	90	100	110	110	120	120	130	140
¾	120	120	130	140	140	150	160	170
1	140	140	150	160	170	180	180	190
1¼	150	160	170	180	190	200	210	220
1½	170	180	190	200	210	220	230	240
1¾	180	190	200	210	220	230	240	260
2	190	200	210	230	240	250	260	270
2¼	200	220	230	240	250	260	280	290
2½	220	230	240	250	270	280	290	310
2¾	230	240	250	260	280	290	310	320
3	240	250	260	280	290	310	320	340
3¼	250	260	270	290	300	320	330	350
3½	250	270	280	300	310	330	350	360
3¾	260	280	290	310	330	340	360	370
4	270	290	300	320	340	350	370	390
4¼	280	300	310	330	350	360	380	400
4½	290	300	320	340	360	370	390	410
4¾	300	310	330	350	370	380	400	420
5	300	320	340	360	380	390	410	430
5¼	310	330	350	370	390	400	420	440
5½	320	340	350	370	390	410	430	450
5¾	330	340	360	380	400	420	440	460
6	330	350	370	390	410	430	450	470
6¼	340	360	380	400	420	440	460	480
6½	350	370	390	410	430	450	470	490
6¾	350	370	390	410	440	460	480	500
7	360	380	400	420	440	470	490	510
7¼	370	390	410	430	450	480	500	520
7½	370	390	410	440	460	480	510	530
7¾	380	400	420	440	470	490	510	540
8	380	410	430	450	480	500	520	550
8¼	390	420	430	460	480	510	530	560
8½	400	420	440	460	490	510	540	560
8¾	400	420	450	470	500	520	550	570
9	410	430	450	480	500	530	550	580
9¼	410	440	460	480	510	540	560	580
9½	420	440	470	490	520	540	570	600
9¾	420	450	470	500	520	550	580	600
10	430	450	480	500	530	560	580	610

DISCHARGE TABLE FOR CIRCULAR OUTLETS

Outlet pressure measured by pitot gauge.

Outlet Pres. in lbs. per sq. in.	OUTLET DIAMETER, IN INCHES							
	2¼	2 5/16	2⅜	2 7/16	2½	2 9/16	2⅝	2 11/16
	Gallons per Minute							
10½	440	460	480	510	540	570	590	620
10¾	440	470	490	520	540	570	600	630
11	450	470	500	520	550	580	610	630
11¼	450	480	500	530	560	590	610	640
11½	460	480	510	530	560	590	620	650
11¾	460	490	510	540	570	600	630	660
12	470	490	520	550	580	610	640	670
12½	480	510	540	560	590	620	650	680
13	490	520	550	570	610	640	670	700
13½	500	530	560	590	620	650	680	710
14	510	540	570	600	630	660	690	730
14½	520	550	580	610	640	670	700	740
15	530	560	590	620	650	680	720	750
15½	540	570	600	630	660	700	730	760
16	540	570	610	640	670	710	740	780
16½	550	580	620	650	680	720	750	790
17	560	590	620	660	690	730	760	800
17½	570	600	630	670	700	740	770	810
18	580	610	640	680	710	750	780	820
18½	590	620	650	690	720	760	790	820
19	590	630	660	700	730	770	810	840
19½	600	640	670	700	740	780	820	860
20	610	640	680	710	750	790	830	870
21	620	660	690	730	770	810	850	880
22	640	670	710	750	790	830	870	910
23	650	690	730	760	810	850	890	930
24	670	700	740	780	820	860	910	950
25	680	720	760	800	840	880	920	970
26	690	730	770	810	860	900	940	990
27	710	750	790	830	870	920	960	1010
28	720	760	800	840	890	930	970	1020
29	730	770	820	860	910	950	990	1040
30	750	790	830	870	920	970	1010	1060
31	760	800	840	890	940	980	1030	1080
32	770	810	860	900	950	1000	1040	1100
33	780	830	870	920	970	1010	1060	1110
34	790	840	880	930	980	1030	1070	1130
35	810	850	900	940	990	1040	1090	1140
36	820	860	910	960	1010	1060	1110	1160

Coefficient .8

For outlet pressures above 36 pounds per square inch for 2½-inch outlet diameter = Table value (g.p.m.) = $167.79\sqrt{P}$.

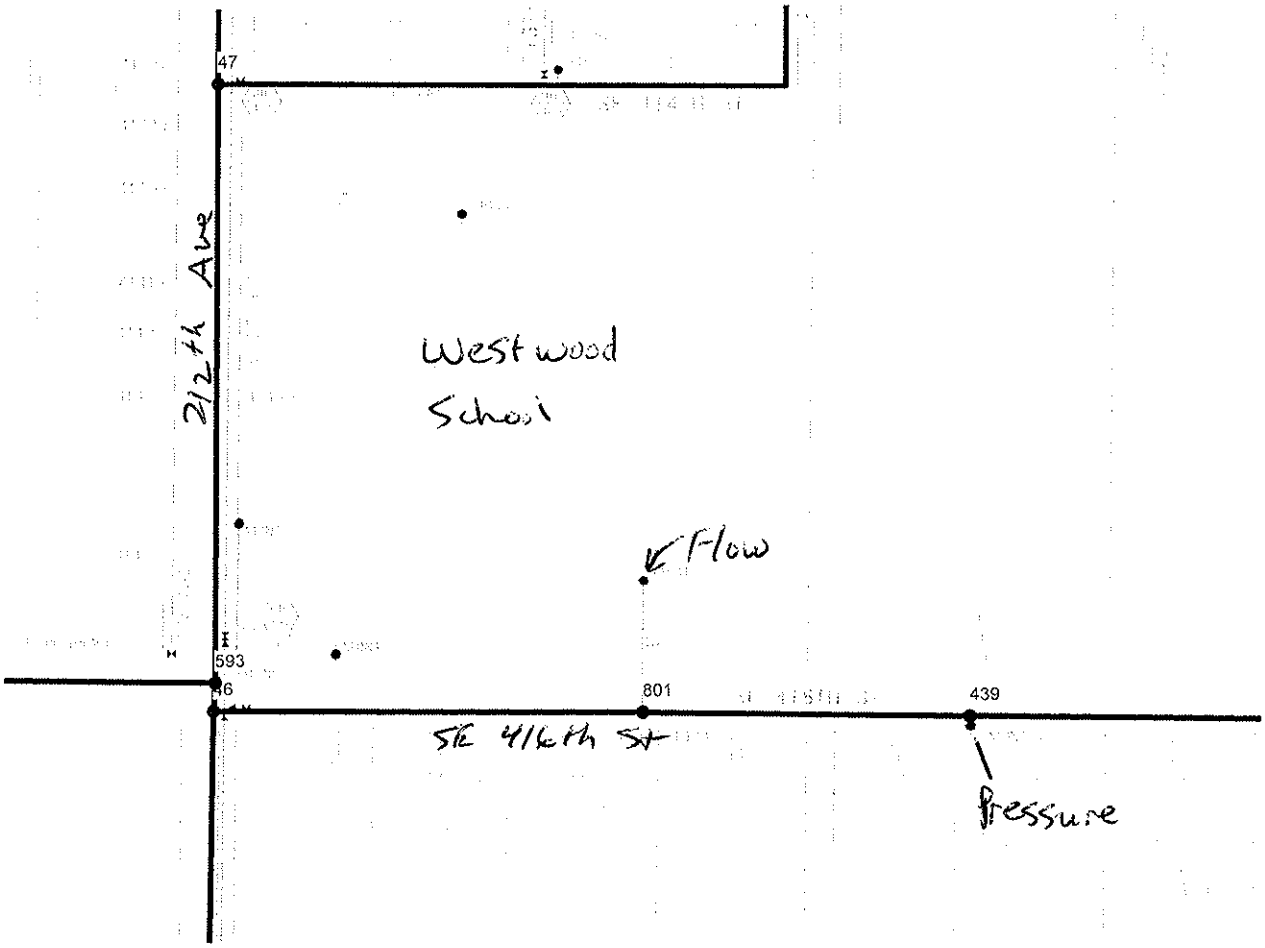
P = Pitot discharge pressure.

Hydrant Testing Figure 3

Handheld Pitot

Dec 2012 and Previous Flow Tests

City of Enumclaw Existing Water Model



Water Flow Test Summary Sheet

Device	Outlet Diameter Inches	Pitot Pressures psi	Discharge, gpm
Hose Mon	2	18	662
Akron	2	38	737

Location (1) Westwood School

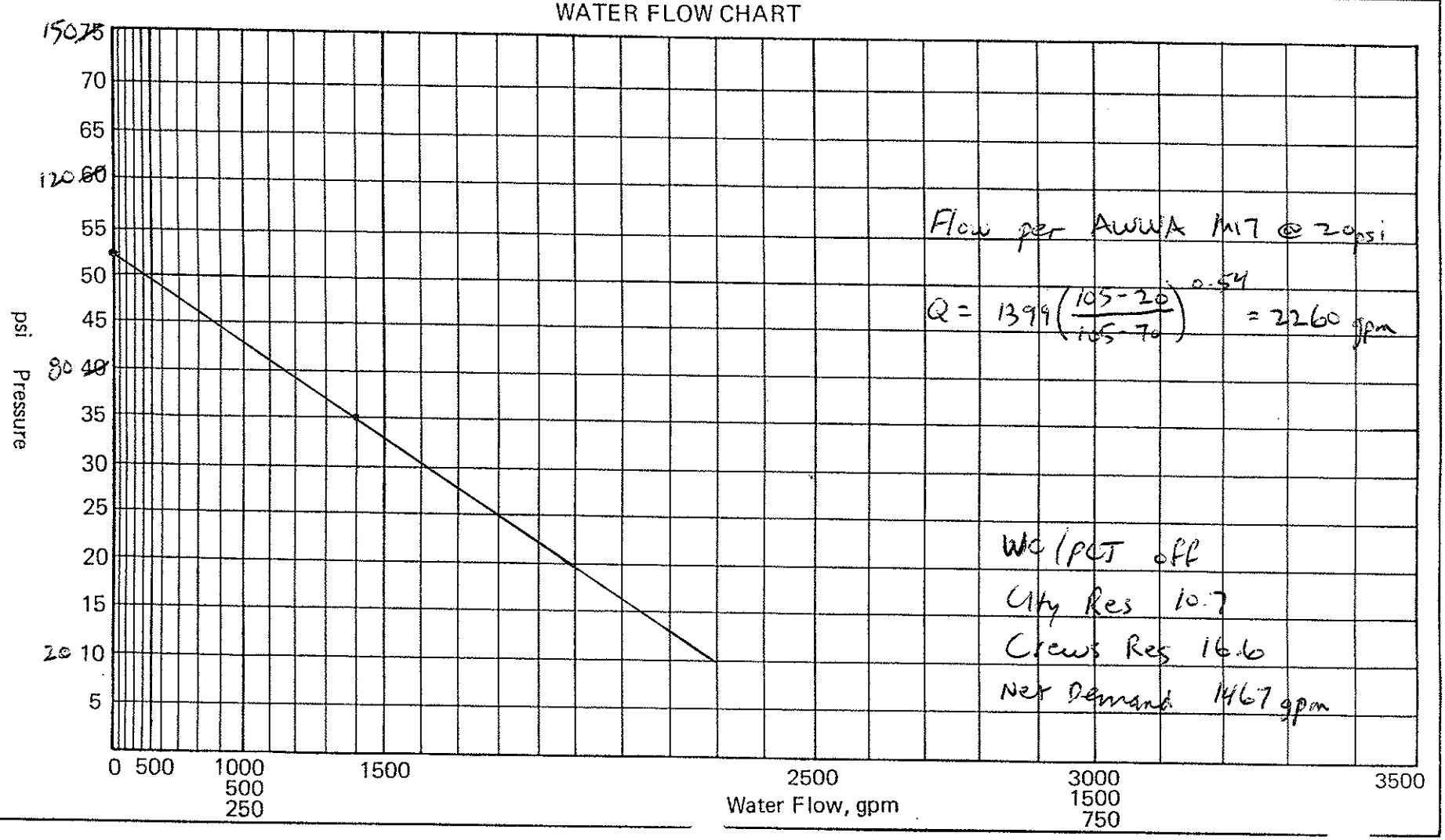
Date 12/19/12 9:30 AM

Static psi 105

Residual psi 70

Total Discharge During Test	Available gpm	
	at 20 psi	at 0 psi
1399 gpm	2280	

WATER FLOW CHART



Flow per AWWA M17 @ 20psi

$Q = 1399\left(\frac{105-20}{105-70}\right)^{0.54} = 2260$ gpm

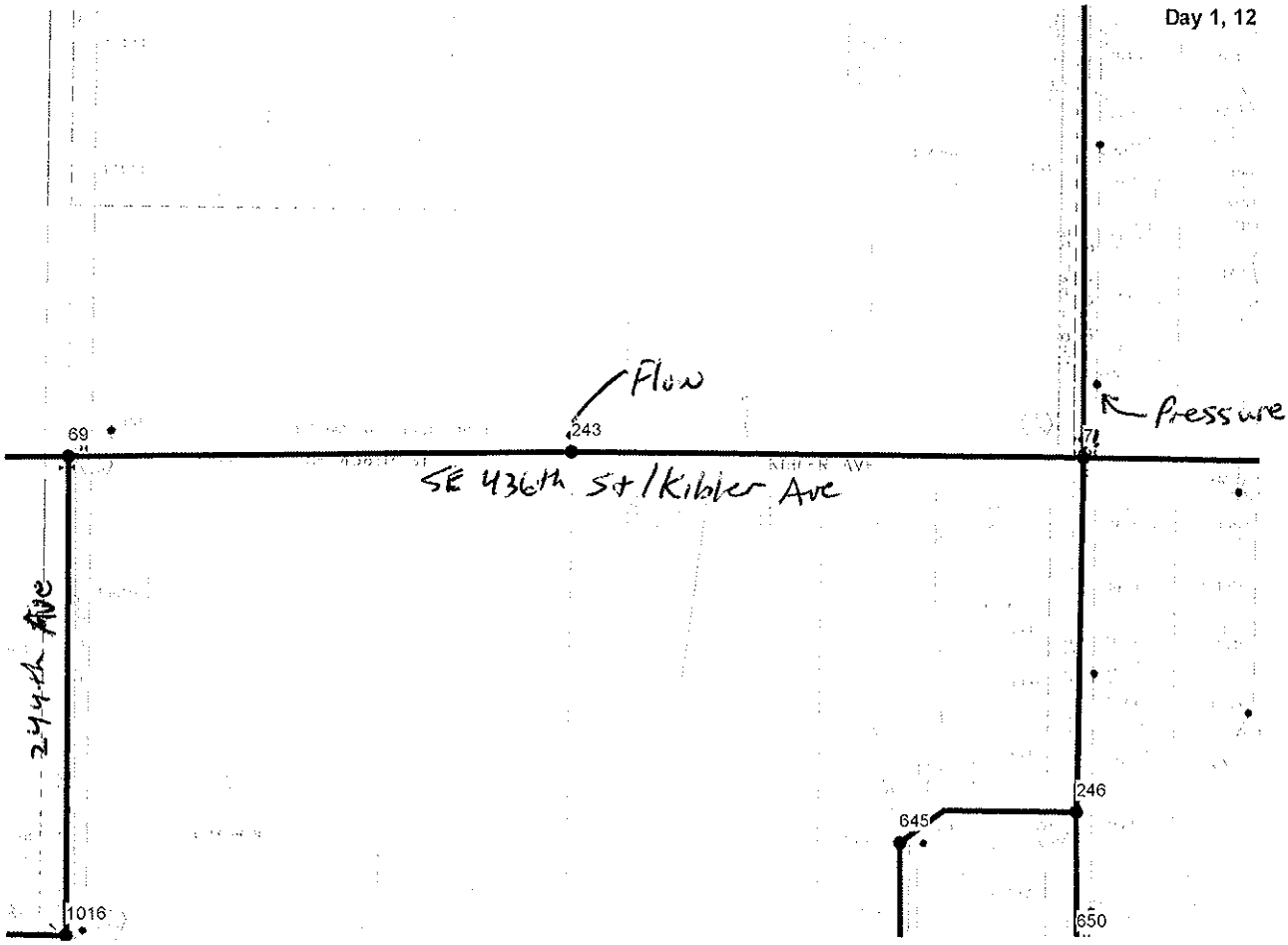
WC/PCT off

City Res 10.7

Crews Res 16.6

Net Demand 1467 gpm

City of Enumclaw Existing Water Model



Water Flow Test Summary Sheet

Device	Outlet Diameter Inches	Pitot Pressures psi	Discharge gpm
Akron	2	44	788
HH Pitot	2 1/2	50	1186

Location (2) SE 436th St

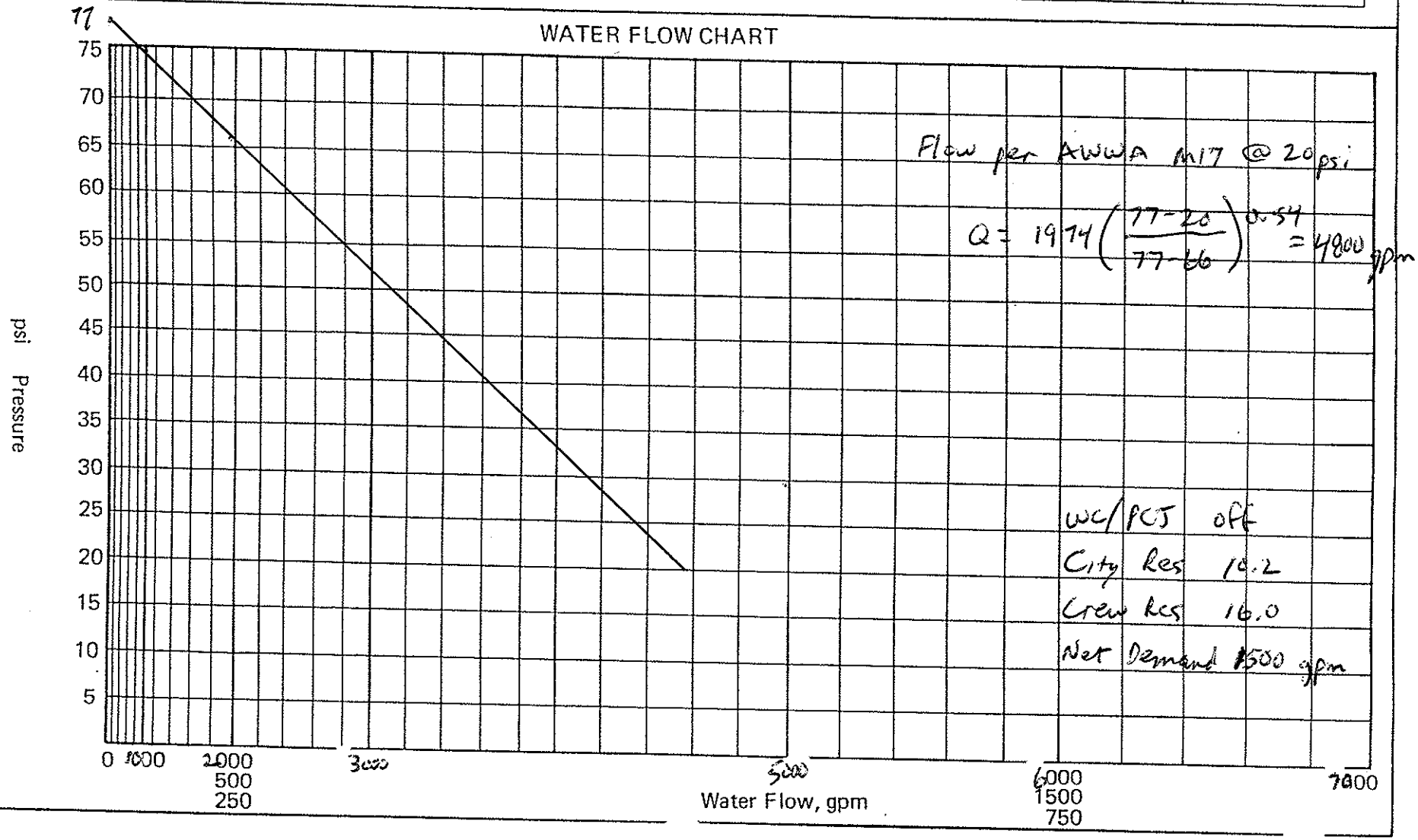
Date 12/12/12 11:10 AM

Static psi 77

Residual psi 66

Total Discharge During Test	Available gpm	
	at 20 psi	at 0 psi
1974 gpm	4580	

WATER FLOW CHART



Flow per AWWA M17 @ 20 psi

$$Q = 1974\left(\frac{77-20}{77-66}\right)^{0.54} = 4800 \text{ gpm}$$

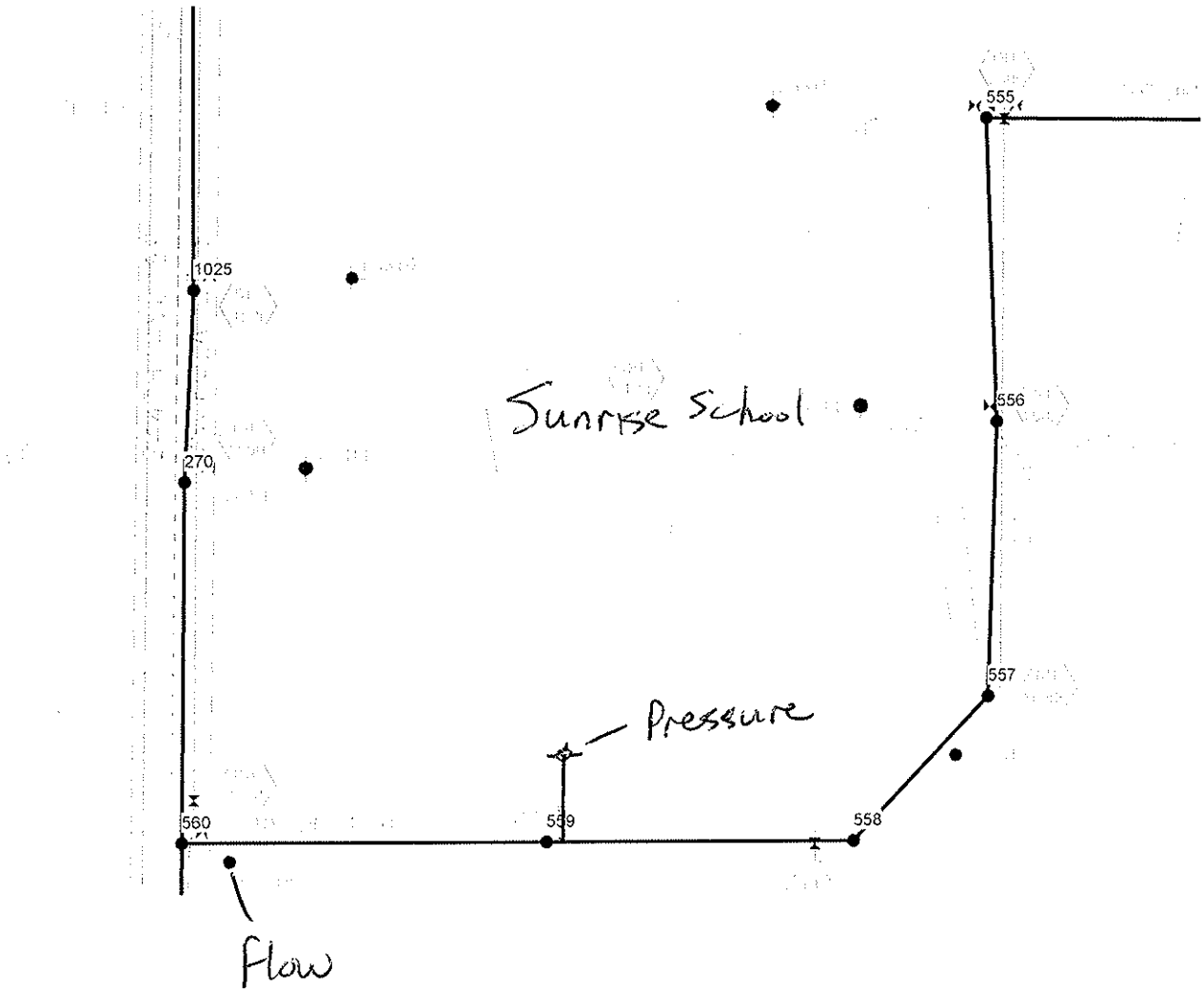
wc/PCJ off

City Res 10.2

Crew Res 16.0

Net Demand 1500 gpm

City of Enumclaw Existing Water Model



Water Flow Test Summary Sheet

Device	Outlet Diameter Inches	Pitot Pressures psi	Discharge, gpm
Akron	2	30	669
Hose Mon	2	17	643

Location: (3) Sunrise School

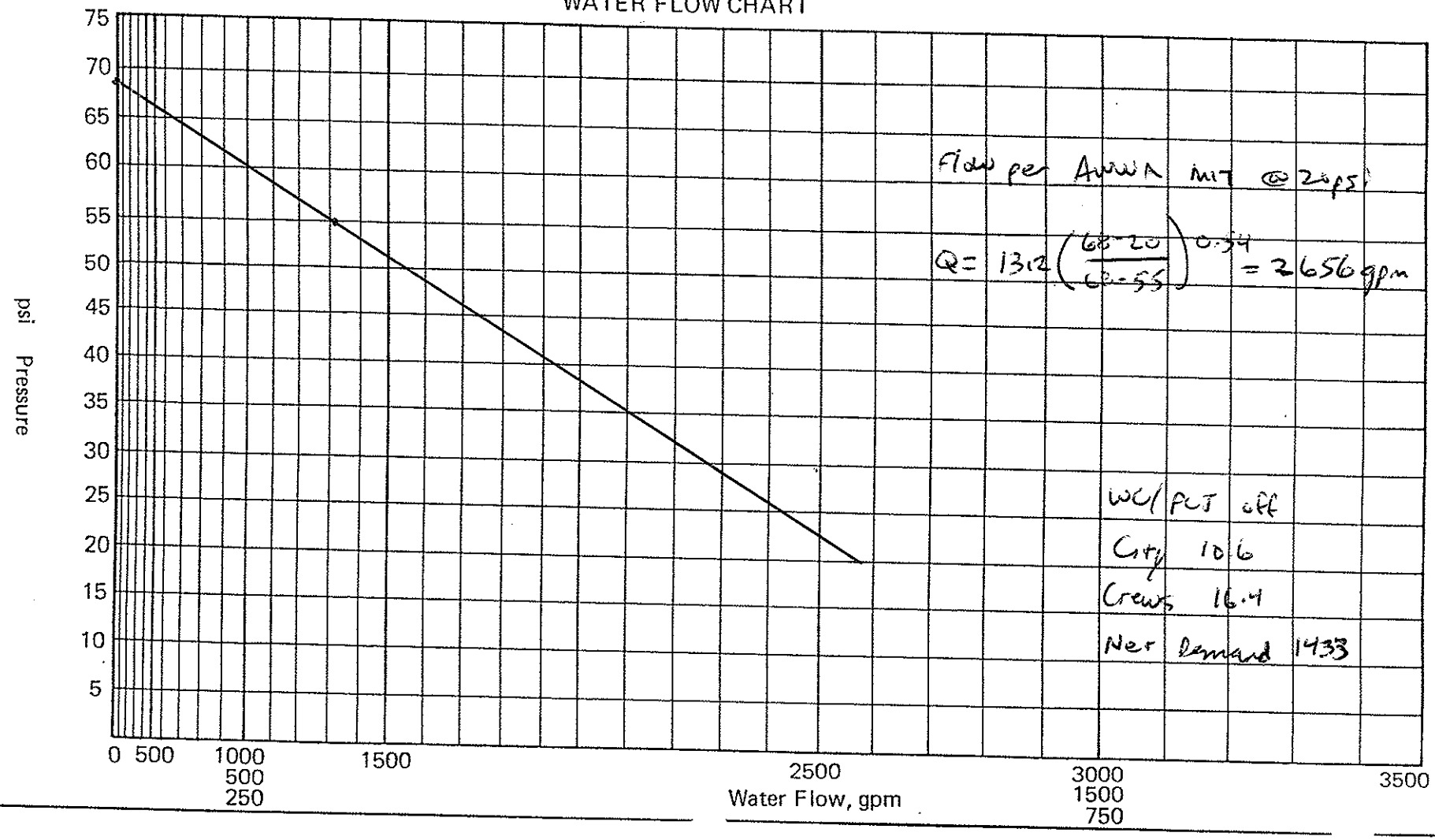
Date: 12/20/12 1 PM

Static psi: 68

Residual psi: 55

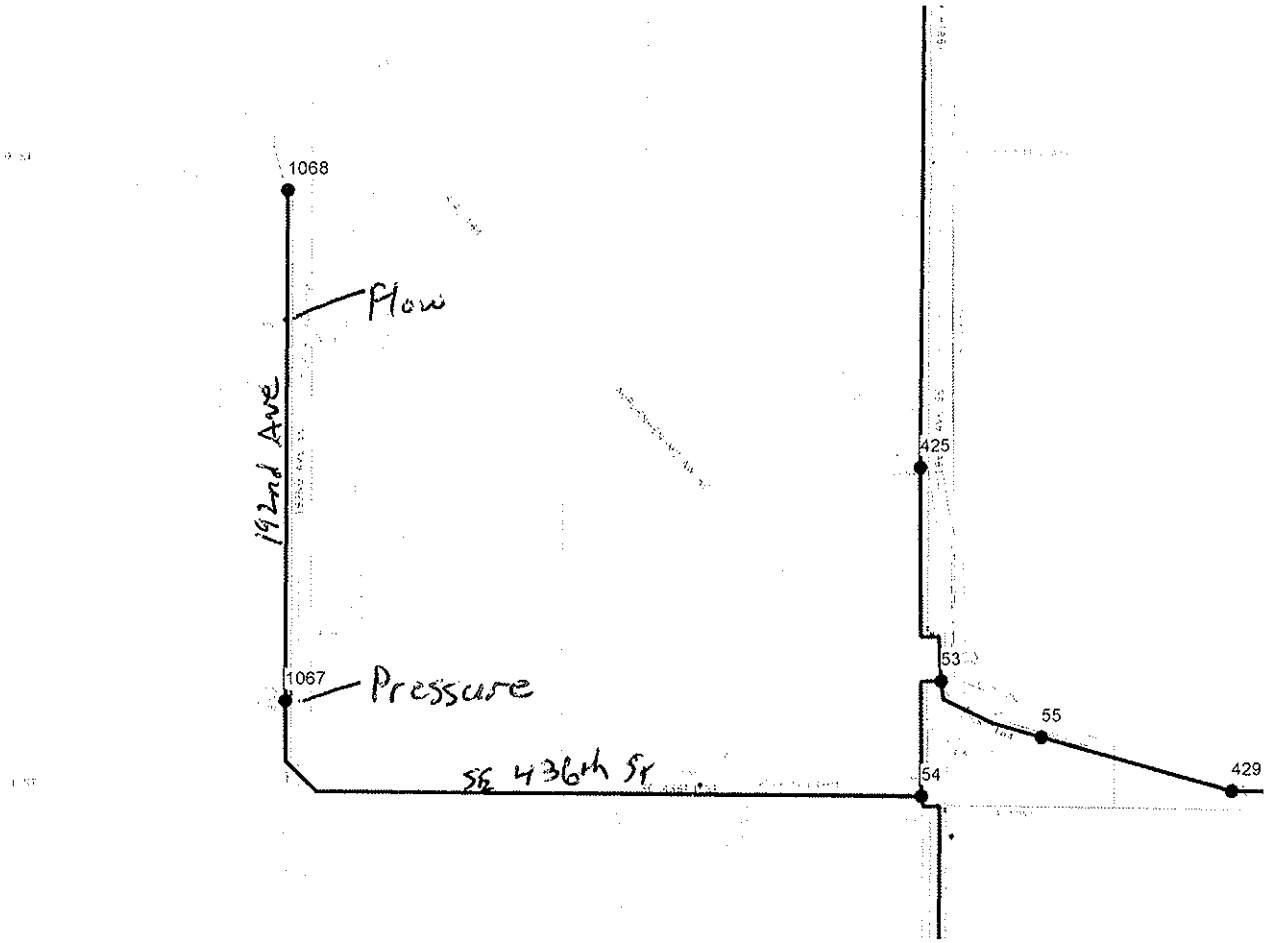
Total Discharge During Test	Available gpm at 20 psi	Available gpm at 0 psi
1312 gpm	2570	

WATER FLOW CHART



4

City of Enumclaw Existing Water Model



City Res 10.5'
Crews 15.0'
WC/PCJ off

Water Flow Test Summary Sheet

Hydrants Nos.	Outlet Diameter Inches	Pitot Pressures psi	Discharge, gpm
1	See attached		
2			

Location (4) FH @ Sta 10+00 on 192nd St
Set in Project 9811 Segment 3&4

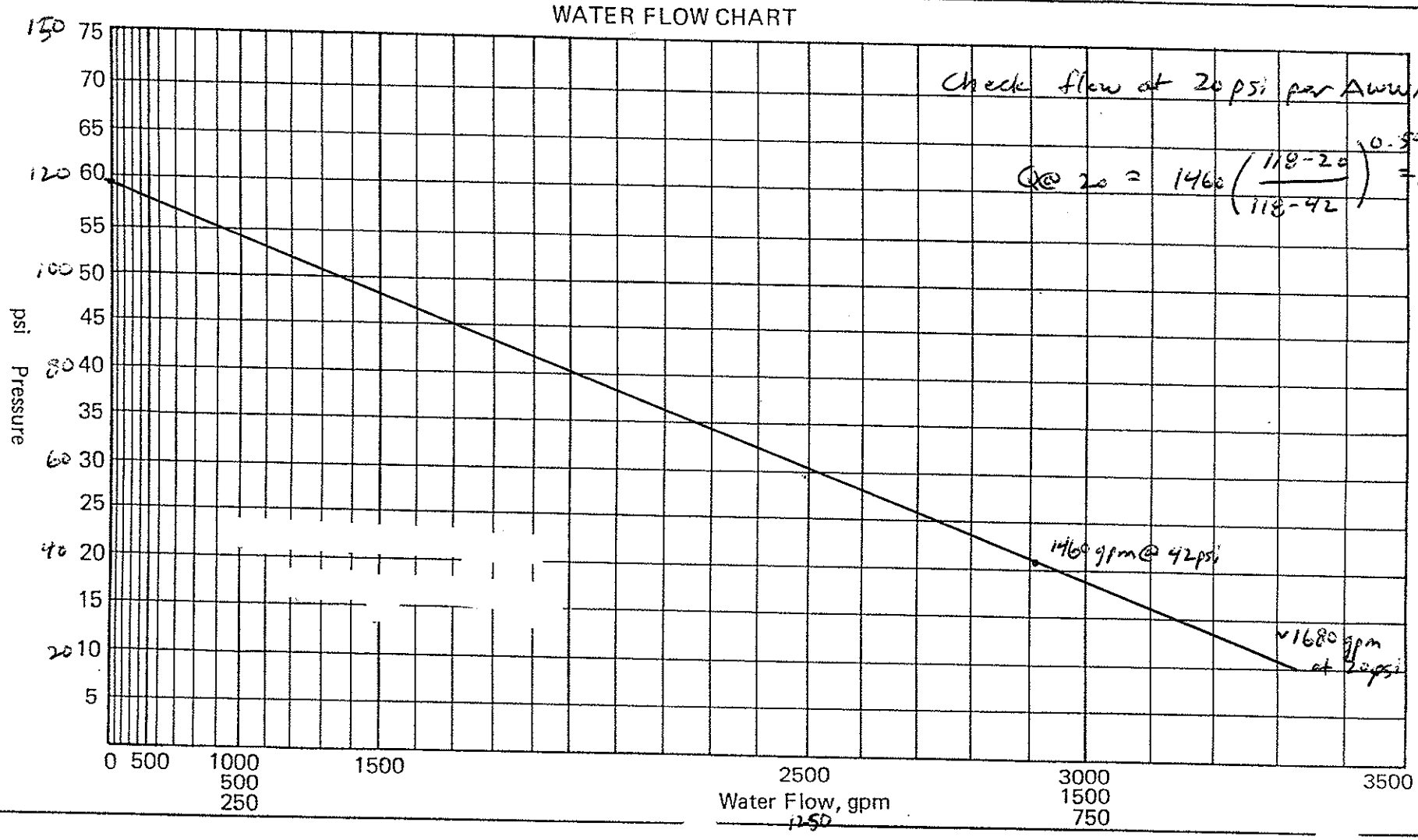
Date 3/1/04 1pm

Static psi 118

Residual psi 42

Total Discharge During Test	Available gpm	
	at 20 psi	at 0 psi
1460 gpm	1680	

WATER FLOW CHART



Check flow at 20 psi per AWWA M17

$$Q_{@20} = 1460\left(\frac{118-20}{118-42}\right)^{0.54} = 1675 \text{ gpm}$$

DISCHARGE TABLE FOR CIRCULAR OUTLETS

Outlet pressure measured by pitot gauge.

Outlet Pres. in lbs. per sq. in.	OUTLET DIAMETER IN INCHES							
	2¼	2 5/16	2⅜	2 7/16	2½	2 9/16	2⅝	2 11/16
	Gallons per Minute							
¼	70	70	80	80	80	90	90	100
½	90	100	110	110	120	120	130	140
¾	120	120	130	140	140	150	160	170
1	140	140	150	160	170	180	180	190
¼	150	160	170	180	190	200	210	220
½	170	180	190	200	210	220	230	240
¾	180	190	200	210	220	230	240	260
2	190	200	210	230	240	250	260	270
¼	200	220	230	240	250	260	280	290
½	220	230	240	250	270	280	290	310
¾	230	240	250	260	280	290	310	320
3	240	250	260	280	290	310	320	340
¼	250	260	270	290	300	320	330	350
½	250	270	280	300	310	330	350	360
¾	260	280	290	310	330	340	360	370
4	270	290	300	320	340	350	370	390
¼	280	300	310	330	350	360	380	400
½	290	300	320	340	360	370	390	410
¾	300	310	330	350	370	380	400	420
5	300	320	340	360	380	390	410	430
¼	310	330	350	370	390	400	420	440
½	320	340	350	370	390	410	430	450
¾	330	340	360	380	400	420	440	460
6	330	350	370	390	410	430	450	470
¼	340	360	380	400	420	440	460	480
½	350	370	390	410	430	450	470	490
¾	350	370	390	410	440	460	480	500
7	360	380	400	420	440	470	490	510
¼	370	390	410	430	450	480	500	520
½	370	390	410	440	460	480	510	530
¾	380	400	420	440	470	490	510	540
8	380	410	430	450	480	500	520	550
¼	390	420	430	460	480	510	530	560
½	400	420	440	460	490	510	540	560
¾	400	420	450	470	500	520	550	570
9	410	430	450	480	500	530	550	580
¼	410	440	460	480	510	540	560	580
½	420	440	470	490	520	540	570	600
¾	420	450	470	500	520	550	580	600
10	430	450	480	500	530	560	580	610

DISCHARGE TABLE FOR CIRCULAR OUTLETS

Outlet pressure measured by pitot gauge.

Outlet Pres. in lbs. per sq. in.	OUTLET DIAMETER IN INCHES							
	2¼	2 5/16	2⅜	2 7/16	2½	2 9/16	2⅝	2 11/16
	Gallons per Minute							
10¼	440	460	490	510	540	570	590	620
½	440	470	490	520	540	570	600	630
¾	450	470	500	520	550	580	610	630
11	450	480	500	530	560	590	610	640
¼	460	480	510	530	560	590	620	650
½	460	490	510	540	570	600	630	660
¾	470	490	520	550	580	600	630	660
12	470	500	520	550	580	610	640	670
½	480	510	540	560	590	620	650	680
13	490	520	550	570	610	640	670	700
½	500	530	560	590	620	650	680	710
14	510	540	570	600	630	660	690	730
½	520	550	580	610	640	670	700	740
15	530	560	590	620	650	680	720	750
½	540	570	600	630	660	700	730	760
16	540	570	610	640	670	710	740	780
½	550	580	620	650	680	720	750	790
17	560	590	620	660	690	730	760	800
½	570	600	630	670	700	740	770	810
18	580	610	640	680	710	750	780	820
½	590	620	650	690	720	760	790	820
19	590	630	660	700	730	770	810	840
½	600	640	670	700	740	780	820	860
20	610	640	680	710	750	790	830	870
21	620	660	690	730	770	810	850	890
22	640	670	710	750	790	830	870	910
23	650	690	730	760	810	850	890	930
24	670	700	740	780	820	860	910	950
25	680	720	760	800	840	880	920	970
26	690	730	770	810	860	900	940	990
27	710	750	790	830	870	920	960	1010
28	720	760	800	840	890	930	970	1020
29	730	770	820	860	910	950	990	1040
30	750	790	830	870	920	970	1010	1060
31	760	800	840	890	940	980	1030	1080
32	770	810	860	900	950	1000	1040	1100
33	780	830	870	920	970	1010	1060	1110
34	790	840	880	930	980	1030	1070	1130
35	810	850	900	940	990	1040	1090	1140
36	820	860	910	960	1010	1060	1110	1160

Coefficient .8

For outlet pressures above 36 pounds per square inch for 2½-inch outlet diameter = Table value (g.p.m.) = 167.79 √P.

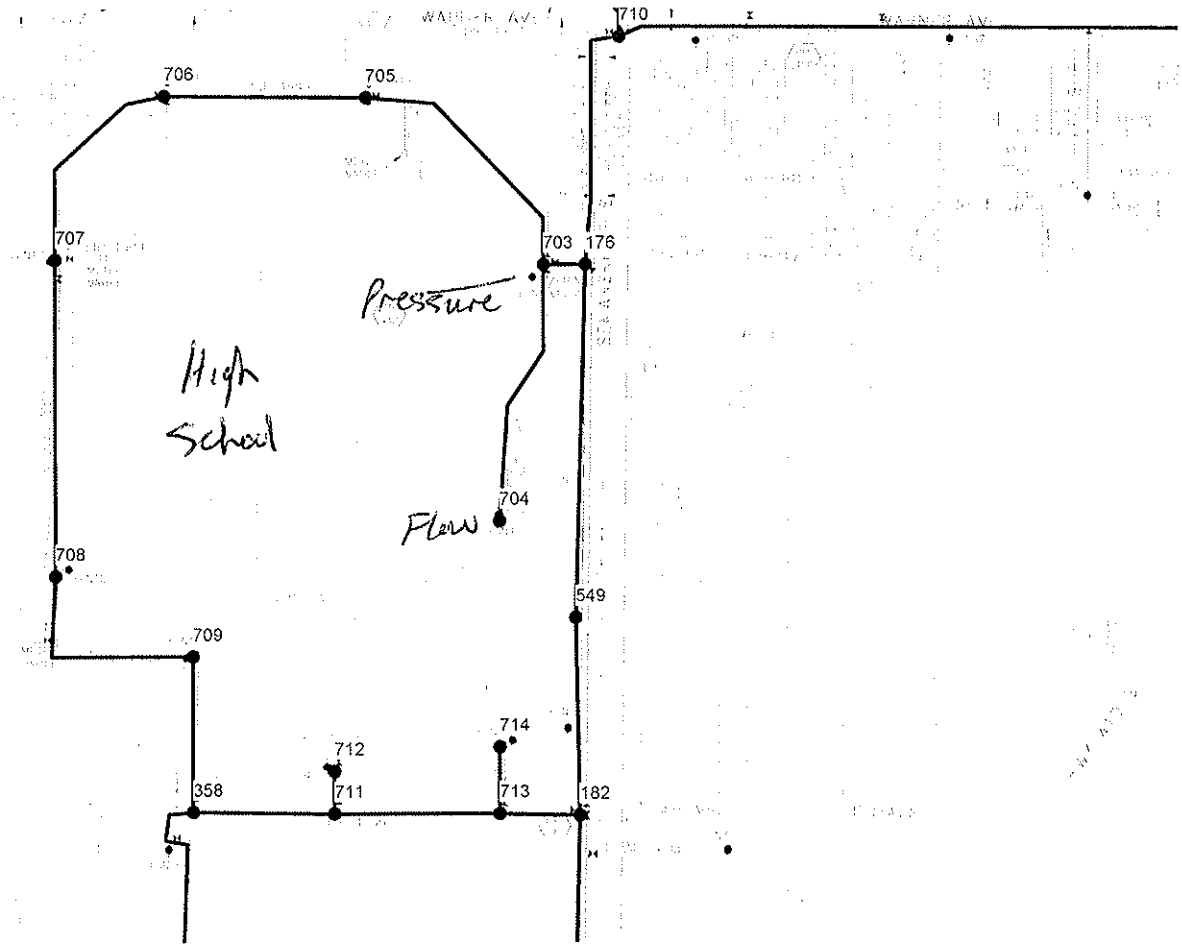
P = Pitot discharge pressure.

Total Flow = 650 + 810 = 1460

Hydrant Testing Figure 3

5

City of Enumclaw Existing Water Model



Water Flow Test Summary Sheet

Device	Outlet Diameter Inches	Pitot Pressures psi	Discharge gpm
Hose Man	2	18	662
Akron	2	32	686

Location (5) High School

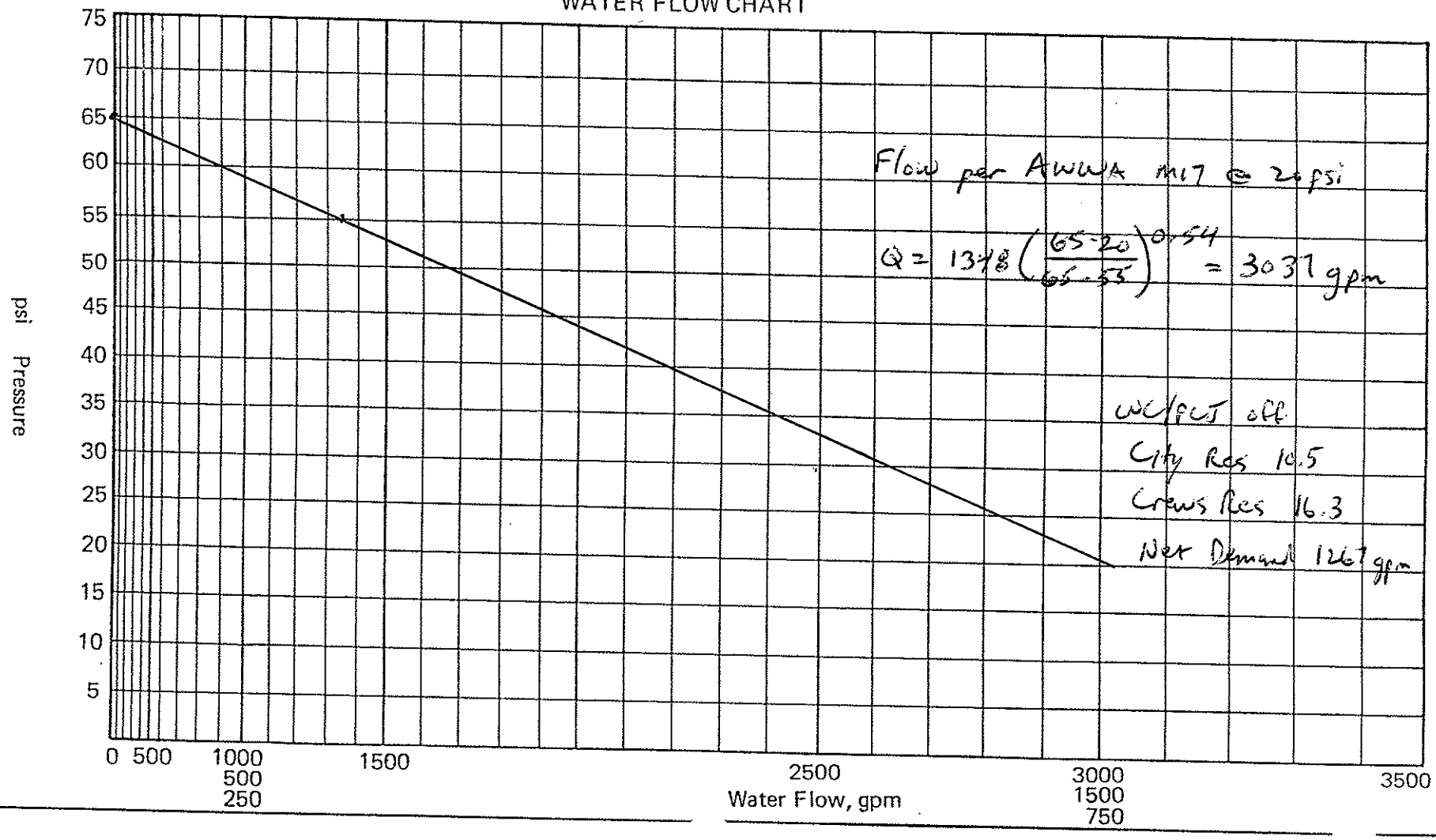
Date 12/19/12 12:30 pm

Static psi 65

Residual psi 55

Total Discharge During Test	Available gpm at 20 psi	Available gpm at 0 psi
1348 gpm	3020	

WATER FLOW CHART



Flow per AWWA M17 @ 20 psi

$Q = 1348\left(\frac{65-20}{65-55}\right)^{0.54} = 3037$ gpm

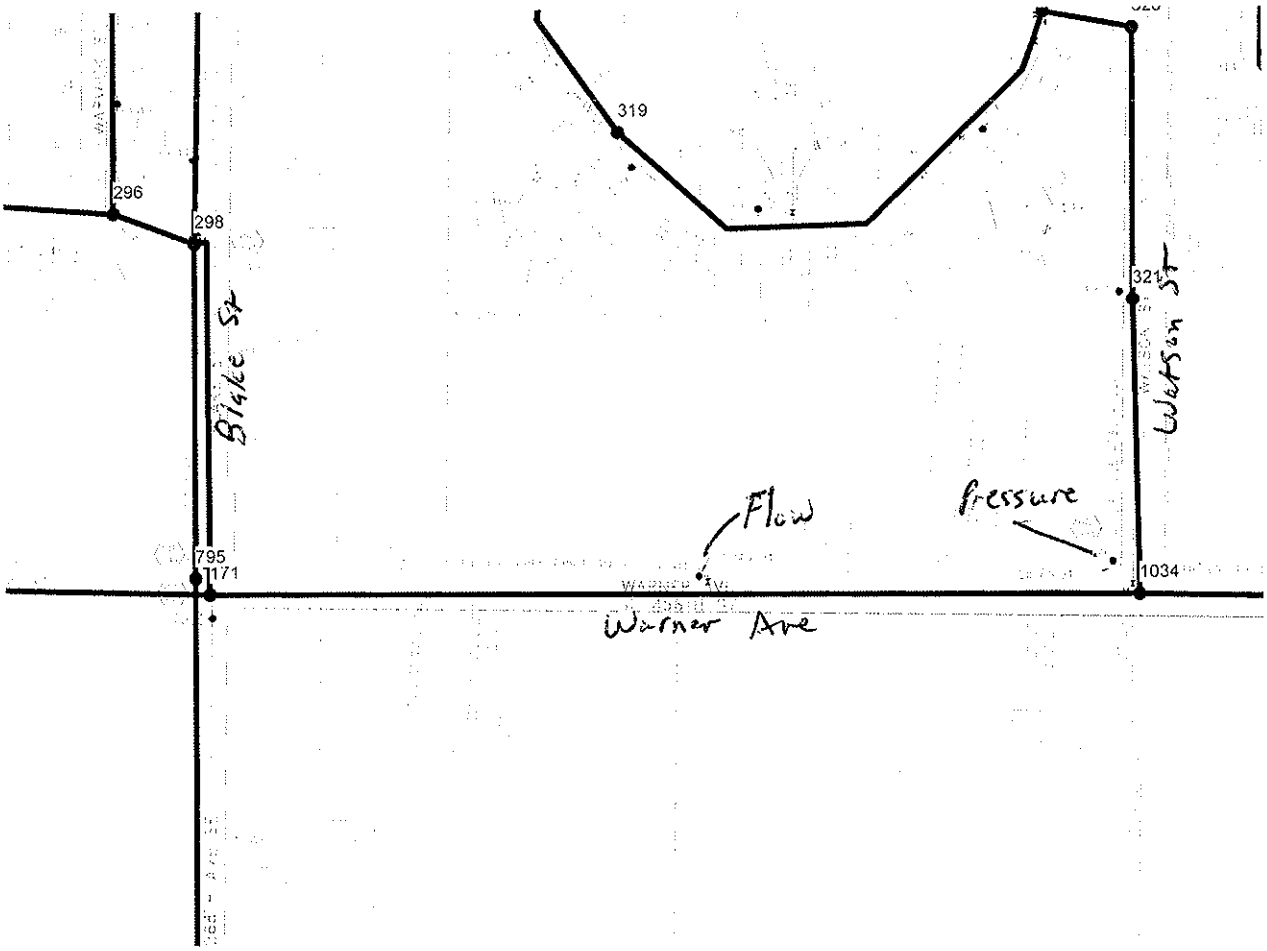
WC/PCT off

City Res 10.5

Crews Res 16.3

Net Demand 1267 gpm

City of Enumclaw Existing Water Model



Water Flow Test Summary Sheet

Device	Outlet Diameter Inches	Pitot Pressures psi	Discharge, gpm
Hose Mon	2	18	662
Akron	2	32	686

Location ⑥ Warner Ave

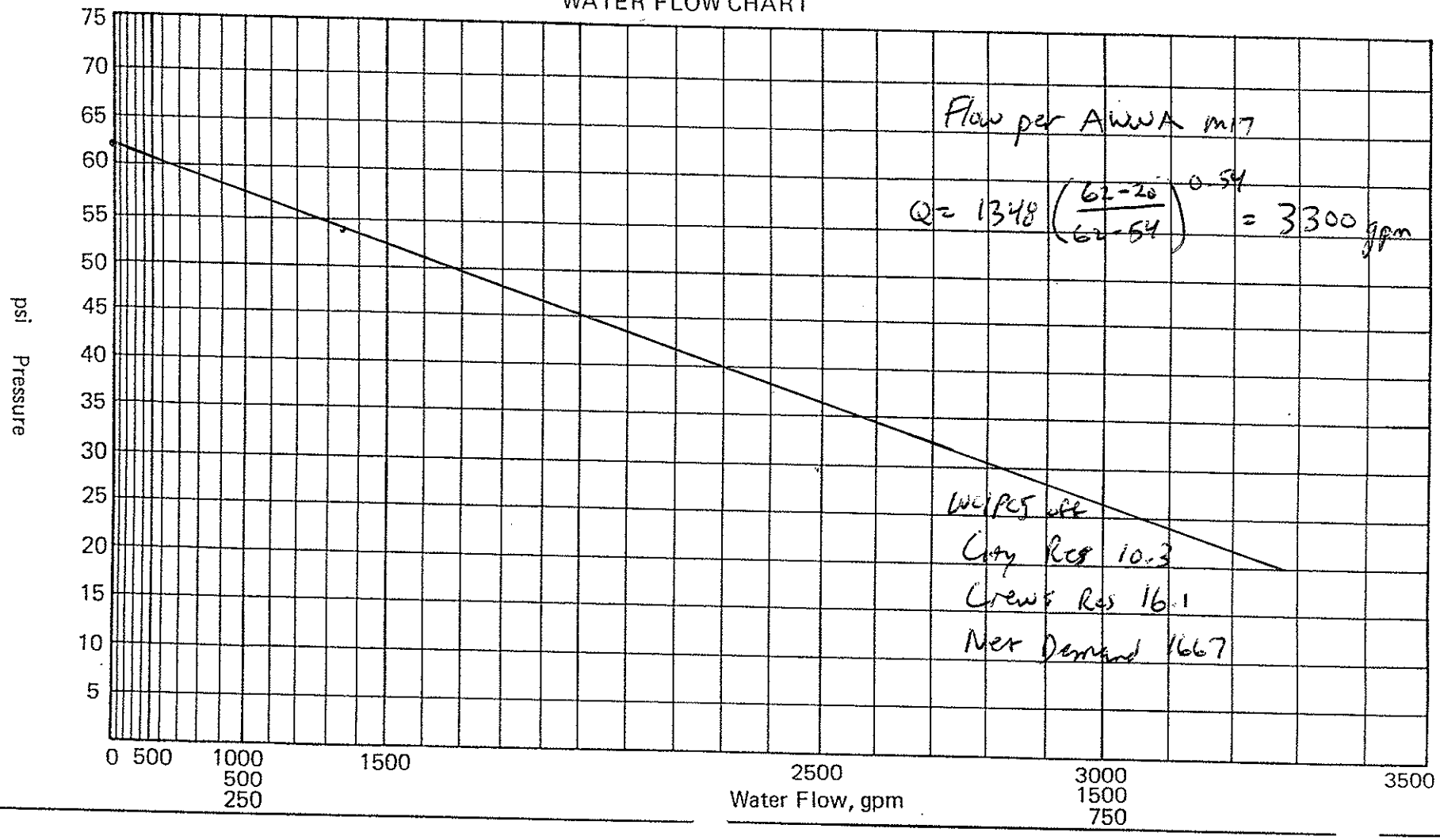
Date 12/17/12 12:45 Pm

Static psi 62

Residual psi 54

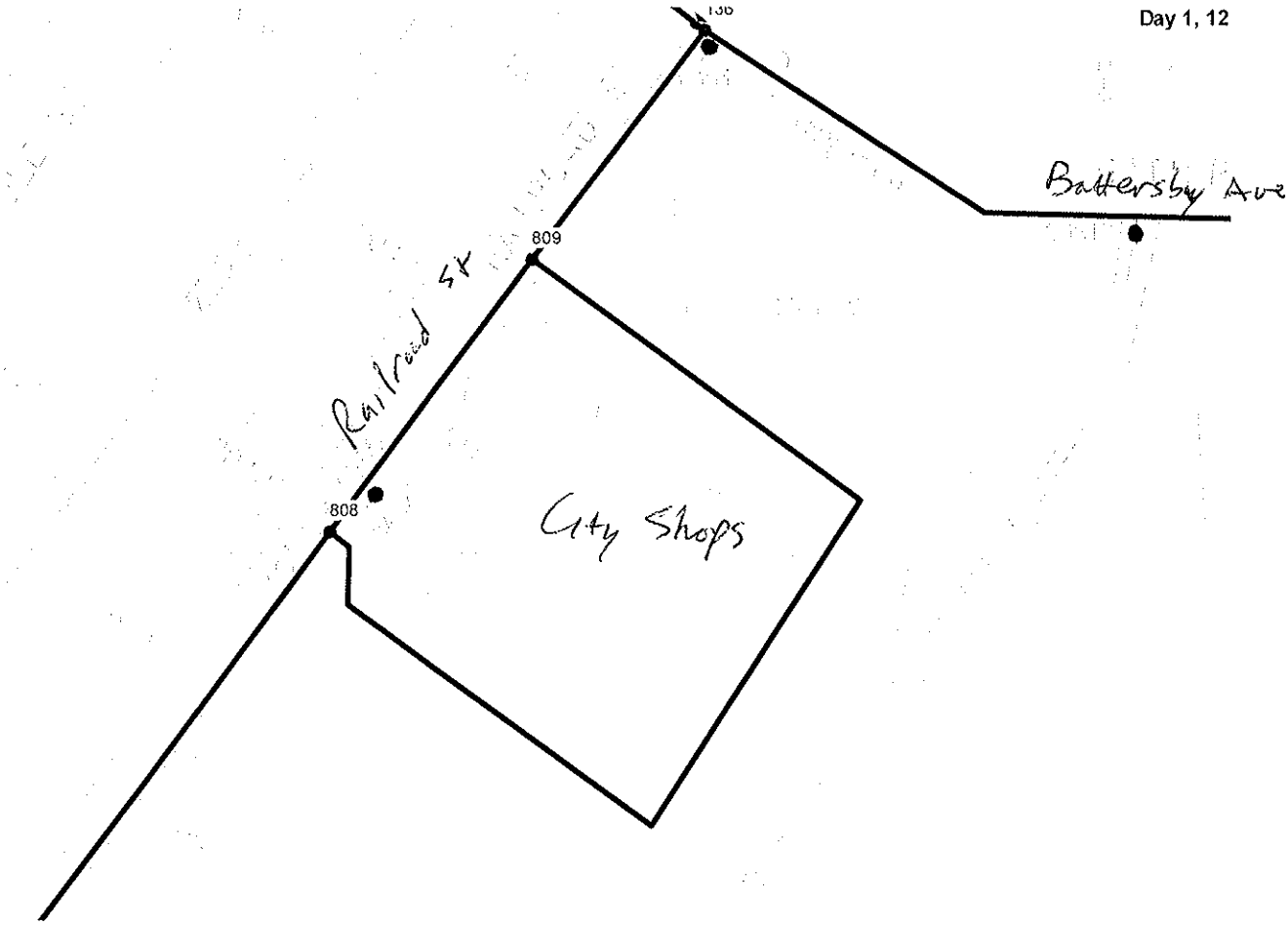
Total Discharge During Test	Available gpm	
	at 20 psi	at 0 psi
1348 gpm	3280	

WATER FLOW CHART



City of Enumclaw Existing Water Model

Day 1, 12



Water Flow Test Summary Sheet

Device	Outlet Diameter Inches	Pitot Pressures psi	Discharge, gpm
Hose Mon	2	20	698
Akron	2	38	737

Location ① City Shops

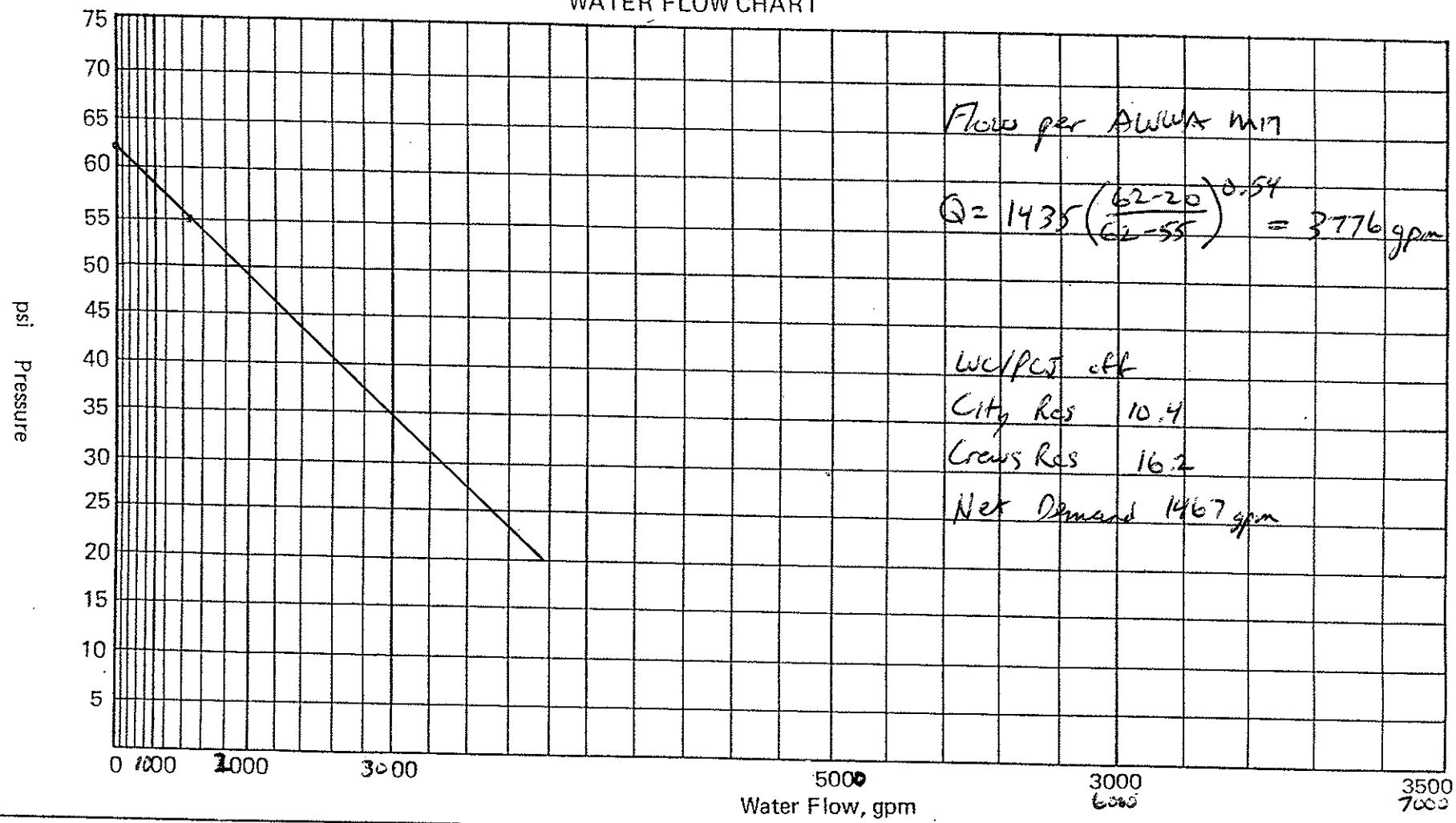
Date 12/17/12 12:20pm

Static psi 62

Residual psi 55

Total Discharge During Test	Available gpm	
	at 20 psi	at 0 psi
1435 gpm	3760	

WATER FLOW CHART



Flow per AWWA M17

$$Q = 1435\left(\frac{62-20}{62-55}\right)^{0.54} = 3776 \text{ gpm}$$

WC/PCJ off

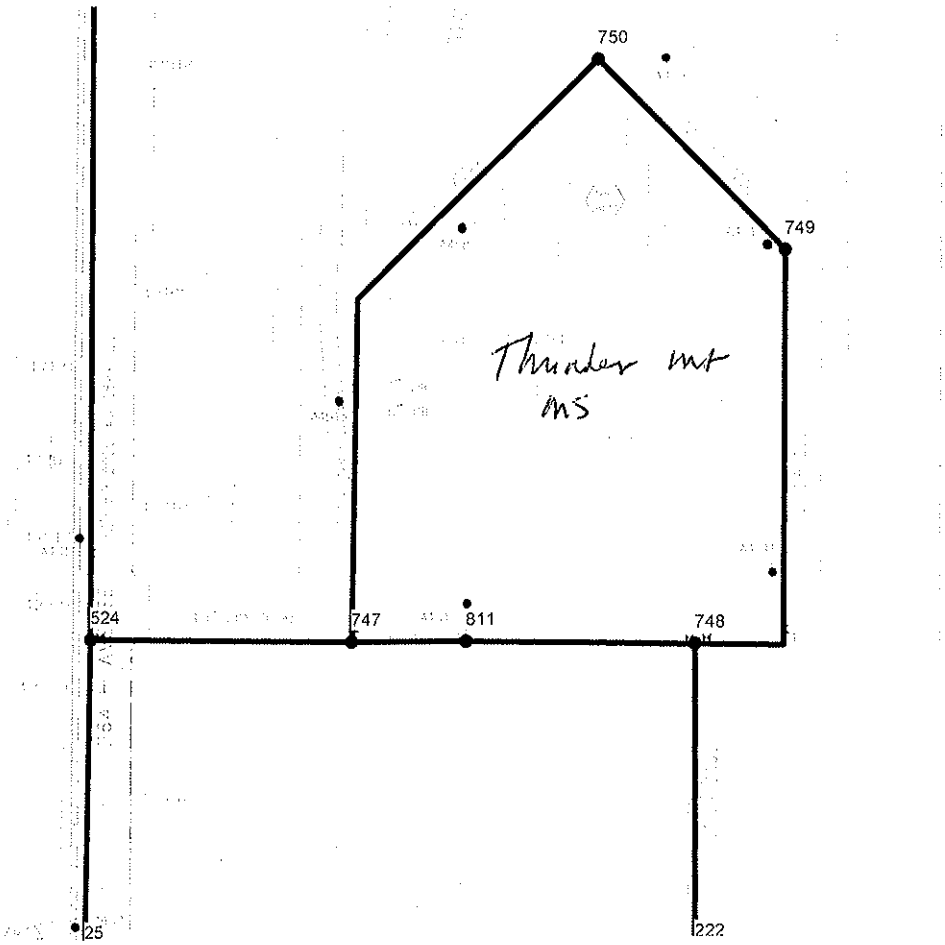
City Res 10.4

Crews Res 16.2

Net Demand 1467 gpm

City of Enumclaw Existing Water Model□□□□□□□□□

Day 1, 12



Water Flow Test Summary Sheet

Device	Outlet Diameter Inches	Pitot Pressures psi	Discharge, gpm
Hose Mon	2	22	784
Akron	2	37	728

Location (8) Thunder Mt. MS

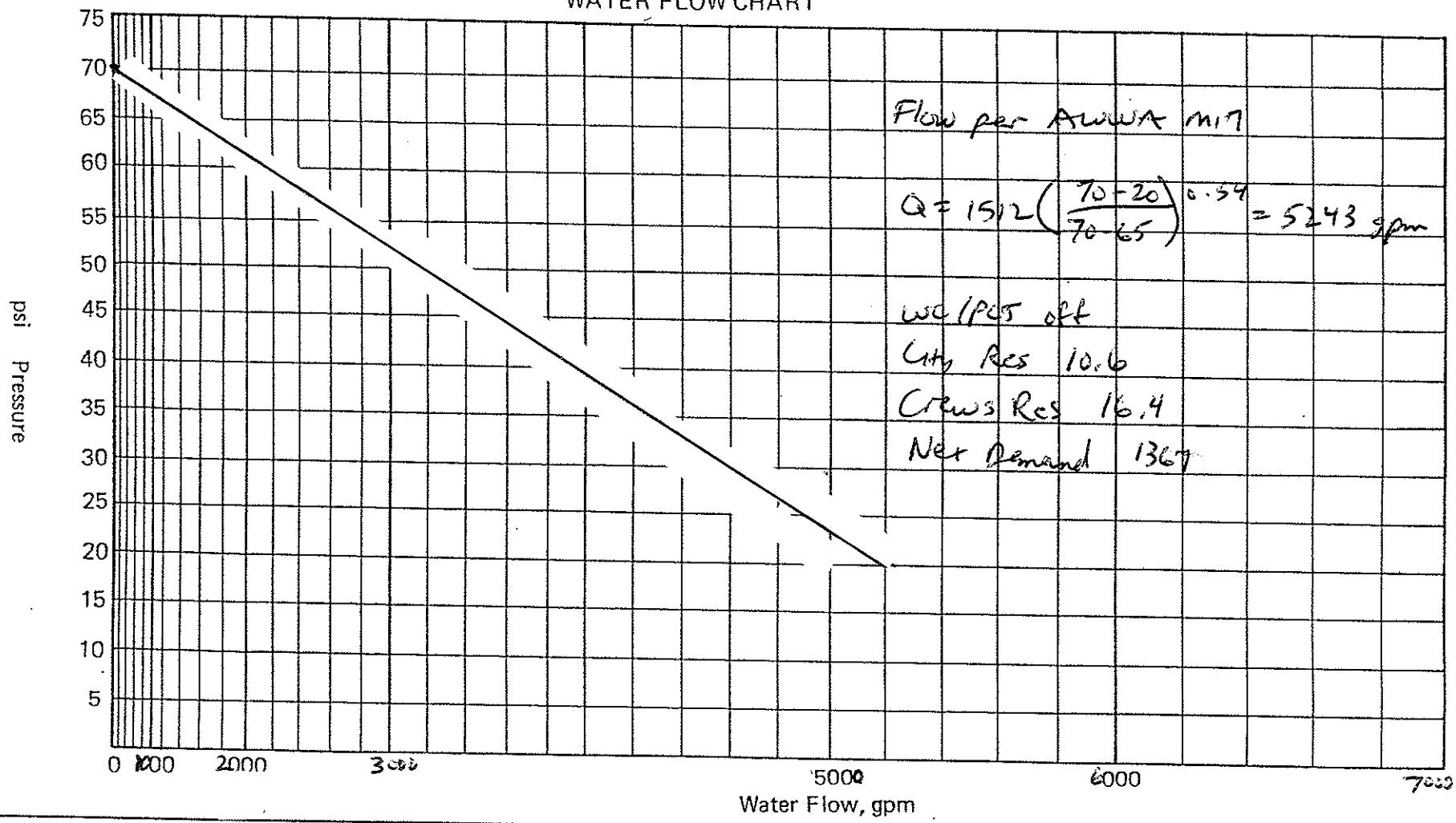
Date 12/19/12 11 AM

Static psi 70

Residual psi 65

Total Discharge During Test	Available gpm	
	at 20 psi	at 0 psi
1512 gpm	5200	

WATER FLOW CHART



Flow per AWWA M17

$$Q = 1512\left(\frac{70-20}{70-65}\right)^{0.54} = 5243 \text{ gpm}$$

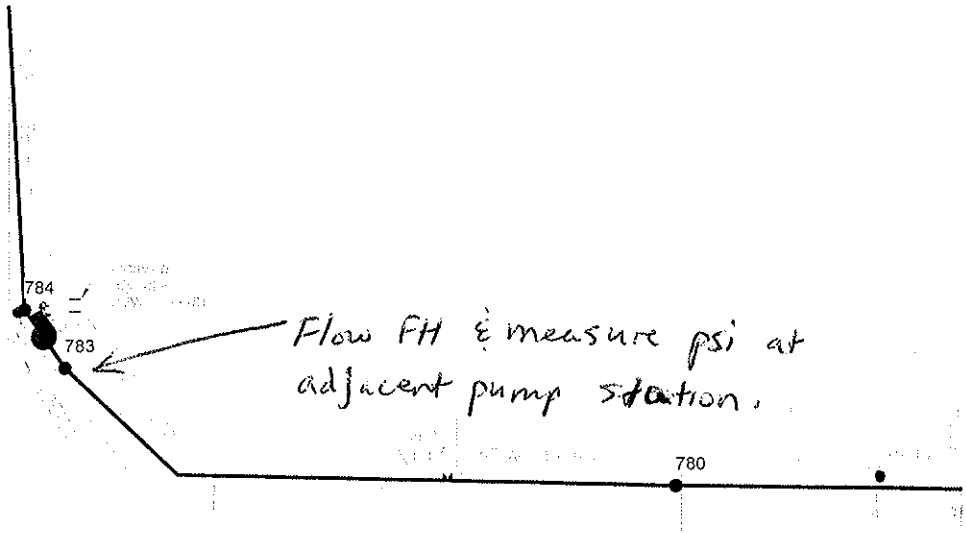
WC/PCS off

City Res 10.6

Crews Res 16.4

Net Demand 1367

City of Enumclaw Existing Water Model



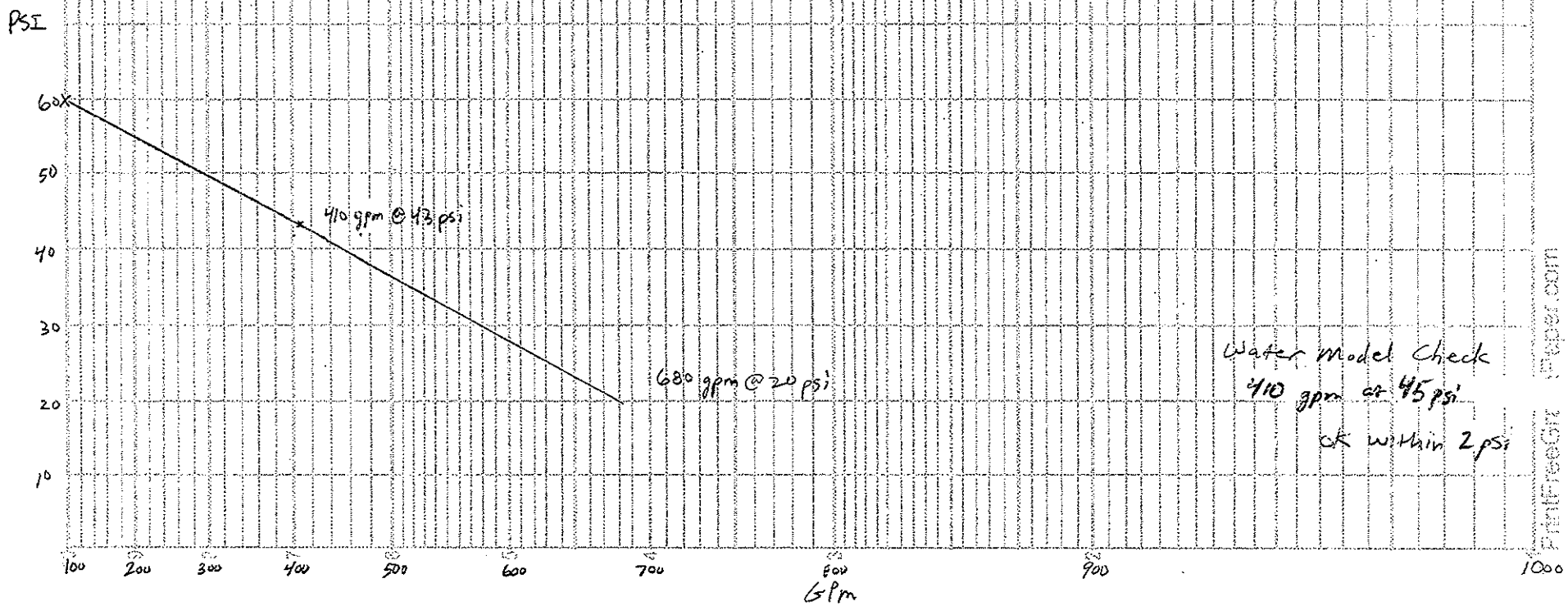
FH Flow Test 2/5/10 ~1 pm

39520 254th Ave SE

City Res 10.7
Crews Res 16.3
WC Source Off
Boise ~ 900 gpm
PC/Tacoma off

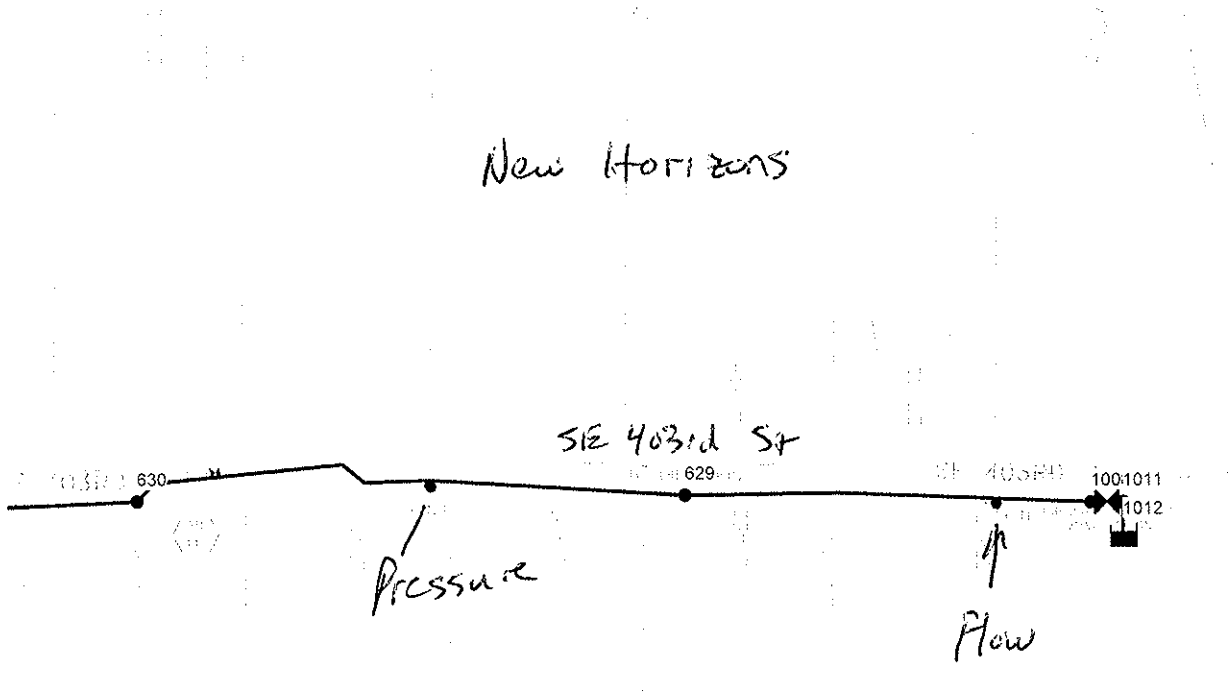
Flow @ 20 psi per AWWA M17

$$Q @ 20 = 410 \left(\frac{60-20}{60-43}\right)^{0.54} = 651 \text{ gpm}$$



Water Model Check
410 gpm at 45 psi
OK within 2 psi

City of Enumclaw Existing Water Model



Water Flow Test Summary Sheet

Dence	Outlet Diameter Inches	Pitot Pressures psi	Discharge gpm
Hose Mon	2	18	662

Location (10) New Horizons

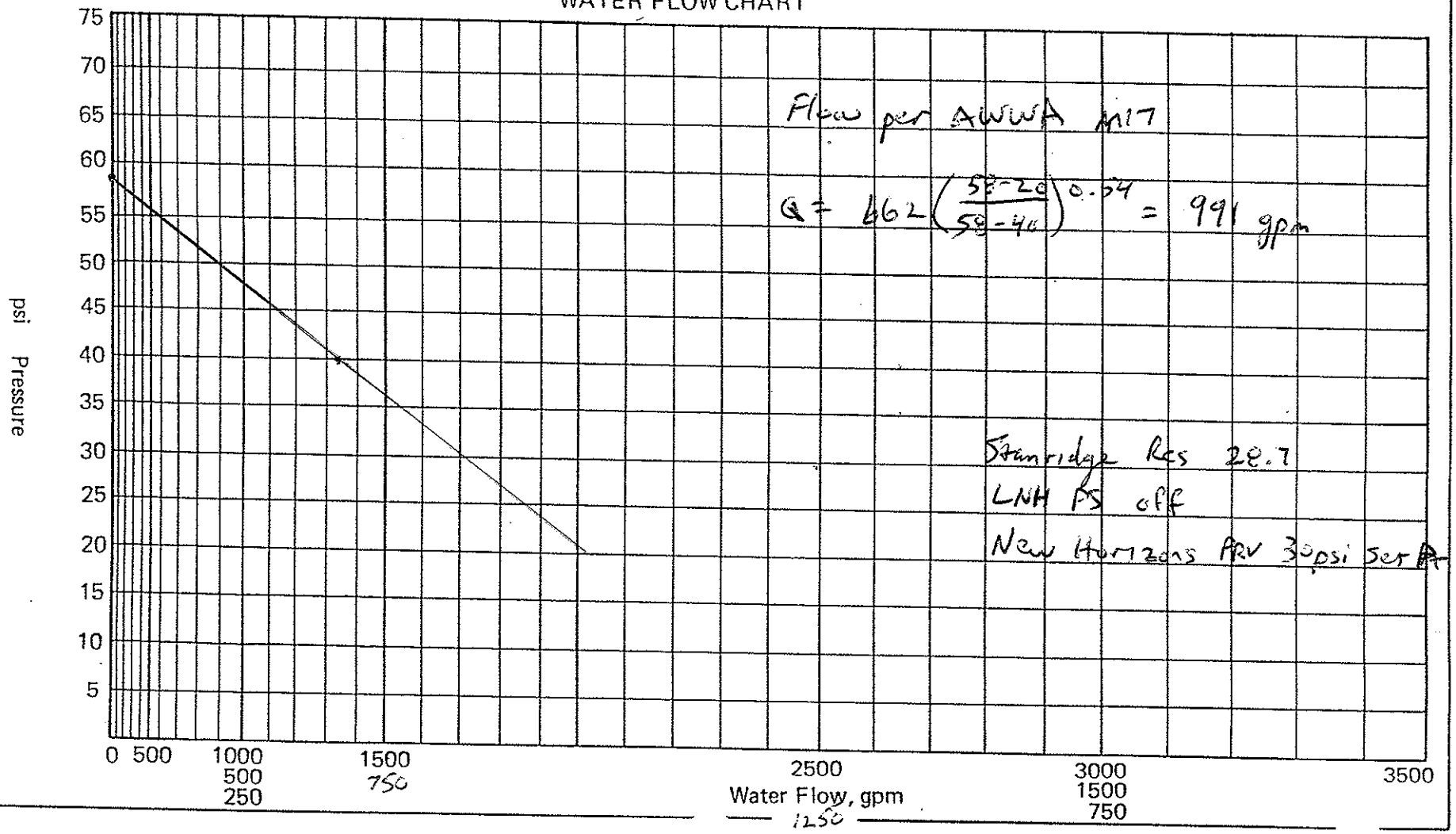
Date 12/17/12 1:10 Pm

Static psi 58

Residual psi 40

Total Discharge During Test	Available gpm	
	at 20 psi	at 0 psi
662 gpm	1010	

WATER FLOW CHART



Flow per AWWA M17

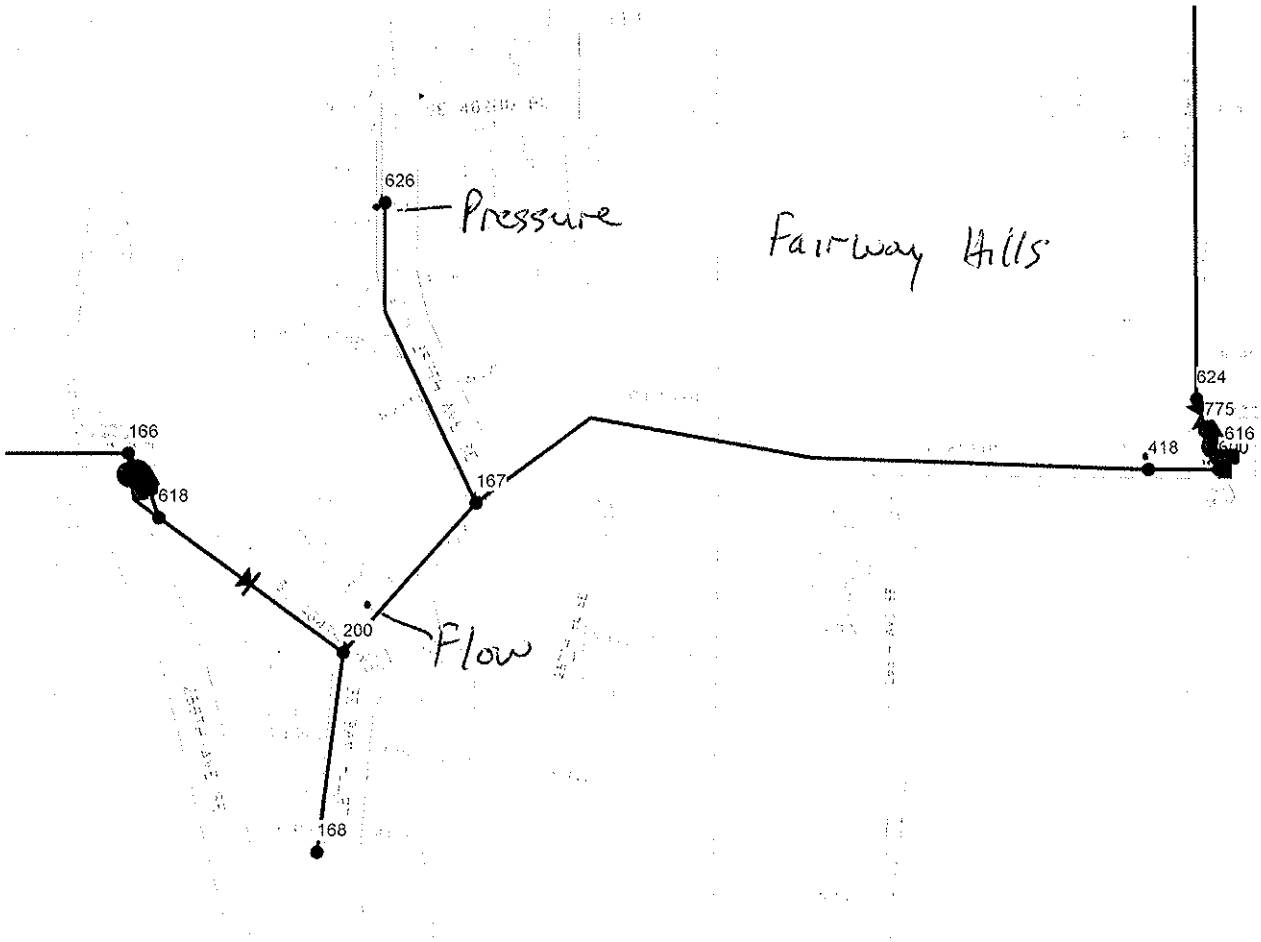
$Q = 662\left(\frac{58-20}{58-40}\right)^{0.54} = 991$ gpm

Stanridge Res 28.7

LNH PS off

New Horizons PRV 30psi Set Pr

City of Enumclaw Existing Water Model



Water Flow Test Summary Sheet

Device	Outlet Diameter Inches	Pitot Pressures psi	Discharge, gpm
Akron	2	35	711

Location (11) Fairway Hills

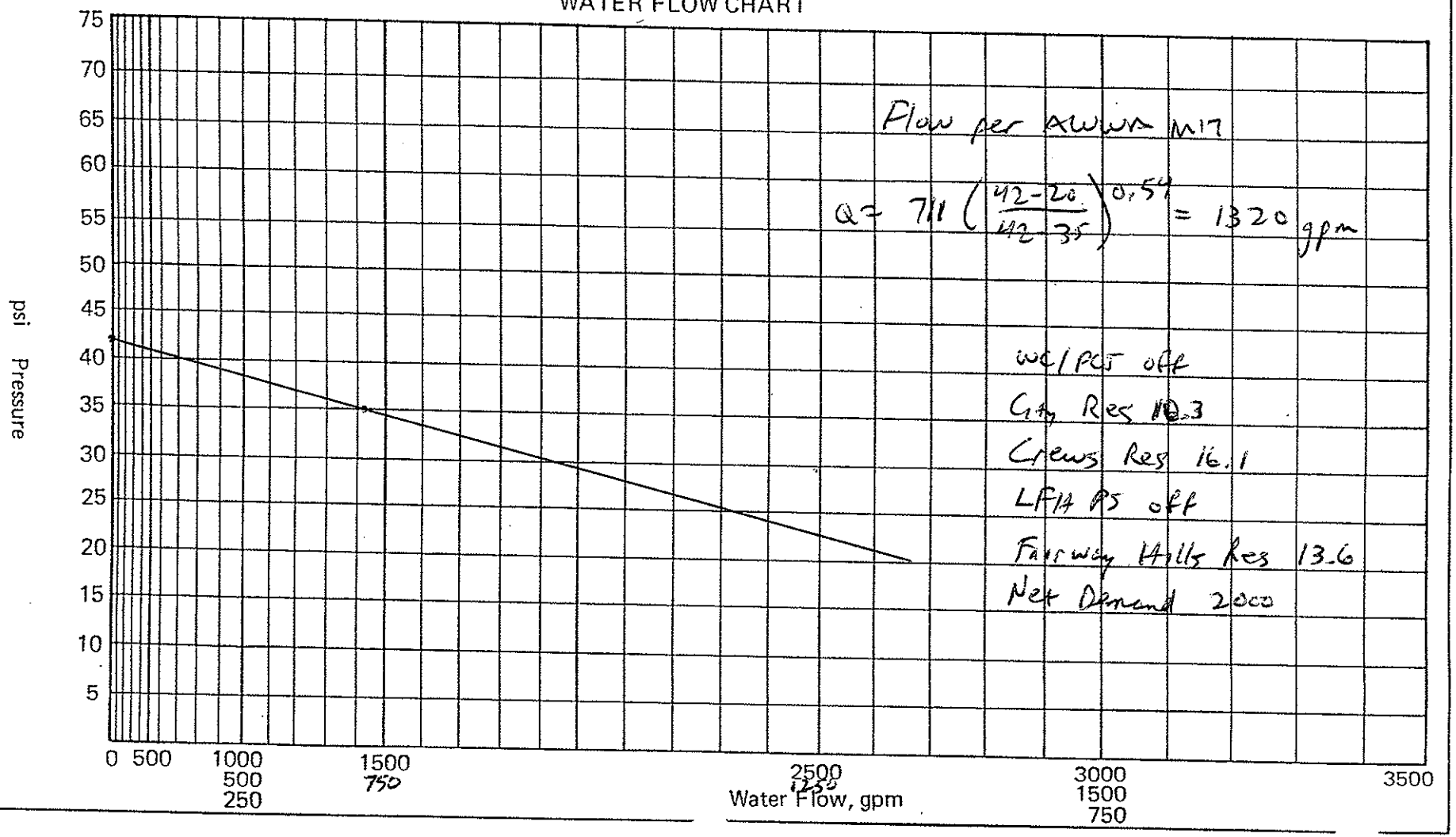
Date 12/12/12 10:40 Am

Static psi 42

Residual psi 35

Total Discharge During Test	Available gpm	
	at 20 psi	at 0 psi
711 gpm	1330	

WATER FLOW CHART



Flow per AWWA M17

$Q = 711 \left(\frac{42-20}{42-35}\right)^{0.54} = 1320$ gpm

WC/PCJ off

City Res 10.3

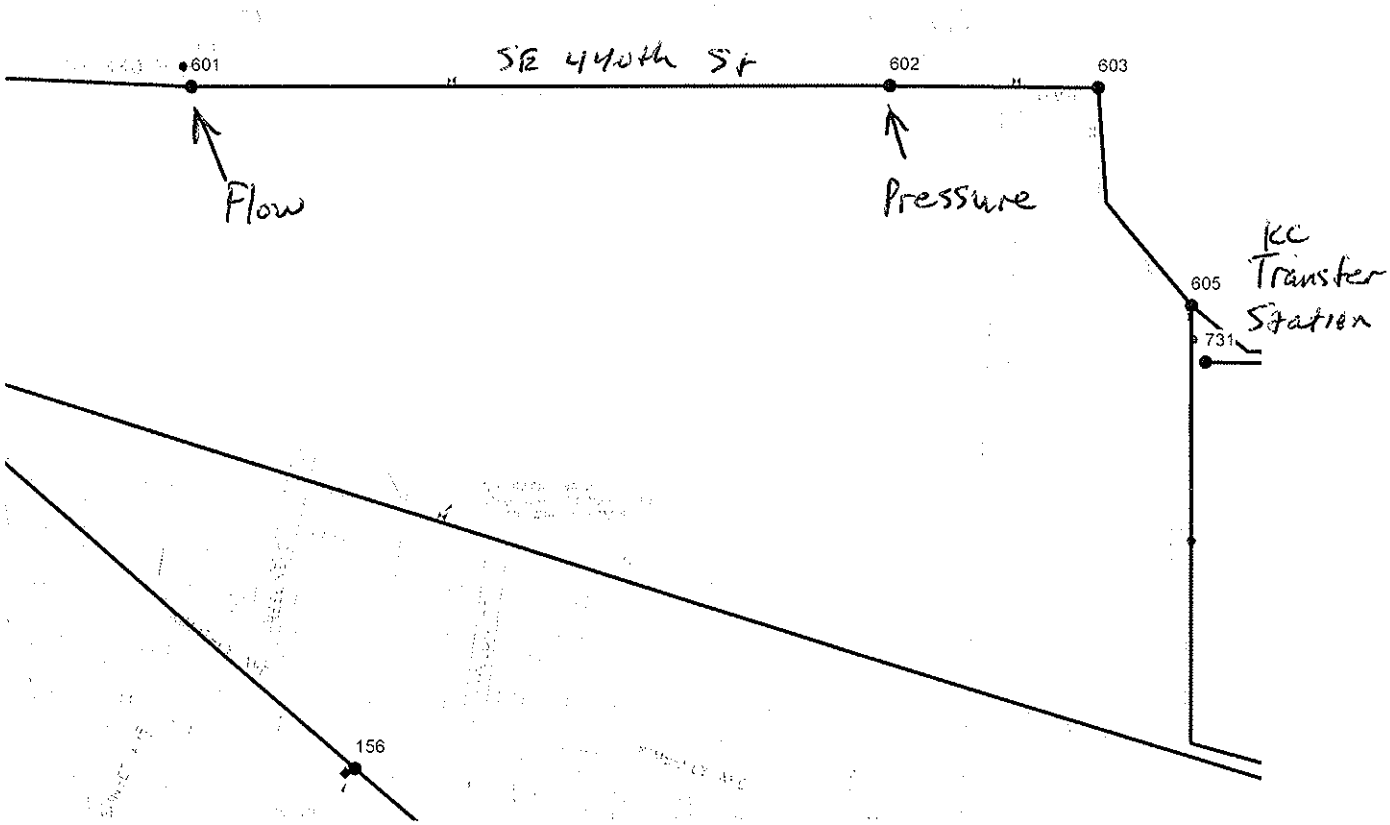
Crews Res 16.1

LFH PS off

Fairway Hills Res 13.6

Net Demand 2000

City of Enumclaw Existing Water Model



Flow and pressure from Jim Pierce.

Water Flow Test Summary Sheet

Hydrants Nos.	Outlet Diameter Inches	Pitot Pressures psi	Discharge, gpm
1	2 1/2	29	730
2	2 1/2	31	760
Flow 1st FH west of Pressure Gage Location (see right)			

Location: Pressure gage at FH north side of SE 44th St opposite west entrance to KC Transfer Station

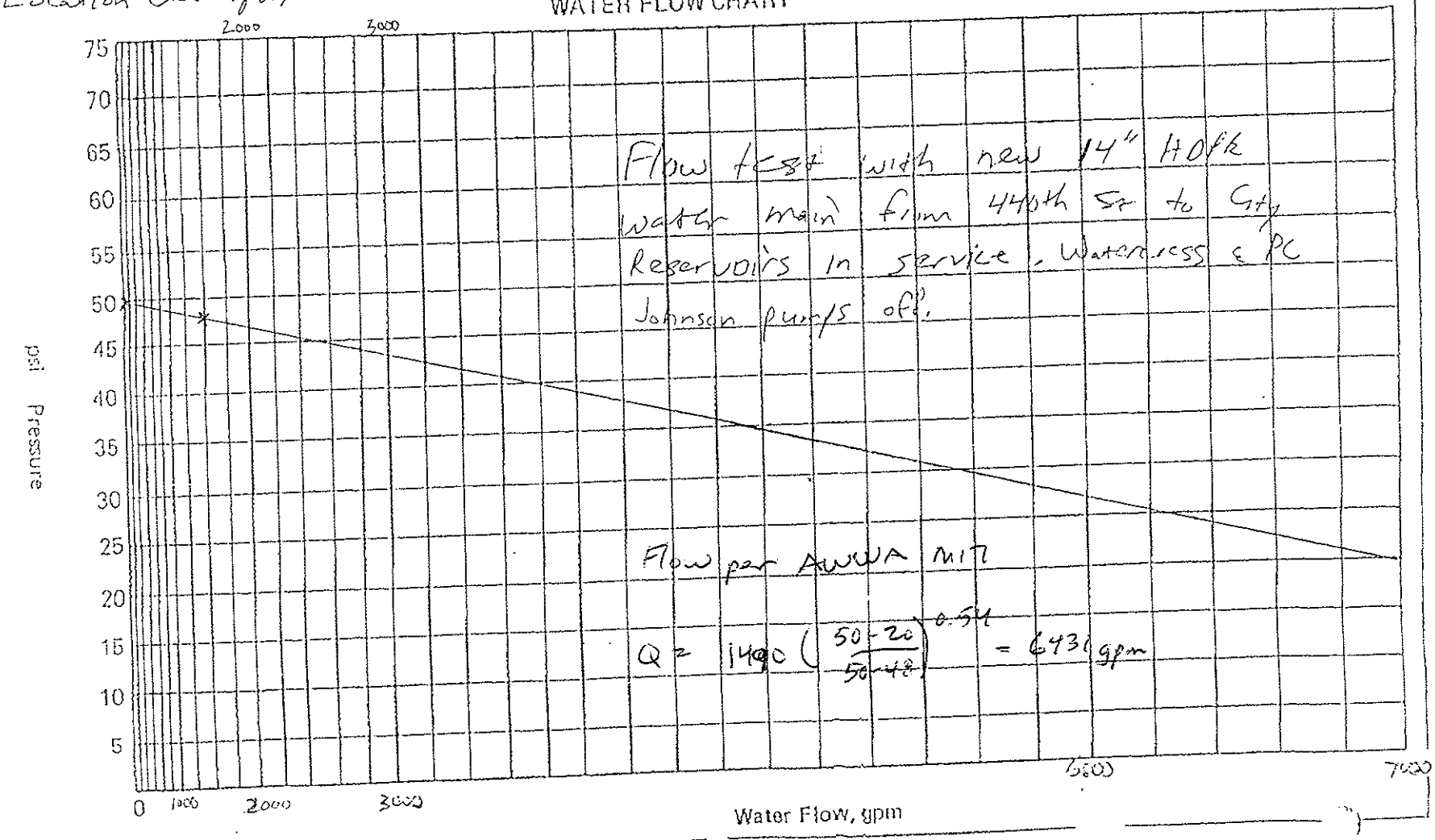
Date: 11/7/02

Static psi: 50

Residual psi: 48

Total Discharge During Test	Available gpm at 20 psi	Available gpm at 0 psi
1490 gpm @ ≈ 8:45 Am 11/7/02	7000	

WATER FLOW CHART



Jan 2013 Flow Tests

Summary of Jan 2013 Flow Tests for Locations 1-8

					4.5" Hose Mon		2" Hose Mon		2" Akron		Total	Flow at	WC/PC	
Date	**Time**	**Test Location/FH**	**Stat**	**Res**	**psi/FH**	**Flow**	**psi/FH**	**Flow**	**psi/FH**	**Flow**	**Flow**	**20 psi**	**On/Off**	**Notes**
01/04/2013	9:54	6. Warner/E3S9	61	56	26/E3S11	1688					1688	5258	Off/off	Residual varied 55-58 psi
01/04/2013	10:28	6. Warner/E3S9	61		/E3S11		/E3S8		/E3S8				Off/off	Test aborted due to erosion at E3S8
01/04/2013	10:37	6. Warner/E3S9	61	51	23/E3S11	1588	15/E3S12	604	20/E3S12	583	2775	5945	Off/off	Use 1/4/13 9:54 test. 2nd FH thought to be too far away.
01/04/2013	10:54	7. City Shop/D4N21	63	60	29/D4N28	1783							Off/off	Reject test. Test 12/17/12 had greater psi drop at less flow.
01/04/2013	11:12	7. City Shop/D4N29	63	52	29/D4N28	1783	16/D4N21	624	27/D4N21	643	3050	6368	Off/off	
01/04/2013	13:57	8. Thunder Mt./A4S13	69	58	29/A4S8	1783	22/A4S12	732	39/A4S12	745	3260	7304	On/off	
01/04/2013	14:44	5. High Sch/F5N5	64	47	22/F5N2	1593	15/F5N4	604	25/F5N4	626	2823	4718	Off/off	
01/07/2013	13:07	1. Westwood/A10N3	103	72	31/Z10S4	1843					1843	3137	Off/off	
01/07/2013	13:32	4. 192nd Ave/C13N2	118	56	33/C13N3	1902					1902	2435	Off/off	
01/07/2013	14:33	2. 436th Ave/C6N3	73	67	41/C6N2	2120					2120	6875	Off/off	
01/07/2013	14:44	2. 436th Ave/C6N3	73	58	38/C6N2	2041	29/C6N6	840	33/C6N6	694	3575	7068	Off/off	
01/07/2013	15:00	3. Sunrise/F5S12	69	54	27/F5S16	1720					1720	3259	Off/off	

Appendix 2
Model Calibration Summary Tables

Model Calibration Scenario Summary

1. Results w/ initial adjustments, incl C values reduced globally by 5%

Location	Link	Static	Residual	Test Flow at 20 psi	Model Flow at 20 psi	% Difference
1 Westwoood	948	105	70	2260	2444	8%
2 SE 436th St	950	77	66	4800	5178	7%
3 Sunrise	951	68	55	2656	2555	-4%
4 192nd Ave	949	118	42	1675	1688	1%
5 High School	952	65	55	3037	3631	16%
6 Warner Ave	953	62	54	3300	4227	22%
7 City Shop	957	62	55	3776	5440	31%
8 Thunder Mt	959	70	65	5243	6368	18%
9 High View PS		60	43	Within 2 psi of test pressure at 410 gpm.		
10 New Horizions	960	58	40	1010	967	-4%
11 Fairway Hills	961	42	35	1330	1345	1%
12 SE 440th St	962	50	48	6431	6572	2%

2. Adjust Roughness Globally by 0.9 - Rejected

Location	Link	Static	Residual	Test Flow at 20 psi	Model Flow at 20 psi	% Difference
1 Westwoood	948	105	70	2260	2184	-3%
2 SE 436th St	950	77	66	4800	4595	-4%
3 Sunrise	951	68	55	2656	2273	-17%
4 192nd Ave	949	118	42	1675	1508	-11%
5 High School	952	65	55	3037	3223	6%
6 Warner Ave	953	62	54	3300	3748	12%
7 City Shop	957	62	55	3776	4816	22%
8 Thunder Mt	959	70	65	5243	5661	7%
9 High View PS		60	43			
10 New Horizions	960	58	40	1010	870	-16%
11 Fairway Hills	961	42	35	1330	1213	-10%
12 SE 440th St	962	50	48	6431	5693	-13%

3. Pipe on 424th St West of Crews Res Closed - Rejected

Location	Link	Static	Residual	Test Flow at 20 psi	Model Flow at 20 psi	% Difference
1 Westwoood	948	105	70	2260	2249	0%
2 SE 436th St	950	77	66	4800	3839	-25%
3 Sunrise	951	68	55	2656	2217	-20%
4 192nd Ave	949	118	42	1675	1607	-4%
5 High School	952	65	55	3037	2875	-6%
6 Warner Ave	953	62	54	3300	3330	1%
7 City Shop	957	62	55	3776	3852	2%
8 Thunder Mt	959	70	65	5243	3709	-41%
9 High View PS		60	43			
10 New Horizions	960	58	40	1010	966	-5%
11 Fairway Hills	961	42	35	1330	1344	1%
12 SE 440th St	962	50	48	6431	6144	-5%

4. Pipe on Battersby Ave West of Railroad St Closed - Rejected

Location	Link	Static	Residual	Test Flow at 20 psi	Model Flow at 20 psi	% Difference
1 Westwoood	948	105	70	2260	2443	7%
2 SE 436th St	950	77	66	4800	5157	7%
3 Sunrise	951	68	55	2656	2558	-4%
4 192nd Ave	949	118	42	1675	1687	1%
5 High School	952	65	55	3037	3633	16%
6 Warner Ave	953	62	54	3300	4226	22%
7 City Shop	957	62	55	3776	4838	22%
8 Thunder Mt	959	70	65	5243	6272	16%
9 High View PS		60	43			
10 New Horizions	960	58	40	1010	967	-4%
11 Fairway Hills	961	42	35	1330	1345	1%
12 SE 440th St	962	50	48	6431	6560	2%

5. Results w/ revised flow tests locations 5-8 and C values adj up globally 5%

Location	Link	Static	Residual	Test Flow at 20 psi	Model Flow at 20 psi	% Difference
1 Westwoood	948	105	70	2260	2592	13%
2 SE 436th St	950	77	66	4800	5593	14%
3 Sunrise	951	68	55	2656	2736	3%
4 192nd Ave	949	118	42	1675	1786	6%
5 High School	952	64	47	4718	4192	-13%
6 Warner Ave	953	61	56	5258	4698	-12%
7 City Shop	957	63	52	6368	5948	-7%
8 Thunder Mt	959	69	58	7304	6853	-7%
9 High View PS		60	43	Within 2 psi of test pressure at 410 gpm.		
10 New Horizions	960	58	40	1010	1017	1%
11 Fairway Hills	961	42	35	1330	1415	6%
12 SE 440th St	962	50	48	6431	6907	7%

6. Results w/ revised flow tests locations 1-8 & Scenario 5 C values ex New Horizons/Fairway Hills adj up globally by 5%

Location	Link	Static	Residual	Test Flow at 20 psi	Model Flow at 20 psi	% Difference
1 Westwoood	948	103	72	3137	2791	-12%
2 SE 436th St	950	73	58	7068	5905	-20%
3 Sunrise	951	69	54	3259	2884	-13%
4 192nd Ave	949	118	56	2435	1881	-29%
5 High School	952	64	47	4718	4423	-7%
6 Warner Ave	953	61	56	5258	4961	-6%
7 City Shop	957	63	52	6368	6282	-1%
8 Thunder Mt	959	69	58	7304	7228	-1%
9 High View PS		60	43	Within 2 psi of test pressure at 410 gpm.		
10 New Horizions	960	58	40	1010	1017	1%
11 Fairway Hills	961	42	35	1330	1420	6%
12 SE 440th St	962	50	48	6431	7219	11%

7. Results w/ Scenario 6 Model w/ Final C Value Adjustments

Location	Link	Static	Residual	Test Flow at 20 psi	Model Flow at 20 psi	% Difference
1 Westwoood	948	103	72	3137	2791	-12%
2 SE 436th St	950	73	58	7068	6010	-18%
3 Sunrise	951	69	54	3259	2904	-12%
4 192nd Ave	949	118	56	2435	1882	-29%
5 High School	952	64	47	4718	4487	-5%
6 Warner Ave	953	61	56	5258	5025	-5%
7 City Shop	957	63	52	6368	6473	2%
8 Thunder Mt	959	69	58	7304	7168	-2%
9 High View PS		60	43	Within 2 psi of test pressure at 410 gpm.		
10 New Horizions	960	58	40	1010	1017	1%
11 Fairway Hills	961	42	35	1330	1391	4%
12 SE 440th St	962	50	48	6431	7453	14%

7a. Results w/ Scenario 7 Model and Decreased System Demand

Location	Link	Static	Residual	Test Flow at 20 psi	Model Flow at 20 psi	% Difference
1 Westwoood	948	103	72	3137	2895	-8%
2 SE 436th St	950	73	58	7068	6452	-10%
3 Sunrise	951	69	54	3259	3085	-6%
4 192nd Ave	949	118	56	2435	1948	-25%
5 High School	952	64	47	4718	4866	3%
6 Warner Ave	953	61	56	5258	5379	2%
7 City Shop	957	63	52	6368	6992	9%
8 Thunder Mt	959	69	58	7304	7601	4%
9 High View PS		60	43	Within 2 psi of test pressure at 410 gpm.		
10 New Horizions	960	58	40	1010	1021	1%
11 Fairway Hills	961	42	35	1330	1395	5%
12 SE 440th St	962	50	48	6431	7608	15%

APPENDIX O

WATER MODEL ANALYSIS

DEPARTMENT OF PUBLIC WORKS

TO: **File**

FROM: **Scott Woodbury, P.E. / Assistant City Engineer**

DATE: **January 16, 2013**

SUBJECT: **Water Model Analysis**

The following information is included to supplement the water model analysis described in Chapter 7 of the Comprehensive Water System Plan (CWSP):

- *Model Map Diagram.* The diagram included is of the future water system model with the water system inventory map as a background. The existing water system model diagram is similar.
- Analysis Summary Tables. Model output data at selected nodes around the system is summarized for the existing and future system analysis along with the calculated change in pressure, flow, and maximum velocity from existing to future conditions.
- Future Water System Model Input File. Model node and vertices coordinate data was removed from the printout to reduce the number of printed pages.
- Water Line Changes Included in Future Water Model. Planned large diameter water line replacements and new water lines that were included in the future system model are shown highlighted in red on expanded plots of the model network diagram. A table summary of the replacement water lines is also included. Potential water lines that may be constructed as part of future development were not included in the future model analysis, but will help to increase flows and pressures in the system as a whole by adding to the network grid. Modeling without trying to account for future development results in a conservative analysis.

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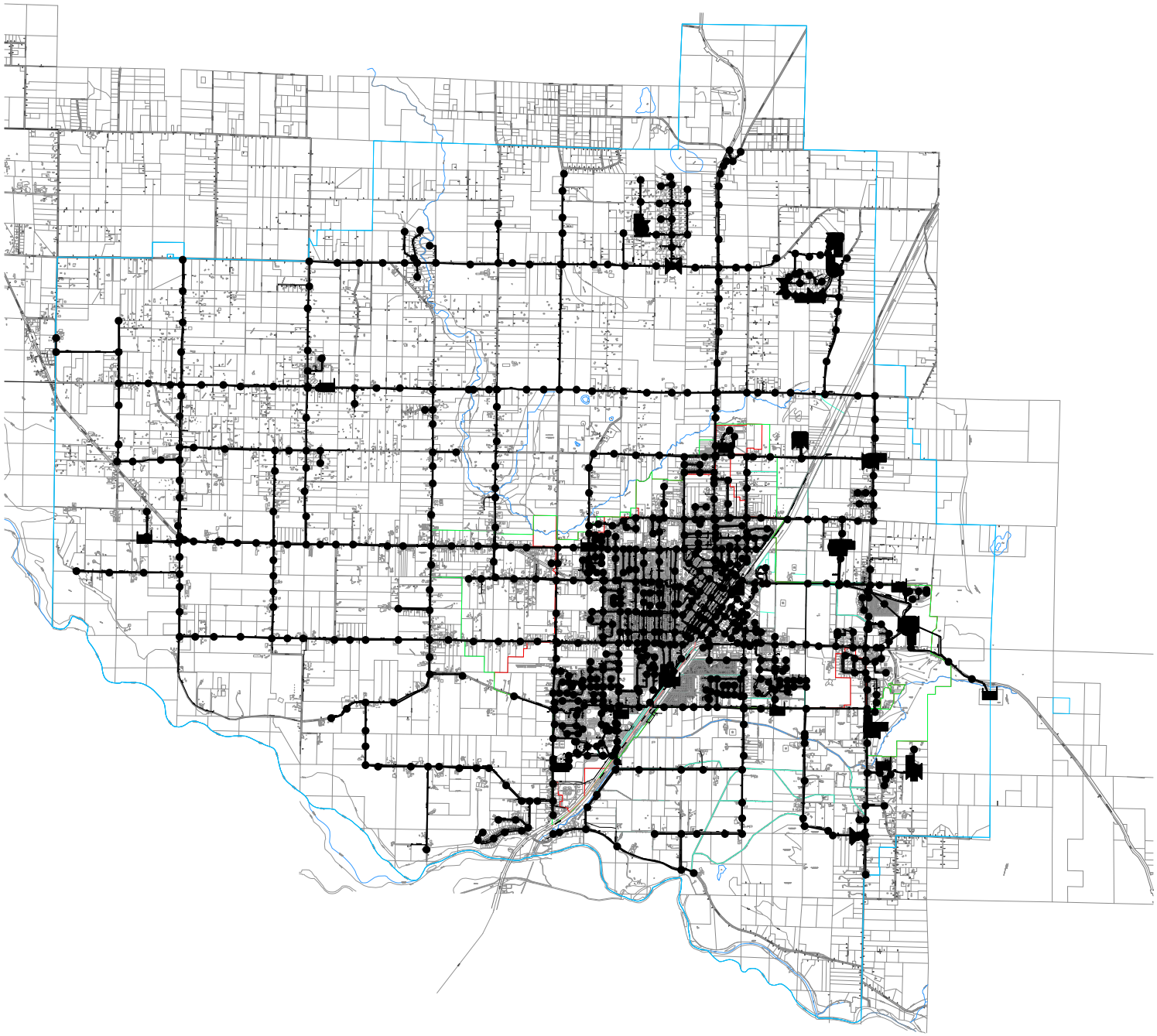
Model Map Diagram

City of Enumclaw Future Water Model



Analysis Summary Tables

Existing System Fire Flow Analysis

Node	Location	Flow	Pressure	Goal	Max V	Notes
559	Sunrise Elem	2738	20	3000	8.2	
176	High School	3000	36.8	3000	7.3	
251	Semanski/Griffin	3000	33.3	3000	7.2	
141	Roosevelt/Monroe	3000	40	3000	8.3	
131	Railroad/Initial	3000	42.6	3000	6.8	
153	Farman/SR410	3000	42.1	3000	6.2	
579	McHugh/SR169	3000	47.1	3000	6.9	
811	Thunder Mt. School	3000	53.9	3000	6.9	
103	Kibler School	3000	43	3000	4.6	
312	Watson/Dickson	3000	39	3000	7.2	
439	Westwood School	2697	20	3000	9.8	
51	SR164/188th Ave	500	98.1	500	4	There are lots <35k, but original system approved at only 500 gpm.
1042	228th Ave/474th St	500	29.2	500	5.7	
1505	224th Ave/~396th St	500	91.7	500	5.7	
13	400th Pl/278th Ave	1000	40.8	1000	6.2	
1008	403rd St/~276th Ave	500	53.6	See notes	5.7	There are lots <35k, but original system approved at only 500 gpm.
189	Mud Mt/~244th Ave	500	35.4	See notes	5.7	There are lots <35k but goal only 500 gpm
1033	235th Ave/~472nd	500	58.3	See notes	5.7	There are lots <35k, but original system approved at only 500 gpm.
1502	Mud Mt/~262nd Ave	500	32.9	500	3.2	
607	284th Ave/~476th St	500	29.4	500	3.2	
626	287th Ave/~462nd St	500	41.3	See notes	3.2	There are lots <35k, but original system approved at only 500 gpm.
508	Misty Meadow MHP	1000	59.9	1000	4.2	
1087	272nd Ave/400th Way	500	52	500	5.7	
766	244th Ave/~389th St	1000	58.6	1000	6.4	
738	N End Expo Stadium	1000	22.9	See notes	11.4	Original system approved at only 1000 gpm
742	Expo Cntr S Horse Brn	1215	20	See notes	7.8	Original system approved at only 1000 gpm
671	Wilson Ave/James St	390	40.9	1750	10	
35	257th Pl/428th St	305	20	1000	7.9	
1003	402nd Pl/~274th Ave	500	27.5	500	4.2	There are lots <35k, but original system approved at only 500 gpm.

The City will plan to provide the following minimum fire flows for future development:

Rural Residential (lots >35 ksf outside city):	500 gpm for 30 minutes duration
Single Family Residential (5 DU/acre):	1,000 gpm for 2 hours duration
Medium Density Residential (7 DU/acre):	1,750 gpm for 2 hours duration
High Density Residential (15 DU/acre):	2,500 gpm for 2 hours duration
Commercial/Business Park:	**3,000 gpm for 3 hours duration**
Industrial/Schools:	**3,000 gpm for 3 hours duration**

Future System Fire Flow Analysis

						+/- from existing			
Node	Location	Flow	Pressure	Goal	Max V	Flow	Pressure	Max V	Notes
559	Sunrise Elem	2438	20	3000	9.1	-300	0	0.9	
176	High School	3000	28.9	3000	7.4	0	-7.9	0.1	
251	Semanski/Griffin	3000	25.6	3000	7.2	0	-7.7	0	
141	Roosevelt/Monroe	3000	33.3	3000	8.2	0	-6.7	-0.1	
131	Railroad/Initial	3000	35.8	3000	6.8	0	-6.8	0	
153	Farman/SR410	3000	39.5	3000	5.3	0	-2.6	-0.9	
579	McHugh/SR169	3000	40.1	3000	6.9	0	-7	0	
811	Thunder Mt. School	3000	47.1	3000	6.7	0	-6.8	-0.2	
103	Kibler School	3000	35.8	3000	4.4	0	-7.2	-0.2	
312	Watson/Dickson	3000	34.1	3000	7.3	0	-4.9	0.1	
439	Westwood School	2520	20	3000	9.1	-177	0	-0.7	
51	SR164/188th Ave	500	91.3	500	4	0	-6.8	0	There are lots <35k, but original system approved at only 500 gpm.
1042	228th Ave/474th St	500	22.4	500	5.7	0	-6.8	0	
1505	224th Ave/~396th St	500	86.1	500	5.7	0	-5.6	0	
13	400th Pl/278th Ave	1000	34.2	1000	6.2	0	-6.6	0	
1008	403rd St/~276th Ave	500	53.5	See notes	5.7	0	-0.1	0	There are lots <35k, but original system approved at only 500 gpm.
189	Mud Mt/~244th Ave	500	29.2	See notes	5.7	0	-6.2	0	There are lots <35k but goal only 500 gpm
1033	235th Ave/~472nd	500	52.2	See notes	5.7	0	-6.1	0	There are lots <35k, but original system approved at only 500 gpm.
1502	Mud Mt/~262nd Ave	500	26.5	500	2.9	0	-6.4	-0.3	
607	284th Ave/~476th St	500	70.7	500	3.2	0	41.3	0	
626	287th Ave/~462nd St	500	39.8	See notes	3.2	0	-1.5	0	There are lots <35k, but original system approved at only 500 gpm.
508	Misty Meadow MHP	1000	53.5	1000	4.2	0	-6.4	0	
1087	272nd Ave/400th Way	500	46.6	500	5.7	0	-5.4	0	
766	244th Ave/~389th St	1000	52.1	1000	6.4	0	-6.5	0	
738	N End Expo Stadium	1400	37.1	See notes	10	400	14.2	-1.4	Original system approved at only 1000 gpm
742	Expo Cntr S Horse Brn	1065	20	See notes	6.7	-150	0	-1.1	Original system approved at only 1000 gpm
671	Wilson Ave/James St	1750	43.3	1750	7.2	1360	2.4	-2.8	
35	257th Pl/428th St	1430	20	1000	9.1	1125	0	1.2	
1003	402nd Pl/~274th Ave	500	28	500	3.6	0	0.5	-0.6	There are lots <35k, but original system approved at only 500 gpm.

Future Water System Model Input File

[TITLE]
City of Enumclaw Future Water Model
2033 PHD Use multiplier of 1.8
2033 MDD Use multiplier of 1 for system demand of 3581 gpm
2033 ADD Use multiplier of 0.48

[JUNCTIONS]

;ID	Elev	Demand	Pattern	
1	571	6.02	1	;
2	571	5.64	1	;
3	590	3.72	1	;
4	563	7.18	1	;
5	656	3.33	1	;
6	659	3.72	1	;
7	694	2.82	1	;
8	682	5	1	;
9	698	2.69	1	;
11	903	0	1	;
13	762	4.48	1	;
14	732	4.74	1	;
15	727	0	1	;
16	745	0.51	1	;
17	746	0	1	;
19	745	0	1	;
20	749	18.99	1	;
21	750	3.72	1	;
22	750	0	1	;
23	715	5.64	1	;
24	690	6.79	1	;
25	745	5.38	1	;
26	745	7.56	1	;
27	745	3.72	1	;
28	752	5.38	1	;
29	745	5.38	1	;
30	742	5.77	1	;
31	740	8.84	1	;
32	735	5.38	1	;
33	742	5	1	;
34	735	13.2	1	;
35	730	11.28	1	;
36	712	6.79	1	;
37	670	4.1	1	;
38	680	5.25	1	;
39	647	9.48	1	;
40	660	8.71	1	;
41	646	16.02	1	;
42	640	7.94	1	;
43	640	3.2	1	;
44	640	2.82	1	;
45	640	3.2	1	;
46	641	7.3	1	;
47	640	5.13	1	;
48	640	4.48	1	;
49	595	7.3	1	;
50	610	7.94	1	;
51	580	6.02	1	;
52	545	5.13	1	;
53	620	12.81	1	;
54	624	2.31	1	;
55	630	1.92	1	;
56	645	11.28	1	;
57	632	9.74	1	;
58	642	7.56	1	;
59	642	8.97	1	;
60	641	28.8	1	;
61	642	3.08	1	;

62	635	6.02	1 ;
63	642	5.13	1 ;
64	641	5.51	1 ;
65	675	3.33	1 ;
66	639	3.59	1 ;
67	644	3.08	1 ;
68	666	6.66	1 ;
69	690	7.18	1 ;
70	710	7.94	1 ;
71	718	4.74	1 ;
72	740	5.51	1 ;
73	735	5.64	1 ;
74	735	6.79	1 ;
75	750	11.79	1 ;
76	750	25.5	1 ;
77	735	11.02	1 ;
78	735	11.79	1 ;
79	735	11.28	1 ;
80	735	8.97	1 ;
81	745	20.25	1 ;
82	750	7.94	1 ;
83	730	3.33	1 ;
84	750	5.51	1 ;
85	750	6.92	1 ;
86	745	3.59	1 ;
87	745	3.72	1 ;
88	745	4.1	1 ;
89	745	3.72	1 ;
90	745	7.94	1 ;
91	745	10.76	1 ;
92	745	17.68	1 ;
93	745	11.79	1 ;
94	745	20.37	1 ;
95	745	18.07	1 ;
96	745	11.66	1 ;
97	745	13.2	1 ;
98	745	7.94	1 ;
99	750	9.61	1 ;
100	745	10.38	1 ;
101	745	14.61	1 ;
102	745	11.28	1 ;
103	745	16.91	1 ;
104	745	8.84	1 ;
105	745	8.84	1 ;
106	745	12.43	1 ;
107	750	8.97	1 ;
108	745	15.25	1 ;
109	760	3.33	1 ;
110	743	15.76	1 ;
111	762	7.3	1 ;
112	755	13.71	1 ;
113	758	13.58	1 ;
114	758	6.79	1 ;
115	755	22.55	1 ;
116	760	13.58	1 ;
117	745	12.56	1 ;
118	745	9.74	1 ;
119	744	18.07	1 ;
120	744	16.02	1 ;
121	744	13.2	1 ;
122	744	8.97	1 ;
123	744	6.41	1 ;
124	744	15.76	1 ;
125	744	20.37	1 ;
126	744	12.94	1 ;
127	744	11.79	1 ;

128	744	13.58	1 ;
129	744	4.48	1 ;
130	745	17.56	1 ;
131	745	13.84	1 ;
132	745	12.05	1 ;
133	745	10.12	1 ;
134	745	13.2	1 ;
135	745	10.38	1 ;
136	745	8.97	1 ;
137	741	7.3	1 ;
138	743	3.2	1 ;
139	743	5.13	1 ;
140	743	5.13	1 ;
141	743	4.48	1 ;
142	743	8.84	1 ;
143	744	83.51	1 ;
145	745	10.76	1 ;
146	745	11.79	1 ;
147	746	3.59	1 ;
148	746	13.58	1 ;
149	746	10.12	1 ;
150	746	11.79	1 ;
151	746	8.07	1 ;
152	762	4.74	1 ;
153	757	51.38	1 ;
154	762	6.15	1 ;
155	870	0	1 ;
157	763	7.56	1 ;
158	758	43.88	1 ;
159	758	3.59	1 ;
160	760	4.1	1 ;
162	740	0	1 ;
163	738	0	1 ;
164	780	8.33	1 ;
165	775	13.58	1 ;
166	780	2.82	1 ;
167	865	6.79	1 ;
168	835	2.18	1 ;
169	775	7.94	1 ;
170	763	6.02	1 ;
171	745	8.84	1 ;
172	744	28.87	1 ;
173	743	6.02	1 ;
174	739	5.13	1 ;
175	735	0	1 ;
176	736	23.19	1 ;
177	736	14.61	1 ;
178	737	11.79	1 ;
179	737	9.74	1 ;
180	738	12.17	1 ;
181	738	14.61	1 ;
182	738	11.11	1 ;
183	738	7.69	1 ;
184	738	9.74	1 ;
185	737	13.2	1 ;
186	730	10.76	1 ;
187	730	5.64	1 ;
188	722	6.54	1 ;
189	722	2.95	1 ;
190	670	4.23	1 ;
191	720	7.94	1 ;
192	719	10.12	1 ;
193	723	10.38	1 ;
194	728	11.53	1 ;
195	730	10.76	1 ;
196	708	6.41	1 ;

197	685	5.51	1 ;
198	680	5.25	1 ;
199	702	14.99	1 ;
200	850	4.23	1 ;
201	750	11.66	1 ;
202	750	24.47	1 ;
203	765	4.87	1 ;
204	736	17.3	1 ;
205	700	5.77	1 ;
206	713	3.84	1 ;
207	730	5.77	1 ;
208	730	0	1 ;
209	730	5.77	1 ;
210	645	3.84	1 ;
211	740	0	1 ;
212	730	0	1 ;
213	730	9.74	1 ;
214	730	3.84	1 ;
215	730	7.69	1 ;
216	730	0	1 ;
217	864	0	1 ;
218	864	0	1 ;
219	745	0	1 ;
220	740	0	1 ;
221	740	7.56	1 ;
222	740	0	1 ;
223	745	7.56	1 ;
224	745	3.72	1 ;
225	739	5.38	1 ;
226	745	5.38	1 ;
227	750	5.38	1 ;
228	752	0	1 ;
229	745	7.43	1 ;
230	752	3.84	1 ;
231	750	3.84	1 ;
232	675	0	1 ;
233	670	0	1 ;
234	670	0	1 ;
235	670	0	1 ;
236	670	0	1 ;
237	670	0	1 ;
238	665	0	1 ;
239	700	1.79	1 ;
240	690	1.28	1 ;
241	710	1.67	1 ;
242	715	1.67	1 ;
243	676	3.59	1 ;
244	740	1.79	1 ;
245	742	2.82	1 ;
246	730	1.79	1 ;
247	741	1.41	1 ;
248	720	3.33	1 ;
249	745	0.64	1 ;
250	750	10.12	1 ;
251	750	32.93	1 ;
252	750	0	1 ;
253	750	48.82	1 ;
254	745	5	1 ;
255	745	5.51	1 ;
256	745	5	1 ;
257	752	6.66	1 ;
258	752	9.35	1 ;
259	750	2.05	1 ;
260	730	1.15	1 ;
261	745	0	1 ;
262	750	1.79	1 ;

263	755	1.79	1 ;
264	752	5.25	1 ;
265	730	1.15	1 ;
266	735	0	1 ;
267	735	0	1 ;
268	735	0	1 ;
269	731	17.56	1 ;
270	727	0	1 ;
271	738	9.74	1 ;
272	740	7.3	1 ;
273	740	0	1 ;
275	734	6.15	1 ;
276	748	5.64	1 ;
277	738	8.71	1 ;
278	740	12.69	1 ;
279	735	19.61	1 ;
280	735	0	1 ;
281	735	70.22	1 ;
283	735	0	1 ;
286	735	0	1 ;
287	740	15.63	1 ;
288	740	22.04	1 ;
289	740	7.3	1 ;
290	740	11.92	1 ;
291	740	14.61	1 ;
292	740	14.61	1 ;
293	740	12.81	1 ;
294	740	12.81	1 ;
295	740	11.02	1 ;
296	742	8.2	1 ;
297	742	18.32	1 ;
298	743	2.18	1 ;
299	743	0.9	1 ;
300	740	2.18	1 ;
301	743	2.18	1 ;
302	745	2.18	1 ;
303	754	6.02	1 ;
304	754	0	1 ;
305	753	0	1 ;
306	754	0	1 ;
307	745	2.69	1 ;
311	743	19.02	1 ;
312	743	19.67	1 ;
313	743	0	1 ;
314	743	0	1 ;
315	744	4.1	1 ;
316	743	11.66	1 ;
317	743	7.94	1 ;
318	743	8.59	1 ;
319	743	20.76	1 ;
320	743	0	1 ;
321	743	0	1 ;
322	741	6.28	1 ;
323	739	0.77	1 ;
324	738	3.08	1 ;
325	741	3.2	1 ;
326	740	4.23	1 ;
327	740	0	1 ;
328	739	5.13	1 ;
329	740	6.02	1 ;
330	738	5.38	1 ;
331	738	0	1 ;
332	738	0	1 ;
333	739	0	1 ;
334	742	5.77	1 ;
335	738	9.61	1 ;

336	740	10.64	1 ;
337	740	13.33	1 ;
338	745	11.92	1 ;
339	739	0	1 ;
340	739	9.99	1 ;
341	738	12.3	1 ;
342	738	14.22	1 ;
343	740	3.72	1 ;
344	731	0	1 ;
345	730	0	1 ;
346	745	5.38	1 ;
347	745	1.41	1 ;
348	757	1.03	1 ;
349	745	1.41	1 ;
350	740	1.28	1 ;
351	739	2.82	1 ;
354	722	3.2	1 ;
355	724	0	1 ;
356	726	5.38	1 ;
357	738	0	1 ;
358	738	0	1 ;
359	730	0	1 ;
360	725	7.69	1 ;
361	710	1.67	1 ;
362	670	0	1 ;
363	720	2.56	1 ;
364	710	1.67	1 ;
365	705	1.67	1 ;
366	680	1.28	1 ;
367	700	1.28	1 ;
368	705	0	1 ;
369	710	0	1 ;
370	710	0	1 ;
371	725	1.15	1 ;
372	658	1.28	1 ;
373	653	0	1 ;
374	648	1.79	1 ;
375	655	3.97	1 ;
376	680	2.18	1 ;
377	725	1.92	1 ;
378	650	3.33	1 ;
379	646	1.79	1 ;
380	643	1.15	1 ;
381	650	1.15	1 ;
382	650	1.79	1 ;
383	644	1.15	1 ;
384	639	0	1 ;
385	640	0	1 ;
386	742	6.02	1 ;
387	748	5.25	1 ;
388	745	5.89	1 ;
389	745	0	1 ;
390	745	7.69	1 ;
391	750	8.84	1 ;
392	750	5.25	1 ;
393	750	0	1 ;
394	745	7.05	1 ;
395	745	2.95	1 ;
396	745	4.1	1 ;
397	748	4.74	1 ;
398	750	0	1 ;
399	765	4.87	1 ;
400	760	0.9	1 ;
401	731	0	1 ;
402	740	0	1 ;
403	738	0	1 ;

404	738	1.03	1 ;
405	750	3.46	1 ;
406	755	4.1	1 ;
407	755	1.67	1 ;
408	755	0	1 ;
409	755	1.67	1 ;
410	760	0	1 ;
411	773	0	1 ;
412	775	0	1 ;
413	745	2.69	1 ;
414	750	0	1 ;
415	780	2.05	1 ;
416	784	2.05	1 ;
417	780	3.33	1 ;
418	950	0	1 ;
419	780	7.3	1 ;
420	550	1.54	1 ;
421	570	1.54	1 ;
422	610	1.92	1 ;
423	631	1.92	1 ;
424	616	0	1 ;
425	615	6.41	1 ;
426	640	3.97	1 ;
427	640	2.82	1 ;
428	640	2.43	1 ;
429	630	0.9	1 ;
430	543	1.28	1 ;
431	542	1.28	1 ;
432	573	2.43	1 ;
433	600	2.43	1 ;
434	620	2.43	1 ;
435	600	0	1 ;
436	625	0	1 ;
437	625	2.43	1 ;
438	630	2.43	1 ;
439	635	2.43	1 ;
440	648	0	1 ;
441	645	0	1 ;
442	640	2.56	1 ;
443	580	2.82	1 ;
444	570	2.95	1 ;
445	575	0	1 ;
446	580	9.89	1 ;
447	625	0	1 ;
448	596	2.56	1 ;
449	590	2.18	1 ;
450	637	2.43	1 ;
451	638	0	1 ;
452	640	0	1 ;
453	635	2.56	1 ;
454	640	1.79	1 ;
455	640	2.31	1 ;
456	640	2.31	1 ;
457	640	1.79	1 ;
458	635	2.56	1 ;
459	640	3.59	1 ;
460	645	1.79	1 ;
461	640	2.95	1 ;
462	640	2.95	1 ;
463	640	1.28	1 ;
464	642	2.56	1 ;
465	635	1.54	1 ;
466	633	1.54	1 ;
467	644	1.28	1 ;
468	675	1.28	1 ;
469	675	1.41	1 ;

470	635	0	1 ;
471	635	1.79	1 ;
472	650	0	1 ;
473	685	1.28	1 ;
474	685	1.41	1 ;
475	660	1.28	1 ;
476	695	0	1 ;
477	580	0	1 ;
478	640	0.9	1 ;
479	656	0.9	1 ;
480	657	0.9	1 ;
481	671	6.54	1 ;
482	685	0	1 ;
483	681	9.87	1 ;
484	701	0	1 ;
485	686	1.67	1 ;
486	644	0	1 ;
487	620	0	1 ;
488	660	2.95	1 ;
489	653	2.95	1 ;
490	650	2.31	1 ;
491	650	2.31	1 ;
492	670	1.03	1 ;
493	677	1.03	1 ;
494	680	0	1 ;
495	686	2.56	1 ;
496	695	2.56	1 ;
497	704	0	1 ;
498	715	0	1 ;
499	715	0	1 ;
500	685	2.56	1 ;
501	694	2.56	1 ;
502	693	2.69	1 ;
503	692	2.69	1 ;
504	687	4.36	1 ;
505	680	4.36	1 ;
506	689	2.69	1 ;
507	690	1.03	1 ;
508	700	43.3	1 ;
509	854	2.56	1 ;
510	810	0.9	1 ;
511	890	1.03	1 ;
512	940	0	1 ;
513	950	0	1 ;
514	762	0	1 ;
515	650	2.95	1 ;
516	745	0	1 ;
517	739	0	1 ;
518	734	0	1 ;
519	735	0	1 ;
520	725	0	1 ;
521	724	0	1 ;
522	729	0	1 ;
523	734	0	1 ;
524	720	0	1 ;
525	742	4.48	1 ;
526	729	0	1 ;
527	758	13.07	1 ;
528	759	7.18	1 ;
529	745	5.25	1 ;
530	740	2.69	1 ;
531	745	6.66	1 ;
532	749	6.41	1 ;
533	738	2.05	1 ;
534	748	6.54	1 ;
535	740	0	1 ;

536	750	0	1 ;
537	750	0	1 ;
538	750	11.92	1 ;
539	750	0	1 ;
540	750	9.23	1 ;
541	583	0	1 ;
542	732	0	1 ;
543	635	1.03	1 ;
544	630	32.03	1 ;
545	630	1.03	1 ;
546	630	1.03	1 ;
547	630	2.18	1 ;
548	644	0	1 ;
549	738	0	1 ;
550	738	0	1 ;
551	738	0	1 ;
552	738	0	1 ;
553	738	0	1 ;
554	738	0	1 ;
555	738	0	1 ;
556	738	0	1 ;
557	738	0	1 ;
558	738	0	1 ;
559	728	0	1 ;
560	727	0	1 ;
561	735	0	1 ;
562	736	0	1 ;
565	736	0	1 ;
566	736	0	1 ;
567	735	0	1 ;
569	735	0	1 ;
571	735	0	1 ;
572	735	0	1 ;
573	735	0	1 ;
574	735	0	1 ;
576	735	0	1 ;
577	735	0	1 ;
578	742	0	1 ;
580	741	0	1 ;
582	741	0	1 ;
583	741	0	1 ;
584	740	0	1 ;
585	740	0	1 ;
586	735	0	1 ;
587	735	0	1 ;
598	950	0	1 ;
599	950	0	1 ;
600	950	0	1 ;
601	762	0	1 ;
602	768	0	1 ;
603	770	0	1 ;
604	780	0	1 ;
605	780	0	1 ;
620	746	0	1 ;
621	738	0	1 ;
1000	910	0	1 ;
1002	834	2.18	1 ;
1003	903	2.56	1 ;
1004	878	2.56	1 ;
1005	830	0	1 ;
1006	830	0	1 ;
1007	790	4.1	1 ;
1008	740	0.51	1 ;
1011	740	0	1 ;
1015	736	0	1 ;
1016	710	0	1 ;

1017	715	1.28	1 ;
1018	743	0	1 ;
1019	743	0	1 ;
1020	537	1.67	1 ;
1021	609	3.33	1 ;
1022	742	0	1 ;
1023	742	0	1 ;
1024	732	0	1 ;
1025	728	0	1 ;
1026	734	16.02	1 ;
1027	733	16.53	1 ;
1028	713	4.36	1 ;
1029	720	0	1 ;
1030	705	0	1 ;
1031	710	5	1 ;
1032	670	2.69	1 ;
1033	670	1.03	1 ;
1034	745	0	1 ;
1035	745	0	1 ;
1036	745	0	1 ;
1037	745	0	1 ;
1038	742	0	1 ;
1039	736	0	1 ;
1040	750	11.53	1 ;
1041	695	0	1 ;
1042	695	2.18	1 ;
1043	742	0	1 ;
1044	745	0	1 ;
1045	708	0	1 ;
1046	691	0	1 ;
1047	725	7.18	1 ;
1048	723	12.17	1 ;
1049	529	3.33	1 ;
1051	658	5.51	1 ;
1054	777	0	1 ;
1055	780	2.69	1 ;
1056	782	0	1 ;
1057	777	0	1 ;
1058	643	1.67	1 ;
1059	645	13.83	1 ;
1060	560	2.18	1 ;
1061	560	1.67	1 ;
1062	542	2.18	1 ;
1063	638	0	1 ;
1064	538	1.67	1 ;
1065	519	0	1 ;
1066	520	1.03	1 ;
1067	614	2.82	1 ;
1068	604	2.18	1 ;
1069	597	0	1 ;
1070	594	1.67	1 ;
1071	606	2.82	1 ;
1072	644	9.35	1 ;
1073	645	0	1 ;
1074	625	1.67	1 ;
1075	640	1.67	1 ;
1076	710	5	1 ;
1077	728	1.03	1 ;
1078	674	2.18	1 ;
1079	672	25.6	1 ;
1080	733	0	1 ;
1081	730	2.82	1 ;
1082	736	1.03	1 ;
1083	741	1.67	1 ;
1084	756	1.03	1 ;
1085	723	1.67	1 ;

1086	685	1.67	1 ;
1087	727	1.03	1 ;
1500	721	1.67	1 ;
1501	748	2.82	1 ;
1502	745	2.82	1 ;
1503	705	2.18	1 ;
1504	565	1.67	1 ;
1505	613	0	1 ;
1506	642	2.82	1 ;
1507	656	5.51	1 ;
1508	694	2.69	1 ;
1509	693	1.03	1 ;
1510	689	2.18	1 ;
1511	696	4.36	1 ;
1512	760	0	1 ;
1513	763	0	1 ;
156	763	48.31	1 ;
1515	740	0	1 ;
606	763	0	1 ;
611	870	0	1 ;
619	870	0	1 ;
352	860	0	1 ;
18	745	0	1 ;
161	745	0	1 ;
353	685	0	1 ;
607	790	5.51	1 ;
608	763	0	1 ;
614	764	0	1 ;
622	758	11.02	1 ;
308	735	0	1 ;
310	735	0	1 ;
623	864	0	1 ;
624	980	1.28	1 ;
625	1005	1.03	1 ;
626	896	2.18	1 ;
627	930	0.38	1 ;
628	890	2.56	1 ;
629	765	2.18	1 ;
630	780	2.18	1 ;
633	683	0	1 ;
635	760	0	1 ;
636	760	0	1 ;
637	750	0	1 ;
638	650	1.15	1 ;
639	635	0	1 ;
640	634	0	1 ;
631	750	0	1 ;
632	750	0	1 ;
641	750	0	1 ;
642	750	0	1 ;
643	750	0	1 ;
644	747	0	1 ;
645	730	0	1 ;
646	741	0	1 ;
647	741	13.23	1 ;
648	745	0	1 ;
649	742	0	1 ;
650	740	0	1 ;
651	742	0	1 ;
652	742	0	1 ;
653	730	0	1 ;
654	740	0	1 ;
655	728	0	1 ;
656	730	0	1 ;
657	728	0	1 ;
658	730	0	1 ;

659	740	0	1 ;
660	725	0	1 ;
662	725	0	1 ;
663	722	0	1 ;
664	730	0	1 ;
665	738	0	1 ;
666	745	0	1 ;
667	745	0	1 ;
668	745	0	1 ;
669	745	0	1 ;
670	745	0	1 ;
671	745	0	1 ;
673	744	0	1 ;
674	745	0	1 ;
675	737	0	1 ;
676	737	0	1 ;
677	740	0	1 ;
678	745	0	1 ;
679	743	0	1 ;
680	743	0	1 ;
681	743	0	1 ;
682	743	0	1 ;
683	743	0	1 ;
684	740	0	1 ;
685	740	0	1 ;
686	744	0	1 ;
687	744	0	1 ;
688	744	0	1 ;
689	745	0	1 ;
690	745	0	1 ;
691	739	0	1 ;
692	740	0	1 ;
693	740	0	1 ;
694	745	0	1 ;
695	738	0	1 ;
696	739	0	1 ;
697	740	0	1 ;
698	740	0	1 ;
661	745	0	1 ;
699	745	0	1 ;
700	753	0	1 ;
701	750	0	1 ;
702	750	0	1 ;
703	736	0	1 ;
704	740	0	1 ;
705	740	0	1 ;
706	740	0	1 ;
707	740	0	1 ;
708	740	0.58	1 ;
709	740	0	1 ;
711	738	0	1 ;
712	740	0	1 ;
713	738	0	1 ;
714	738	0	1 ;
715	730	0	1 ;
716	730	0	1 ;
717	730	0	1 ;
720	740	0	1 ;
721	740	0	1 ;
722	740	0	1 ;
723	740	0	1 ;
724	740	0	1 ;
725	740	0	1 ;
726	746	0	1 ;
727	743	0	1 ;
728	744	5.51	1 ;

729	744	2.82	1 ;
730	775	0	1 ;
731	780	0	1 ;
732	805	0	1 ;
733	800	0	1 ;
734	810	0	1 ;
735	810	0	1 ;
736	810	0	1 ;
737	762	0	1 ;
738	760	0	1 ;
739	775	0	1 ;
740	780	0	1 ;
741	780	0	1 ;
742	780	0	1 ;
745	780	0	1 ;
746	780	0	1 ;
747	730	12.79	1 ;
748	740	0	1 ;
749	730	0	1 ;
750	725	0	1 ;
751	876	0	1 ;
752	876	0	1 ;
753	820	1.28	1 ;
754	845	1.03	1 ;
755	876	0	1 ;
756	880	1.67	1 ;
757	820	0	1 ;
775	980	0	1 ;
759	740	0	1 ;
760	730	0	1 ;
761	755	0	1 ;
762	748	23.99	1 ;
672	750	0	1 ;
763	742	0	1 ;
764	740	0	1 ;
765	740	0	1 ;
766	650	0.38	1 ;
767	690	3.72	1 ;
768	700	0	1 ;
769	680	1.28	1 ;
770	675	1.28	1 ;
771	715	1.67	1 ;
772	710	1.67	1 ;
773	745	0.77	1 ;
774	695	1.92	1 ;
776	750	1.15	1 ;
777	670	0.64	1 ;
778	780	1.41	1 ;
780	725	0.77	1 ;
779	760	0.26	1 ;
781	810	1.67	1 ;
782	850	2.43	1 ;
783	740	0.26	1 ;
785	675	0.77	1 ;
784	740	0	1 ;
710	730	0	1 ;
144	746	0	1 ;
274	762	0	1 ;
282	870	0	1 ;
284	763	0	1 ;
285	760	0	1 ;
563	762	0	1 ;
564	740	0	1 ;
568	740	0	1 ;
570	740	0	1 ;
575	745	0	1 ;

579	745	0	1 ;
581	745	16.57	1 ;
588	745	0	1 ;
589	745	0	1 ;
590	740	0	1 ;
591	642	0	1 ;
592	620	0	1 ;
593	641	0	1 ;
594	590	0	1 ;
595	659	0	1 ;
596	690	0	1 ;
597	743	0	1 ;
718	743	3.59	1 ;
719	743	0	1 ;
743	743	0	1 ;
744	743	6.66	1 ;
786	743	0	1 ;
787	743	0	1 ;
788	743	0	1 ;
789	743	3.59	1 ;
790	743	3.59	1 ;
791	750	0	1 ;
792	762	0	1 ;
793	740	0	1 ;
794	755	0	1 ;
795	745	0	1 ;
796	646.5	0	1 ;
797	651.5	0	1 ;
798	743	0	1 ;
799	762	0	;
800	740	0	;
801	635	0	;
808	745	0	;
809	745	0	;
811	728	0	;
816	745	0	;
817	737	0	;
634	765	0	;
819	783	0	;
820	784	0	;
821	784	0	;
822	783	0	;
823	783	0	;
824	782	0	;
825	782	0	;
826	782	0	;
829	903	0	;
830	950	0	;
831	940	0	;
10	742	0	;
618	743	0	;
827	745	0	;
828	745	0	;
832	745	0	;
833	750	0	;
834	760	0	;
835	743	0	;
836	760	0	;
837	760	0	;
838	743	0	;

[RESERVOIRS]

;ID	Head	Pattern	
609	920		;Boise Springs
612	600		;PC Johnson 2
613	732		;Watercress Springs

1012	740	;New Horizons Pump Station
12	600	;PC Johnson Well 3
309	780	;Tacoma Booster Pump Station
758	730	;
802	681	;
803	660	;
804	764	;
805	774	;
806	782	;
807	791	;
810	791	;
812	774	;
813	811	;
814	942	;
815	814	;
818	740	;

[TANKS]

;ID	Elevation	InitLevel	MinLevel	MaxLevel	Diameter	MinVol	VolCurve	
610	875.7	8.4	1	12	170	0	6	;City Reservoir.
615	954	24.2	1	34	30	0		;Stanridge Hill
616	987	9.2	1	15	26	0		;Fairway Hills
617	868	14.4	1	20	114	0		;Crews Reservoir

[PIPES]

;ID	Node1	Node2	Length	Diameter	Roughness	MinorLoss	Status	
1	1057	169	260	8	120.75	0	Open	;
2	165	166	410	8	120.75	0	Open	;
3	200	167	230	8	110	0	Open	;
4	200	168	310	4	110	0	Open	;
5	838	200	390	8	110	0	Open	;
6	419	165	1360	8	120.75	0	Open	;
7	417	165	1300	8	120.75	0	Open	;
8	152	154	500	6	126	0	Open	;
9	153	154	493.39	8	115.51	0	Open	;
10	619	412	887.14	12	105	0	Open	;
11	606	756	3663.75	10	126	0	Open	;
12	156	282	1095.92	12	110	0	Open	;
14	157	156	752.58	12	110	0	Open	;
15	284	158	258.69	8	115.51	0	Open	;
16	406	159	531.5	6	115.51	0	Open	;
17	1513	1512	1404.04	15.23	136.5	0	Open	;
18	136	324	568.46	12	110	0	Open	;
19	412	634	562.62	12	131.26	0	Open	;
20	305	304	250	7.06	136.51	0	Open	;
21	150	311	700	12	105	0	Open	;
22	149	312	630	8	131.25	0	Open	;
23	148	150	630	10	105	0	Open	;
24	1022	145	455.25	6	115.51	2	Open	;
25	146	144	500	10	105	0	Open	;
26	586	147	665	6	110	0	Open	;
27	147	299	520	6	126	0	Open	;
28	171	289	1111.44	6	136.51	0	Open	;
29	347	173	640	6	126	0	Open	;
30	143	525	725	6	110	0	Open	;
31	141	1018	50	6	105	0	Open	;
33	141	142	1230	8	115.51	0	Open	;
34	142	146	270	10	105	0	Open	;
35	140	681	259.76	8	126	0.5	Open	;
36	126	325	314.51	10	105	0	Open	;
37	139	140	313.85	8	136.51	0	Open	;
38	680	139	281.3	6	115.51	0	Open	;
39	326	129	328.67	8	115.51	0	Open	;
40	129	131	244.18	8	105	0	Open	;
41	128	129	266.39	8	105	0	Open	;
42	126	128	353.54	8	105	0	Open	;

43	125	126	256.86	8	105	0	Open	;
44	123	125	574.48	8	110	0	Open	;
45	687	123	150	10	115.51	0	Open	;
46	121	123	410	8	110	0	Open	;
47	686	125	153.24	8	105	0	Open	;
48	119	122	410	8	126	0	Open	;
49	122	124	576.27	8	126	0	Open	;
50	118	122	637.39	10	115.51	1	Open	;
51	124	127	352.14	8	126	0	Open	;
52	127	130	518.09	8	126	0	Open	;
53	127	128	553.11	6	110	0	Open	;
54	130	131	558.66	6	115.51	0	Open	;
55	130	132	612.39	8	126	0	Open	;
56	678	133	421.65	8	115.51	0	Open	;
57	809	136	176.54	10	115.51	0	Open	;
58	132	534	485.83	8	126	0	Open	;
59	134	135	278.07	8	110	0	Open	;
60	135	529	413.47	10	115.51	0	Open	;
61	111	134	215.73	8	110	0	Open	;
62	110	762	557.48	8	141.75	0	Open	;
63	108	673	274.71	10	115.51	0	Open	;
64	108	109	457.83	6	105	0	Open	;
65	109	563	241.26	8	110	0	Open	;
66	528	112	748.12	6	115.51	3	Open	;
67	115	132	538.8	6	141.75	0	Open	;
68	112	115	517.04	6	141.75	0	Open	;
69	112	113	618.11	6	115.51	0	Open	;
70	113	114	255.07	6	110	0	Open	;
71	832	114	362.12	6	110	0	Open	;
72	107	112	544.3	6	141.75	0	Open	;
74	106	108	693.41	10	115.51	0	Open	;
75	103	106	592.63	10	115.51	0	Open	;
76	103	107	673	6	105	0	Open	;
77	98	103	332.21	6	115.51	0	Open	;
78	1039	98	701.22	6	110	0	Open	;
79	532	99	676.66	6	105	0	Open	;
80	589	99	874.97	6	105	0	Open	;
81	256	588	361.27	6	115.51	0	Open	;
82	117	118	387.78	8	115.51	0	Open	;
83	836	527	296.26	6	110	0	Open	;
84	100	118	308.79	10	115.51	0	Open	;
85	94	588	650.64	10	115.51	0	Open	;
86	93	94	326.97	6	110	0	Open	;
87	92	93	494.95	6	110	0	Open	;
88	661	92	333.69	6	110	0	Open	;
89	531	91	848.39	6	105	0	Open	;
90	1039	90	37.97	6	105	0	Open	;
91	79	86	360.22	10	115.51	0	Open	;
92	77	79	234.85	6	115.51	0	Open	;
93	73	77	256.62	6	115.51	0	Open	;
94	73	245	312.45	8	136.51	0	Open	;
95	73	74	925.84	6	115.51	0	Open	;
96	77	78	805.79	4	115.51	0	Open	;
97	79	80	805.86	6	115.51	0	Open	;
98	530	87	774.02	6	115.51	0	Open	;
99	78	80	229.51	6	115.51	0	Open	;
100	74	78	379.86	6	115.51	0	Open	;
101	81	87	329.21	8	110	0	Open	;
102	1038	91	289.3	6	110	0	Open	;
103	1044	255	407.64	6	115.51	0	Open	;
104	82	88	342.71	10	115.51	0	Open	;
105	88	1035	275.46	10	115.51	0	Open	;
106	94	95	809.74	6	110	0	Open	;
107	95	101	622.87	6	138	0	Open	;
108	101	119	450	6	138	0	Open	;
109	119	688	160	8	126	0	Open	;

110	101	102	490	6	115.51	0	Open	;
111	102	120	350	6	115.51	0	Open	;
112	31	276	340	6	115.51	0	Open	;
113	95	96	445.01	6	115.51	0	Open	;
114	694	689	360	6	110	0	Open	;
115	85	30	391.08	6	110	0	Open	;
116	84	85	398.51	8	115.51	0	Open	;
117	258	85	472.27	6	115.51	0	Open	;
118	30	692	360	6	120.75	0	Open	;
120	31	178	1235	6	126	1	Open	;
121	276	277	720	6	115.51	2	Open	;
122	120	793	697.58	8	110	0.4	Open	;
123	177	204	500	8	110	1	Open	;
124	178	278	570	8	120.75	0	Open	;
125	181	211	650	6	120.75	0	Open	;
126	180	181	1260	6	120.75	0	Open	;
127	179	180	910	6	120.75	0.5	Open	;
128	280	213	620	12	136.51	2	Open	;
129	176	549	470	10	134.84	0	Open	;
130	711	358	220	8	131.25	0	Open	;
131	183	184	270	8	126	0	Open	;
132	549	182	250	10	134.84	0	Open	;
133	185	187	500	6	126	0	Open	;
134	186	187	350	6	126	0	Open	;
135	354	188	1150	6	131.26	0	Open	;
136	354	189	300	6	131.26	0	Open	;
137	182	526	450	10	134.84	0	Open	;
138	192	193	700	10	136.51	0	Open	;
139	205	362	700	6	115.51	0	Open	;
140	362	190	550	6	115.51	0	Open	;
141	193	560	650	10	136.51	0	Open	;
142	194	195	650	6	126	0	Open	;
143	269	195	600	6	126	0	Open	;
144	83	260	68.68	8	105	0	Open	;
145	252	76	885.93	6	110	0	Open	;
146	643	250	444.17	8	110	0	Open	;
147	72	75	610.23	8	126	0	Open	;
148	70	248	661.86	8	126	0	Open	;
149	194	359	917	6	126	0	Open	;
150	377	70	840.72	12	136.51	0	Open	;
151	376	377	932.55	12	136.51	0	Open	;
152	68	376	754.5	12	136.51	0	Open	;
153	375	68	650.06	6	115	0	Open	;
154	66	375	534.17	6	115	0	Open	;
155	68	378	620.03	12	136.51	0	Open	;
156	476	1041	696.38	6	115.51	0	Open	;
157	474	476	1335.27	6	126	0	Open	;
158	468	469	691.81	6	126	0	Open	;
159	198	473	1111.84	6	126	0	Open	;
160	366	199	723.08	6	126	0	Open	;
161	64	374	812.38	6	115.51	0	Open	;
162	64	379	808.88	10	136.51	0	Open	;
163	62	466	670.01	10	136.51	0	Open	;
164	63	467	677.54	8	126	0	Open	;
165	460	463	654.29	8	126	0	Open	;
166	61	465	615.51	10	136.51	0	Open	;
167	591	459	590.98	10	136.51	0	Open	;
168	58	455	710.55	8	126	0	Open	;
169	457	60	1288.17	8	126	0	Open	;
170	450	452	780.39	6	126	0	Open	;
171	56	427	546.71	6	115.51	0	Open	;
172	54	426	635.08	6	115.51	0	Open	;
174	55	429	406.18	8	136.51	0	Open	;
175	53	55	263.45	8	136.51	0	Open	;
176	425	53	479.3	8	136.51	0	Open	;
177	49	433	483.25	8	136.51	0	Open	;

178	421	51	632.86	4	115.51	0	Open	;
179	51	420	714.04	6	115.5	0	Open	;
180	49	432	478.34	8	136.51	0	Open	;
181	593	437	1372.32	6	115.51	0	Open	;
182	438	46	1258.53	8	115.51	0	Open	;
183	44	458	680.86	6	115.51	0	Open	;
184	42	461	998.44	8	115.51	0	Open	;
185	42	462	1038.76	8	115.51	0	Open	;
186	464	44	622.4	6	115.51	0	Open	;
187	593	47	657.14	6	115.51	0	Open	;
188	47	48	1155.4	8	115.51	0	Open	;
189	442	443	1774.25	6	115.51	0	Open	;
190	1	2	980.78	6	115.51	0	Open	;
191	486	210	1385.85	8	126	0	Open	;
192	444	445	922.42	8	115.51	0	Open	;
193	448	4	1274.27	8	136.51	0	Open	;
194	110	137	305.83	10	115.51	0	Open	;
195	41	385	1034.21	10	136.51	0	Open	;
196	40	515	757.97	10	136.51	0	Open	;
197	39	490	642.8	8	126	0	Open	;
198	491	39	692.18	8	126	0	Open	;
199	480	6	1316	10	136.51	0	Open	;
200	595	481	1298.86	10	136.51	0	Open	;
201	24	495	1154.25	8	126	0	Open	;
203	240	38	406.9	6	126	0	Open	;
204	34	664	301.59	6	115.51	0	Open	;
205	535	90	743.97	6	115.51	0	Open	;
206	97	103	633.19	8	115.51	0	Open	;
207	33	97	629.14	8	115.51	0	Open	;
208	33	533	853.02	6	115.51	0	Open	;
209	533	542	635	8	138	0	Open	;
210	97	231	592.22	6	115.51	0	Open	;
211	229	33	470.29	6	115.51	0	Open	;
212	105	108	469.7	6	105	0	Open	;
213	230	104	298.51	6	105	0	Open	;
214	105	334	903.79	6	115.51	0	Open	;
215	104	105	186.16	6	105	0	Open	;
216	28	575	617.3	6	115.5	0	Open	;
217	338	28	683	6	115.5	0	Open	;
218	22	400	624.32	10	126	0	Open	;
219	29	227	801.09	12	136.51	0	Open	;
220	226	346	152.97	12	136.51	0	Open	;
221	581	225	665.77	12	136.51	0	Open	;
222	581	32	448.98	12	131.26	0	Open	;
223	24	500	653.97	12	136.51	0	Open	;
224	254	82	907.04	6	115.51	0	Open	;
225	223	224	658.21	6	115.51	0	Open	;
226	8	504	640.35	12	136.51	0	Open	;
227	485	8	985.25	10	136.51	0	Open	;
228	8	505	1137	10	136.51	0	Open	;
229	496	596	1230.24	8	126	0	Open	;
230	520	23	1376.72	8	131.26	0	Open	;
231	14	516	1002.24	8	131.26	0	Open	;
232	517	13	1109.24	6	131.26	0	Open	;
235	1003	509	648.22	6	125	0	Open	;
237	521	23	1372.84	8	126	0	Open	;
238	523	16	1009.54	8	126	0	Open	;
239	17	19	57.72	10	126	0	Open	;
240	620	17	52.23	10	131.26	0	Open	;
243	17	19	77.36	24	126	0	Open	;
244	19	16	47.3	10	126	0	Closed	;
245	16	398	570.56	10	126	0	Open	;
246	399	21	666.64	10	126	0	Open	;
247	21	400	610.58	10	126	0	Open	;
248	22	402	536.42	12	126	0	Open	;
249	162	163	50	12	138.15	0	Open	;

253	1512	403	1183.09	15.23	136.5	0	Open	;
254	308	175	160	12	110	0	Open	;
256	80	81	513.62	6	115.51	0	Open	;
257	115	116	617.8	6	110	0	Open	;
258	677	330	134.08	12	110	0	Open	;
259	173	349	720	6	126	0	Open	;
260	145	146	517.83	6	115	0	Open	;
261	82	201	298.87	10	115.51	0	Open	;
262	201	202	354.89	10	115.51	0	Open	;
263	84	257	480.28	8	126	0	Open	;
264	121	120	500	8	126	0	Open	;
265	405	285	325.4	8	126	0	Open	;
266	259	89	456.3	6	115.51	0	Open	;
267	131	133	618.63	10	115.51	0	Open	;
268	116	113	489.84	6	115.51	0	Open	;
269	103	90	1019.02	10	115.51	0	Open	;
270	349	350	1180	7.55	141.75	0	Open	;8" HDPE
271	1029	1030	1140	8	136.51	0	Open	;
272	1030	205	390	8	136.51	0	Open	;
273	184	553	390	8	126	0	Open	;
274	209	207	590	6	126	0	Open	;
275	207	208	550	6	126	0	Open	;
276	209	208	450	6	126	0	Open	;
277	183	357	850	8	126	0	Open	;
278	439	801	357.55	8	123	0	Open	;
279	124	117	551.2	5	105	0	Open	;
280	211	179	320	6	120.75	0	Open	;
281	180	212	140	8	120.75	0	Open	;
282	212	213	670	8	120.75	0	Open	;
283	212	214	830	8	120.75	0	Open	;
284	389	214	215	8	131.26	0	Open	;
285	214	215	630	8	136.5	0	Open	;
286	213	710	820	12	136.5	0	Open	;
287	710	176	360	12	136.5	2	Open	;
288	3	477	765.56	8	115.51	0	Open	;
289	19	216	3070.24	10	131.26	0	Open	;
290	216	217	668.03	10	131.25	0	Open	;
291	617	217	85.49	12	131.25	0	Closed	;
292	217	218	10	12	131.25	0	Open	;
294	218	219	660.7	16	131.25	0	Open	;
295	219	220	1256.78	12	131.25	0	Open	;
296	220	26	962.48	12	131.25	0	Open	;
297	222	26	711.81	12	131.25	0	Open	;
298	222	25	677.42	12	131.26	0	Open	;
299	32	232	809	12	131.26	0	Open	;
300	232	233	1055.23	12	131.26	0	Open	;
301	233	234	931.6	12	131.26	0	Open	;
302	234	235	906.34	12	131.26	0	Open	;
303	235	236	849.14	12	131.26	0	Open	;
304	236	237	596.04	12	131.26	0	Open	;
305	237	238	1046.5	12	131.26	0	Open	;
306	238	38	1334.08	12	131.26	0	Open	;
307	38	239	321.96	12	131.26	0	Open	;
308	239	71	622.57	12	131.26	0	Open	;
309	71	246	460.78	10	126	0	Open	;
310	246	650	169.73	10	126	0	Open	;
311	646	590	347.99	8	126	0	Open	;
312	243	71	664.55	10	136.51	0	Open	;
313	590	248	640.89	8	126	0	Open	;
314	71	653	250.59	8	126	0	Open	;
315	244	659	254.79	8	126	0	Open	;
316	245	249	360.34	6	126	0	Open	;
317	249	250	943.1	6	126	0	Open	;
318	250	251	153.94	8	126	0	Open	;
319	251	253	413.65	8	126	0	Open	;
320	253	631	285.48	8	126	0	Open	;

321	75	252	401.56	6	110	0	Open	;
322	251	81	693.57	8	110	0	Open	;
323	81	254	376.29	6	115.51	0	Open	;
324	1037	255	262.02	6	115.51	0	Open	;
325	99	256	705.86	6	115.51	0	Open	;
326	202	257	789.36	8	126	0	Open	;
327	201	258	787.11	6	115.51	0	Open	;
328	88	259	798.71	6	115.51	0	Open	;
329	36	241	488.51	6	110	0	Open	;
330	36	242	562.02	6	141.75	0	Open	;
331	260	261	870.5	8	115.51	0	Open	;
332	261	262	1030.73	8	115.51	0	Open	;
333	262	84	623.44	8	115.51	0	Open	;
334	30	89	260	6	110	0	Open	;
335	96	31	210	6	115.51	0	Open	;
336	102	276	160	6	115.51	0	Open	;
337	260	265	720	6	126	0	Open	;
338	265	266	500	6	126	0	Open	;
339	266	267	960	6	126	0	Open	;
340	267	1024	447	6	126	0	Open	;
341	268	269	30	6	126	0	Open	;
342	194	1025	830	6	126	0	Open	;
343	84	263	514.89	8	131.26	0	Open	;
344	263	700	331.87	8	131.26	0	Open	;
345	204	277	440	6	115.51	0	Open	;
346	278	279	620	8	120.75	0	Open	;
347	179	278	330	8	120.75	0	Open	;
348	240	241	598.87	6	110	0	Open	;
349	268	271	1240	6	131.26	0	Open	;
350	271	275	250	8	131.26	0	Open	;
351	271	272	400	8	131.26	0	Open	;
352	272	273	810	8	131.26	0	Open	;
353	273	582	210	8	131.26	0	Open	;
354	273	215	670	8	131.26	0	Open	;
355	177	280	1180	12	136.51	0	Open	;
356	280	281	660	10	131.26	0	Open	;
361	281	283	825	10	131.26	0	Open	;
363	283	286	450	10	131.26	0	Open	;
364	286	287	650	10	131.26	0	Open	;
365	720	287	350	8	131.26	0	Open	;
366	287	289	340	10	131.26	0	Open	;
367	288	292	510	8	131.26	0	Open	;
368	291	292	270	8	131.26	0	Open	;
369	290	291	600	8	131.26	0	Open	;
370	289	290	590	10	131.26	0	Open	;
371	290	293	250	10	131.26	0	Open	;
372	293	294	250	10	131.26	0	Open	;
373	294	295	250	10	131.26	0	Open	;
374	295	296	250	10	131.26	0	Open	;
375	291	297	1005	8	131.26	0	Open	;
376	296	297	680	8	131.26	0	Open	;
377	296	298	140	10	131.26	0	Open	;
378	298	299	980	6	126	0	Open	;
379	298	171	497.86	10	136.51	0	Open	;
380	795	300	711.23	6	126	0	Open	;
381	300	301	1300	6	126	0	Open	;
382	301	172	570	6	126	0	Open	;
383	172	302	1400	6	126	0	Open	;
384	302	347	690	6	126	0	Open	;
385	170	348	330	8	136.51	0	Open	;
386	348	303	1520	8	136.51	0	Open	;
387	303	304	1600	8	136.51	0	Open	;
388	305	306	170	8	136.51	0	Open	;
389	306	307	1030	8	136.51	0	Open	;
394	151	311	625	12	105	0	Open	;
395	321	320	440	12	131.25	0	Open	;

396	320	318	130	12	131.25	0	Open	;
397	317	318	475	12	131.25	0	Open	;
398	316	317	475	12	131.25	0	Open	;
399	316	319	740	8	131.25	0	Open	;
400	319	318	730	8	131.25	0	Open	;
401	313	316	438	12	131.25	0	Open	;
402	313	314	630	8	131.25	0	Open	;
403	313	149	400	12	131.25	0	Open	;
404	144	149	850	12	131.25	0	Open	;
405	314	315	330	8	131.25	0	Open	;
406	312	727	300	8	131.25	0	Open	;
407	150	312	650	8	126	0	Open	;
408	123	329	270	10	131.26	0	Open	;
409	684	329	310	10	131.26	0	Open	;
410	126	329	581.81	10	131.26	0	Open	;
411	325	326	615.38	10	131.26	0	Open	;
412	326	327	434.53	10	131.26	0	Open	;
413	327	328	431.98	10	131.26	0	Open	;
414	325	322	438.19	10	105	0	Open	;
415	10	142	355.23	10	105	0	Open	;
416	326	140	479.57	8	126	0	Open	;
417	133	328	308.6	10	131.26	0	Open	;
418	328	323	484.59	10	131.26	0	Open	;
419	138	323	748.88	6	126	0	Open	;
420	324	138	288.76	8	131.26	0	Open	;
421	331	324	295.09	12	110	0	Open	;
422	332	331	229.2	12	110	0	Open	;
423	333	332	1638.41	12	110	0	Open	;
424	404	333	773.05	12	110	0	Open	;
425	136	330	296.75	12	110	0	Open	;
426	335	137	386.84	12	136.51	0	Open	;
427	568	339	330.86	8	136.51	0	Open	;
428	339	341	778.83	8	136.51	0	Open	;
429	336	334	376.74	8	136.51	0	Open	;
430	564	340	271.43	8	136.51	0	Open	;
431	340	341	446.11	8	136.51	0	Open	;
432	342	341	758.04	8	136.51	0	Open	;
433	337	342	813.8	8	136.51	0	Open	;
434	336	335	501.94	12	136.51	0	Open	;
435	337	570	246.09	12	136.51	0	Open	;
436	338	337	551.23	12	136.51	0	Open	;
437	27	338	33.47	12	126	0	Open	;
438	579	668	559.65	6	115.51	0	Open	;
439	29	228	530.3	12	136.5	0	Open	;
440	228	27	794.26	12	136.5	0	Open	;
441	575	230	315.39	6	105	0	Open	;
442	104	231	691.67	6	115.51	0	Open	;
443	344	343	1107.42	10	126	0	Open	;
444	345	344	842.98	10	126	0	Open	;
445	401	345	707.11	10	126	0	Open	;
446	224	27	1225.54	6	115.51	0	Open	;
447	26	223	610.31	6	115.51	0	Open	;
448	225	346	290.15	12	136.51	0	Open	;
449	226	227	635.77	12	136.51	0	Open	;
450	339	340	559.19	8	136.51	0	Open	;
452	334	137	481.67	6	115.51	0	Open	;
453	26	221	236.17	6	115.5	0	Open	;
454	647	72	309.71	8	126	0	Open	;
455	380	379	1136.37	10	136.51	0	Open	;
456	67	380	673.56	10	136.51	0	Open	;
457	67	383	806.88	10	136.51	0	Open	;
458	383	384	1191.67	10	136.51	0	Open	;
459	1063	385	881.47	10	136.51	0	Open	;
460	67	378	649.88	12	136.51	0	Open	;
461	67	381	685	10	136.51	0	Open	;
462	381	382	632.74	10	136.51	0	Open	;

463	382	69	1301.99	10	136.51	0	Open	;
464	69	243	651.57	10	136.51	0	Open	;
465	374	373	1032.69	6	115.51	0	Open	;
466	373	372	800.7	6	115.51	0	Open	;
467	372	65	1265.42	6	115.51	0	Open	;
468	65	366	671.92	6	126	0	Open	;
469	367	65	774.79	8	115.51	0	Open	;
470	368	367	1007.26	8	115.51	0	Open	;
471	369	368	1084.72	8	115.51	0	Open	;
472	370	369	862.59	8	115.51	0	Open	;
473	371	370	749.06	8	115.51	0	Open	;
474	83	371	728.54	8	115.51	0	Open	;
475	365	196	789.12	6	115.51	0	Open	;
476	206	364	550.65	6	115.51	0	Open	;
477	363	206	1000	6	136.51	0	Open	;
478	191	363	960	6	136.51	0	Open	;
479	360	1029	300	8	136.51	0	Open	;
480	192	360	680	8	136.51	0	Open	;
481	359	209	80	6	126	0	Open	;
482	184	357	530	8	126	0	Open	;
483	358	183	570	8	131.26	0	Open	;
484	186	356	1350	6	131.26	0	Open	;
485	356	355	680	6	131.26	0	Open	;
486	355	188	950	6	131.26	0	Open	;
490	174	351	1100	6	136.51	0	Open	;
491	350	174	730	6	126	0	Open	;
492	148	386	490.55	6	115.51	0	Open	;
493	20	398	676.73	10	126	0	Open	;
494	20	399	496.87	10	126	0	Open	;
495	22	401	733.52	10	126	0	Open	;
496	151	413	510	12	105	0	Open	;
497	1515	402	589.51	12	126	0	Open	;
498	162	403	1050	15.23	136.5	0	Open	;
499	413	414	740	12	105	0	Open	;
500	203	405	948.11	8	126	0	Open	;
501	158	406	205.59	6	115.51	0	Open	;
502	407	408	285.79	12	131.26	0	Open	;
503	153	409	765.04	8	136.51	0	Open	;
504	408	410	519.41	8	136.51	0	Open	;
505	410	411	507.31	8	136.51	0	Open	;
506	411	412	346.69	8	136.51	0	Open	;
507	202	76	693.82	10	131.26	0	Open	;
508	76	536	466.91	6	131.26	0	Open	;
509	76	538	520.71	10	131.26	0	Open	;
510	536	537	344.5	6	131.26	0	Open	;
511	537	538	691.2	6	131.26	0	Open	;
512	538	539	352.22	6	131.26	0	Open	;
513	538	540	517.66	10	131.26	0	Open	;
514	539	540	824.5	6	131.26	0	Open	;
515	540	262	229.45	10	131.26	0	Open	;
516	391	392	140	10	131.26	0	Open	;
517	264	391	680	8	131.26	0	Open	;
518	390	391	690	10	131.26	0	Open	;
519	391	393	540	8	131.26	0	Open	;
520	393	394	370	8	131.26	0	Open	;
521	394	395	330	8	131.26	0	Open	;
522	396	395	270	8	131.26	0	Open	;
523	388	390	355	8	131.26	0	Open	;
524	388	387	290	8	131.26	0	Open	;
525	388	389	315	8	131.26	0	Open	;
526	264	389	690	8	131.26	0	Open	;
527	396	397	350	8	131.26	0	Open	;
528	390	396	270	8	131.26	0	Open	;
529	672	414	680	12	105	0	Open	;
530	274	608	550	8	115.51	0	Open	;
531	164	415	756.79	8	120.75	0	Open	;

532	745	416	610	8	120.75	0	Open	;
533	416	820	196.46	8	120.75	0	Open	;
534	167	418	952.08	8	125	0	Open	;
535	430	420	1594.4	6	115.5	0	Open	;
536	422	421	1150.24	4	115.51	0	Open	;
537	50	422	789.39	4	115.51	0	Open	;
538	50	423	872.22	8	136.51	0	Open	;
539	423	424	689.63	8	136.51	0	Open	;
540	424	425	1176.42	8	136.51	0	Open	;
541	56	426	704.47	6	115.51	0	Open	;
542	427	428	1039.42	6	115.51	0	Open	;
543	57	428	985.93	6	115.51	0	Open	;
544	429	640	1021.27	8	136.51	0	Open	;
545	451	453	787.79	8	136.51	0	Open	;
546	453	58	686.12	8	136.51	0	Open	;
547	57	450	648.26	6	126	0	Open	;
548	452	454	1114.96	6	126	0	Open	;
549	60	454	1302.62	6	126	0	Open	;
550	59	455	648.38	8	126	0	Open	;
551	59	456	651.62	8	126	0	Open	;
552	456	457	645.02	8	126	0	Open	;
553	61	459	742.6	10	136.51	0	Open	;
554	61	462	1128.61	8	115.51	0	Open	;
555	44	461	687.18	8	115.51	0	Open	;
556	45	458	613.78	6	115.51	0	Open	;
557	43	464	466.74	6	115.51	0	Open	;
558	60	460	621.61	8	126	0	Open	;
559	63	463	1287.99	8	126	0	Open	;
560	467	472	617.32	8	126	0	Open	;
561	472	475	1320.78	8	126	0	Open	;
562	65	475	1323.47	8	126	0	Open	;
563	62	465	661.48	10	136.51	0	Open	;
564	466	470	1445.38	10	136.51	0	Open	;
565	470	471	670	10	136.51	0	Open	;
566	64	471	1147.45	10	136.51	0	Open	;
567	199	473	2084.03	6	126	0	Open	;
568	198	468	1127.28	6	126	0	Open	;
569	469	197	791.9	6	126	0	Open	;
570	197	474	504	6	126	0	Open	;
571	1069	541	1302.82	8	136.51	0	Open	;
572	433	541	819.1	8	136.51	0	Open	;
573	44	438	1354.64	8	115.51	0	Open	;
574	47	442	825.14	6	115.51	0	Open	;
575	2	443	922.34	6	115.51	0	Open	;
576	3	448	278.93	6	131.26	0	Open	;
577	594	449	538.07	8	136.51	0	Open	;
578	1	444	1152.96	8	115.51	0	Open	;
579	445	446	972.16	8	115.51	0	Open	;
580	446	447	906.35	8	115.51	0	Open	;
581	594	447	485.69	8	115.51	0	Open	;
582	52	431	1220.42	8	136.51	0	Open	;
583	431	432	893.52	8	136.51	0	Open	;
584	49	434	817.22	6	115.51	0	Open	;
585	434	435	925.19	6	115.51	0	Open	;
586	435	436	683.67	6	115.51	0	Open	;
587	436	437	1395.26	6	115.51	0	Open	;
588	439	440	1140.87	8	123	0	Open	;
589	440	441	925.31	8	123	0	Open	;
590	441	210	939.93	8	123	0	Open	;
591	52	430	931.69	6	115.5	0	Open	;
592	477	478	1453.94	8	115.51	0	Open	;
593	5	478	1144.18	8	115.51	0	Open	;
594	5	479	616.05	10	136.51	0	Open	;
595	479	480	698.75	10	136.51	0	Open	;
596	481	482	619.72	10	136.51	0	Open	;
597	482	483	652.09	10	136.51	0	Open	;

598	483	484	1336.82	10	136.51	0	Open	;
599	7	484	661.77	10	136.51	0	Open	;
600	7	485	942.32	10	136.51	0	Open	;
601	486	487	1503.46	8	126	0	Open	;
602	592	488	632.35	8	126	0	Open	;
603	40	488	311.1	8	126	0	Open	;
604	40	489	1236.33	8	126	0	Open	;
605	489	490	704.7	8	126	0	Open	;
606	41	515	1434.89	10	136.51	0	Open	;
607	491	492	659.33	8	126	0	Open	;
608	37	492	1267.13	8	126	0	Open	;
609	37	493	1001.92	8	126	0	Open	;
610	493	494	996.51	8	126	0	Open	;
611	494	495	697.54	8	126	0	Open	;
612	496	497	437.26	8	126	0	Open	;
613	497	498	676.18	8	126	0	Open	;
614	498	499	686.42	8	126	0	Open	;
615	23	499	1400.69	8	126	0	Open	;
616	353	524	1187.29	12	136.51	0	Open	;
617	596	501	1200.97	12	136.51	0	Open	;
618	501	502	1339.22	12	136.51	0	Open	;
619	502	503	1336.11	12	136.51	0	Open	;
620	503	504	685.31	12	136.51	0	Open	;
621	505	506	1393.99	10	136.51	0	Open	;
622	506	507	784.58	10	136.51	0	Open	;
623	507	508	561.89	10	136.51	0	Open	;
624	9	508	331.95	10	136.51	0	Open	;
625	1004	509	323.64	6	125	0	Open	;
626	11	510	802.21	10	125	0	Open	;
627	11	1000	174.73	8	125	0	Open	;
628	510	511	626.09	10	125	0	Open	;
630	512	513	283.02	10	125	0	Open	;
631	514	831	919.98	6	125	0	Open	;
633	14	517	705.52	6	126	0	Open	;
634	14	518	635.96	8	131.26	0	Open	;
635	518	519	734.71	8	131.26	0	Open	;
636	519	520	1371.36	8	131.26	0	Open	;
637	15	521	727.47	8	126	0	Open	;
638	15	522	942.43	8	126	0	Open	;
639	522	523	775.05	8	126	0	Open	;
640	34	535	517.66	6	115.51	0	Open	;
641	147	525	725	6	110	0	Open	;
642	270	560	300	6	126	0	Open	;
643	117	527	319.11	6	110	0	Open	;
644	563	528	273.84	6	141.75	0	Open	;
645	137	529	587.62	10	115.51	0	Open	;
646	86	530	522.94	6	115.51	0	Open	;
647	90	531	484.85	6	105	0	Open	;
648	98	532	879.01	6	105	0	Open	;
649	34	533	160.1	6	115.51	0	Open	;
650	25	524	347.29	12	136.51	0	Open	;
651	135	534	262.56	8	126	0	Open	;
652	160	404	532.16	12	110	0	Open	;
653	27	343	585.5	10	126	0	Open	;
654	196	364	722.76	6	115.51	0	Open	;
655	35	542	667.06	8	138	0	Open	;
656	64	543	1287.4	8	136.51	0	Open	;
657	543	544	1315.28	8	136.51	0	Open	;
658	544	545	663.56	8	136.51	0	Open	;
659	545	546	611.14	8	136.51	0	Open	;
660	546	547	1133.65	8	136.51	0	Open	;
661	547	548	589.79	8	136.51	0	Open	;
662	548	486	884.72	8	136.51	0	Open	;
663	185	1080	150	10	134.84	0	Open	;
664	185	550	260	10	134.84	0	Open	;
665	550	551	400	10	134.84	0	Open	;

666	551	357	30	8	134.84	0	Open	;
667	551	552	710	10	134.84	0	Open	;
668	552	553	340	8	126	0	Open	;
669	552	554	400	10	134.84	0	Open	;
670	554	555	430	10	134.84	0	Open	;
671	555	556	240	10	134.84	0	Open	;
672	556	557	220	10	134.84	0	Open	;
673	557	558	150	10	134.84	0	Open	;
674	558	559	235	10	134.84	0	Open	;
675	559	560	300	10	134.84	0	Open	;
676	266	561	230	6	131.26	0	Open	;
677	561	562	465	8	131.26	0	Open	;
680	562	565	310	8	131.26	0	Open	;
681	565	566	260	8	131.26	0	Open	;
682	566	567	570	8	131.26	0	Open	;
683	267	567	200	8	131.26	0	Open	;
685	567	569	370	8	131.26	0	Open	;
686	569	577	315	8	131.26	0	Open	;
687	569	571	320	8	131.26	0	Open	;
689	571	572	620	8	131.26	0	Open	;
690	395	572	340	8	131.26	0	Open	;
691	572	573	160	8	131.26	0	Open	;
692	573	574	135	8	131.26	0	Open	;
694	576	573	345	8	131.26	0	Open	;
695	576	577	145	8	131.26	0	Open	;
696	565	576	200	8	131.26	0	Open	;
697	390	578	335	10	131.26	0	Open	;
699	578	580	400	8	131.26	0	Open	;
701	578	582	300	10	131.26	0	Open	;
703	582	583	410	8	131.26	0	Open	;
704	583	584	650	8	131.26	0	Open	;
705	584	585	600	8	131.26	0	Open	;
706	146	586	85	6	126	0	Open	;
707	586	587	265	8	131.26	0	Open	;
724	513	598	341.38	10	125	0	Open	;
725	599	598	50.03	10	125	0	CV	;
726	830	615	31.16	8	125	0	Open	;
727	615	599	37.18	10	125	0	Open	;
729	418	600	96.66	8	125	0	Open	;
730	616	600	1	8	129.68	0	Open	;
731	157	203	318.42	12	131.26	0	Open	;
732	203	601	391.16	12	131.26	0	Open	;
733	601	602	785.3	12	131.26	0	Open	;
734	602	603	233.64	12	131.26	0	Open	;
735	605	604	163.19	10	136.51	0	Open	;
736	603	605	279.37	12	131.26	0	Open	;
737	207	553	40	8	126	0	Open	;
739	617	623	52.75	16	131.25	0	Open	;
1001	829	1004	309.61	6	125	0	Open	;
1004	509	1005	204.18	6	125	0	Open	;
1006	1006	1007	331.92	6	125	0	Open	;
1007	1007	630	374.57	6	125	0	Open	;
1012	516	13	262.21	6	131.26	0	Open	;
1013	1011	1012	33.18	4	125	0	Closed	;
1016	330	1015	691.78	12	131.26	0	Open	;
1017	675	335	349.32	12	131.26	0	Open	;
1018	69	1016	619.61	8	136.51	0	Open	;
1019	1016	1017	232.95	8	136.51	0	Open	;
1020	1018	143	520	6	110	0	Open	;
1021	1018	1019	270	6	136.51	0	Open	;
1022	1062	1020	1314.05	8	136.51	0	Open	;
1023	56	1059	1480.3	8	136.51	0	Open	;
1024	386	1022	194.89	6	126	0	Open	;
1025	1022	1023	122.64	6	136.51	0	Open	;
1026	1024	268	123	6	126	0	Open	;
1027	1024	585	400	8	131.26	0	Open	;

1028	1025	270	150	6	126	0	Open	;
1029	275	1026	430	8	131.26	0	Open	;
1030	1026	1027	560	8	131.26	0	Open	;
1031	1027	195	380	8	131.26	0	Open	;
1032	192	1028	580	8	136.51	0	Open	;
1033	1029	191	300	6	136.51	0	Open	;
1034	1030	361	650	8	136.51	0	Open	;
1035	361	1031	720	8	136.51	0	Open	;
1036	190	1032	860	6	126	0	Open	;
1037	1032	1033	350	8	136.51	0	Open	;
1038	172	1083	1650	6	136.51	0	Open	;
1039	321	1034	399.69	12	136.51	0	Open	;
1040	307	1034	1270.86	10	136.51	0	Open	;
1041	1034	816	599.57	10	136.51	0	Open	;
1043	92	1037	374.02	6	115.51	0	Open	;
1044	690	1035	183.69	10	115.51	0	Open	;
1047	87	1038	320.26	6	110	0	Open	;
1048	86	1039	621.32	10	115.51	0	Open	;
1051	346	1040	537.85	6	136.51	0	Open	;
1052	791	228	577.01	6	136.51	0	Open	;
1053	365	1041	492.95	6	115.51	0	Open	;
1054	1041	1042	3389.66	6	136.51	0	Open	;
1055	1023	1043	305.94	6	136.51	0	Open	;
1056	88	1044	412.07	6	115.51	0	Open	;
1057	1035	1036	304.58	8	131.26	0	Open	;
1058	33	1045	1932.13	8	136.51	0	Open	;
1059	1045	1046	307.22	8	136.51	0	Open	;
1060	1046	232	348.18	8	136.51	0	Open	;
1061	1046	1047	638.33	6	136.51	0	Open	;
1062	1047	1048	310.7	6	136.51	0	Open	;
1063	1045	1048	631.51	6	136.51	0	Open	;
1064	1048	225	614.47	6	136.51	0	Open	;
1065	1064	1049	1306.59	8	136.51	0	Open	;
1067	372	1051	1301.58	8	136.51	0	Open	;
1185	70	1085	1403.9	10	136.51	0	Open	;
1072	170	1054	1030	8	136.51	0	Open	;
1073	1054	1055	310.89	8	136.51	0	Open	;
1074	1055	824	1009.21	8	136.51	0	Open	;
1075	1056	1057	700	8	136.51	0	Open	;
1076	1057	419	640	8	120.75	0	Open	;
1077	164	307	2750	8	136.51	0	Open	;
1078	1059	1058	1409.64	8	136.51	0	Open	;
1079	1058	1021	1398.23	8	136.51	0	Open	;
1080	1061	1062	1310.38	8	136.51	0	Open	;
1081	1060	1061	1214.16	8	136.51	0	Open	;
1082	49	1060	1342.07	8	136.51	0	Open	;
1083	384	1063	400.91	8.8	136.51	0	Open	;
1084	52	1064	1301.68	8	136.51	0	Open	;
1085	1064	1065	2612.56	2	136.51	0	Open	;
1086	1065	1066	559.57	2	136.51	0	Open	;
1087	54	1067	1486.12	8	136.51	0	Open	;
1088	1067	1068	1044.02	8	136.51	0	Open	;
1089	1069	50	475.37	8	136.51	0	Open	;
1090	1069	1070	562.11	6	136.51	0	Open	;
1091	1070	1071	1329.39	6	136.51	0	Open	;
1092	1071	45	2026.87	6	136.51	0	Open	;
1093	45	1072	874.82	8	136.51	0	Open	;
1094	1072	1073	1679.5	8	136.51	0	Open	;
1095	1073	591	1291.06	8	136.51	0	Open	;
1096	546	1074	989.39	8	136.51	0	Open	;
1097	548	1075	317.27	8	136.51	0	Open	;
1098	199	1076	1388.29	6	136.51	0	Open	;
1099	269	1077	1755.49	6	136.51	0	Open	;
1100	198	1078	933.7	8	136.51	0	Open	;
1101	1078	1079	732	2	136.51	0	Open	;
1102	1080	526	250	10	134.84	0	Open	;

1103	186	1081	1000	6	136.51	0	Open	;
1104	1081	1082	1730	6	136.51	0	Open	;
1105	1082	1083	960	6	136.51	0	Open	;
1106	516	1084	635.18	8	131.26	0	Open	;
1107	83	1085	1167.95	10	136.51	0	Open	;
1108	528	761	309.7	8	136.51	0	Open	;
1109	633	1086	481.13	10	136.51	0	Open	;
1110	1086	1087	1321	6	136.51	0	Open	;
2000	6	39	5186.7	6	136.51	0	Open	;
2002	188	1500	1400	6	136.51	0	Open	;
2003	1500	1501	3020	6	136.51	0	Open	;
2004	1501	174	1465	6	136.51	0	Open	;
2005	1501	1502	585	8	136.51	0	Open	;
2006	483	1503	1346.85	6	136.51	0	Open	;
2007	477	1504	954.84	6	136.51	0	Open	;
2008	448	1505	1335.41	6	136.51	0	Open	;
2009	5	1506	1627.64	8	136.51	0	Open	;
2010	797	1507	1112.78	8	136.51	0	Open	;
2011	9	1508	227.67	10	136.51	0	Open	;
2012	1508	1509	298.35	10	136.51	0	Open	;
2013	1509	1510	546.57	8	136.51	0	Open	;
2014	1509	1511	474.09	8	136.51	0	Open	;
2024	282	605	1466.65	13.39	136.51	0	Open	;
2025	285	1515	1512.73	12	126	0	Open	;
236	610	611	5	12	126	0	Open	;
233	610	352	5	12	126	0	Open	;
242	284	160	1298.53	12	110	0	Open	;
255	322	140	635.04	8	136.51	0	Open	;
293	162	1515	10	12	126	0	Closed	;
251	1513	282	2605.63	15.23	136.5	0	Open	;
252	610	619	150	12	126	0	Open	;
487	53	54	281.61	8	136.51	0	Open	;
488	353	500	395.87	10.43	136.51	0	Open	;
489	1056	607	1600	8	136.51	0	Open	;
632	608	740	336.78	8	120.75	0	Open	;
738	608	614	481.93	8	136.51	0	Open	;
740	614	622	1201.85	8	136.51	0	Open	;
741	614	152	550	8	136.51	0	Open	;
742	152	622	515.15	8	136.51	0	Open	;
390	309	175	10	12	110	0	Open	;
743	625	624	899.59	4	150	0	Open	;
753	167	626	500	8	110	0	Open	;
755	512	627	348.81	10	125	0	Open	;
629	627	511	491.04	10	125	0	Open	;
756	1002	628	774.99	6	125	0	Open	;
757	628	1000	393.22	6	125	0	Open	;
758	1008	629	607.21	6	125	0	Open	;
759	629	630	286.02	6	125	0	Open	;
762	8	633	713.45	10	136.51	0	Open	;
763	399	635	560.04	8	126	0	Open	;
764	20	636	346.26	8	126	0	Open	;
765	636	637	277.45	8	126	0	Open	;
766	440	638	605.38	8	123	0	Open	;
767	451	639	641.84	8	136.51	0	Open	;
768	640	639	142.62	10	136.51	0	Open	;
761	252	253	685.73	6	110	0	Open	;
769	631	642	256.15	6	126	0	Open	;
770	632	641	250.85	6	126	0	Open	;
771	641	642	499.22	6	126	0	Open	;
772	631	632	272.19	8	126	0	Open	;
773	632	202	333.52	8	126	0	Open	;
774	643	644	372.4	8	110	0	Open	;
775	643	75	52.01	8	110	0	Open	;
776	246	645	243.5	8	126	0	Open	;
777	645	646	664.13	8	126	0	Open	;
778	646	247	265.52	8	126	0	Open	;

779	247	649	219.64	6	126	0	Open	;
780	647	648	298.84	8	126	0	Open	;
781	247	647	258.1	8	126	0	Open	;
782	650	651	513.36	8	126	0	Open	;
783	244	652	355.15	8	126	0	Open	;
784	652	651	275.12	8	126	0	Open	;
785	650	247	141.78	8	126	0	Open	;
786	653	654	390.94	8	126	0	Open	;
787	653	244	262.92	8	126	0	Open	;
788	244	656	276.87	8	126	0	Open	;
789	656	655	217.81	8	126	0	Open	;
790	656	657	276.53	8	126	0	Open	;
791	658	659	647.43	8	126	0	Open	;
792	660	657	178.8	8	126	0	Open	;
793	659	245	382.01	8	136.51	0	Open	;
794	242	662	444.4	8	131.26	0	Open	;
795	662	663	449.54	8	131.26	0	Open	;
796	664	665	640.42	8	131.26	0	Open	;
797	242	664	691.07	6	115.51	0	Open	;
798	668	229	217.14	6	115.51	0	Open	;
799	229	666	484.53	8	136.51	0	Open	;
800	666	667	420.01	8	136.51	0	Open	;
801	668	669	209.45	8	131.26	0	Open	;
802	670	230	1073.43	6	115.51	0	Open	;
803	671	106	275.41	10	138	0	Open	;
804	673	111	624.23	8	141.75	0	Open	;
805	673	110	316.56	10	115.51	0	Open	;
807	674	110	166.4	6	126	0	Open	;
808	675	676	166.21	8	136.51	0	Open	;
809	675	1015	170.92	12	131.26	0	Open	;
810	677	678	738.86	4	115	0	Open	;
811	132	678	146.3	8	115.51	0	Open	;
812	135	677	132.12	12	110	0	Open	;
813	679	139	275.56	6	115.51	0	Open	;
814	680	683	257.82	6	136.51	0	Open	;
815	683	682	301.05	6	136.51	0	Open	;
816	682	681	306.84	6	136.51	0	Open	;
817	681	145	267	8	126	0.5	Open	;
818	323	680	275.12	6	115.51	0	Open	;
819	685	684	300	8	131.26	0	Open	;
820	684	141	290	10	131.26	0	Open	;
821	687	688	410	4	126	0	Open	;
822	687	122	160	10	115.51	0	Open	;
823	688	121	150	8	126	0	Open	;
824	686	687	571.7	4	126	0	Open	;
825	124	686	151.95	8	105	0	Open	;
826	100	101	721.16	6	131.26	0	Open	;
827	827	689	440.87	4	126	0	Open	;
828	96	689	190	6	110	0	Open	;
829	94	690	179.17	10	115.51	0	Open	;
830	694	693	380	4	110	0	Open	;
831	693	692	340	6	110	0	Open	;
832	692	691	270	6	120.75	0	Open	;
833	691	181	120	6	120.75	0	Open	;
834	211	697	170	6	120.75	0	Open	;
835	697	696	340	6	120.75	0	Open	;
836	696	695	450	6	120.75	0	Open	;
837	695	691	310	6	120.75	0	Open	;
838	697	698	110	6	120.75	0	Open	;
839	694	89	110	6	110	0	Open	;
840	93	699	145.57	6	115.51	0	Open	;
841	699	661	978.73	4	115.51	0	Open	;
842	589	661	133.49	6	110	0	Open	;
843	700	392	830	6	131.26	0	Open	;
844	263	701	541.61	8	131.26	0	Open	;
845	700	264	300	8	131.26	0	Open	;

846	702	393	360	8	131.26	0	Open	;
847	176	703	60	8	134.84	0	Open	;
848	703	704	340	8	134.84	0	Open	;
849	703	705	390	8	134.84	0	Open	;
850	705	706	230	8	134.84	0	Open	;
851	706	707	370	8	134.84	0	Open	;
852	707	708	490	8	134.84	0	Open	;
853	708	709	340	8	134.84	0	Open	;
855	709	358	110	8	134.84	0	Open	;
857	712	711	50	6	134.84	0	Open	;
858	713	714	80	6	134.84	0	Open	;
859	182	713	110	8	131.25	0	Open	;
860	711	713	210	8	131.25	0	Open	;
861	1027	715	460	8	131.26	0	Open	;
862	715	716	420	8	131.26	0	Open	;
863	716	717	350	8	131.26	0	Open	;
864	717	1026	330	8	131.26	0	Open	;
867	288	721	210	8	131.26	0	Open	;
868	720	722	140	8	131.25	0	Open	;
869	720	288	320	8	131.26	0	Open	;
870	295	725	200	8	131.26	0	Open	;
871	294	724	200	8	131.26	0	Open	;
872	293	723	200	8	131.26	0	Open	;
873	726	150	325	8	126	0	Open	;
874	727	728	470	8	126	0	Open	;
875	729	728	330	8	126	0	Open	;
876	314	727	140	8	126	0	Open	;
877	730	203	627.11	8	126	0	Open	;
878	604	731	138.62	10	136.51	0	Open	;
879	604	732	482.23	10	136.51	0	Open	;
880	732	733	526.46	10	136.51	0	Open	;
881	732	734	326.87	10	136.51	0	Open	;
882	735	734	80.12	6	136.51	0	Open	;
883	736	734	64.28	6	136.51	0	Open	;
884	274	737	380.89	6	131.26	0	Open	;
885	737	738	382.37	6	131.26	0	Open	;
886	737	739	836.85	6	136.51	0	Open	;
887	740	741	997.69	6	115	0	Open	;
888	741	742	301.17	6	115	0	Open	;
889	742	746	413.16	6	115	0	Open	;
890	746	745	330	6	115	0	Open	;
893	740	415	455.18	8	120.75	0	Open	;
894	164	745	90	8	115	0	Open	;
895	524	747	291.32	10	136.5	0	Open	;
896	747	811	128.09	10	136.5	0	Open	;
897	222	748	342.73	10	136.5	0	Open	;
898	748	749	535.93	10	136.5	0	Open	;
899	749	750	296.37	10	136.5	0	Open	;
900	750	747	753.37	10	136.5	0	Open	;
903	755	754	1000	2	131.26	0	Open	;
904	754	753	1728.98	1.65	131.26	0	Open	;
905	619	751	41.02	4	105	0	Open	;
906	609	756	1043.08	10	126	0	Open	;
908	419	757	720	2	136.51	0	Open	;
914	245	760	553.36	8	136.51	0	Open	;
915	134	762	247.21	8	141.75	0	Open	;
916	529	762	341.75	6	131.26	0	Open	;
806	153	672	567.56	12	105	0	Open	;
917	672	763	700	8	136.51	0	Open	;
918	764	414	460	6	126	0	Open	;
919	764	765	160	6	126	0	Open	;
920	763	764	855	8	136.51	0	Open	;
921	1507	766	687.77	8	136.51	0	Open	;
922	798	767	802.88	8	141.75	0	Open	;
923	767	768	498.6	8	141.75	0	Open	;
924	768	772	660	8	141.75	0	Open	;

925	772	773	550	4	141.75	0	Open	;
926	772	771	660	8	141.75	0	Open	;
927	768	769	660	6	141.75	0	Open	;
928	769	770	1320	6	141.75	0	Open	;
929	771	770	660	6	141.75	0	Open	;
930	771	774	750	8	141.75	0	Open	;
931	774	776	480	4	141.75	0	Open	;
932	774	777	370	8	141.75	0	Open	;
933	768	780	660	6	141.75	0	Open	;
934	771	778	660	6	141.75	0	Open	;
935	780	783	700	6	141.75	0	Open	;
937	779	781	700	4	141.75	0	Open	;
938	781	782	1000	4	141.75	0	Open	;
941	770	785	460	6	141.75	0	Open	;
936	800	779	460	4	141.75	0	Open	;
854	710	215	35	8	134.84	0	Open	;
32	144	148	170	10	105	0	Open	;
357	154	274	93.79	8	126	0	Open	;
358	155	282	162.05	12	126	0	Open	;
359	157	284	50.27	12	110	0	Open	;
360	111	563	67.25	8	110	0	Open	;
362	335	568	55.96	8	126	0	Open	;
678	568	564	504.03	8	126	0	Open	;
679	336	570	23.74	12	136.51	0	Open	;
684	570	564	59.44	8	126	0	Open	;
688	579	29	27.58	12	126	0	Open	;
693	575	579	34.58	6	126	0	Open	;
451	581	25	64.14	12	136.51	0	Open	;
698	100	588	95.38	10	115.51	0	Open	;
700	589	91	36.93	6	110	0	Open	;
702	72	590	13.91	8	126	0	Open	;
708	591	58	24.63	8	136.51	0	Open	;
709	592	487	260.37	7.06	136.51	0	Open	;
710	46	593	30.64	6	115.51	0	Open	;
202	3	594	30.83	8	115.51	0	Open	;
711	595	6	24.91	10	136.51	0	Open	;
712	24	596	74.24	8	126	0	Open	;
714	314	597	549.72	8	136.5	0	Open	;
715	597	718	362.4	8	136.5	0	Open	;
716	718	786	248.01	8	136.5	0	Open	;
717	786	788	261.31	8	136.5	0	Open	;
718	788	789	274.92	8	136.5	0	Open	;
719	789	790	268.82	8	136.5	0	Open	;
720	786	787	268.76	8	136.5	0	Open	;
721	787	790	533.19	8	136.5	0	Open	;
722	597	743	247.94	8	136.5	0	Open	;
723	718	719	245.01	8	136.5	0	Open	;
856	743	719	357.88	8	136.5	0	Open	;
865	743	744	579.01	8	136.5	0	Open	;
866	719	744	242	8	136.5	0	Open	;
713	791	1040	992.55	6	136.51	0	Open	;
891	514	792	55	3	125	0	Closed	;
892	792	13	55	3	131.26	0	Open	;
940	793	204	625.52	8	110	0	Open	;
942	408	794	213.76	12	131.26	0	Open	;
943	298	795	455.59	6	126	0	Open	;
944	595	796	1285.63	8	136.51	0	Open	;
945	796	797	655.27	8	136.51	0	Open	;
947	799	153	443.59	12	105	0	Open	;
728	801	46	471.42	8	123	0	Open	;
948	439	802	1	16	140	0	Closed	;
949	1067	803	1	16	140	0	Closed	;
950	71	804	1	16	140	0	Closed	;
951	559	805	1	16	140	0	Closed	;
952	176	806	1	16	140	0	Closed	;
953	1034	807	1	16	140	0	Closed	;

954	809	808	208.28	10	115.51	0	Open	;
955	808	133	352.73	10	115.51	0	Open	;
956	809	808	771.21	8	130.98	0	Open	;
957	808	810	1	16	140	0	Closed	;
958	748	811	251.5	10	136.5	0	Open	;
959	811	812	1	16	140	0	Closed	;
960	629	813	104.28	16	140	0	Closed	;
961	626	814	1	16	140	0	Closed	;
962	602	815	1	16	140	0	Closed	;
963	816	171	676.11	10	136.5	0	Open	;
964	332	817	670.4	10	131.26	0	Open	;
965	817	331	1084.31	8	131.26	0	Open	;
391	160	285	42.05	12	126	0	Open	;
250	634	799	203.87	12	131.26	0	Open	;
760	634	738	428.49	6	138	0	Open	;
913	794	409	55.68	12	138	0	Open	;
966	821	417	482.67	8	120.75	0	Open	;
967	820	819	185.09	10	138	0	Open	;
968	822	821	185.21	8	138	0	Open	;
972	1056	825	239.05	8	136.51	0	Open	;
975	826	824	10	8	136.51	0	Open	;
978	11	829	34.61	8	125	0	Open	;
979	1003	1000	433.6	6	125	0	Open	;
980	831	830	619.08	6	138	0	Open	;
744	10	322	285.84	10	105	0	Open	;
745	10	618	357.33	8	136.51	0	Open	;
754	618	835	231.28	8	138	0	Open	;
977	827	690	813.93	4	126	0	Open	;
982	95	827	173.49	6	138	0	Open	;
983	827	259	463.7	6	138	0	Open	;
984	259	258	644.79	6	138	0	Open	;
985	256	828	145.53	4	126	0	Open	;
986	832	99	137.83	6	110	0	Open	;
987	832	828	697.9	4	126	0	Open	;
988	527	828	780.48	6	138	0	Open	;
989	109	834	60.31	8	110	0	Open	;
990	834	833	839.5	6	138	0	Open	;
991	107	833	478.84	6	141.75	0	Open	;
992	681	835	57.39	6	126	0	Open	;
993	836	116	256.65	6	110	0	Open	;
994	836	837	232.74	6	110	0	Open	;
995	837	114	257.18	6	138	0	Open	;
996	178	277	379.1	6	138	0	Open	;
73	166	838	10	8	138	0	Open	;

[PUMPS]

;ID	Node1	Node2	Parameters	
746	612	161	HEAD 2	;PC Johnson 2
747	613	621	HEAD 3	;Watercress Spring
748	13	514	HEAD 4	;Lower New Horizons BPS
749	13	514	HEAD 5	;Lower New Horizons 2
750	12	18	HEAD 7	;PC Johnson Well 3
751	308	310	HEAD 8	;Tacoma BPS 1
752	308	310	HEAD 9	;Tacoma BPS 2
393	616	775	POWER .1	;Upper Fairway Hills Upper BPS
901	751	752	HEAD 12	;Corrosion Control Facility BPS
911	758	759	HEAD 13	;Watercress Springs Well
939	783	784	HEAD 14	;Highview BPS
969	819	822	HEAD 16	;Zone 1002 BPS
971	818	823	HEAD 17	;
974	819	822	HEAD 19	;
981	599	598	HEAD 1	;

[VALVES]

;ID	Node1	Node2	Diameter	Type	Setting	MinorLoss	
1005	1005	1006	6	PRV	30	0	;New Horizons high zone

```
      1014      1008      1011         3 PSV              90         0 ;New Horizons high zone-
       234       606       352        10 FCV             700         0 ;
        13       611       155        12 GPV              10         0 ;
       173        18        17        10 PSV             100         0 ;
       241       161       620        10 PSV             100         0 ;
       392       218       623        12 TCV               0         0 ;
       902       752       755         2 PRV              40         0 ;Hydropneumatic Tank
       907       621       163        12 PSV              92         0 ;
       909       310       177        12 PSV             100         0 ;
       910       775       624         4 PRV              55         0 ;
       912       759       163        12 PSV              99         0 ;
       946         7       798         4 GPV              15         0 ;
       119       784       800         8 PRV             107         0 ;
       970       823       822         8 PSV             190         0 ;
       973       825       824         8 PRV              40         0 ;
       976       825       826         8 PSV             100         0 ;

[TAGS]
 LINK             747 WC1
 LINK             911 WC2

[DEMANDS]
;Junction    Demand     Pattern      Category

[STATUS]
;ID          Status/Setting
       747 Closed
       751 Closed
       752 Closed
       971 Closed
       974 Closed
       907 Closed

[PATTERNS]
;ID          Multipliers
;
         1         1
;
         2         1         1         1         1         1         1
         2         1         1         1         1         1         1

[CURVES]
;ID          X-Value     Y-Value
;PUMP: PUMP: PUMP: Pump curve for Pump 745 (Upper New Horizons)
         1         0        54
         1        40        52
         1       103        36
;PUMP: PUMP: PUMP: Pump curve for Pump 746 (PC Johnson 2)
         2         0       498
         2       560       395
         2       800       353
         2       920       330
         2      1200       220
;PUMP: PUMP: PUMP: Pump curve for Pump 747 (Watercress Springs)
         3      1600       236
         3      2000       220
         3      2300       190
         3      2600       160
;PUMP: PUMP: PUMP: Pump curve for Pump 748 (Lower New Horizons)
         4         0       108
         4        30       100
         4        90        45
;PUMP: PUMP: PUMP: Pump curve for Pump 749 (Lower New Horizons)
         5         0       108
         5        30       100
         5        90        45
```

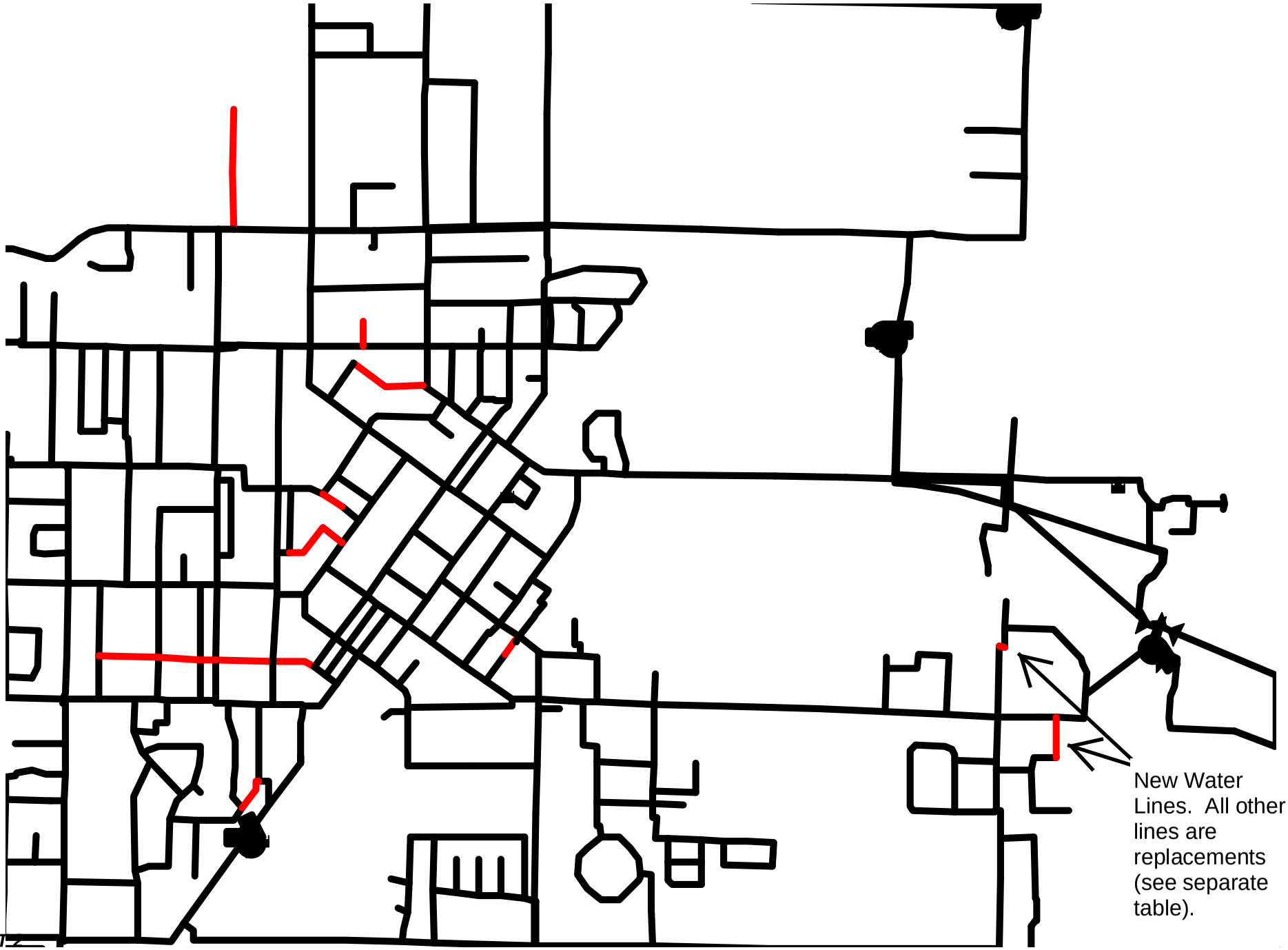
```
;PUMP: PUMP: VOLUME: 1 and 2 MG City Reservoirs Combined Storage
        6        0        0
        6      0.5        0
        6        1     4300
        6        2    36110
        6        3    68628
        6        4   101880
        6        5   135892
        6        6   170692
        6        7   206304
        6        8   242756
        6        9   280074
        6       10   318285
        6       11   357414
        6       12   397012
;PUMP: PUMP: PUMP: Pump 748 PC Johnson 3
        7        0      571
        7      648      451
        7      810      396
        7      972      324
;PUMP: PUMP: PUMP: Tacoma Pump Station VFD #1
        8        0      250
        8      800      236
        8     1200      212
;PUMP: PUMP: PUMP: Tacoma Pump Station VFD#2
        9        0      250
        9      800      236
        9     1200      212
;PUMP: PUMP: HEADLOSS: City Reservoir Control Valve
       10       50        0
       10      200     0.03
       10      500     0.19
       10     1000     0.76
       10     2000     3.04
       10     3000     6.83
;PUMP: Pump curve for Lower Fairway Hills
       11       15      135
       11       30      130
       11       40      110
;PUMP: PUMP: PUMP: Pump Curve for Pump 901 (Corrosion Control Facility BPS)
       12        0      310
       12       20      244
       12       40      100
;PUMP: PUMP: PUMP: Watercress Springs Well
       13     1000      295
       13     1500      272
       13     2000      250
       13     2500      220
;PUMP: PUMP: PUMP: High View Estates 27 customers est at buildout
       14        0      180
       14       40      160
       14      100      110
;HEADLOSS:
       15      100      0.5
       15      300        3
       15      600        9
       15      800       16
;PUMP: Zone 1002 BP
       16      200      150
;PUMP: Zone 888-1002 Well
       17      766      444
;PUMP: Zone 888-1002 High Flow Pump
       19     1500      200

[CONTROLS]
;LINK 748 OPEN IF NODE 615 BELOW 20   ; New Horizons Station lead pump controlled by Stanridge Hill Res. level; pump on
```

```
;LINK 748 CLOSED IF NODE 615 ABOVE 23 ; New Horizons Station lead pump controlled by Stanridge Hill Res. level; pump off
;LINK 749 OPEN IF NODE 615 BELOW 20   ; New Horizons Station lag pump controlled by Stanridge Hill Res. level; pump on
;LINK 749 CLOSED IF NODE 615 ABOVE 23 ; New Horizons Station lag pump controlled by Stanridge Hill Res. level; pump off
;LINK 746 OPEN IF NODE 617 BELOW 12   ; PC Johnson Well #2 controlled by Crews Reservoir level; pump on
;LINK 746 CLOSED IF NODE 617 ABOVE 13 ; PC Johnson Well #2 controlled by Crews Reservoir level; pump off
;LINK 911 OPEN IF NODE 612 BELOW 10   ; Watercress Spring controlled by Crews Reservoir level; pump on
;LINK 911 CLOSED IF NODE 612 ABOVE 11 ; Watercress Spring controlled by Crews Reservoir level; pump off
;LINK 750 OPEN IF NODE 617 BELOW 12   ; PC Johnson Well #3 controlled by Crews Reservoir level; pump on
;LINK 750 CLOSED IF NODE 617 ABOVE 13 ; PC Johnson Well #3 controlled by Crews Reservoir level; pump off
;LINK 13 CLOSED IF NODE 610 ABOVE 10.9; Control valve at City Reservoir
;LINK 751 CLOSED IF NODE 617 ABOVE 9  ; Tacoma BPS 1
;LINK 751 OPEN IF NODE 617 BELOW 10   ; Tacoma BPS 1
LINK 891 OPEN IF NODE 792 BELOW 30    ; PRV for flowing from Stanridge Zone to Main 888 Zone for fire event on suction side of LNH BPS
LINK 974 OPEN IF NODE 822 BELOW 90    ; High flow pump for Zone 1002

[RULES]



[ENERGY]
 Global Effi          75
 Global Pric           0
 Demand C              0

[EMITTERS]
;Junction    Coefficient

[QUALITY]
;Node        InitQual

[SOURCES]
;Node        Type         Quality      Pattern

[REACTIONS]
;Type        Pipe/Tank  Coefficient


[REACTIONS]
 Order Bulk            1
 Order Tanl            1
 Order Wal             1
 Global Bul            0
 Global Wa             0
 Limiting Pc           0
 Roughness             0

[MIXING]
;Tank        Model

[TIMES]
 Duration              0
 Hydraulic T           0
 Quality Tir        0:05
 Pattern Tir        1:00
 Pattern Sta        0:00
 Report Tim         1:00
 Report Sta         0:00
 Start Clock  12:00 AM
 Statistic    NONE

[REPORT]
 Status       No
 Summary      No
 Page                  0

[OPTIONS]
```

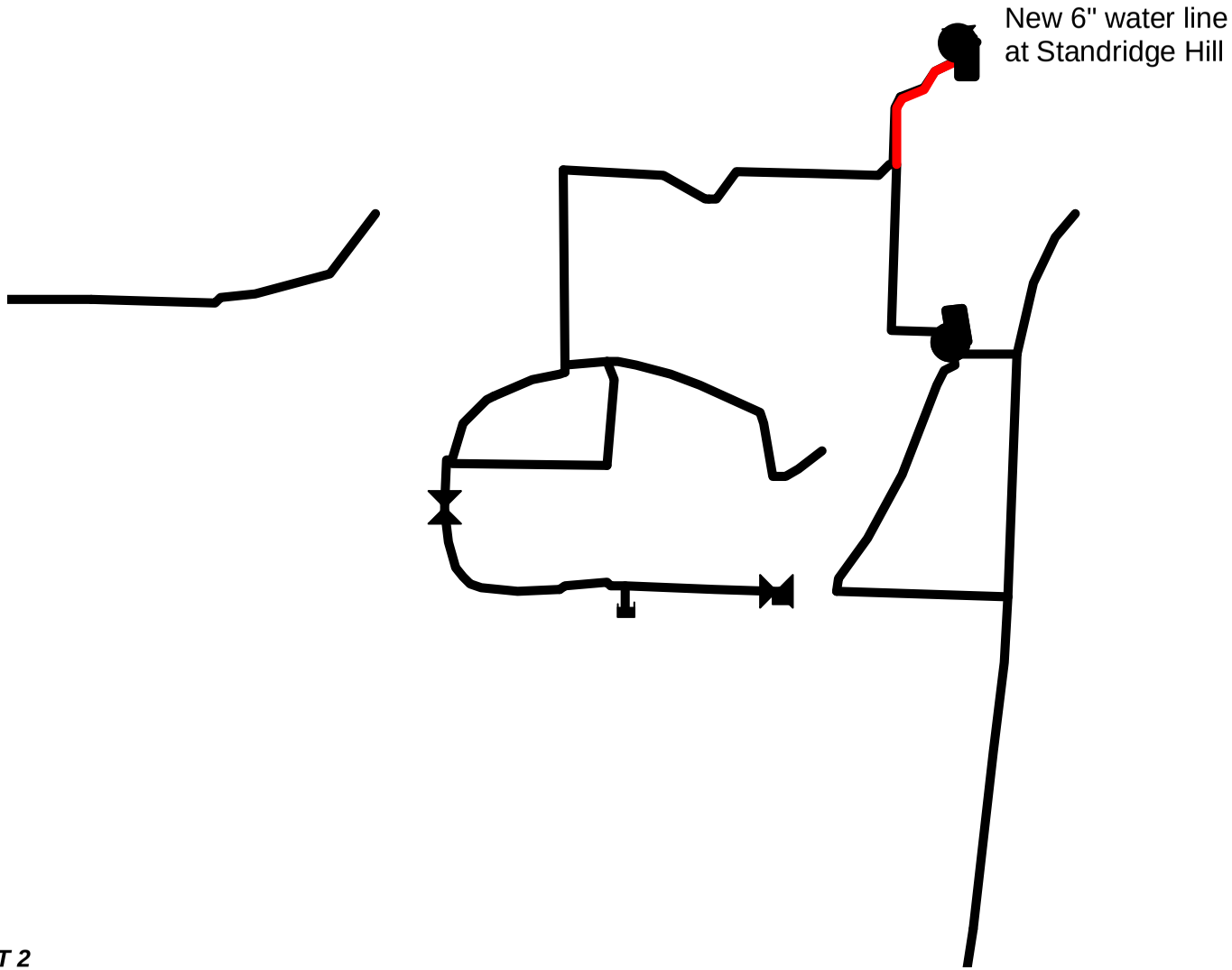
```
 Units          GPM
 Headloss       H-W
 Specific Gr       1
 Viscosity         1
 Trials           20
 Accuracy      0.005
 CHECKFRE          2
 MAXCHEC          10
 DAMPLIMI          0
 Unbalance Continue 10
 Pattern           1
 Demand M          1
 Emitter Ex      0.5
 Quality        None mg/L
 Diffusivity       1
 Tolerance      0.01

[COORDINATES]
;Node          X-Coord      Y-Coord

[VERTICES]
;Link          X-Coord      Y-Coord

[LABELS]
;X-Coord          Y-Coord          Label & Anchor Node

[BACKDROP]
 DIMENSIO    1323493    58345.16     1371024    102026.8
 UNITS          Feet
 FILE           G:\City Roads, Utilities & Wire Utilities\Water Utility\Modeling\EPANet 2.0\Watermap-citymap 2-28-12.wmf
 OFFSET            166.75         -76.61

[END]
```

Water Line Changes Included in Future Water Model

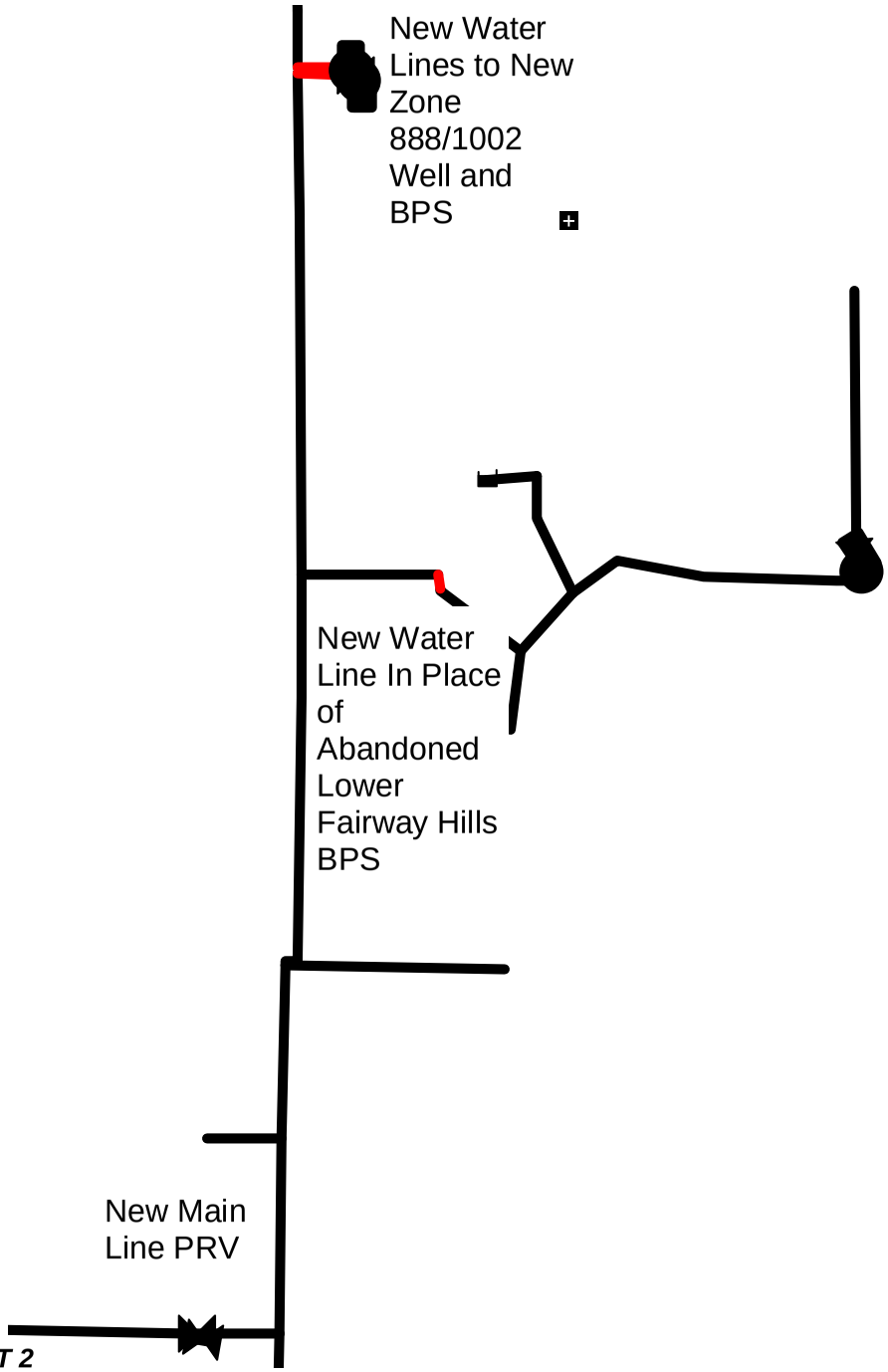
City of Enumclaw Future Water Model



City of Enumclaw Future Water Model



City of Enumclaw Future Water Model



Potential Water Line Improvements

On	From	To	Length	Inventory Map Page	Existing Size	Existing Material	Proposed Size	Proposed Material	Notes
Hillcrest Ave	Kibler Ave	Fell St	760	C4	2"	Galv.	2"/6"		Abandon 6" across park at James and 2" on Kibler from Hillcrest to Division
Hillcrest Ave	Fell St	Porter St	430	C4	2"	Galv.	6"		Connect on east to 8" line at NW corner of Hillcrest/Porter. Abandon 4" crossing to park. 8" line north of NW corner of Hillcrest/Porter intersection to be abandoned. Cap 2" xing Porter at 8" main.
Marion St	Griffin Ave	Washington Ave	890	D4	6"	Steel/W.I.	6"		
Griffin Ave	Fell St	Franklin St	260	D4	1"	Galv.	6"		
Franklin St	Griffin Ave	Stevenson Ave	850	D4	1-1/2" & 2"	Galv.	2"/6"		Initial Ave to Griffin Ave segment to be 2" so as to not have to cross Griffin with large diameter line.
Initial Ave	Marion St	Franklin St	280	D4	1"	Galv.	6"		
3rd St	Griffin Ave	South for 250'	250	D4	2"	Galv. / PE	8"		
Lincoln Ave	Wells St	Lafromboise St	590	D5	2" & 6"	Steel/galv.	6"		Include replacement of 6" steel crossing of Lincoln at Laframboise. 5/2011 Leak at 2032 Lincoln. Incl removing 8" valve at Wells and disconnecting 2"
James Street	Kibler Ave	Lowell Ave	275	C4	2" & 4"	Galv./I.P./Steel	10"		Abandon Wilson to Lowell
Lincoln Ave	Lafromboise St	Harding St	650	D5	2" & 6"	Galv.	6"		Need to confirm if existing 6" is CI or steel. Replace if steel. Abandon 2" whether 6" replaced or not. Abandon 1-1/2" on Lafromboise south of Lincoln.
Lincoln Ave	Harding St	McKinley St	1300	D5	2"	Galv.	6"		
Myrtine St	613 Myrtine	717 Myrtine	380	E5			6"		
Harding St	McHugh Ave	North to end main	1410	B-5	2"/4"	Galv/CI	8"		Flow at fire hydrants is deficient