CASCADIA WATER ™
WASHINGTON STATE – SOUTHWEST REGION
PART B – ESTATES, INC.

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August 2025

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CERTIFICATE OF ENGINEER
Water System Plan for Estates, Inc
a system owned by Cascadia Water, LLC.

The technical material and data contained within this report has been prepared by or under the direction of the following registered professional engineer(s), licensed in accordance with the laws of the State of Washington to practice in the State of Washington.

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ABBREVIATIONS

AC	Asbestos Cement
AF	Auditor's File
ADD	Average Day Demand
App	Approved
APWA	American Public Works Association
AWWA	American Water Works Association
BMPs	Best Management Practices
CCC	Cross-Connection Control
CCS	Cross-Connection Control Specialist
CFR	Code of Federal Regulations
CIP	Capital Improvement Plan
CWSP	Coordinated Water System Plan
CWSSA	Critical Water Supply Service Area
DOH	Washington State Department of Health
DOE	Washington State Department of Ecology
DS	Dead Storage
DSL	Distribution System Leakage
ERU	Equivalent Residential Unit
ES	Equalizing Storage
Ex	Existing
FSS	Fire Suppression Storage
gpm	Gallons Per Minute
GMA	Growth Management Act
GWI	Ground Water Under the Influence of Surface Water
HGL	Hydraulic Grade Line
ID	Identification
ICC	Island County Code
LID	Local Improvement District
LLC	Limited Liability Corporation
MCL	Maximum Contaminant Level
MDD	Maximum Day Demand
MMADD	Maximum Month Average Day Demand
mg/L	Milligram per liter
NFPA	National Fire Protection Association
No.	Number
OS	Operational Storage
PE	Professional Engineer
PHD	Peak Hour Demand
ppb	Part Per Billion
psi	Pounds Per Square Inch
PVC	Polyvinyl Chloride
OFM	State Office of Financial Management
RCW	Revised Code of Washington
SAL	State Advisory Level
SBS	Standby Storage
SDWA	Safe Drinking Water Act
SOC	Synthetic Organic Chemical
SWI	Seawater Intrusion
UTC	Utilities and Transportation Commission

UBI	Unified Business Identifier
VOC	Volatile Organic Chemical
WAC	Washington Administrative Code
WDM	Water Distribution Manager
WDS	Water Distribution Specialist
WFI	Water Facilities Inventory
WHPA	Wellhead Protection Area
WQMS	Water Quality Monitoring Schedule
WRIA	Water Resources Inventory Area
WSP	Water System Plan
WTPO	Water Treatment Plant Operator
WSDOT	Washington State Department of Transportation
WUE	Water Use Efficiency

1 DESCRIPTION OF WATER SYSTEM

This chapter addresses the Estates, Inc. (hereafter "Water System") ownership and management, system background, inventory of existing facilities, related plans, existing service area characteristics, future service area, service area agreement, service area policies, satellite management agencies, and conditions of service.

1.1 System History and Background

The following sections summarize the water system name and ID number, type of ownership, management structure, certified operator, engineer, and WFI.

1.1.1 Water System Name and ID Number

Water System Name: Estates Inc.
Water System ID No: 08166 9

1.1.2 Type of Ownership and Management

Estates, Inc. is owned by Cascadia Water, LLC (Cascadia), a private investor-owned utility company consisting of water systems located throughout the State of Washington. Cascadia is a wholly owned subsidiary of NW Natural Water Company, LLC.

1.1.3 Management Structure

Cascadia Water, LLC was formed in November of 2018 through the acquisition and combination of Lehman Enterprises, Inc. on Whidbey Island. Cascadia is a for-profit corporation incorporated in the State of Washington. As noted above, Cascadia is a wholly owned subsidiary of NW Natural Water Co. Because Cascadia owns multiple water systems with a combined number of customers greater than 100, its systems are regulated by the Washington Utilities and Transportation Commission (UTC).

1.1.4 Water System Operations

Daily operation and compliance for all water systems is handled internally by Cascadia. These services include meter reading, billing, and general accounting. Contact information for Cascadia is provided below:

Cascadia Water
Mailing Address:
PO Box 549, Freeland, WA 98249
Physical Address:
18181 SR 525, Freeland WA 98249
Phone: (360) 331.7388
E-Mail: info@cascadiawater.com

1.1.5 Estates Staff

Table 1-1 Water System Staff

Name	Position	Certification
Culley Lehman	General Manager	WDM 2
Adam Lehman	System Operator	CCS, WDM 3, WDS, WTPO 1
Dale Metzger	System Operator	WDM 2
Amy Lehman	Office Manager	-
Stephani Long	Office Administrator	-

1.1.6 Engineer

Water system engineer of record:

Facet, Inc.
Jeff Tasoff, P.E., Principal/Civil Engineer
Additional Principals: Erik Davido, P.E. and Quin Clements, P.E.
P.O. Box 1132
Freeland, WA 98249
Phone: (360) 331-4131 x203
Email: JTasoff@facetnw.com or QClements@facetnw.com

The Water System's engineer performs the following services:

1. Identifying source, storage, or water distribution system needs and improvements;
2. Analyzing alternate solutions to address the identified needs and improvements;
3. Assuring that the system configuration will function properly, be efficient, and economical;
4. Preparing detailed construction documents to implement the selected improvements;
5. Assisting in obtaining plan approval and obtaining bids from contractors to perform the work;
6. Inspecting and testing the quality of the contractor's work and making necessary reports and recommendations to the water system;
7. Completing Washington State Department of Health (WSDOH) certification documents to the extent that the engineer has direct knowledge of the as-built facilities; and
8. Review developer's extension to ensure proposed projects meet Cascadia Water's standards and future system needs.

1.1.7 Water System Financial Accounting

Cascadia provides billing services and maintains customer records, including water usage for all water systems. Cascadia also maintains each of the systems' financial records, estimates future budgetary needs, and proposes changes to the water rate structure. Cascadia is a private water company operating within Washington State that has 100 or more connections and/or charges more than $557 a year per customer, it is regulated by the Washington Utilities and Transportation Commission (UTC). The UTC reviews the budgets, expenses, and profits of a water system to govern utility rates for customers. The latest tariff results from the UTC and system budgets are presented in the Part A Water System Plan for Cascadia Water.

1.2 System History and Background

Estates Water System Inc. is located within unincorporated Clallam County, and serves the area bounded on the north by the Strait of Juan de Fuca and Lotzgesell Road, in the east by Dungeness Golf

Course, in the south by Woodcock Road and in the west by Kitchen-Dick Road. The location of the service area is shown in Figure 1-1. The existing served connections are currently single-family residential units.

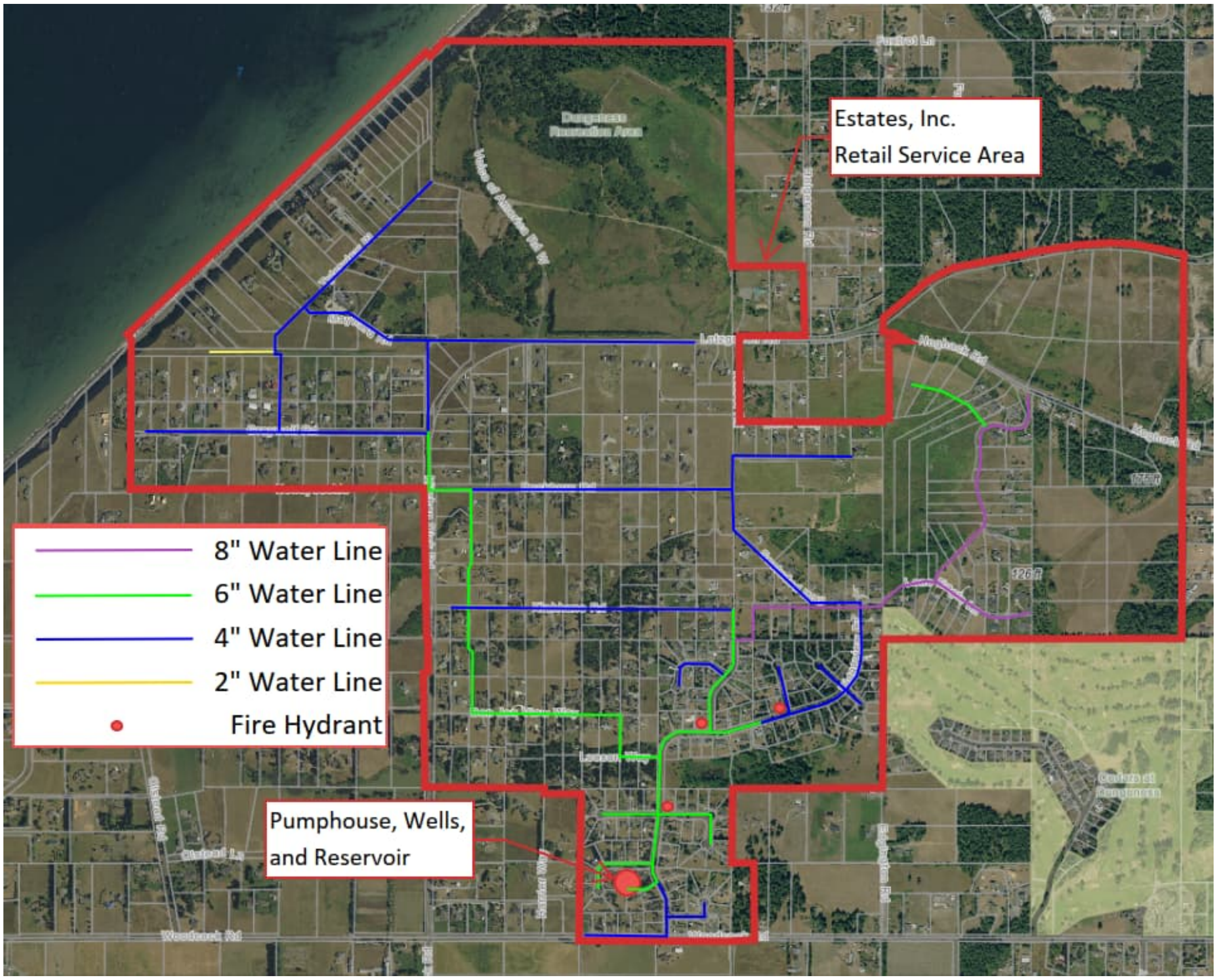


Figure 1-1 Estates Inc. Retail Service Areas

The original water system was constructed in the early 1970s for the Mountain Park Subdivision in Sequim, Washinton. The original system included a single well, pressure tanks and distribution piping. Following the original construction, in the late 1970s, the water system was expanded to serve Divisions I, II and III of Dungeness Estates. Due to this expansion, a 2nd well was drilled, along with the construction of a 30,000-gallon reservoir and an extension to the existing distribution piping. In 1982, the owners purchased the Estate Water System and expanded it to serve all three divisions of Blue-Ribbon Farms and the County Park. Because of this expansion, a 145,000-gallon reservoir was constructed, both existing wells were deepened, and the distribution piping was again extended. The newly deepened wells could produce 200 gallons per minute (gpm) and 225-gpm for Well #1 and #2 respectively. In 1990, water meters were installed at every service connection which allowed the Department of Health (DOH) to approve 480 connections for Estates Water Systems Inc. Following this approval, subsequent water conservation allowed the Department of Ecology (DOE) to then approve 540 connections in their water right.

In 2023 Estates began removing the two partially buried reservoir and pumphouse. A new -158,000-gallon reservoir is being installed. In addition, a new booster pump pressurization system, and manganese treatment facility is being installed onsite with the reservoir and system sources. Currently, Estates has 367 active connections and contains two wells. The wells (Wells #1 and #2) 200-gpm and-225 gpm respectively.

1.2.1 Geography and Topography

The communities served by Estates are located in the northeast portion of Clallam County along the coast of the Salish Sea, about 5 miles northwest of Sequim. The geography throughout the area consists of various plats with single-family residences and rural fields along coastal bluffs. The system is located on the northern shoreline with steep slopes that create a natural boundary down to the sea. Aside from the slope down to the Salish Sea, the service area for the system is generally flat with elevations that range from 120- to 140-feet feet above sea level.

There are various streams, ponds, wetlands and other geohazard areas located throughout the current retail service area. These items are shown in Figure 1-2.

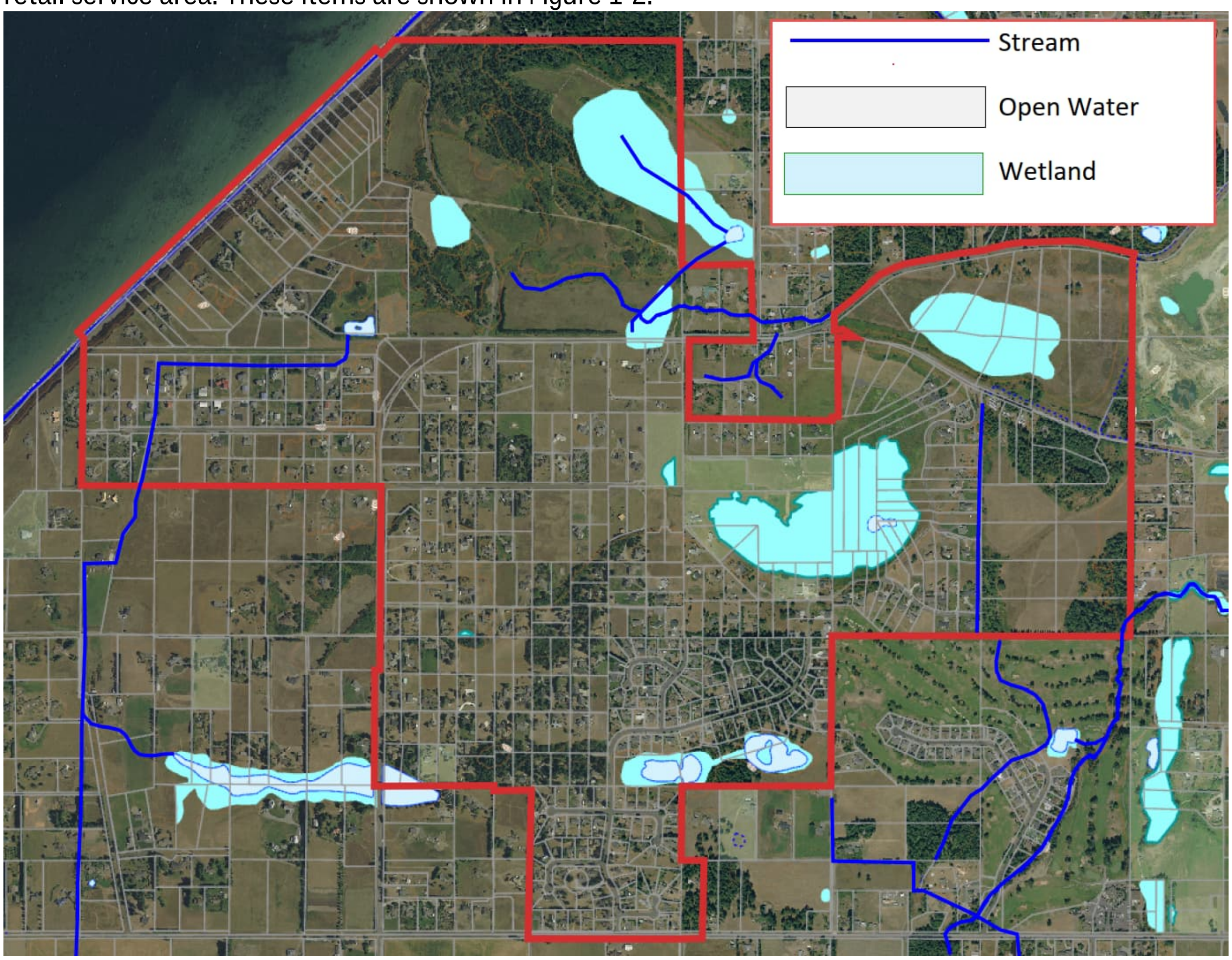


Figure 1-2 Estates Inc. Critical Areas

1.2.2 Climate

The climate within Clallam is mild year-round with an average temperature of 70-degrees Fahrenheit in the hottest months of the summer and 35-degrees in the coldest months of the winter. Rainfall for Clallam County is on the high end with approximately 60-inches of rain per year.

1.2.3 Neighboring/Adjacent Water Systems

The current service area map for the system is included in Appendix B. Estates is located near other Group A community water systems. The Dungeness Golf Course & Mountain Vista Water System (Water System ID 20453 D) is located approximately 500-feet east of the Estates service area. Per exhibits in the 1994 Water System Plan, there is an existing easement for emergency/future intertie with the Dungeness Golf Course water system. The intertie does not currently exist and will be discussed in further detail in subsequent sections of this report.

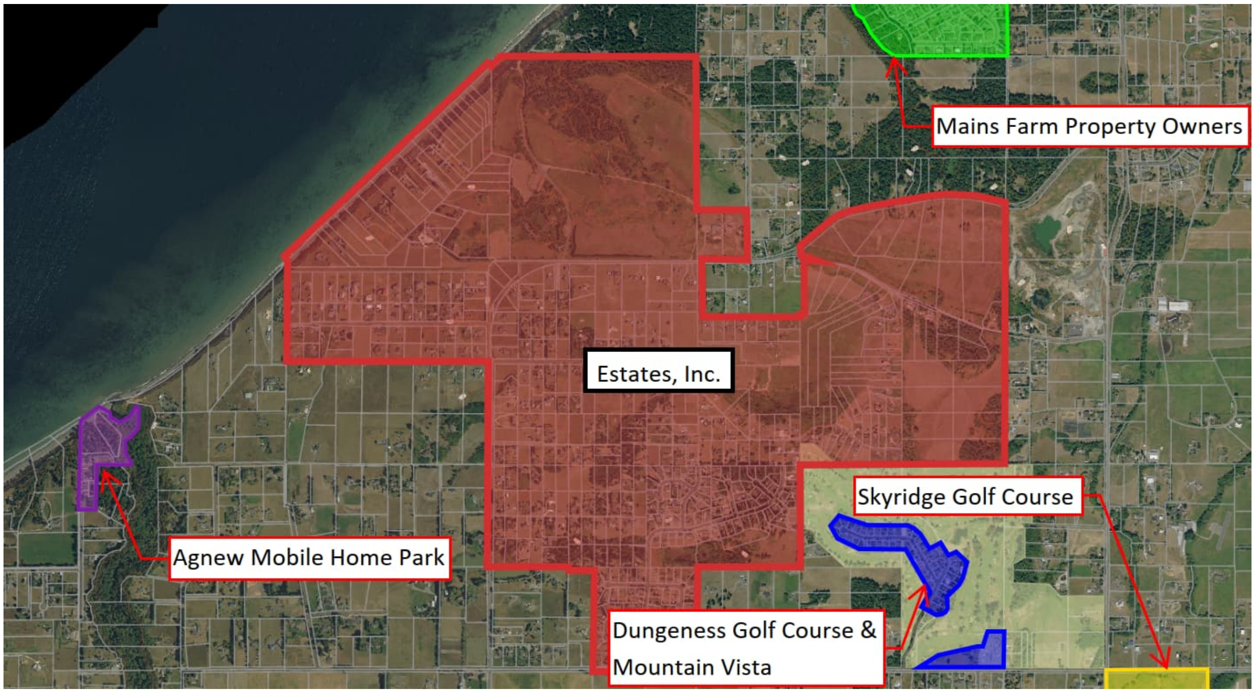


Figure 1-3 Neighboring Water Systems

1.3 Inventory of Existing Facilities

A detailed inventories for the system is provided in Appendix O and Chapter 3 discusses the system's existing facilities in greater detail.

1.4 Existing Service Area Characteristics

General descriptions of the service area characteristics and existing zoning/land use are discussed in the following sections.

1.4.1 Description of Service Area

The retail service area for Estates is located approximately 5 miles west of Sequim, Washington and encompasses approximately 920 acres. The northwestern boundary is the Salish Sea just west of the Dungeness Recreation Area. The system encompasses various plats with the southernmost boundary of the service area being Woodcock Road. The service area boundary is shown on the map in Figure 1-1 and is included in Appendix B.

1.4.2 Existing Zoning and Land Use

The service area contains various Clallam County zoning areas. A portion of the Clallam County zoning map is provided in Appendix D. The following zoning categories are included in the service area with the corresponding section from the Clallam County Code (CCC):

- Parks and Recreation (PR): CCC 33.07.070
- Rural Neighborhood Conversion (NC): CCC 33.10.015
- Rural Low (R5): CCC 33.10.020
- Rural (R1): CCC 33.10.040

The service area primarily consists of rurally zoned areas. The way these areas can be developed depends on their various zoning classifications. The CCC should be consulted for additional information.

1.5 Service Area Boundary and Franchise Agreements.

Currently there is no available documentation for a Service Area Agreement and/or Franchise Agreement for Clallam County. Prior to the purchase of the water system by Cascadia Water, the franchise agreement had expired. Cascadia is in the process of providing the county with the necessary documents to renew the franchise agreement.

1.6 Consistency from Local Planning

Concurrent with the state submittal, the Water System Plan will be coordinated with Clallam County to ensure consistency with the county planning requirements.

2 BASIC PLANNING DATA AND WATER DEMAND FORECASTING

Current and projected planning data/parameters are discussed in this Chapter. There are currently 365 active residential connections, 2 active non-residential connections, and 480 approved connections for the Estates Water System. The system provides service mostly to single-family residential customers; therefore, this report will use the terms service connection and ERU interchangeably.

This plan evaluates three planning phases. Phase 1 is the six-year planning window from 2023 to 2029. Phase 2 is for the extended planning period of 2029 to 2043. Phase 3 covers the long-term planning from the year 2044 and beyond. This chapter and the next will provide data to support an increase in the number of service connections that can be supported by the system.

2.1 Current Water Use

The current population, service connections, water use, and Equivalent Residential Units (ERUs) are discussed in the following sections for Estates.

2.1.1 Current Population

Estates currently serves 387 full-time single-family residences and 3 non-residential connections. The system is estimated to serve 960 residents for 180 days or more per year. The 3 non-residential connections consist of the Dungeness Recreation Area, a building for Washington State Fish & Wildlife, and the Five Acre School. The Water Facility Inventory (WFI), included in Appendix A, has been updated to reflect the current connections and residents served.

Dungeness Recreation Area

The Dungeness Recreation Area is a 216-acre park which contains 66 campsites, restrooms, and showers. The temporary and transient population served is estimated as 1000 people in the summer months of May through September and 250 people for all other months.

Five Acre School

The Five Acre School is an independent school that serves preschool through 6th grade which typically operates from September through mid-June. The regular non-residential population served by the school is estimated to be 25 people. These numbers are based on the current Water Facility Inventory (WFI), which was last updated in October of 2022.

2.1.2 Water Production and Usage History

Water usage data from 2020 through 2022 was analyzed to determine current design values for the distribution system. The capacity calculation provided in Appendix P provides a detailed summary of the demands based on water use data. The data is summarized in Table 2-1.

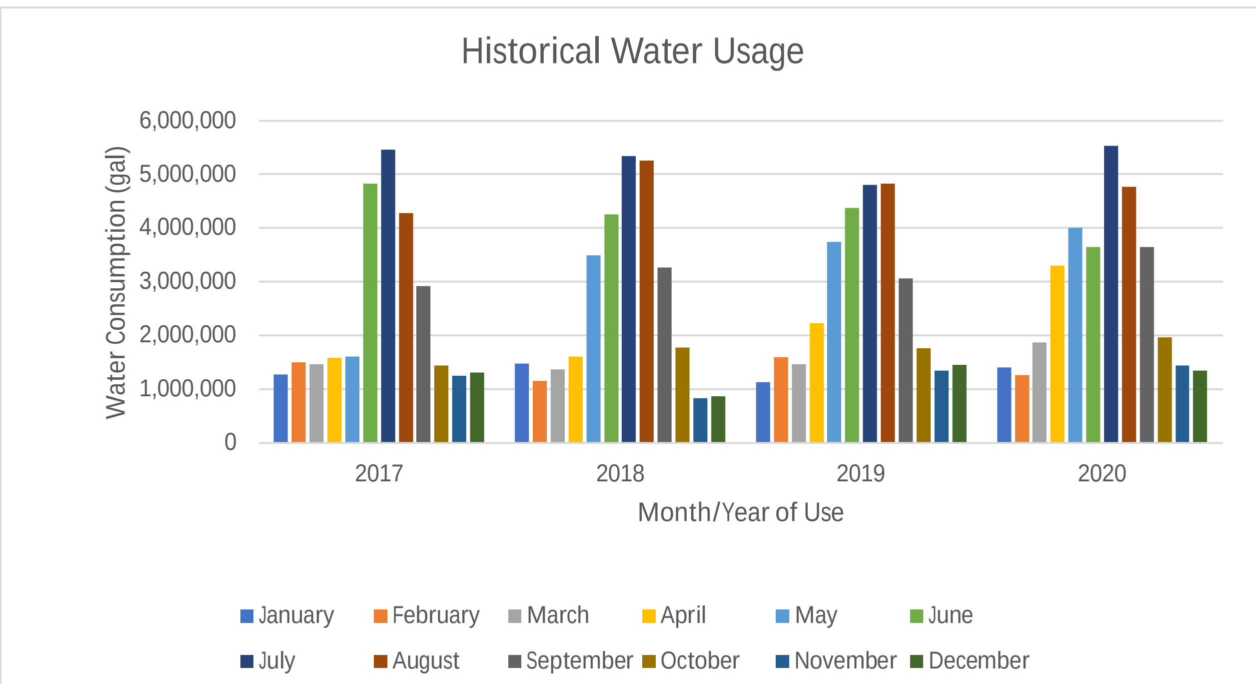
Table 2-1 Water Production and Usage

Year	Annual Production (gallons)	Annual Usage (gallons)	Annual Residential Usage[A] (gallons)	Residential Max. Month[B] (gallons)	Annual ADD (gpd/ERU)	MMADD (gpd/ERU)	MDD[C] (gpd/ERU)
2020	34,169,631	30,968,696	29,535,154	3,978,986	235	359	593
2021	33,432,421	31,152,330	29,744,145	3,895,428	235	340	560
2022	31,027,488	28,075,507	27,015,823	3,467,687	213	313	517

A: Annual usage from full-time residential connections
B: Half of the usage from full-time residential connections during the max billing period
C: MMADD with a factor of 1.65 applied

There is a seasonal demand which occurs during the summer months as irrigation increases and the demand at the Dungeness Recreation Area increases. Variations in consumption rates reflect changes in weather conditions, community activities, and habits of the population. The seasonal changes in the water demand are shown in Figure 2-1.

Figure 2-1 Estates Seasonal Demand



Knowledge of seasonal variations in water demand can help planning personnel better serve customers and properly maintain the distribution system.

Data from Figure 2-1 shows that the highest seasonal use occurs during the months of July through October. This is typical for most municipalities, as irrigation requirements significantly increase due to warmer temperatures. The following sections summarize the system production, water loss, service connections, and consumer demands. The following sections summarize the production, water loss, ADD, ERUs, MDD, and PHD calculations.

2.1.2.1 Distribution System Leakage

Distribution system leakage (DSL) is the difference between the amount of water produced and authorized consumption in a system. The DSL for Estates has been variable from year to year as shown in Table 2-2. All connections on the system are metered. Replacement of aging infrastructure is proposed over the short to medium term to assist in accurately measuring leakage. Although the 3-year average for DSL is below the 10% threshold, Cascadia Water has developed a water loss control action plan.

Table 2-2 Historical Water Consumption and Loss

Year	Annual Production (gallons)	Annual Withdrawal (acre-feet)	Annual Consumption (gallons)	Leakage (gallons)	DSL
2020	34,169,631	104.9	30,968,696	3,200,935	9.4%
2021	33,432,421	102.6	31,152,330	2,280,091	6.8%
2022	31,027,488	95.2	28,075,507	2,951,200	9.5%

2.1.3 Equivalent Residential Units

Water systems, including Estates, are often comprised of various types of connections including residential, commercial, industrial, etc. To properly assess the capacity of a system, connections are referred to as Equivalent Residential Units (ERUs). An ERU is a system-specific unit of measure used to express the amount of water consumed by a typical full-time single-family residence (WAC 246-290-010). There are four (4) non-residential connections on the system associated with the Dungeness Recreational Area Park, the Five Acre School, and the Department of Fish & Wildlife.

Due to distribution system leakage (DSL), a number of those the system ERUs are associated with DSL. Per section 4.4.5 of the DOH Water System Design Manual, 2019 edition (Design Manual), DSL demand can be expressed as a separate demand on the water system in terms of ERUs based on ERU_{MDD}. The ERUs associated with these connections and DSL are provided in Table 2-3.

Table 2-3 Equivalent Residential Unit Calculations

Type	Connections	Annual Usage (gallons)	ADD (gpd/con)	Max Bill Usage C (gallons)	MDD (gpd/con)	ERUs
Residential	400	28,943,511	260 A	4,955,250	720 B	400
Dungeness Park	1	804,100	2,203	240,856	3,948	8
School	1	175,032	480	28,424	466	2
Fish & Wildlife	2	222,405	305	29,172	239	2
DSL	-	2,811,252	-	-	-	19
			Total			431

A: See the ERU_{ADD} value from Section 2.1.4
B: See the ERU_{MDD} value from Section 2.1.5
C: Each bill period covers 2 months of consumption

2.1.3.1 Full-Time Residential Connection

System demands such as ADD and MDD are often expressed per ERU and should represent the demand associated with a typical full-time single-family residence (WAC 246-290-010). Water usage data from customer accounts was analyzed from 2020 through 2022 to determine current design values for the system. Full-time residential consumers were determined to be service connections that average more than 1,200 gallons per billing period. These accounts were isolated from the non-residential connections associated with the Five Acre School, the Dungeness Recreational Area, and two connections with the Department of Fish & Wildlife. A list of the connections over the three years is compiled in Table 2-4.

Table 2-4 System Connections

Type	2020	2021	2022
Full-Time Residential Connections	363	376	363
Part-Time Residential Connections	34	33	37
Non-Residential Connection	4	4	4
Total	401	413	404

2.1.4 Average Day Demand

Average day demand (ADD) is the typical demand of a full-time single-family residence. For Estates, it has been calculated by total volume of authorized consumption from active residential meters in one year divided by the number of days in the year and the number of ERUs associated with the full-time single-family residences. Water usage data from customer accounts was analyzed from 2020 through 2022 to determine current design values for the system. The water use data for these periods is provided in Appendix P and is summarized in Table 2-1. A safety factor of 1.10 was applied to the calculated ADD in accordance with Section 3.11 of the Design Manual. The ERU_{ADD} design value for Estates is 260 gallons per day per ERU (gpd/ERU).

2.1.5 Maximum Day Demand

Maximum day demand (MDD) is ideally determined by meter readings and is the largest single-day usage of water based upon production. MDD could not be determined from actual water use data due to lack of daily source meter readings. Therefore, a multiplier of 1.65 is used to estimate MDD from maximum monthly average day demand (MADD) per Section 3.4.1 of the Design Manual. Estates consumer meters are read every two months. For MDD, water usage data from customer accounts was analyzed to determine the maximum consumption from the full-time residential connections in a given billing period. The water use data for these periods is provided in Appendix R and is summarized in Table 2-1. In addition to the MMADD multiplier, a safety factor of 1.20 was applied to the calculated MDD in accordance with Section 3.11 of the Design Manual. The ERU_{MDD} design value for Estates is 720 gallons per day per ERU (gpd/ERU).

2.1.6 Peak Hour Demand

Peak Hour Demand (PHD) was calculated in accordance with Section 3.4.2 of the Design Manual. Equation 3-1 from the Design Manual uses the MDD and the number of potential connections to determine the PHD flowrate.

Equation 2-1

$$PHD = \frac{MDD}{1440}[(C)(N) + F] + 18$$

PHD = Peak Hourly Demand (gallons per minute)
N = number of potential connections
C = coefficient based on system size
F = coefficient based on system size
MDD = Maximum Daily Demand (gpd/ERU)

The coefficients used in the above formula are dependent upon the number of connections served as summarized in Table 2-5.

Table 2-5 Peak Hour Demand (PHD) Equation Coefficients

Range of ERUs	C	F
15-50	3.0	0
51-100	2.5	25
101-250	2.0	75
251-500	1.8	125
501-1,000,000	1.6	225

The design MDD of 630 gpd/ERU, Equation 3-1 and the values provided in Table 2-4 were used to calculate the PHD for years 2023, 2029, and 2043 and the maximum system physical capacity of 512 ERUs. The calculated PHD values are summarized in Table 2-5.

Table 2-6 Group A Peak Hour Demand (PHD) Based on MDD

Year	N (ERUs)	MDD (gpd/ERU)	Coefficient Associated with Range of ERUs	Factor Associated with Range of ERUs	PHD (gpm)
2023	420	720	1.8	125	459
2029	458	720	1.8	125	493
2043	526	720	1.6	225	551
Maximum*	600	720	1.6	225	611

*Max = Maximum number of ERUs that the system can support based on the capacity analysis calculations provided in Appendix P.

The PHD calculations assume the maximum possible ERUs based on the projected future system and the maximum possible number of connections purported by this Water System Plan. For the purpose of design in the distribution system, the PHD based on the calculated capacity of 539 ERUs will be used which corresponds to the projected growth in 20-years. The PHD design value for Estates is 562 gallons per minute (gpm).

2.2 Projected Land Use, Future Population, and Demand Forecasting

The projected land use, future population, and water demand forecasting for Estates, Inc. is discussed in the following sections.

2.2.1 Projected Land Use

As discussed in Section 1, the Water System's existing service area primarily provides service to land zoned as various rural designations (See CCC 33.10). There is potential for growth within the existing service area as previously subdivided (but undeveloped) plots undergo development. A vicinity map showing the location of the retail service area for Estates is provided in Appendix B.

Site specific fire flow requirements for individual development projects are determined by Clallam County through its development review processes. There is a potential for Rural Cluster Developments, and commercial (nonresidential) development within the service area. However, the timeframe for development of these subdivided plots is currently unknown.

2.2.2 Projected Connections

The estimated number of connections for 2029 and 2043 were determined by using a 1.0% population growth rate to establish the number of future residents served and 2.5 residents per residential connection as recommended by DOH. The 1.0% population growth rate used for this report is a conservative estimation based off the current growth rate of 0.73% indicated in the Clallam County Census and the available lots in the service area. Equation 2-1 and the values provided in Table 2-5 were used to calculate the PHD for 2023, 2029, 2043, the current number of DOH approved connections, and the maximum system physical capacity.

2.2.3 Projected Demand

Projected demands are based on ERU projections and trends in the annual production of ADD. The project source withdrawal for annual production is summarized in Table 2-7 based on the number of projected ERUs discussed in Section 2.1.6.

Table 2-7 Projected Annual Demand Based on ADD

Year	N (ERUs)	ADD (gpd/ERU)	Annual Withdrawal (gallons)	Annual Withdrawal (ac-ft)
2023	442	260	41,945,800	128.7
2029	458	260	43,418,191	133.3
2043	526	260	49,908,091	153.2

Projections are based on the increase in the proposed ERUs at a rate of 1.0% and trends in Annual Production and the ADD. The ADD is assumed to be level as the increase in consumer demand can be offset by the steps currently underway and those that will be implemented to reduce the DSL.

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3 SYSTEM ANALYSIS

This chapter summarizes the analysis of the existing systems to determine if the system facilities are capable of supplying sufficient quality and quantity of water to meet existing and projected demands as identified in Chapter 2. Improvements to the system required to meet projected demands are discussed in the final section of this chapter.

3.1 System Design Standards

See Part A of the Cascadia Water – Water System Plan for the Southwest region.

3.2 Water Quality Parameters and Analysis

Groundwater wells provide the source water for the water system and therefore they are required to comply with the water quality requirements specified in WAC 246-290 Part 4 – Water Quality, which includes requirements from the Code of Federal Regulations (CFR) Title 40.

It is required that purveyors of the community water system have one complete analysis from each water source every thirty-six months. A selection of recent water quality test results is included in Appendix L and additional information is available on the DOH Sentry website:

https://fortress.wa.gov/doh/eh/portal/odw/si/Intro.aspx

Waivers are available to modify some of the testing requirements noted below. The DOH will provide the system with a water quality monitoring schedule (WQMS) that summarizes the specific testing requirements for that system. A copy of the system's WQMS is provided in Appendix K. See Section 3.2.1 below for additional information. Required water quality monitoring locations and schedules, as specified in WAC 246-290 and 40 CFR, are summarized in Table 3-1.

Table 3-1 Water Quality Monitoring Schedule

Constituent	Sample Location	Schedule/Frequency
Asbestos	One sample from the routine coliform sampling sites that contains asbestos concrete pipe.	Waiver One sample every 9 years
Bacteriological	From representative points throughout distribution system.	One sampler per month
Complete Inorganic Chemical & Physical	From a point representative of the source(s), after treatment, and prior to entry to the distribution system.	Waiver One sample every 9 years
Lead/Copper	From the distribution system at targeted sample tap locations.	Ten sample every 3 years
Nitrate/Nitrite	From a point representative of the source(s), after treatment, and prior to entry to the distribution system.	One sample annually
Potential Trihalomethanes – Ground Water *	From two representative points in the distribution system.	Annually at 2 locations
Radionuclides	From the source(s).	One sample every 6 years
Volatile Organic Chemicals (VOCs)	From a point representative of the source(s), after treatment, and prior to entry to distribution system.	Waiver One sample every 6 years.
Synthetic Organic Chemicals (SOCs Herbicides)	From a point representative of the source(s), after treatment, and prior to entry to distribution system.	Waiver One sample every 9 years
Synthetic Organic Chemicals (SOCs Pesticides)	From a point representative of the source(s), after treatment, and prior to entry to distribution system.	Waiver One sample every 3 years
Synthetic Organic Chemicals (SOCs including EDB and other soil contaminants, Dioxin, Endothall, Diquat, Glyphosate, Insecticides)	From a point representative of the source, after treatment, and prior to entry to distribution system.	Complete Waiver Granted
Per- & Polyfluoroalkyl (PFAS)	From a point representative of the source, after treatment, and prior to entry to distribution system.	One sample every 3 years

*Currently the water system is not chlorinating but chlorination may be added as future oxidation and filtration equipment or for preventative disinfection. If chlorination is used, then these testing requirements may need to be implemented.

3.2.1 Water Testing

The latest water quality testing results are provided for each system in Appendix L. The testing schedule for each system is provided in Appendix K. The frequency of testing for each system is dependent on size, past testing results, and system configuration. The following tests are performed throughout the system:

- Radionuclides
- Arsenic

- Lead & Copper
- Synthetic Organic Chemicals
- Volatile Organic Chemicals
- Bacteriological
- Asbestos
- Iron
- Manganese
- Nitrates

3.2.2 Bacteriological Testing

The State requires that systems serving up to 1,000 people have a minimum of one routine bacteriological analysis per month. The sample is to be taken from the distribution system. When any samples with a coliform presence are collected during the previous month, the purveyor must take five (5) repeat samples. If those samples do not contain any presence of coliform bacteria, the sampling may revert to the statutory number of samples per month. If coliform bacteria are detected, four (4) follow-up samples are required the same month, then five (5) routine samples the following month if the four (4) follow-up tests are negative; otherwise, DOH will specify follow-up requirements. The Coliform Monitoring Plan, provided in Appendix M, provides the sampling points that will be used within the system.

3.2.3 Inorganic Chemical Testing

WAC 246-290 and CFR 40 specify testing for primary and secondary inorganic chemicals. The maximum contaminant levels (MCLs) and latest source test results for inorganic chemicals (IOCs) are summarized in Table 3-2.

Table 3-2 Inorganic Chemical Maximum Contaminant Levels (MCLs)

PRIMARY INORGANIC CHEMICALS			
Substance	MCLs (mg/L)	State Reporting Limits (mg/L)	IOC Results [A] Well Field S03 (mg/L)
Antimony (Sb)	0.0060	0.0030	LT
Arsenic (As)	0.0104	0.0010	LT
Asbestos	7 million fibers/liter (longer than 10 microns)	-	-
Barium (Ba)	2.0000	0.1000	LT
Beryllium (Be)	0.0040	0.0003	LT
Cadmium (Cd)	0.0050	0.0010	LT
Chromium (Cr)	0.1000	0.0070	LT
Copper (Cu)	*	0.0200	LT
Cyanide (HCN)	0.2000	0.0500	LT
Lead (Pb)	*	0.0010	LT
Mercury (Hg)	0.0020	0.0002	LT
Nickel (Ni)	0.1000	0.0050	LT
Nitrate (as N)	10.00	0.5000	LT
Nitrite (as N)	1.0	0.1000	LT
Selenium (Se)	0.0500	0.0020	LT
Sodium (Na)	*	5.00	11.30
Thallium (Tl)	0.0020	0.0010	LT

SECONDARY INORGANIC CHEMICALS			
Chloride (Cl)	250.0	20.00	LT
Fluoride (F)	4.00	0.2000	LT
Iron (Fe)	0.3000	0.1000	LT
Manganese (Mn)	0.0500	0.0100	0.1800
Silver (Ag)	0.1000	0.1000	LT
Sulfate (SO_4)	250.00	50.00	LT
Zinc (Zn)	5.00	0.2000	0.6200

A: Testing results less than the state reporting limit are entered as LT

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

3.2.4 Physical Characteristics

WAC 246-290 and CFR 40 specify testing physical characteristics. The MCLs for physical characteristics are summarized in Table 3-3.

Table 3-3 Physical Characteristics

Substance	Secondary MCLs	Physical characteristics Results
Color	15 Color Units	15 CU
Specific Conductivity	700 umhos/cm	315 umhos/cm
Total Dissolved Solids (TDS)	500 mg/L	N/A

The generally accepted classification of hardness is summarized in Table 3-4. An MCL for hardness has not been established. In general, water having a hardness of less than 100 mg/L is not considered hard for ordinary domestic use. The system's hardness concentration was measured at 129 mg/L and is considered hard.

Table 3-4 Relative Hardness

Description	Concentration of $CaCO_3$
Soft	0-60 mg/L
Moderately hard	61-120 mg/L
Hard	121-180 mg/L
Very hard	181-350 mg/L
Saline/Brackish	> 350 mg/L

The water hardness impacts the corrosivity of water and it may have negative impacts on lead and copper levels in delivered water. If water softening is desired in the future, lead and copper testing should be performed to ensure that water corrosivity concerns do not become an issue.

3.2.5 Disinfection Byproducts (DBP)

When chlorine is added to drinking water to serve as a disinfectant for various organisms, a residual must be maintained throughout the distribution system. However, chlorine is a very active substance, and it reacts with naturally occurring substances to form compounds known as disinfection byproducts (DBPs). The most common DBPs that develop when chlorine is used for disinfection are trihalomethanes (THMs), and haloacetic acids (HAAs).

The Stage 2 Disinfectants and Disinfection Byproducts Rule regulates the concentration of disinfectant chemicals and byproducts that may be present in the distribution system water. These chemical species are considered primary contaminants. Testing for DBPs is performed annually unless the MCL is exceeded, in which case a running annual average (RAA) is used for comparison against the MCL. The number of samples is dependent on system size. Each of the locational running annual average (LRAA) results must be in compliance.

The concentrations of each of the trihalomethane compounds (trichloromethane, dibromochloromethane, bromodichloromethane, and tribromomethane) are totaled to determine the total trihalomethanes (TTHM) level. The MCL for TTHM is 0.080 mg/L. The concentrations of each of the five haloacetic acid compounds (monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, bromoacetic acid, and dibromoacetic acid) are totaled to determine the haloacetic acids (HAA5s) level. The MCL for HAA5 is 0.060 mg/L.

At the time this Water System Plan is being prepared, Estates in in the process of installing a manganese filtration system which uses chlorine as an oxidant and disinfectant. Following installation of the treatment system , Estates will commence monitoring for disinfection byproducts on an annual basis at two locations in the distribution system as noted in the DOH approval letter for Project #22-0805.

3.2.6 Radionuclides

The State considers radionuclides primary contaminants. The MCLs for radionuclides and the latest source test results are summarized in Table 3-5.

Table 3-5 Radionuclides MCLs

Substance	MCL (pCi/L)	State Reporting Limit (pCi/L)	Radionuclides Results [A] (pCi/L)
Radium-226	3.0		-
Combined Radium-226 and Radium-228	5.0	1.00	LT
Gross alpha particle activity (excluding uranium)	15.0	3.0	LT

A: Testing results less than the state reporting limit are entered as LT

The State specifies that the average annual concentration shall not produce an annual dose equivalent to the total body or any internal organ greater than four millirem/year.

3.2.7 Volatile Organic Chemicals (VOCs)

The State requires that public water systems sample and evaluate Volatile Organic Chemicals (VOCs). If there are violations of the MCLs for any constituent, they must be addressed for elimination immediately. If there are no violations of the MCLs, the purveyor must sample again for VOCs after twelve months. If no VOCs (excluding THMs) are verified after the initial twelve months of monitoring, purveyors of community water systems shall monitor each source at least once every thirty-six months. The VOC MCLs and latest system test results are summarized in Table 3-6.

Table 3-6 Volatile Organic Chemicals (VOCs) MCLs

Contaminant	MCL (µg/L)	State Reporting Limits (µg/L)	VOC Results (µg/L)
Vinyl chloride	2.0	All VOC State Action Limits are 0.5 ug/L	All VOC Results LESS THAN STATE ACTION LIMIT
Benzene	5.0		
Carbon tetrachloride	5.0		
1,2-Dichloroethane	5.0		
Trichloroethylene	5.0		
para-Dichlorobenzene			
1,1-Dichloroethylene	7.0		
1,1,1-Trichloroethane	200.0		
cis-1,2-Dichloroethylene	7.0		
1,2-Dichloropropane	5.0		
1,4 Dichlorobenzene	75.0		
Ethylbenzene	700		
Monochlorobenzene	100		
o-Dichlorobenzene	600		
Styrene	100		
Tetrachloroethylene	5.0		
Toluene	1000.0		
trans-1,2-Dichloroethylene	100.0		
Xylenes (total)	10,000.0		
Chloride(Dichloromethane)	5.00		
1,2,4-Trichlorobenzene	70.0		
1,1,2-Trichloroethane	5.0		

3.2.8 Synthetic Organic Chemicals (SOCs)

The synthetic organic chemical (SOC) MCLs are summarized in Table 3-7.

Table 3-7 Synthetic Organic Chemicals (SOCs) MCLs

Contaminant	MCL (µg/L)	State Reporting Limits (µg/L)	SOC Results [A] (µg/L)
Toxaphene	3.0000	1.000	LT
2,4,5-TP	50.0000	0.2000	LT
Benzo[a]pyrene	0.2000	0.0200	0.0400
Dalapon	200.000	1.000	LT
Di(2-ethylhexyl)adipate	400.0000	0.6000	1.3000
Di(2-ethylhexyl)phthalate	6.0000	0.6000	1.3000
Dinoseb	7.0000	0.2000	LT
Diquat *	20.0000	-	-
Endothall *	0.1	-	-
Endrin	2.000	0.0100	LT
Glyphosate *	0.7	-	-
Hexacholorbenzene	1.0000	0.1000	LT
Hexachlorocyclo pentadiene	50.0	0.1000	LT
Oxamyl (Vydate) **	200.00	-	4.000
Picloram	500.00	0.1000	LT
2,3,7,8-TCDD (Dioxin) *	$3x10^{-8}$	-	-

* The DOH has granted complete waivers for dioxin, endothall, glyphosate, and diquat.
** The DOH has granted complete waiver for these insecticides but latest test results are included.
A: Testing results less than the state reporting limit are entered as LT

3.2.9 Seawater Intrusion

Due to the existence of seawater intrusion (SWI) in many wells located on the shorelines of Washington State, the possibility of seawater intrusion into the potable water aquifers must be investigated on a regular basis. The Design Manual identifies wells at risk for SWI as those wells that are located within ½ mile of the shoreline and pump water from a depth below sea level, and within ½ mile of a groundwater source with chloride concentrations over 100 mg/L. Department of Ecology may condition water right permits to provide for reduced pumping rates or may require a water system to abandon sources if seawater intrusion threatens senior water right permits. Estates' groundwater wells are located approximately 1.5 miles away from nearest shoreline. Chloride concentration has consistently measured less than 5 mg/L. Estates is considered low risk for seawater intrusion. It is recommended that the system continue testing its well field for chloride to check for any long-term trends in the aquifer.

3.2.10 Source Water Quality

A wellhead protection plan was developed to help identify items and situations that could possibly pose a threat to the water quality of the system. A copy of the Wellhead Protection Plan is included in Appendix I.

The primary contaminant of concern for the water system is manganese, which is a naturally occurring contaminant common in groundwater sources. Currently Estates is in the process of installing a manganese oxidation/filtration system with a chemical feed of sodium hypochlorite (NaOCl) as the oxidant.

3.2.11 Finished Water Quality

Water quality samples from the distribution system show adequate water quality. Lead and copper concentrations were measured at less than 0.001- and 0.02-mg/L respectively. Total coliform concentrations are measured monthly, with the most recent results indicating that coliform is absent. Where water quality improvements have been identified a capital improvement project has been identified and scheduled for the immediate term. See Chapter 8 for additional information.

3.3 System Description and Analysis

Potential system improvements were determined by analysis of system components, testing, past studies, review of water system inventories, consultation with the system operator regarding needed improvements, and longer-term goals for the systems. The distribution systems' needs by functional group are summarized in the following sections.

3.3.1 Existing System Configurations

The system is currently supplied by two groundwater wells. The wells are located on Clallam County Parcel 043004510880, owned by Cascadia Water. The parcel is provided access off of Ridgeview Drive via an access easement. The two wells function in a lead/lag alternating orientation. Estates has a water right with a maximum instantaneous withdrawal rate of 500-gpm so both wells can physically and legally be operated at the same time. The well lot also contains a single reservoir that is currently under construction. The reinforced concrete reservoir is 30-feet in diameter and 33-feet tall with an approximate volume of 174,500-gallons. Well function is controlled by reservoir levels which are relayed to system controls by a pressure transducer. Pressurization of the distribution system is provided by booster pumps located in a pumphouse that is situated on the parcel with the wells and reservoir.

Raw water from Well #2 is pumped into the pumphouse where it is dosed with sodium hypochlorite prior to being conveyed through an ATEC filter system with five (5) filter vessels. Each filter vessel is 30-inches in diameter and 60-inches tall. The ATEC filter system treats raw water from Well #2 for elevated levels of manganese prior to being discharged into the storage reservoir. Raw water from Well #1 is dosed with sodium hypochlorite for disinfection, bypasses filtration, and is conveyed into the storage reservoir.

Treated water from the wells is stored in the 174,500-gallon reinforced concrete reservoir. An 8-inch suction line from the storage reservoir is supplied into the distribution system by four (4) booster pumps. Each pump is a 15 hp Grundfos LC 20709 pump. System booster pump specifications are included in Appendix O. System pressures are maintained and pump protection is provided by three (3) 370-gallon pressure tanks (See Appendix O for Pressure Tank specifications). Distribution piping consists of 2-, 4-, and 6-inch water mains. A distribution system map is provided in Appendix V. Figure 3-1 provides a schematic of the system operations from the source wells to the distribution system. The hydraulic grade line (HGL) of the distribution system is 260-feet based upon the finished floor elevation of the pumphouse (135 feet).

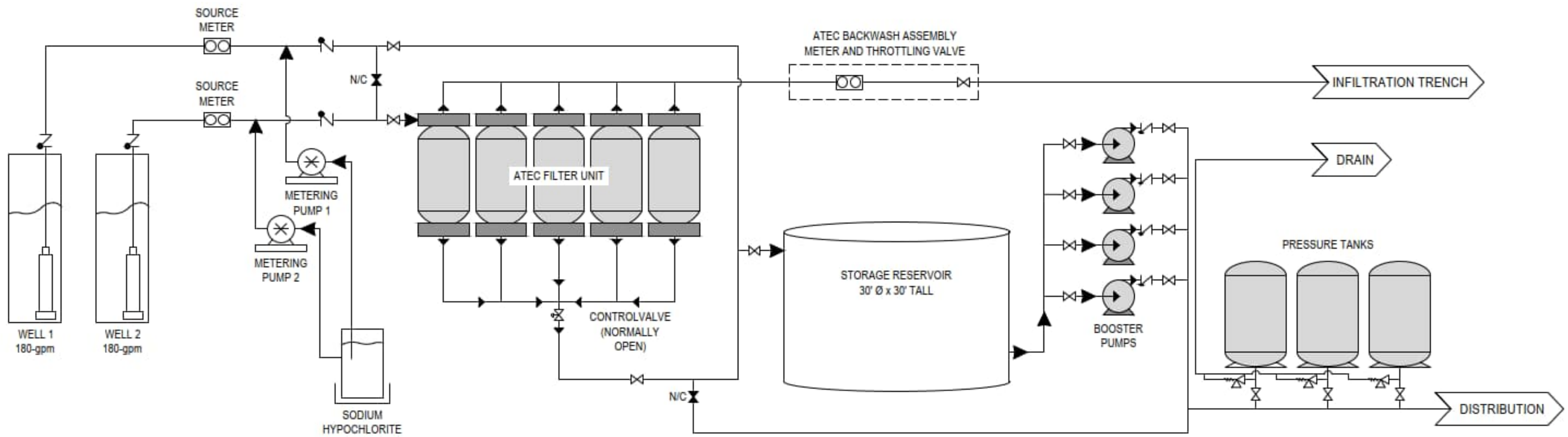

Figure 3-1 Estates Distribution System Schematic

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3.3.2 Water Rights

Washington State Department of Ecology (DOE) issued Ground Water Certificate G2-27484 C (Priority Date February 14, 1989) to Estates Water Systems, Inc. This water right authorizes an instantaneous withdrawal of 500-gpm and a maximum annual withdrawal of 240 acre-feet for the Water System. A copy of the water right is provided in Appendix E. A water rights self-assessment for Estates, Inc. is provided in Appendix F.

3.3.3 Source

Estates is served by two groundwater wells that are located on Clallam County parcel 043004510880. This parcel is owned by Cascadia Water and has access from the water system located off Ridgeview Drive in the southern portion of the service area. DOH requirements for ground water sources specify that the well shall be located, constructed, and maintained in a manner which will ensure the minimum possibility of contamination, and be so situated and developed as to prevent surface water from entering the well. To ensure adequate sanitary control in the vicinity of the well, water systems must control all land within a radius of 100-feet of the well field, except that the systems shall control land of a greater or lesser size or of a different shape than is defined by a 100-foot radius where an evaluation of geological and hydrological data, well construction details, and other relevant factors indicates that a control area of different size or shape will assure adequate sanitary control in the vicinity of the well. Cascadia Water owns the property which makes up the sanitary control radius. Bacteriological, chemical, and physical water quality requirements are discussed in Section 3.2 and water quality results are included in Appendix L.

Well 1 was drilled in 1982 to a final depth of 607-feet to serve as a primary source. The initial pump test for Well 1 was conducted in November 1982. That test recorded a static water level of 58-feet below the top of well. It also conducted a stepped pump test with a maximum rate of withdrawal of 201 gpm with a corresponding drawdown of 17-feet. A copy of the well log and corresponding pump test is included in Appendix G.

Well 2 was initially drilled in 1974 to a depth of 86-feet with a static water level of 41-feet 1-inch. In 1983, Well 2 was deepened to a depth of 462-feet with a static water level of 57-feet below the top of well. A stepped pump test was conducted in May 1983 with a rate of withdrawal of 225 gpm with a corresponding drawdown of 31-feet. A copy of the well log and corresponding pump test is included in Appendix G. Additional detailed information regarding each source is summarized in Table 3-8.

Table 3-8 Source Type, Location, and Use Information

	Well 1	Well 4
Source Type	Well (Non GWI)	Well (Non GWI)
DOE Tag	ACA573	ACA574
Source Location	Sec 4 T30N R04W	Sec 4 T30N R04W
Purpose of Use	Domestic Water Supply – Primary	Domestic Water Supply – Primary
Place of Use	See Water Right	See Water Right
Year of Installation	1982	1983
App. Capacity (gpm)	201	225
Ex. Capacity (gpm)	180	180
Pump Size (hp – gpm)	7.5 hp – 180 gpm	7.5 hp – 180 gpm
Casing Size	6"/4"	8"
Ground Elev. (ft)	135	135
Well Depth (ft)	607	462
Static Water Depth (ft)	58	58
Top of Screen (ft)	197	436
Bottom of Screen (ft)	592	462
Drawdown (ft)	17	31

3.3.3.1 *Current Facility Age and Estimate of Future Life Expectancy*

Both groundwater sources are approximately 40-years old. The anticipated useful life of wells will vary depending on numerous factors. It is recommended that the static water level and pumping water levels be measured and recorded annually to monitor the status of both the wells and the installed pumps. The static water levels, pumping rates, and drawdown levels will help to determine timelines and priorities for replacement.

Depending on the operating conditions of the well pumps (i.e., if the head/flow and cycle times are within manufacturer recommendations), the well pumps should last through the Phase I planning cycle. However, as submersible pumps may fail without much warning, it is recommended that documentation on the installed submersible pumps and adequate reserves be kept on hand to fund and facilitate an emergency well pump replacement.

3.3.3.2 *Condition and Capacity of Transmission Mains*

The transmission mains from groundwater wells to the pumphouse and reservoir are being replaced as part of the improvements project currently in process. The transmission mains and well site piping should last through the long-term planning period of this Water System Plan.

3.3.4 Treatment

As part of the improvements project currently being installed at Estates (DOH Project #22-0805), a manganese (Mn) filter system is being installed to treat raw water from Well 2. The Mn filter system consists of raw water, from Well 2, being pumped through an ATEC filter system with five (5) filter vessels. Each filter vessel is 2.5-feet in diameter, has a surface area of 4.9-square feet, and contains 16-cubic feet of filter media (42-inches). The filter media is a manganese dioxide coated media. The typical operating mode, referred to as catalytic oxidation, includes continuous feeding of chlorine to oxidize the iron, manganese, and any other constituents that have a chlorine demand (e.g., hydrogen sulfide, ammonia). Additional chlorine (at residual between 0.5 to 1.0 mg/L leaving the filters) is required to continuously regenerate the media. The system is capable of filtering 200-gpm, which should provide sufficient capacity for Well 2.

3.3.5 Storage

Water storage is necessary for multiple reasons. These reasons include an adequate storage volume to meet the daily fluctuations in demand, a sufficient volume to allow adequate runtime for pumps and the treatment system(s), an emergency reserve in case the supply system should fail, and to provide a large volume of water for potential firefighting needs.

The water system storage is provided by a 174,500-gallon reservoir located on Clallam County parcel 043004510880. This reservoir is part of the improvement project currently being constructed at the water system. The reservoir is 30-feet in diameter and is 33-feet tall. The reservoir has a base elevation of 132.75-feet above sea-level.

The system reservoir provides the following storage components:

- Operational Storage (OS) – Section 3.4.6.1
- Equalizing Storage (ES) – Section 3.4.6.2
- Standby Storage (SB) – Section 3.4.6.4
- Dead Storage (DS) – Section 3.4.6.3

The storage capacity of the system is discussed in subsequent subsections.

3.3.5.1 *Current Facility Age and Estimate of Future Life Expectancy*

Concrete storage reservoirs that employ the latest construction standards are anticipated to have a useful lifespan of at least 70-years. The useful lifespan of the reservoir under construction at Estates should surpass the planning periods of this Water System Plan.

3.3.6 Booster Pumps and Pressure Tanks

The distribution system is pressurized by four (4) booster pumps fed from the 174,500-gallon reservoir. System pressures are maintained, and pump protection is provided by three (3) 370-gallon pressure tanks. These pumps and pressure tanks are currently being installed as part of the 2023 improvements project. Each pump is a 15 hp Grundfos LC 20709 pump.

The four booster pumps will operate on an alternating lead/lag 1/lag 2/lag 3 configuration where the starting and lag pumps will alternate with each pump-start. The proposed pressure settings are summarized in Table 3-9 and pump curves associated with the proposed equipment are included in Appendix O

Table 3-9 Booster Pump Pressure Settings

(4) 15 hp Grundfos LC 20709				
Pump Position	On Settings		Off Settings	
	Pressure - psi (ft) -	Pump Rate - gpm -	Pressure - psi (ft) -	Pump Rate - gpm -
Lead Pump	55-psi (127.1)	295 gpm	65-psi (150.2)	190 gpm
Lag #1	50-psi (115.5)	327 gpm	60-psi (138.6)	255 gpm
Lag #2	45-psi (104.0)	358 gpm	55-psi (127.1)	295 gpm
Lag #3	40-psi (92.4)	385 gpm	50-psi (115.5)	327 gpm

3.3.6.1 *Current Facility Age and Estimate of Future Life Expectancy*

The useful lifespan of the new booster pumps system under construction at Estates should surpass the 20-year planning period of this Water System Plan.

3.3.7 Distribution

Mains throughout the systems are tapped for the individual service connections. The following sections provide additional details on the distribution system.

3.3.7.1 Length, Diameter, and Type of Pipe

A comprehensive inventory of each system, including distribution system piping, is provided in Appendix O. A summary of the water mains in the distribution system are provided in Table 3-10.

Table 3-10 Distribution System Piping

	PVC Pipe Diameter				
	2-inch	4-inch	6-inch	8-inch	Total
Pipe Length (feet)	2,850	21,600	9,000	400	33,850

There are three (3) fire-hydrants located on the system within the Dungeness Estates Subdivision. The standard pipe diameter for future watermain replacements should be a minimum of 6-inches for looped portions of the system and 8-inches for dead end mains. A map of the distribution system and the corresponding pipe sizes are included in Appendix V.

3.3.8 Hydraulic Analysis of Distribution System

Hydraulic analyses were done for the distribution system using the hydraulic modeling software EPANet. The model uses the Hazen-Williams equation to estimate head-losses throughout the system. Models were developed for both the existing system and the system following distribution system improvements at approximately 2043 in accordance with Section 6.1.4 of the Design Manual. For both the existing and future scenario hydraulic models were run for (1) the system at PHD and also for (2) the fire flow demand with MDD.

<u>PHD Scenario:</u>

The PHD scenario models the system at the calculated demands that the system is expected to undergo during normal operation. Per the Design Manual, water systems are required to be capable of providing the PHD to the system while maintaining a required minimum pressure of 30 psi at all service connections. For the PHD scenarios, the reservoir levels are set to the bottom of equalizing storage, and booster pumps are set at the on pressure for the 1st lag pump at 50 psi (115 feet TDH). This pressure setting provides a hydraulic grade line of 255-feet.

Fire Flow & MDD Scenario:
For the fire flow scenario model, the distribution system is required to be capable of providing the MDD with fire flow demand at a hydrant while maintaining a required minimum pressure of 20 psi at all service connections. For the fire flow scenarios, the reservoir levels are set to the bottom of fire suppression storage. Booster pumps are set at the on pressure for the 2nd lag pump at 45 psi (104 feet TDH). This pressure setting provides a hydraulic grade line of 244-feet. Data from each of the scenarios is provided in Appendix Q. The results are summarized in the subsections below. This modeling scenario has been included despite fire flow requirements not being applicable to the Estates system. A letter from the Clallam County Fire Marshal has been included in Appendix U clarifying that fire flow requirements are not applicable at this system as they were constructed before any applicable county regulations were in effect.

3.3.8.1 Existing Distribution System – Peak Hour Demand

For the PHD model, the demands are distributed throughout the system and reservoir levels are set at the bottom of equalizing storage. In this scenario, the distribution system has service pressures in excess of the required minimum of 30-psi. The lowest pressure service connections are located along Bon Jon View Way (Node 30 in the hydraulic model) with pressures just under 40-psi.

3.3.8.2 Existing Distribution System – Fire Flow & MDD

For the Fire Flow model, the MDD demands are distributed throughout the system and reservoir levels are set at the bottom of fire suppression storage. In this scenario, most of the system has service pressures in excess of the required minimum of 20-psi. Various portions of the distribution system are not able to provide the minimum required service pressures when fire flow is applied at the hydrant located along the 4-inch water main located at the intersection of Ridge View Drive and Nello Place. This deficiency in the current system is due to the undersized 4-inch water main installed along Ridge View Drive between Secluded Way and 300-feet west of Percy Lane. There are significant portions of the existing distribution system that do not have hydrants installed and would not be capable of providing fire flow. These portions of the system include the following:

- Lotzgesell Road – This road serves the northern boundary of the system including Five Acre School and Dungeness Recreation Area. The head loss in the 4-inch main while providing residential fire flow (500-pgm) is excessive and causes reduced service pressures throughout the distribution system.
- Northwest Corner – Greywolf Road, Maynard Place, and Tyler View Place. The head loss in the 4-inch main while providing residential fire flow (500-pgm) is excessive and causes reduced service pressures throughout the distribution system.
- Eastern Portion of Buckhorn Road – The 4-inch water main along Buckhorn Road would have excessive head loss while operating at fire flow levels reducing pressures in the area to below 20-psi.

Section 3.3.8.4 and 3.5.5 further discuss future capital improvements to address these system deficiencies.

3.3.8.3 Future Distribution System – PHD

The hydraulic model for the distribution system was updated with the distribution system improvements listed in Chapter 8. In addition, demand was increased to correspond to those associated with the capacity of the system. In this scenario, the distribution system has service pressures in excess of the required minimum of 30-psi. The lowest pressure service connections are located along Bon Jon View Way (Node 30 in the hydraulic model) with pressures just under 40-psi.

3.3.8.4 Future Distribution System – Fire Flow & MDD

The distribution system improvements listed in Chapter 8 replaced and increased water main sizing in multiple portions of the distribution system. The following portions of the system were previously unable to provide the minimum required fire flow:

- Ridge View Drive (Between Secluded Way and Percy Lane) – The 4-inch water main along Ridge View Drive is replaced with 8-inch water mains. The increased water main size provides sufficient capacity to meet system demands.
- Lotzgesell Road – All the watermains along Lotzgesell Road should be replaced with 8-inch water mains. The eastern end of Lotzgesell Road should be looped around to the water main at Dungeness Greens Way via Hogback Road. This project would involve the installation of approximately 5,500-feet of watermain but would provide a valuable loop to the distribution system and additional flow to the northwest portion.
- Northwest Corner (Greywolf Road, Maynard Place, and Tyler View Place) – The 4-inch water mains along all roads will need to be increased to 8-inches. In addition, the water main connecting the eastern portions of Greywolf Road and Maynard Place should be replaced and connected to the improvements along Lotzgesell Road.
- Eastern Portion of Buckhorn Road – With the improvements along both Ridge View Drive, Lotzgesell Road, and a connection of the line from Buckhorn to Lotzgesell, the flow capacity to this section of the system will be capable of providing 500-gpm while maintaining service pressures.

In addition to the above noted areas, the planned capital improvements increase fire flow capacity throughout additional portions of the system and future distribution system areas.

3.4 Capacity Analysis

The system capacity was calculated in accordance with the DOH Water System Design Manual (June 2020) using the equations/procedures in Chapter 4: Water System Capacity Analysis.

The capacity calculations are based on the accepted design values as outlined in Chapter 2 for both Average Daily Demand (ADD) and Maximum Daily Demand (MDD). The capacities were calculated and expressed in terms of Equivalent Residential Units (ERUs) based on existing system parameters. System consumption data, including ADD and MDD expressed in terms of gallons per day per ERU, were used throughout the system capacity calculations. The analysis shows that Estates, Inc. has the physical and legal capacity to serve 581 ERUs, limited by the source capacity.

3.4.1 Water Right Capacity Based on Annual Volume

The water right for the system allows for an annual withdrawal of 240 acre-feet per year (78,198,912-gallons). Equation 4-4b in the Design Manual was used to determine the number of ERUs based upon Average Daily Demand (ADD) and water right:

Equation 4-4b:

$$\mathrm{N} = \frac{(Q_a)}{(ERU_{ADD})(365)}$$

$$N = \frac{240\ acre \cdot \frac{\mathrm{ft}}{\mathrm{yr}} \cdot \frac{43{,}560\ \mathrm{ft}^2}{\mathrm{acre}} \cdot 7.48 \frac{\mathrm{gal}}{\mathrm{ft}^3}}{365\ days/yr \cdot 260 \frac{gpd}{ERU}} = 824\ ERUs$$

Where,

N = ERUs Supported
V_a = Annual Volume (gallons/year)
Q_a = Annual Volume (gallons/year)
t_a = time that the source (Qi) delivers flow in a 24-hour period (minutes)
ERU_{ADD} = ADD value per ERU (Section 2.1.4)

ADD was determined to be 260 gpd/ERU (See Section 2.1.4) and the established water right annual withdrawal volume of 240 ac-ft/yr (See Section 3.3.2) as the annual volume (V_a). Therefore, the number of total ERUs capable of being supported based on ADD and the allowed annual withdrawal volume calculates to 824 ERUs.

3.4.2 Water Right Capacity Based on Instantaneous Flow

The water right for Estates allows for an instantaneous pumping rate of 500 gallons per minute. Equation 4-4a in the WSDOH Design Manual was used to determine the number of ERUs based upon Maximum Daily Demand (MDD) and water right:

Equation 4-4a:

$$\mathrm{N} = \frac{(Q_{di})}{(ERU_{MDD})} = \frac{\sum_d^1 (Q_d)(t_d)}{(ERU_{MDD})}$$

$$N = \frac{500\ gpm\ \cdot\ 1{,}440\ minutes/day}{720\ gpd/ERU} = 1{,}000\ ERUs$$

Where:
N = ERUs Supported
V_a = Annual Volume (gallons/year)
Q_a = Annual Volume (gallons/year)
t_a = Annual Volume (gallons/year)
ERU_{MDD} = MDD value per ERU (Section2.1.5)

MDD was determined to be 720 gpd/ERU (Section 2.1.5) and the current water right instantaneous pumping rate of 500 gallons per minute (See Section 3.3.2) as the annual volume (V_d). Therefore, the number of total ERUs that can be supported based on MDD and the allowed instantaneous pumping rate calculates to 1,000 ERUs.

3.4.3 Source Capacity Based on Maximum Day Demand

The Design Manual Section 4.4.2.7 outlines the evaluation procedure to the number of ERUs that can be supported based upon source capacity and MDD. The Design Manual provides Equation 4-3 for the evaluation.

Equation 4-3:

$$\mathrm{N} = \frac{V_t}{ERU_{MDD}} = \frac{\sum(Q_i)(t_i)}{ERU_{MDD}}$$

$$N = \frac{360\ gpm\ \cdot\ 1{,}200\ minutes/day}{720\ gpd/ERU} = 600\ ERUs$$

Where:
N = ERUs Supported
Q_i = Delivery rate of source (gallons per minute)
t_i = Time that the source (Qi) delivers flow in a 24-hour period (minutes)
ERU_{MDD} = MDD value per ERU (Section 2.1.5)

Section 3.10.4 of the Design Manual recommends against designs based on pumping 24-hours per day to meet future MDD. An assumed 20 hours per day of pumping provides a factor of safety and an increased ability to meet unexpected demands. Therefore, the number of ERUs that can be supported by the system's sources is 600 ERUs.

3.4.4 System Capacity Based on Treatment

Equation 4-3 from the WSDOH Design Manual was used to evaluate the allowable ERUs associated with the treatment capacity and MDD.

Equation 4-3:

$$\mathrm{N} = \frac{\sum(Q_i)(t_i)}{ERU_{MDD}}$$

$$\mathrm{N} = \frac{(380\ gpm)[(24hrs)(60min/hr)]}{720\ gpd/ERU} = 760\ ERUs$$

Where:
N = ERUs Supported
Q_i = Delivery rate of source (gallons per minute)
t_i = Time that the source (Qi) delivers flow in a 24-hour period (minutes)
ERU_{MDD} = MDD value per ERU (Section2.1.5)

The delivery rate of Well 1 (180-gpm) does not require treatment and will bypass the filtration system. The treatment system for Well 2 has a capacity of 200-gpm which allows for some increase in production from Well 2. The full delivery rate from the treated sources is the sum of Well 1 and the Mn treatment facility (200-gpm) 380-gpm thus supporting 760 ERUs.

3.4.5 System Capacity Based on Booster Pump Capacity

Booster pumps are needed to meet the system's peak hour demand and a combination of fire flow and maximum day demand (MDD) in the distribution systems. Equation 3-1 may be used to determine the number of ERUs available based on booster pump capacity.

With one of the four booster pumps out of service, the pumps can provide fire flow and MDD at 40-psi (93-feet TDH) at a rate of 385-gpm per pump (See Table 3-9). The combined capacity of the remaining three (3) pumps is 1,155-gpm. With a fire flow demand of 500-gpm, the remaining 655-gpm of pumping rate is available to meet MDD.

Equation 3-1:

$$N = \frac{\left[\frac{1440(Q_B - 18)}{MDD - F}\right]}{C}$$

$$N = \frac{\left[\frac{1440(655 - 18)}{720 - 225}\right]}{1.6} = 656\ ERUs$$

Where:
N = Number of ERUs
Q_B = Booster Pump Capacity, (gallons/minute)
MDD = Maximum Daily Demand per ERU (gpd/ERU)
F = PHD Coefficient from Table 2-5
C = PHD Coefficient from Table 2-5

With a system MDD of 720 gpd/ERU the three (3) operating pumps are able to support 656 ERUs. A full set of capacity calculations are included in Appendix P.

3.4.5.1 Pressure Tanks

The proposed improvements will have three (3) vertically oriented hydropneumatic tanks, each with a minimum volume of 370-gallons. The tanks provide the necessary pump protection for the proposed booster pumps. Equation 9-1 from the DOH Design Manual was used to determine the minimum pressure tank volume needed for the system.

Design Manual Equation 9-1:

$$T \geq \frac{(R)(Q_p)}{(N_C)(V_B)}$$

Where:

R	=	$\frac{15(P_1 + 14.7)(P_2 + 14.7)}{(P_1 - P_2)/(P_2 + 9.7)}$
T	=	Total number of pressure tanks (gallons)
P_1	=	Pump-Off pressure for water system operation (psi)
P_2	=	Pump-On pressure for water system operation (psi)
N_c	=	Number of pump operating cycles per hour (6 cycles per alternating pump)
Q_p	=	Pump delivery capacity at the midpoint of the selected pressure range (gpm)

The lead pump for the system has on/off pressure settings of 55-psi and 65-psi. Q_P was found to be 255-gpm at 60-psi. The number of pump cycles per hour, NC, was assumed to be 24 total cycles per hour, or 6 cycles per hour per alternating pump. Using 370-gallon Amtrol WX-455C bladder tanks, the minimum number of bladder tanks is three. The pressure tanks should have a minimum acceptance volume of 240 gallons which would equate to minimum pump run time of 1 minute. This meets minimum run time recommendations from the pump manufacturer. Data regarding the proposed pressure tanks are included in Appendix O.

3.4.6 System Capacity Based on Existing Storage Volumes

Water storage is necessary for multiple reasons. These reasons include an adequate storage volume to meet the daily fluctuations in demand, a sufficient volume to allow adequate runtime for pumps and the treatment system(s), an emergency reserve in case the supply system should fail, and to provide a large volume water for potential firefighting needs.

The capacity for the distribution system was analyzed to determine the necessary storage volumes associated with the reservoir. A complete set of calculations are included in Appendix P. The following storage components were analyzed and reported:

- Operational Storage (OS) – Section 3.4.6.1
- Equalizing Storage (ES) – Section 3.4.6.2
- Standby Storage (SBS) – Section 3.4.6.4
- Fire Suppression Storage (FSS) – Section 3.4.6.5
- Dead Storage (DS) – Section 3.4.6.3

Each component of storage for the system is discussed in the following subsections.

3.4.6.1 Operational Storage

Operational storage (OS) is the volume of the reservoir devoted to supplying the water system while under normal operating conditions. OS is the height difference between where the well pumps are turned on and off. OS levels should be set in order to prevent the excess cycling of well pumps. The lead well pump turns on at a height of 30.75-feet and turns off at 32.25-feet, providing 1.5-feet of OS.

$$OS = 1.5\,foot \cdot (5{,}287)\,\frac{gallons}{foot} = 7{,}931\,gallons$$

The total OS of 7,931-gallons provides a minimum run time of 40-minutes for the wells and treatment system.

3.4.6.2 Equalizing Storage

Equalizing Storage (ES) is defined as the volume of storage needed to supplement the sources when the peak hourly demand exceeds the total source pumping capacity. Since the PHD exceeds the combined well pumping capacity for the system ES is required to meet the peak demand period for the water system. ES is calculated from Equation 7-1 of the Design Manuel:

Equation 7-1:

$$ES = (PHD - Qs) \cdot 150\,minutes\,(but\ in\ no\ cases\ less\ than\ zero)$$

Where:
PHD = peak hour demand (Table 2-7, Section 2.1.6);
Qs = well pump capacity,

$$ES = (551 - 360) \cdot 150 = 28{,}695 \text{ gallons}$$

The required equalizing storage for the Estates water system reservoir is 28,695-gallons.

3.4.6.3 Dead Storage

Dead storage (DS) is the portion of the reservoir that is not usable for storage. Dead storage includes the volume at the top that is needed for installation of the overflow pipe and the offset at the bottom of the tank that is used for silt accumulation. Approximately 9-inches is provided at the top of the reservoir for the overflow pipe (freeboard) and an additional 6-inches at the bottom of the tank for a silt stop. The total DS of 1.25-feet is provided in the reservoir for a total of 6,609-gallons. See the "Storage Capacity Calculations" provided in Appendix P.

3.4.6.4 Standby Storage

Standby Storage (SB) volume is intended to provide continued water supply during abnormal operating conditions, such as structural, electrical, mechanical, or treatment process failures; or source contamination (WAC 246-290-420). As noted in the Design Manual, the degree to which SB is incorporated into reservoir design "is a direct reflection of the consumers' expectations of water service during abnormal operating conditions" (Design Manual Section 7.1.1.3).

The Design Manual recommends SB volume to be greater than MDD in most systems. However, for water systems with multiple sources, such as Estates, SB may be reduced if a source is considered to be continuously available and provides redundancy and resilience for the water system. To satisfy the requirements of WAC 246-290-420 the DOH recommends a minimum SB of 200 gallons per day per ERU (Design Manual Section 4.4.3.2). The available (SB_{Ava}), recommended (SB_{Rec}), and minimum (SB_{Min}) volumes of standby storage associated with the Estates reservoir are calculated as follows:

$$SB_{Ava} = V_R - OS - ES - DS = 174{,}481\ gal - 7{,}931\ gal - 28{,}695\ gal - 6{,}609\ gal = 129{,}686\ gal$$

$$SB_{Rec1} = ERU_{MDD}\ x\ ERUs = 720\frac{gpd}{ERU}\ x\ 539\ ERUs = 388{,}080\ gal$$

$$SB_{Min1} = 200\frac{gpd}{ERU}\ x\ ERUs = 200\frac{gpd}{ERU}\ x\ 539\ ERUs = 107{,}800\ gal$$

With a projected future ERU of 539 at the end of the 20-year planning period, the reservoir has 241 gallons per ERU which exceeds the minimum recommended levels. A summary of reservoir storage components is provided in Table 3-11.

3.4.6.5 Fire Suppression Storage

Fire Suppression Storage (FSS) level depends on the maximum flow rate and duration which is set by the local fire protection authority who determines a fire flow requirement for water systems. Fire flow requirements for residential communities in Clallam County are 500 gpm for 45 minutes, or 22,500 gallons of storage. Per WAC 246-290-235(4) systems may consolidate or nest SB and FSS volumes with the larger of the two volumes being the minimum available. The available SB volume exceeds the required FSS of 22,500 gallons so the reservoirs provide adequate FSS. The storage volumes provided are summarized in Table 3-11 below.

$$FSS = 500 \text{ gpm} \cdot 45 \text{ minutes} = 22{,}500\ gallons$$

3.4.6.6 Storage Summary

The storage volumes provided, assuming the projected number of ERUs at the end of the 20-year planning period (539 ERUs), are summarized in Table 3-11.

Table 3-11 Storage Components

Component	Volume (gallons)	Height (feet)
Top Dead Storage	3,965	0.75
Operational Storage	7,931	1.5
Equalizing Storage	28,695	5.4
Standby Storage	131,246	24.5
Fire Suppression (nested with SB)	(22,500)	(4.25)
Bottom Dead Storage	2,644	0.5
Total	174,481	33.0

3.4.6.7 Water Age and Turnover

Water age may sometimes become a problem in storage reservoirs, especially when the system is not at its maximum design capacity. The average age of water in the reservoir is calculated based upon annual average day demand of 220 gpd/ERU and the current number of ERUs on the distribution system. The storage volume used is the total volume of the reservoir minus the top dead storage and the operational storage.

$$Water\ Age = \frac{Storage\ Volume}{ADD_{min} \cdot ERU} = \frac{162{,}585\ gallons}{260 \text{ gpm/ERU} \cdot 420 \text{ ERU}} = 1.49\ days$$

It is recommended that the complete turnover of water should occur at least every three to five days. Currently, the water age for the system is 1.68 days, which is below the minimum three-day recommendation.

3.4.6.8 Storage Capacity

As noted in the previous subsection, storage capacity in the reservoir correlates to system operations. To place an actual numerical value to the storage capacity of the reservoir, the following assumptions have been made:

1. Top Dead Storage, Bottom Dead Storage, and Operational Storage remain unchanged as the ERUs increase.
2. The minimum recommended Standby Storage of 200 gallons per ERU (Design Manual Section 7.1.1.3) will be maintained.

In this scenario, that maximum number of ERU is that can be supported by the reservoir would be the available ES and SB for each reservoir. It is calculated as follows:

$$ES_{Avail} + SB_{Avail} = \left[[(\frac{MDD}{1440})(CN + F) + 18\right] - Q_S\, x\, 150] + 200N$$

$$N = \frac{(ES + SB) - 2700 + 150Q_S - \left(5/_{48}\right)(MDD)(F)}{\left(5/_{48}\right)(MDD)(C) + 200}$$

The available ES and SB for the reservoir is 129,686 gallons (See Table 3-11). The number ERUs that can be supported by the reservoir is 607.

3.4.7 Summary of System Capacities

An analysis of the system components, water rights and well capacities was performed to determine which factor provided the system's connection limit. The calculations for this are summarized in Table 3-12:

Table 3-12 Connection Limiting Factors

Components	Limiting Factor	Potential Connections
Annual Water Right (V_a)	V_a & ADD	824
Instantaneous Water Right (Q_i)	Q_i & MDD	1,000
Instantaneous Source Production	Q_s & MDD	600
Booster Pump Capacity	Q_s & MDD	656
Treatment System	Q_T & MDD	760
System Storage	SB & ES Volume	607

The water system was analyzed to estimate the maximum number of ERUs that can be supported by each relevant system component, and to determine which components limit the system's capacity. The current limiting factor for the system is the source capacity and MDD volume at 600 ERUs. Due to distribution system leakage (DSL), nineteen (19) of those 600 ERUs are associated with DSL (See Section 2.3.1). Therefore, the capacity of the system is 581 ERUs to account for DSL and non-revenue water. It is anticipated that this ERU capacity will surpass the 20-year planning period for Estates.

The WFI in Appendix A has been updated to show a physical capacity of 573 connections. This accounts for the 600 ERUs minus the DSL (19 ERUs) and the additional ERUs associated with Dungeness Recreational Area (7 additional ERUs), and the Five Acres School (1 additional ERU). (19 ERU ERUs. It is anticipated that this ERU capacity will surpass the 20-year planning period for Estates.

3.5 Selection and Justification of Improvement Projects

System needs discussed in this chapter were selected and prioritized based on the categories shown in Table 3-13:

Table 3-13 Potential Improvements Prioritization Categories

Category	Description	Time Frame
Emergency	Improvement needed to eliminate a health risk or serious physical risk to the system	Now
Immediate	Improvement that should be investigated, initiated, and/or completed as soon as possible to minimize potential risk or to get process started for future needs	Within 1 year
Near Term	Improvement that improves capacity, flow, or redundancy	1 to 2 years
Medium Range	Improvement that is not necessary near term but will improve system enough that it should not be long term	2 to 6 years
Long Range	Improvement that is needed in the future	6+ years
Budget Providing	Non-critical improvement that can occur anytime budget providing	Anytime budget providing

The time frames shown in Table 3-13 are for guidance purposes and are subject to change based on such factors as regulations, emerging system concerns, and available financing from Cascadia Water.

Based on the analysis of each system and their existing components included in this chapter, potential system improvements were prioritized based on the categories in Table 3-13 and are summarized in Table 3-14.

3.5.1 Source Needs

The system currently has sufficient sources and source production to meet the measured and projected demands of the consumers through the 20-year planning period. However, at the end of the 20-year period both groundwater sources will be approximately 60 years old and planning for replacement of the sources will likely be necessary at that time.

The system and its operator should incorporate annual monitoring of the system sources into their standard operations and maintenance. Annually the static water level, pump rates, and corresponding drawdown should be measured and evaluated to assist in assessing the health of the aquifer and well.

Well pumps will likely need to be in the long-range planning for the system. Replacement well pumps should be selected to provide a production rate of 200-gpm at the required total dynamic head to pass-through treatment and into the top of the reservoir.

3.5.2 Treatment Needs

As part of the 2023 system improvements project (DOH Project #22-0805), the system is installing a manganese oxidation and filtration system. This system will treat elevated levels of manganese in Well 2 with a treatment capacity of 200-gpm. This treatment system has the capacity to meet the projected demands of the system through the 20-year planning period.

3.5.3 Storage Needs

As part of the 2023 system improvements project (DOH Project #22-0805), the system is installing a 174,500-gallon reinforced concrete reservoir. It is anticipated that the concrete reservoir will have a useful lifespan of approximately 75-years. The reservoir has been designed to provide sufficient storage to supply the physical and legal capacity of the water system. No additional storage needs are anticipated for the system through the 20-year planning period.

3.5.4 Booster Pump Needs

As part of the 2023 system improvements project (DOH Project #22-0805), the system is installing a four (4) booster pumps pressurization system to supply the full distribution system. The booster pump configuration is detailed in Section 3.3.6. There are not any additional booster pump needs anticipated for the system through the 20-year planning period outside of standard operations and maintenance for the new system.

3.5.5 Distribution Needs

The Estates distribution system requires a variety of upgrades to ensure that adequate service levels are maintained for customers, particularly with regards to fire flow capacity. The northern and northwestern portions of the distribution system are served by 4-inch water mains which do not have sufficient capacity to meet MDD and fire flow demand if/when fire hydrants are installed. Future water main replacements should incorporate a minimum size of 8-inches and prioritize loops in the system. The following projects should be planned for within the next 20 years.

- Providing a loop in the system from the east end of Buckhorn Road within the utility/access easement associated with Nisbet Road. This will provide a valuable loop to Lotzgesell Road in the immediate to near term for the system.
- Replacement of the 4-inch water main along Ridge View Drive from Secluded Way to approximately 300-feet west of Percy Lane. This portion of water main, totaling approximately 1,700-feet, should be replaced with 8-inch water mains.
- When the 4-inch water main along Ridge View Drive is replaced, the water mains associated with Lone Eagle Lane to Secluded Way should be connected to provide additional reliability to the system.
- Connecting the watermain at the intersection of Dungeness Greens Way and Hogback Road to the east end of Lotzgesell Road. This connection should be an 8-inch diameter main totaling approximately 2,000-feet. This project will provide a valuable loop to the system using the newest portion of the distribution system along Dungeness Greens Way.
- Replacement of the 4-inch water main along Lotzgesell Road, totaling approximately 3,400-feet of pipe. This portion of the distribution system should be increased to 8-inch diameter water mains to enable fire flow capacity to the northern portion of the system including Five Acre School and the Dungeness Recreation Area.
- Replacement of the 4-inch water mains along Greywolf Road, Maynard Road, Tyler View Place, and the associated connecting lines with new 8-inch water mains. This project would replace

approximately 6,200-feet of distribution main and enable fire flow capacity to the northwest portion of the service area.

Table 3-14 and Chapter 8 provide additional details regarding the budgeting and anticipated timeline for the water main replacement projects.

3.5.6 Control and Telemetry Needs

As part of the improvements currently under construction at Estates, the new controls will integrate a supervisory control and data acquisition (SCADA) system that can be monitored from a central location. The SCADA system allows the operators to more efficiently monitor the many systems located throughout Clallam and the neighboring counties. The SCADA system provides the functionality to monitor and adjust well pump run status, booster pump run status, system pressures, treatment system status, reservoir elevation, source production values, and alarm status.

Cascadia Water is planning to provide security improvements to their individual systems. The security improvements include site fencing around pumphouses and reservoirs, intrusion alarms on storage tanks, reservoir hatches, and pumphouse doors.

3.5.7 Non-Facility Needs

Cascadia is in the process of installing remote read meters to replace/upgrade existing meters. The remote read meters would reduce labor costs associated with meter reading and would have the capability to alert customers of potential leaks on their property. Meter replacement projects will be prioritized based on the age of existing meters, systems with higher distribution system leakage, ease of installation and potential labor savings. Source meters will also be routinely replaced scheduled to ensure accuracy of well production data.

Table 3-14 Prioritized Potential System Improvements Needs

#	Prioritization	Component	Component Description	Cost
1	Immediate (2024/2025)	Non-Facility	Water meters throughout the system will be replaced with remote read meters.	$250,000 $700/meter
2	Near Term (2026/2027)	Distribution	Connect/Loop the water mains associated with Lone Eagle Lane and Secluded Way to provide additional reliability to the system.	$50,000
3	Near Term (2027)	Distribution	Nisbet Road – Loop the distribution system from the western most portion of Buckhorn Road up to Five Acre School on Lotzgesell Road. This section of main will be installed in an easement along Nisbet Road totaling approximately 1,400-feet.	$280,000
4	Near Term (2027/2028)	Distribution	Connecting the watermain at the intersection of Dungeness Greens Way and Hogback Road to the east end of Lotzgesell Road. This connection should be an 8-inch diameter main totaling approximately 2,000-feet. This project will provide a valuable loop to the system using the newest portion of the distribution system along Dungeness Greens Way.	$400,000
5	Near Term (2030/2035)	Distribution	Replacement of the 4-inch water main along Lotzgesell Road, totaling approximately 3,400-feet of pipe. This portion of the distribution system should be increased to 8-inch diameter water mains to enable fire flow capacity to the northing portion of the system including Five Acre School and the Dungeness Recreation Area.	$680,000
6	Near Term (2030/2035)	Distribution	Replacement of the 4-inch water mains along Greywolf Road, Maynard Road, Tyler View Place, and the associated connecting lines with new 8-inch water mains. This project would replace approximately 6,200-feet of distribution main and enable fire flow capacity to the northwest portion of the service area.	$1,250,000
7	Medium Term (2040)	Distribution	Replacement of the 4-inch water main along Ridge View Drive from Secluded Way to approximately 300-feet west of Percy Lane. This portion of water main, totaling approximately 1,700-feet, should be replaced with 8-inch water mains.	$400,000

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4 WATER USE EFFICIENCY PROGRAM AND WATER RESOURCE ANALYSIS

4.1 Water Use Efficiency Program

Western Washington even with abundant precipitation does not have an unlimited supply of fresh potable water as highlighted by recent decisions by the Department of Ecology to close basins in Skagit and Whatcom counties from allowing new exempt wells and stopping the issuance of new water rights. The Estates water system is located in Clallam County which experiences approximately 60-inches of rain per year, although actual precipitation for specific areas can vary depending on the location within the county.

These events highlighted the need to establish measures for both short term emergency and long term systematic per capita water use reduction. Cascadia has consistently encouraged water conservation through a variety of methods and plans. These follow state legislated guidelines to do as much as possible to encourage more conservation.

A general mandate has been made by RCW 90.03.005, RCW 90.03.400, RCW 90.54.020 and RCW 90.54.180 for water use efficiencies in Washington State water systems. RCW 43.20.230 makes a specific directive to DOH to incorporate procedures and guidelines relating to the conservation of water during the approval procedures of system plans.

Cascadia recognizes that water is a valuable and essential natural resource that needs to be managed wisely. The main objectives of this water conservation program are:

Increase awareness among water users of the importance of conserving water and of the methods available to achieve reductions in their water use. Replacement of water meters to accurately measure distribution system water loss. The most recent available WUE reports for the System report a 3-year annual average DSL of 9.1%.

4.1.1 Water Loss Control Action Plan

Cascadia is required to establish a water use reduction goal as part of its Water Loss Control Action Plan to address distribution system losses. The action plan to be implemented contains various aspects with the intent of obtaining accurate data, identifying real losses, and improving system efficiency. The water systems will implement several water use efficiency measures which are covered in the WLCAP included in Appendix J.

4.1.1.1 Goals

As part of this Water System Plan, Estates has set a Water Use Efficiency (WUE) goal as part of their conservation program. The purpose of their conservation program is to further reduce distribution system leakage and the reduction of the growth adjusted maximum day demand.

The second goal is to reduce the growth adjusted maximum day demand by a minimum of 1.5% within ten years. Cascadia plans to accomplish this goal by reducing DSL as part of their first goal and as they further educate customers regarding the resource and methods for conservation.

4.2 Source of Supply Analysis

The Department of Ecology requires water systems to demonstrate serious consideration of all options prior to issuing new or expanded water rights. The purpose of a source of supply analysis is to evaluate opportunities to obtain or optimize the use of existing sources already developed and evaluate other innovative methods to meet water needs.

A source of supply analysis is required of any system that will be pursuing water rights within 20 years of approval of their WSP as defined by the water demand forecast. The Estates water systems have adequate water rights currently and are not projected to require additional rights within the 20-year planning period. Systems that are not pursuing additional water rights are also encouraged to conduct a source of supply analysis; however, it is not required. A copy of the system's Water Right Self-Assessment is included in Appendix F.

4.2.1 Enhanced Conservation Measures

As discussed in Section 4.1, Estates will implement water use efficiency measures with the goal of reducing MDD and DSL system wide.

4.2.2 Water Rights Changes

As further discussed in Section 4.3, Estates is not projected to pursue additional water rights within the six-year planning period. Therefore, no changes in water rights are foreseen.

4.2.3 Interties

The system has no current interties. Interties may be a cost-effective way of providing system redundancy in the event of a line break or source production issues. In the past, Estates has considered an intertie with the Dungeness Golf Court & Mountain Vista (Water System ID: 20453). The system will continue to evaluate a potential emergency intertie project that would provide an alternative water supply. An intertie with another water purveyor would only be considered if:

- The water quality meets State/Federal water quality standards, and
- The water chemistry is compatible with the existing water quality of the system, and
- The hydraulic grade is consistent with the system's pressures or can feasibly/economically be boosted as necessary, and
- The system has adequate capacity to support the intertie, and
- Both systems are able to maintain compliance with their water rights.

4.3 Water Right Evaluation

The following sections summarize the Estates water right evaluation.

4.3.1 Existing Water Rights

Ground Water Certificate G2-27484 C (Priority Date February 14, 1989) to Estates Water Systems, Inc. This water right authorizes an instantaneous withdrawal of 500-gpm and a maximum annual withdrawal of 240 acre-feet for the Water System. A copy of the water right is provided in Appendix E.

4.3.2 Water Right Self-Assessment

The "Water Rights Self-Assessment Form for Water System Plan" provided by the DOH has been completed for the System is included in Appendix F

5 SOURCE WATER PROTECTION

5.1 Introduction

Protection of the source of the water supply is of utmost concern for public water systems. Groundwater supplies can be susceptible to contamination from surface sources such as underground storage tanks (UST), pesticides, industrial and commercial activity, accidental spills, and nitrates from septic systems or leaky sewer pipes. To protect these groundwater resources, The Safe Drinking Water Act requires all states to develop a wellhead protection program (WPP) for all Group A public water systems.

The purpose of this source protection program is to provide the System with a proactive program for preventing groundwater contamination. Source protection programs in Washington must include:

- A delineated Sanitary Control Area (SCA) around each source.
- An inventory of potential contamination sources in the wellhead protection area that could threaten the aquifer used by the well.
- Documentation showing the water system sent delineation and inventory findings to the required entities.
- Contingency plans for providing alternate drinking water sources if contamination does occur.
- Coordination with local emergency responders for appropriate spill or incident response measures.

5.1.1 Wellhead PFAS Sampling

The DOH requires all Group-A water systems to complete PFAS sampling by December of 2025. The Water System is scheduled to perform PFAS sampling in 2024. The two groundwater sources are completed in relatively deep aquifers, and typically protected by glacial till or clay confining layers. These confining layers slow the transport of potential contaminates and allow for their natural degradation.

5.2 Wellhead Protection Program

Estates will implement a WPP which will incorporate the following:

- Periodic monitoring of the existing wells for any sudden change in water quality.
- Sending informational flyers out to water customers outlining proper storage and use of common household chemicals, yard and lawn fertilizers, pesticides, and herbicides.
- Posting signs identifying the system source pollution control zones.
- Providing letters to property owners within the capture zones regarding the presence of the system source wells

The System sources are groundwater wells. The wells' physical parameters are discussed in Section 3.3.3. The Estates WHPP is attached in Appendix I.

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6 OPERATION AND MAINTENANCE PROGRAM

The Estates Operation and Maintenance Program Manual (O&M Manual) is intended to be used as a standalone document. A copy of the O&M Manuals shall be maintained on site at the system as well as Cascadia offices. The O&M Manual includes pertinent contact information, worksheets, and operational procedures. The O&M Manual also includes the Water Shortage Plan, Emergency Response Plan, and the Cross-Connection Control Plan.

6.1 Water System Management and Personnel

Cascadia Water hires knowledgeable and certified staff to operate and maintain their owned systems. Cascadia Water is a wholly owned subsidiary of NW Natural Water Company, LLC. Cascadia staff consists of a qualified system manager, certified operators, and maintenance staff. These staff are responsible for the day-to-day operation and maintenance of Cascadia's water systems.

6.2 Operator Certification

The duties of certified waterworks operators are defined in WAC 246-292. Table 6-1 lists the titles and certifications for positions in Cascadia's staff that maintain Estates. Staff should continually maintain certifications through continuing education as required by each certification.

Table 6-1 Water System Staff Certifications

Operator	Position	Certifications
Culley Lehman	General Manager	WDM 2
Adam Lehman	System Operator	CCS, WDM 3, WDS, WTPO 1
Dale Metzger	System Operator	WDM 2

6.3 Routine Operating Procedures and Preventative Maintenance

Periodic maintenance of all components of the Water System is necessary to ensure continuous, uninterrupted service. General maintenance of many items may include checking set-points, security items, and screens, painting exposed surfaces, lubricating moving parts, cleaning, rebuilding, and assessing overall operation for major repairs or replacement. Such maintenance should at minimum include the tasks outlined in Table 6-2.

Table 6-2 Drinking Water Operations & Maintenance (O&M) Schedule

Daily	
Pump Houses	
▪	Record production and source meter readings (actual and digital)
▪	Record pump hours, calculate daily run times for booster and well pumps
▪	Check chlorine (NaOCl) drums levels. Rebatch as needed
▪	Chlorine Residuals (total and free) from 2 different locations in the system, record, and make CL_2 adjustments as needed
▪	Visual premises check – correct or report any problems
▪	Hydropneumatic Tanks: Monitor Pressure fluctuation during a cycle (cut-in cut-out pressures) and number of cycles per hour
▪	Hydropneumatic Tanks: Monitor air to water ratio
Reservoirs	
▪	Record reservoir levels
▪	Pressure checks (incoming system, outgoing system, pressure tanks)
▪	Verify reservoir level(s) on tank match level at pump house
▪	Visual premises check – correct or report any problems
Treatment & System Controls	
▪	Iron and Manganese Filter System: Monitor Pressure drop across the system with gauges upstream and downstream of the contact tank and at the system discharge. Backwash as necessary if pressure drop is outside recommended range
▪	ATEC filter system: Check the HMI screen to monitor treatment systems and chlorination residuals leaving ATEC filter system.
▪	Visual premises check – correct or report any problems
Weekly	
Pump Houses	
▪	Operate all pumps manually
▪	Pump facilities should be visually checked at least weekly.
▪	Visual inspection of well heads – correct or report problems
▪	Generator – check fuel levels (fill as needed)
▪	Generator – check and record hours
▪	Generator – verify auto test is operating properly
Reservoirs	
▪	Perimeter check – correct or report problems

Monthly
General System O&M
▪ Well water level and chloride measurement for each source
▪ Bacteria Testing: 1 sample required per month. See Coliform Monitoring Plan
▪ Chlorination Report (due to WSDOH the 10th of each month)
▪ Static and pumping level measurements
▪ Flow/production calculations
▪ Temperature and pH samples from individual wells and reservoir
▪ Hydropneumatic Tanks: Check water or air leakage of tanks associated pipes and fittings
Every Two Months
▪ Shut off/on services with delinquent & unresolved bills
Quarterly
Pump Houses
▪ Lab testing for monitoring Manganese
▪ All Valves: Open and close the valves to make sure they are not seized.
▪ Booster Pumps: Check the integrity of the pump's foundation and check the hold down bolts for tightness.
▪ Booster Pumps: Conduct a motor inspection: Clean? Grease free of dirt? Blockage? Ohmmeter periodically to see if winding insulation is OK.
▪ Hydropneumatic Tanks: Check compressor intake air filters
▪ Hydropneumatic Tanks: Monitor the condition of the tank support and ensure tanks are firmly mounted to the floor.
Bi-Annually
General System O&M
▪ Water main flushing (see Flushing Plan)
▪ Source meter testing, maintenance, and calibration
▪ Water Use Efficiency – review production and consumption data to identify presence of any leaks
▪ Hydropneumatic Tanks: Tanks should be checked to ensure the pre-charge pressure is properly maintained.
▪ By January 31st and April 30th of each year: submit the year's chloride and conductivity chemical analysis results to DOE [per Water Right Provisions]
▪ By January 31st and April 30th of each year: submit the year's depth to static water level measurements to DOE [per Water Right Provisions]
Annually
General System O&M
▪ Cross-connection control – Verify high/medium risk customers have submitted test reports for backflow devices

▪	Hydropneumatic Tanks: Check whether there is sediment in the tanks
▪	Water Use Efficiency (due July 1)
▪	Consumer Confidence Report (due July 1)
▪	Operator Continuing Education
▪	All electrical contacts in the pump control systems should be tightened once a year.
▪	Blow-off inspection and exercising
▪	Fire hydrant inspection and exercising (performed by Fire Department)
▪	Backflow prevention device inspection
▪	Line valve inspection and exercising
▪	Chlorine Contact Tank: Backwash and Rinse Chlorine Contact Tank
▪	Iron and Manganese Filters: Backwash and Rinse Filter
Every 3 Years	
▪	Reservoir inspection and cleaning by underwater divers
▪	Air valve inspections (air release, air/vacuum, and combination air valves)
▪	Large customer meter testing and replacement
As Needed	
▪	Water Quality Monitoring as required by WSDOH
▪	Cross-Connection Control (CCC) – Identify new risk customers; require CCC installation of devices according to CCC plan
▪	Meter Reads
▪	Meter Installation / Testing / replacement (as needed)
▪	Meter box maintenance
▪	Leak checks/detection. Maintain record of leaks
▪	System leak repair / pair / service line replacement
▪	Repair supply ordering
▪	Fire hydrant maintenance
▪	As-Built records should be kept on each water line in the system
▪	Pumps and motors should be inspected and maintained in accordance with the manufacturer's recommendations
▪	Lawn maintenance and weed trimming of facilities, near hydrants, etc.
▪	Respond / troubleshoot customer complaints
▪	Treatment & System Controls
▪	Chlorine injection pumps: Need to be manually adjusted and consistent with the flow rate setpoint established for raw water pumps system.

As Triggered
▪ Emergency Shutdown Trigger: Emergency conditions (fire, leak, etc.) Action: Activate local emergency shutdown buttons. Notify the owner/general manager.
▪ Respond to fault conditions and shutdown notifications. Trigger: PLC sends text message and email notifications for fault conditions and shutdowns Action: Respond to notification by investigating conditions at the Water System
▪ Replace Hydropneumatic Tank butyl rubber bladder. Trigger: Bladder failure, such as due to abnormal pressure drop Action: Investigate issue and potentially replace butyl rubber bladder

If the Water System has received approval of a comprehensive plan or abbreviated water system plan by the DOH and has submitted and received approval of standard construction specifications, then detailed plans and specifications for distribution mains need not be submitted individually for approval. If such approval is obtained, only alterations to the plan need be submitted to the DOH.

The DOH also requires bacteriological samples to be taken and that chemical analyses of Estates' supply sources be made often enough to assure compliance. Water quality requirements are listed in detail in Section 3.2. It's good practice to have paper cards on file or an electronic database with information that includes the type of meter and its serial number, date of installation, and maintenance performed. In addition, operators have found that a service record for each resident is valuable for maintaining a complete system record. This record can be valuable when attempting to repair or locate service lines or when attempting to see if breakage or leaks follow a pattern.

6.4 Water Quality Sampling Procedures & Program

The Water Quality Monitoring requirements are set forth in WAC 246-290-300 and were discussed in Chapter 3 of this plan. The regulations cover sampling frequencies for bacteriological, inorganic chemical and organic chemical samples as well as radionuclides, volatile organic compounds (VOC), and secondary chemical and physical contaminants.

Samples must be analyzed in laboratories approved by the DOH. A minimum of one bacteriological sample per month is required. For the groundwater well field, one inorganic chemical sample is required every three years. Currently, Estates has an established waiver for IOC samples to be taken every nine years. Organic and VOC samples are necessary only when required by the DOH. The Water System organic sampling has an established waiver for every three and six years, while VOC testing has a waiver for every six years. Radionuclides must be sampled during four consecutive quarters, once every six years. Sampling for secondary chemical and physical contaminants must occur once every three years. Table 3-1 provides a description of required samples and frequency.

The MCL's for the various substances are listed in Section 3.2. If these levels are exceeded at any time, the procedures in Section 6.4.1 must be followed. (These procedures are described in more detail in the State Board of Health Drinking Water Regulations).

6.4.1 Bacteriological Detection Procedures

Coliform treatment Level 1 technique is triggered when the Water System has two or more total coliform-positive samples in the same month. The Level 1 technique is also triggered if the Water System fails to take every required repeat sample after any single total coliform-positive routine sample. The notifications required by the Water System vary depending on the type of violation that occurs. Table 6-3 outlines the testing results, repeat sample results and the type of violation associated with each scenario:

Table 6-3 Coliform & E.coli Detection Response Procedures

Routine Sample 1	Routine Sample 2	Repeat Samples [A]	Violation
Coliform Detected No E.coli/Fecal	No Detection	No Detections	No Violation
Coliform Detected No E.coli/Fecal	Coliform Detected No E.coli/Fecal	No Detections	Non-Acute Violation
Coliform Detected No E.coli/Fecal	No Detection	Coliform Detected	Non-Acute Violation
Coliform Detected No E.coli/Fecal	No Detection	Coliform Detected E.coli/Fecal Detected	Acute Violation
Coliform Detected E.coli/Fecal Detected	No Detection	No Detections	No Violation [B]
Coliform Detected E.coli/Fecal Detected	No Detection	Coliform or E.coli/ Fecal Detected	Acute Violation
Coliform Detected E.coli/Fecal Detected	Coliform Detected E.coli/Fecal Detected	No Detections	Non-Acute Violation

A. Each detection will require 3 repeat samples taken as noted in the Water System's Coliform Monitoring Plan
B. Although not considered a violation, The WSDOH should be contacted following routine results.

A non-acute violation requires public notification as soon as is practical but must be performed within 30 days. The WSDOH must be notified, and certification forms submitted within 10 days. For an acute violation, the public must be notified within 24 hours with a boil water advisory. The DOH must be notified, and certification forms submitted within 10 days.

6.4.2 Organic Compound Detection Procedures

The procedures to comply with the DOH requirements in the event of a MCL exceedance for an Inorganic Chemical (IOC), Volatile Organic Chemical (VOC), or Synthetic Organic Chemical (SOC) detection are outlined in the steps below.

1. The WSDOH must be notified, and the testing frequency is increased to a quarterly interval.
2.(A) If the running annual average is less than the MCL there isn't considered to be a violation and the system should continue testing as instructed by the WSDOH.
2.(B) If the running annual average is greater than the MCL the violation must be reported to the WSDOH within 48-hours.
3. Following notification of the violation, the WSDOH determines if the violation poses an acute health risk.
4.(A) If the violation is determined to be an acute health risk by the WSDOH the Water System must notify the public within 24-hours with a Tier 1 Public Notice (Notice to the public via publication and TV).
4.(B) If the violation is determined not to be an acute health risk by the WSDOH the Water System must notify the public within 30-days with a Tier 2 Public Notice (Newspaper notice, or mailing).
5. Following the violation, the Water System will take actions as directed by the WSDOH.

Nitrates and Nitrates are subject to a separate process by the DOH as noted in Section 6.5.3. Currently the Water System has varied waivers for testing parameters as detailed in Table 3-1. The following steps should be taken in the event of an MCL exceedance for either IOC or VOC.

6.4.3 Nitrate and Nitrite Detection Procedures

Nitrate and nitrite are classified as inorganic constituents but are subject to a separate process from other IOCs. The responses to an MCL violation are outlined in WAC 246-290-320 (3)(b). If the nitrate or nitrite MCL is exceeded, a confirmation sample is required. In the case of any nitrate/nitrite MCL exceedance the WSDOH should be notified of the violation. Compliance actions will then be based on the average of the routine and confirmation samples. Quarterly monitoring would be required if the average result is greater than 5.0 mg/L. The Water System will follow any subsequent actions in accordance with guidance from the WSDOH.

6.4.4 Radionuclide Detection Procedures

The Water System has a waiver to test for radionuclides every 6-years for the established well field (S03). Pursuant to 40 CFR 141.26, any MCL violation must be reported to the WSDOH. The Water System will provide public notice in accordance with the WSDOH standards and the WSDOH will be notified if there are any Radionuclide Detections over the MCL.

6.4.5 Pressure Loss in Distribution System

When disruptions to the distribution system occur which lead to pressure-loss, the following procedures will be followed:

a. Investigation of the cause for pressure loss: The primary cause of pressure loss in the distribution system is due to breaks in water mains. Other potential causes include the failure of the distribution system pump or inadequate water levels at the reservoir.
b. Repair the failed system: Once the cause of pressure loss is identified the system should be repaired to restore pressurization in the system.
c. Identify Impacted Customers.
d. Contact Impacted Customers: Service connections impacted by the pressure loss event will be notified.
e. Contact the DOH: In the case of a significant loss of pressure to the distribution system, the DOH will be notified. Coordinating with the DOH, the Water System will determine the necessary advisories and testing procedures for the event.
f. Collect Samples: After normal operating pressures have been restored the Water System will collect bacteriological samples to determine which maintenance procedures should be followed regarding flushing of the system, disinfection, and repeat sampling.
g. Notify Customers: Once resolved, customers will be notified that drinking water is safe for use.

Cascadia Water operator will follow the protocols found in Table 6-4 in assessing proper procedures during water main break events.

Table 6-4 Water Main Break Response Procedures

	I	II	III	IV
Pressure During Break	Positive pressure maintained during break	Positive pressure maintained during break	Loss of pressure at break site or limited water system depressurization elsewhere	Loss of pressure at break site and depressurization elsewhere in the system
Pressure During Repair	Positive pressure maintained during repair	Positive pressure maintained at break site until pipe exposed & trench dewatered. Shutdown limited to immediate valved off area. No Loss of pressure elsewhere in system.	Loss of pressure at the while the pipe is buried or submerged / Or no pressure loss at break site, but pressure loss elsewhere in system.	Loss of pressure at break site while the pipe is still buried or submerged and/or widespread depressurization.
Contamination Risk	Unlikely	Limited Possibility	Significant Possibility	Likely or Certain
Boil Water Advisory	No	No	Yes	Yes
Coliform Sampling	No	No	Yes	Yes

6.5 Coliform Monitoring Program

Group A public water systems are required to develop a written coliform monitoring plan and to collect samples according to that plan. The plan consists of a map of sampling locations and a description of sampling procedures. The DOH has put together two manuals; "Preparation of a Coliform Monitoring Plan" and "Coliform Monitoring." These manuals provide guidance for preparation of a coliform monitoring plan and the required frequency of sample collection. The samples must be received and analyzed by a laboratory within 30 hours from the time collected. When any sample results in a coliform presence, a "set" of repeat samples must be collected within 24 hours of notification. For the system that collects one routine sample per month, three repeat samples are required. The following procedure should be followed in collecting the three repeat samples:

- Collect the first "repeat" sample from the same location as the previous coliform presence sample was taken.
- Collect a second "repeat" sample at a site within five service connections in either direction down the distribution pipeline from the previously mentioned coliform presence location.
- Collect a third "repeat" sample from a site within five service connections down the distribution pipeline in the opposite direction (starting from the first repeat sample location).

6.6 Emergency Program

The ability of the Water System to sustain operations during emergency events and/or respond to emergency situations is important. The goal is to quickly react to emergency conditions, adjust the system to maintain safe and adequate service to the greatest extent feasible, and to return the system to entirely normal operations as rapidly as possible. Depending upon the nature and severity of an emergency event, certain components of the system are going to be more vulnerable and subject to failure than others. This plan addresses the operation of Estates under such conditions. The Water System must also be prepared to notify the potentially affected public if an emergency arises. Depending upon the urgency, the affected public may be notified through any of one or a combination of methods such as the following:

- Posted notices at publicly visible locations.
- Public notices in newspapers circulating in the local vicinity.
- Announcements over local radio and television stations.
- Police loudspeaker - roaming system.
- Door-to-door delivery of announcements and personal contact.
- E-mail to community residents.

All announcements should inform the public what situation has occurred, what intermediate measures must be taken by them (i.e., conservation methods, where to go for water, or what to do with their water prior to consumption) and when they can expect to see the system return to normal operation.

If there is an outage over 24-hours in duration notify the Southwest Drinking Water Operations Office of the DOH. In case of emergency the DOH may order Estates to provide notification by newspaper and to radio and television stations where such notice is required to protect public health. The Water System shall keep detailed and complete records of all public notification occurrences to document compliance with this section.

Table 6-5 Emergency Contact List

Emergency Contact	Contact Information
Culley Lehman, Manager Cascadia Water, LLC	Cell: 360-661-7781
Buried Cable Locations	1-800-424-5555
Jeff Tasoff, PE	Office: 360-331-4131 ext. 203 Cell: 360-914-0682
DOH After Hours Hotline	1-877-481-4901
DOE Spill Response	1-800-424-8802
Clallam County Public Health	360-417-2274
Fire/Police/Medical Emergencies	911

An Emergency Response Plan has been prepared for the system. In the event of an emergency the plan should be used as a guide to assist in identifying appropriate steps and measures to be taken by system operators. A copy of the Emergency Response Plan is provided in Appendix S.

6.7 Cross-Connection Control Program

Estates has developed a cross-connection control program as required under WAC 246-290-100 and outlined under WAC 246-290-490. A copy of the Cross-Connection Control Program is included in Appendix T.

The system's responsibility for cross-connection control shall begin with its water supply sources, including storage, distribution facilities, and end at the point of delivery to each customer's water system, which is the water meter. The plan for Estates is outlined below. The rules and regulations are provided in the tariff for Cascadia are included in the Appendix of the Cascadia Water – Water System Plan Part A. In general, the tariff outline requirements for cross-connection control. Cascadia Water is in the process of surveying consumers and the Water System to determine the potential cross-connection devices currently connected to the system. This process should be completed by the end of 2025 for the system.

6.7.1 Procedures for Hazard Evaluations

As a condition of new connections to the water system, an initial evaluation to assess the degree of cross-connection hazard posed by the consumer's premises to the distribution system shall be conducted by Cascadia. Cascadia shall determine the method of backflow protection required, if any. The required method of backflow protection shall be installed and a satisfactory test result by a qualified backflow assembly tester shall be provided by the consumer to Cascadia before water service is provided.

As a condition of continued water service, annual evaluation should be conducted on existing connections with water use characteristics that pose potential hazardous cross-connection conditions to the Estates distribution system. These potential uses can include, but are not limited to:

- Outdoor pools
- Livestock storage
- Sprinkler systems
- Premises with heat exchangers and/or solar potable hot water systems
- Premises with fire systems using chemicals.

As a condition of continued water service, the system will evaluate connections that have had a potential change in use.

6.7.2 Eliminating or Controlling Cross-Connections

When cross-connections cannot be eliminated they shall be controlled by installation of approved backflow prevention devices commensurate with the degree of hazard.

The Estates Cross-Connection Control Program shall consist of premises isolation at or near the service connection or an alternative location acceptable to the Water System, between the service connection and the first point of any hazard. The Water System shall ensure that an approved reduced pressure backflow assembly (or reduced pressure detector assembly) is installed for all premises posing a high degree of cross-connection hazard, including those listed in Section 6.7.1.

Ata minimum, the system shall require a double check valve assembly (or double check detector assembly) installed in accordance with WAC 51-46-0603 of the Unified Plumbing Code for premises posing a low degree of cross-connection hazards.

Cascadia prohibits interconnection of any private water supply with the Water System's distribution system. Cascadia policy requires that the owner of a property or any person residing thereon receiving water service from Estates shall not connect, directly or indirectly, the water service line, or any part of the plumbing of such structure receiving water service from Estates.

6.7.3 Backflow Preventer Inspection, Testing, and Repairs

All backflow prevention assemblies are subject to annual inspection and testing by a DOH certified backflow assembly tester.

As a condition of continued water service, customers shall make their premises, to which water is supplied, accessible to a state certified backflow assembly tester for inspection and testing annually to determine whether backflow prevention assemblies are properly installed, maintained and are operational. Estates may deny or discontinue water service to any customer failing to cooperate in the installation, inspection, testing, maintenance, or repair of approved backflow prevention devices pursuant to WAC 246-290-490.

The system will promptly notify property owners with known potential cross-connections. The system shall also notify on an annual basis all customers with approved backflow prevention devices of the need for an annual inspection.

6.7.4 Quality Assurance Program

Cascadia Water shall require backflow prevention assemblies to be models included on the current list of backflow prevention assemblies approved for use in Washington State. Existing backflow prevention assemblies installed on the system not on the current list of backflow prevention assemblies approved for use in Washington State may be allowed by the Water System if the following applies:

- The backflow prevention assembly was included on the list of backflow prevention assemblies approved for use in Washington State and/or Uniform Building Code list of approved backflow prevention assemblies at the time of installation;
- The backflow prevention assembly has been properly maintained;
- The backflow prevention assembly is commensurate with Cascadia's assessed degree of hazard as determined by Cascadia in its sole discretion; and
- The backflow prevention assembly has been inspected and tested annually and has successfully passed the annual tests.

Cascadia requires that an unlisted backflow prevention assembly be replaced by an approved assembly commensurate with the degree of hazard, when the unlisted assembly:

- Is moved; or
- Cannot be repaired using spare parts from the original manufacturer.

6.7.5 Responding to Backflow Incidents

In the case of a backflow incident in the Water System's distribution system, the water system operator shall notify Cascadia Water and the local DOH as soon as possible, but no later than the end of the next business day, when a backflow incident is known to have:

- Contaminated Cascadia's public water system.
- Occurred within the premises of a customer served by Estates.

6.7.6 ATEC Manganese Filtration System

As part of the current improvements to Estates, a new oxidation and filtration system is being installed by ATEC Systems to remove iron and manganese. The Operations & Maintenance Manual for the ATEC treatment equipment will be kept on file at the pumphouse. The ATEC O&M Manual is a stand-alone document which is included in this WSP by reference. The manual outlines system characteristics, standard operating procedures, and troubleshooting of various issues. Various tasks from the manual are included in Table 6-2.

6.8 Record Keeping and Reporting

Record keeping and reporting requirements are given in WAC 246-290-480 for all public water systems. All files are retained at the offices of Cascadia Water. Customer complaints are maintained by Cascadia and are brought to the attention of operators, corporate offices, and general management as needed.

6.9 Summary of O&M Deficiencies

Cascadia continually strives to improve O&M procedures for the Water System. There are no specific improvements planned that need to be addressed at this time.

7 DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS

7.1 Technical Specifications and Design Standards

Cascadia has created technical specifications and standard details which are included in the Part A Water System Plan for Cascadia Water.

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8 IMPROVEMENT PROGRAM

The purpose of this chapter is to incorporate the needs of the distribution system, as identified in previous chapters, into an improvement program. The Capital Improvement Plan (CIP) presented in this chapter has been developed in accordance with the requirements identified in WAC 246-290-100.

The development of a comprehensive plan and improvement program provides orderly maintenance and improvement to the system. Population and water demand forecasts and existing system analyses, discussed in previous chapters, were used to formulate the following CIP. Each water systems' design criteria were included in the formation of the plan.

The distribution system piping was also reviewed with a hydraulic analysis to determine the necessity of replacing older water mains and providing sufficient fire flow capacity. Considerations included material condition, size, and capacity. The following sections summarize Estate's CIP which is organized in two basic elements: 1) Prioritizing Improvement Projects, and 2) Improvement Schedule.

Planning Phase 1 (6 years; 2020 - 2026)
It is anticipated that the system will serve approximately 443 ERUs by the end of 2029. Based on the capacity analysis detailed in Section 3.4, the system's current infrastructure appears adequate to meet the anticipated growth outside of the desire to improve fire flow capacity to various portions of the system. Following the immediate replacement projects under way, the System will prioritize looping portions of their distribution system and replacing and/or extending existing watermains.

Planning Phase 2 (20-year horizon; 2026 - 2040)
It is anticipated that the System will potentially serve 512 ERUs connections over the next 20-year planning period. During this phase, replacing/upgrading the distribution system is anticipated to continue to be a priority. Due to the large costs associated with water main replacement it is important to initiate the financial plans in Phase 1 that will enable these projects to be completed during Phase 2. Other capital projects will consist of maintenance, repair, and replacement of the existing facilities, providing treatment, and fire flow needs. The owners should be aware of those future needs to ensure that sufficient funding is available to address necessary repairs/replacements to aging infrastructure that are needed in future phases.

Planning Phase 3 (20+ years, 2040 and beyond)
As indicated above, build-out for many of the water systems is estimated to occur during Phase 2. As the systems continue to grow in Phase 3, the primary challenge may be developing additional sources of supply. In Phase 3, replacement/upgrade of the remaining distribution system is anticipated.

8.1 Prioritizing Projects

A three-step process was used to develop the Cascadia CIP. These steps are identification of potential system improvements, evaluation of the alternatives, and selection of alternatives. Potential system improvements/needs are identified in Section 3.5 and summarized in Table 3-14. This Section summarizes projects addressing the potential system improvements/needs, evaluation of the improvements alternatives, and selection of improvements.

8.2 Identification of System Improvements Projects

Section 3.5 identifies the potential system needs categorized by each system functional group (or component). Each aspect of the water system was analyzed, and a draft list of potential improvements was developed to address existing or anticipated system deficiencies. When applicable, alternative improvements were developed for each deficiency. The alternatives were determined in consideration of meeting DOH and specific water system standards, improving reliability of the water system, and minimizing capital and operating costs. The following sections summarize potential improvement projects addressing the needs in each of the system functional groups.

8.2.1 Source

Currently Estates is installing improvements to their sources which include new source meters, emergency generator installation, and pumphouse piping. It is anticipated that these improvements will meet the needs of the system through the long-term planning period of this water system plan.

Wells should be analyzed to determine their efficacy compared to when the well was originally installed and tested. If a well's performance is diminishing, then rehabilitation or replacement will be considered. This analysis should include a yearly test to determine static and dynamic water levels. Further information is included in the Operations and Maintenance Program outlined in Chapter 6.

8.2.2 Treatment

As part of the current improvement project underway at Estates (DOH Project #22-0805), the system is installing a manganese (Mn) filter system to treat raw water from Well 2. The system is capable of filtering 200-gpm, which should provide sufficient capacity for Well 2. It is anticipated that these improvements will meet the needs of the system through the long-term planning period of this water system plan.

8.2.3 Storage

The current improvements project replaces the two buried reservoirs with an above ground reservoir totaling 158,000 gallons. This project will address the significant findings identified in the latest sanitary survey provided on 1/12/2022 (See Appendix C) which noted leaking and structural deficiencies in the old reservoirs. The new above ground reservoir has been sized to meet system needs through the long-term planning period of this water system plan.

8.2.4 Distribution

The water system has portions of the distribution system piping that are aging and will need replacing. In addition, there are portions of the system that do not provide adequate flow to meet residential fire demands for Clallam County. The waterline replacement project will include upsizing to meet fire flow requirements and current code requirements. As-built drawings should be created or updated to show existing and new piping installations. Watermain replacements will be an ongoing improvement over several years. Specifics of various water main improvement projects are listed below and are identified with a number (i.e. D1). Figure 8-1 identifies the location and the assumed extents of the proposed improvements which are called out by their corresponding project number.

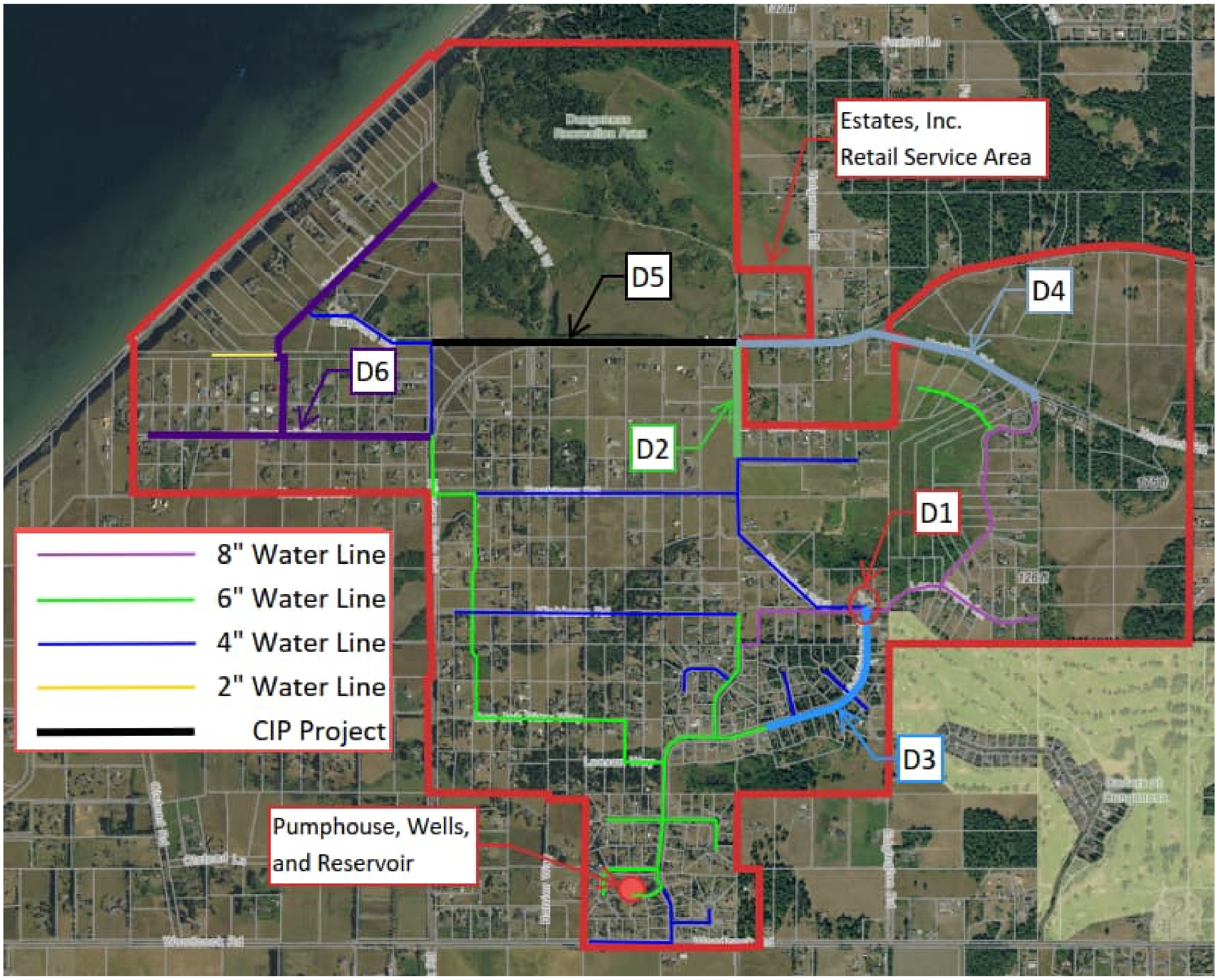

Figure 8-1 Estates Inc. Retail Service Areas

D1: Lone Eagle Lane & Secluded Way Loop – Current Planning Period

The water main along Ridge View Drive does not continue along Lone Eagle Lane and Dungeness Greens Way. Those roads are served by a line off of Nicole Place and an easement to Secluded Way. Providing a connection between the water main running up Lone Eagle Lane and Secluded Way will provide additional reliability to various portions of the distribution system.

D2: Nisbet Road Loop – Current Planning Period

The water main along Buckhorn Road extends to serve the residences along Buds Way. This water main should be continued up to connect with the water main in Lotzgesell Road. This will provide an additional loop to the northern end of the distribution system, provide better circulation down Lotzgesell Road and provide additional flow until future projects are able to be implemented. This project will total approximately 950-feet of 6-inch water main installation.

D3: Ridge View Drive 4-Inch Water Main Replacement – Current Planning Period

As noted in Chapter 3, various portions of the distribution system are unable to provide the residential fire flow due to inadequate water main sizing in portions of the distribution system. Currently, the fire hydrant located at the intersection of Ridge View Drive and Josephine Place is served by the 4-inch water main along Ridge View Drive which is unable to provide sufficient fire flow capacity. The 4-inchsection of water main along Ridge View Drive from Secluded Way to approximately 300-feet west of Percy Lane should be replaced with an 8" water main connecting into the newer water main along Lone Eagle Lane. This portion of water main replacement totals approximately 1,700-feet.

D4: Distribution System Loop from Dungeness Greens Way and Lotzgesell Road – Current Planning Period

The northern portion of the distribution system has limited capacity to provide residential fire flow requirements in accordance with Clallam County standards. There are various routes that could be pursued to increase flow to this portion of the system. Depending on consumer demands and future expansion within the service area the likely route would be to extend the 8-inch water main from the intersection of Dungeness Greens Way and Hogback Road to the east end of Lotzgesell Road. This connection should be an 8-inch diameter main totaling approximately 2,000-feet. This project will provide a valuable loop to the system using the newest portion of the distribution system along Dungeness Greens Way.

D5: Lotzgesell Road Water Main Replacement – Current Planning Period

As noted above, the northern portion of the distribution has water main sizes that limit fire flow capacity. Following the completion of the loop noted in project D3 (along Hogback Road), the 4- inch water main along Lotzgesell Road should be replaced with an 8-inch diameter water main. This project would total approximately 3,400-feet of pipe. This portion of the distribution system will (combined with Project D2 and D3) enable fire flow capacity to the northern portion of the system including Five Acre School and the Dungeness Recreation Area.

D6: Lotzgesell Road Water Main Replacement – Current Planning Period

With the completion of projects D2 through D4, the potential to bring fire flow capacity to the residences in the northwest portion of the service area becomes possible. Once again, there are various routes that could be used to extend capacity depending on the extent and budget available. If the maximum number of residences would want to be served, the water mains along Greywolf Road, Maynard Road, Tyler View Place, and the associated connecting lines will need to be replaced with new 8-inch water mains. This project would replace approximately 6,200-feet of distribution main and enable fire flow capacity to the northwest portion of the service area.

Meter Replacement – Current Planning Period

A system wide replacement of existing service meters with remote read meters is recommended to ensure accurate consumption data, decrease labor costs, provide real time tracking of consumption, and the ability to spot leaks and system problems. The implementation of this improvement project is currently underway. The goal would be to replace all system meters. This will ensure that the system is able to accurately track water usage and charge their customers based on actual water used.

8.2.5 Controls

Cascadia Water is in the process of integrating SCADA (Supervisory Control and Data Acquisition) integration into the Estates water system. As part of the current improvement project underway at Estates (DOH Project #22-0805), the system is installing a new reservoir, treatment system, and booster pumps with the associated controls and electrical components. These control improvements will switch the reservoir controls to pressure transducers to support the installation of a system wide SCADA network. It is anticipated that these improvements will meet the needs of the system through the long-term planning period of this water system plan.

8.2.6 Capital Improvements from Previous WSP

The previous WSP for Estates dates to 1994. Projects in that plan were identified in two phases. Those phases are identified below with notes associated with each phase.

Phase 1:

Phase I did not specify a specific project but noted that it will generally include line extensions, future loops, and pumping system upgrades to serve remaining land within service area. Phase I may also include additional water conservation measures as demand increases for the system.

Phase 1 also specified the consideration for providing a standby generator or diesel pump to provide pressure during power outages.

Following the 1994 WSP the system extended the water line up Lone Eagle Lane and Dungeness Greens Way. There were no additional loops installed as part of this work.

Standby generators have recently been installed by Cascadia Water to power the booster pumps and well pumps during power outages. These systems will be upgraded as needed with the improvements currently being installed.

Phase 2:

Phase 2 included projects specifically needed to support the previously proposed Dungeness West development which was to be installed in the northeast service area. This development was not constructed and the noted improvements were never implemented.

8.2.7 Developer Extensions

Developer extensions are listed in the CIP to identify major water main improvements above and beyond normal looped water main improvements that land developers typically construct for the direct benefit of their project. These specific improvements should be incorporated into future land development activities along property frontage or within land development itself. Alignment for these improvements may be adjusted to local topography and land use.

No developer extensions have been identified for the current planning period. However, the system is interested in a potential expansion of the water systems and would entertain and support developer extensions when feasible.

8.2.8 Non-Facility Improvements

Potential non-facility improvements include continued promotion of conservation policies, clarification of the systems Water Rights, and updates to the water system's procedures and policies to ensure that the integrity of the water distribution system are maintained.

Cascadia is in the process of installing and replacing all water service meters. Cascadia plans on include the replacement of service meters on a 10- to 15-year interval. In addition, source meters will be replaced approximately every 10 years

8.3 Selection of Alternatives

The discussions of projects for supply, storage and distribution are contained within Chapter 3 and summarized in Section 8.2 above. The sequence and scheduling of projects was developed by following a general priority outline balanced with the review of the current and projected financial resources of each water system. These financial resources are further detailed in Chapter 9. The considerations in selecting projects included:

- Health Standards
- Land Use
- Quantity
- Reliability
- Costs
- Regional Benefit
- Environmental Effects
- Flexibility
- Implementation
- Life Expectancy
- Risk

8.4 Improvement Schedule

WAC 246-290-100 specifies that the WSP shall plan improvements for at least 20 years into the future with an annual schedule of improvements at least 6 years into the future. The DOH Planning Handbook states that the improvement schedule should be based on one or more of the following schedule considerations:

- Identified Deficiencies
- Growth
- Fixed Dates Financial Priority
- Milestones
- Ongoing Programs
- Availability of Outside Funding
- Major Facilities
- Critical Facilities
- Distribution Facilities
- Non-Facilities
- Timing of Improvements
- Location of Improvements

The improvement projects shown in Tables 3-14 were developed based on the above factors and the prioritization system presented in Section 3.5.

8.5 Improvement Project Funding

As further detailed in Chapter 9, it is projected that all planned capital improvement projects scheduled for the next 20 years may be funded by projected cash reserves.

9 FINANCIAL PROGRAM

Cascadia Water is a rate supported Investor-Owned Utility (IOU) incorporated in the State of Washington which operates numerous systems throughout the state of Washington. All charges and fees for their systems are established in the Cascadia Water Company Tariff (Tariff) submitted to the Washington Utilities and Transportation Commission (UTC). The summary of the financial program for Cascadia Water is provided in the Cascadia Water – Water System Plan – Part A.

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10 MISCELLANEOUS DOCUMENTS

This Chapter summarizes supportive documents and agreements that are not otherwise discussed in other sections of the Water System Plan.

10.1 County/Adjacent Utility Correspondence

Clallam County was notified of this updated Water System Plan. In addition to Island County, the following adjacent Utilities were also notified:

- Dungeness Golf Course & Mountain Vista (20453D)
- Mains Farm Property Owners (50400N)

Correspondence that supports the updating of the Plan is provided in Appendix U.

10.2 State Environmental Policy Act (SEPA) Determination

A State Environmental Policy Act (SEPA) checklist is not required as Estates serves less than 1,000 connections. Therefore, the documentation has not been included with the Plan.

10.3 Agreements

A copy of any agreements between Estates and the Clallam County are included in Appendix C.

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APPENDIX A
Water Facility Inventory Form (WFI)

WATER FACILITIES INVENTORY (WFI) FORM

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

ONE FORM PER SYSTEM

Quarter: 2
Updated: 10/24/2018
Printed: 4/23/2019
WFI Printed For: On-Demand
Submission Reason: Pop/Connect Update

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

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
08166 9	ESTATES INC	CLALLAM	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS	7. OWNER NAME & MAILING ADDRESS	8. OWNER NUMBER: 034811
ERIC T. THOMAS [OWNER/MGR] PENINSULA WATER, INC. PO BOX 3246 SEQUIM, WA 98382-5016	ESTATES WATER SYSTEMS, INC. ERIC T. THOMAS PO BOX 531 SEQUIM, WA 98382-5016	2014 PRESIDENT
STREET ADDRESS IF DIFFERENT FROM ABOVE	**STREET ADDRESS IF DIFFERENT FROM ABOVE**	
ATTN ADDRESS CITY STATE ZIP	ATTN ADDRESS 25 KATT COURT CITY SEQUIM STATE WA ZIP 98382-5016	

9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION	
Primary Contact Daytime Phone:	xxx xxx-xxxx	Owner Daytime Phone:	(360) 681-8694
Primary Contact Mobile/Cell Phone:	xxx xxxx-xxxx	Owner Mobile/Cell Phone:	(360) 460-5282
Primary Contact Evening Phone:	xxx xxx-xxxx	Owner Evening Phone:	(xxx)-xxx-xxxx
Fax: (360) 681-2192	E-mail: xxxxxxxxxxxxxxxxxxxx	Fax: (360) 681-2192	E-mail: xxxxxxxxxxxxxxxxxxxx

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

13. WATER SYSTEM OWNERSHIP (mark only one)

- ☐ Association
- ☐ City / Town
- ☐ County
- ☐ Federal
- ☒ Investor
- ☐ Private
- ☐ Special District
- ☐ State

14. STORAGE CAPACITY (gallons)

180,000

15	16 SOURCE NAME	17 INTERTIE	18 SOURCE CATEGORY										19 USE			20	21 TREATMENT						22 DEPTH	23	24 SOURCE LOCATION			
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN TERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	WELL #1 WW ACA573				X								X			Y	X						407	200	SE SE	04	30N	04W
S02	WELL #2 WW ACA574				X								X			Y	X						436	200	SE SE	04	30N	04W
S03	WF (S01 & S02)			X									X			N	X						407	400	SE SE	04	30N	04W

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
08166 9	ESTATES INC	CLALLAM	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		404	573
A. Full Time Single Family Residences (Occupied 180 days or more per year)	400		
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	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
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)	1	1	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	3	3	0
28. TOTAL SERVICE CONNECTIONS		448	573

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per year? 960

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?	250	250	250	250	1000	1000	1000	1000	1000	250	250	250
B. How many days per month is water accessible to the public?	30	30	30	30	30	30	30	30	30	30	30	30

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?	25	25	25	25	25				25	25	25	25
B. How many days per month are they present?	20	20	20	20	20				15	20	20	20

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

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

35. Reason for Submitting WFI:

☐ **Update - Change** ☐ **Update - No Change** ☐ **Inactivate** ☐ **Re-Activate** ☐ **Name Change** ☐ **New System** ☐ **Other** ____________

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

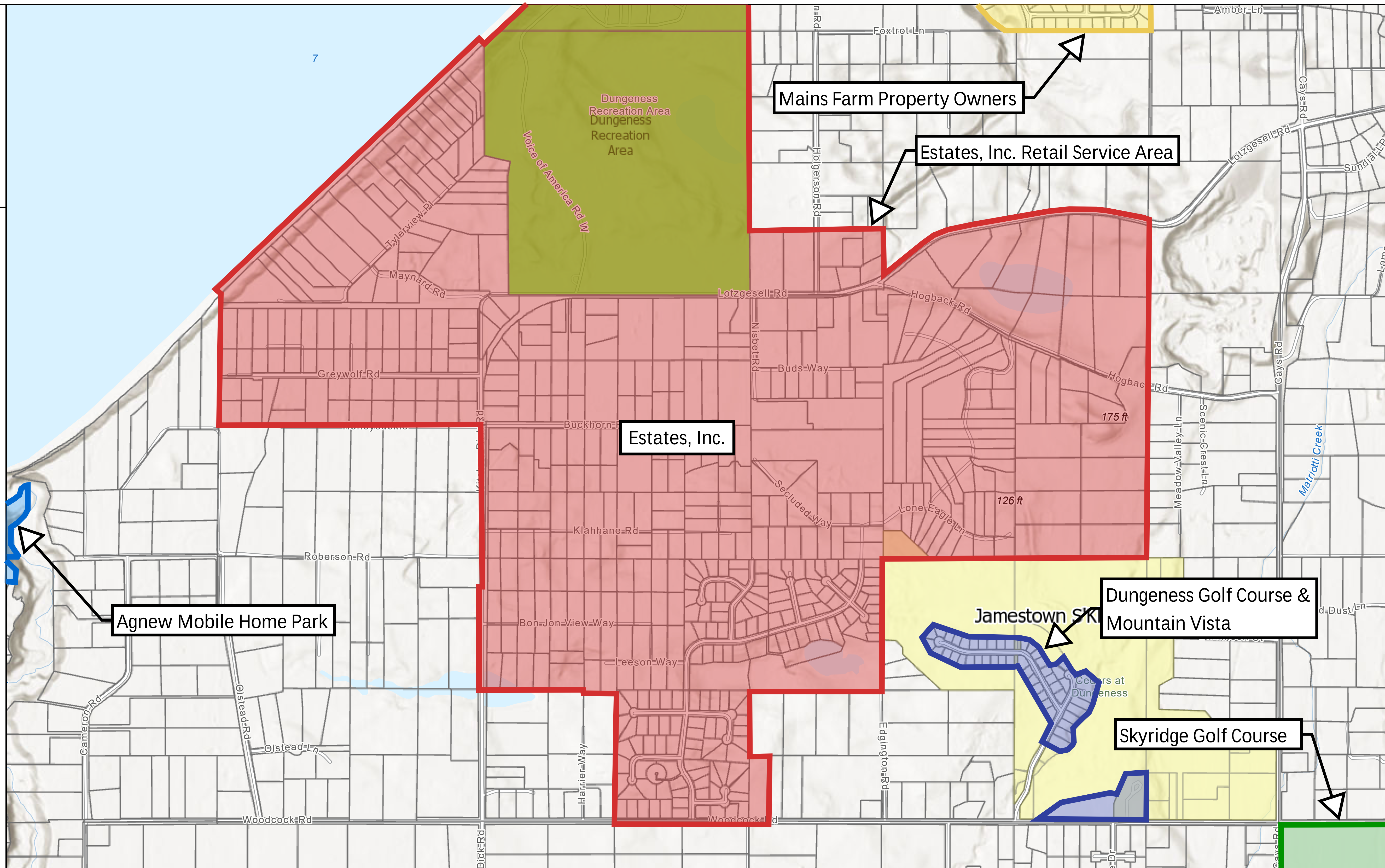
SIGNATURE: ____________ **DATE:** ____________

PRINT NAME: ____________ **TITLE:** ____________

APPENDIX B
Service Area Map

Legend

- County Land Boundary
- Parcels
- Tribal Lands
- Clallam County Parks



Estates, Inc. - Retail Service Area

9/6/2023 2:20 PM

0 0.1 0.2 mi

N W E S

1:18,056

We are happy to share our maps and hope that you find them helpful. Please be
general location of features shown. The accuracy of the individual layers varies and layers may not align with one another. Determination of actual regulatory location of features shown on this map typically requires a field examination by qualified staff. Any person or entity that relies on any information contained herein does so at their own risk. Clallam County makes no warranty of the accuracy or usefulness of this data.

APPENDIX C
Miscellaneous System Documents

Sanitary Survey

STATE OF WASHINGTON

DEPARTMENT OF HEALTH

SOUTHWEST DRINKING WATER REGIONAL OPERATIONS

P.O. Box 47823 Olympia, Washington 98504-7823

TDD Relay 1-800-833-6388

<table>
<tr><td rowspan="6">May 15, 2018

Eric Thomas
Post Office Box 3246
Sequim Washington 98382-5016</td><td colspan="2">Estates Inc. Water System
ID #081669</td></tr>
<tr><td>County:</td><td>Clallam</td></tr>
<tr><td>System Type:</td><td>Community</td></tr>
<tr><td>Operating Permit Color:</td><td>Green</td></tr>
<tr><td>Surveyor:</td><td>Jocelyne Gray</td></tr>
<tr><td>Inspection Date:</td><td>May 2, 2018</td></tr>
</table>

Thank you and Dale Metzger for meeting with me to conduct a survey of this water system. Sanitary surveys are the Office of Drinking Water's (ODW) way to inspect public water systems through a field visit. ODW is also able to offer technical assistance to help utilities improve their system operations and ensure that public health is protected.

This report documents the findings of this survey. Deficiencies that need your attention are summarized below. As you correct the items, send me documentation that demonstrates the items have been completed as directed. Include the system name, ID number, and the date the deficiencies were corrected. You can send them to me by e-mail at jocelyne.gray@doh.wa.gov or by mail at PO Box 47823, Olympia, Washington 98504-7823.

If you are not able to correct these deficiencies, you must submit a Corrective Action Plan by the date assigned describing how and when the work will be completed.

SIGNIFICANT DEFICIENCIES* - BY JUNE 29, 2018

1. Replace a portion of the gasket on Tank 2 that no longer creates a seal, WAC 246-290-235(1)(a).
2. There were openings in the electrical junction box at Well 1. Two screws were missing and the opening for the wires is unsealed. Completed in the field during survey: the two screw holes were sealed with putty and the wiring opening was filled with steel wool. Photos on Page 11. **Thank you for completing this on May 2, 2018.**

SIGNIFICANT FINDINGS - NONE FOUND**

OBSERVATIONS

3. Contact a concrete tank manufacturer about appropriate exterior concrete reservoir sealants, WAC 246-290-235(1)(a).
4. Develop a Coliform Monitoring Plan (CMP) in compliance with the Revised Total Coliform Rule (RTCR) and the Ground Water Rule (GWR), WAC 246-290-300(3)(b). There is a template on the Coliform Monitoring webpage: https://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/Contaminants/Coliform/PreparingaColiformMonitoringPlan/LargeorMultipleSource.

5. Develop a Lead and Copper sampling plan in compliance with the Lead and Copper Rule (LCR), 40 C.F.R 141.86. See the attached lead and copper sampling tier classification for selecting sampling sites.
6. Develop an Operations and Maintenance program, WAC 246-290-415.
7. Develop an Emergency Response Plan (ERP) with contact information for the water system, ODW, county, and others who could assist during different emergencies, WAC 246-290-420.
8. Hold a Water Use Efficiency (WUE) public forum to adopt the WUE goals for your system for the next six years, WAC 246-290-840.
9. Notify ODW and customers of the water system transfers ownership pursuant to WAC 246-290-035.

RECOMMENDATIONS

10. Well 1 electrical wires should be inside conduit.
11. Remove insulation. If worried about freezing, install rigid insulation or a heater. Completed in the field during survey: deteriorated insulation was removed from Well 2 enclosure. **Thank you for completing this on May 2, 2018.**

REFERRAL

12. Contact your Regional Planner, Mark Mazeski, to discuss planning options. The water system plan (WSP) is expired, WAC 246-290-100(2), but the system could convert the WSP to a Small Water System Management Program (SWSMP), WAC 246-290-105(2).

SYSTEM INFORMATION

This is a community water system that currently serves 367 connections including one school and a one park; the remaining connections are single-family residences. The system is approved to serve 480 connections. This approval was established through a water system plan in 1994 that defined the capacity-limiting factor as the available standby storage and the booster pump capacity.

The original water system was constructed in the 1970s to serve Mountain Park and Well 2 was drilled. Dungeness Estates was later added. In 1982, the system expanded to serve Blue Ribbon Farms and County Park and Well 1 was drilled. Well 2 was deepened in 1983. The two wells pump into the reservoirs that are intertied together. Booster pumps then move water to the distribution system. The distribution is made of 4- to 6-inch PVC and provides some fire flow.

SECTION 1: SOURCE

There are two wells that create a wellfield (S03). Well 1 (S01) is 607 feet deep and located next to the small reservoir and access road. Well 2 (S02) is 436 feet deep and located behind Well 1 and next to the storage shed. Both wells pump into the reservoirs. Well 1 pumps into the smaller reservoir and Well 2 pumps into the larger reservoir. The access road is off Ridge View Drive and the site is not fenced.

Source ID #	Name:	Description:	Ecology Tag #	Listed on WFI Yes	No
01	Well #1 WW	4" casing drilled in 1982 to 607 ft deep, 180 gallons per minute (gpm)	ACA573	☒	☐
02	Well #2 WW	Originally drilled in 1974 then deepened in 1983 to 436 ft deep, 6" casing 0 to 437 ft, 5" casing 433 ft to 436 ft, 180 gpm	ACA574	☒	☐
03	Wellfield	S01 and S02		☒	☐

WELLHEAD	Source ID #01		Source ID #02	
	Yes	No	Yes	No
System has well log	☒	☐	☒	☐
*Well cap sealed	☒	☐	☒	☐
*Openings sealed	☐	☒	☒	☐
*Vent screened	☒	☐	☒	☐
Terminates 6" above grade	☒	☐	☒	☐
*Protected from flooding	☒	☐	☒	☐
Source meter	☒	☐	☒	☐
Pressure gauge	☐	☒	☐	☒
**Raw water sample tap	☒	☐	☒	☐
Check valve	☒	☐	☒	☐
**Protected from unauthorized access	☒	☐	☒	☐
Structure in good condition	☒	☐	☒	☐
*Sanitary control area has no unmitigated contaminants	☒	☐	☒	☐
**Protected from physical damage	☒	☐	☒	☐
Frequency of routine site visit	2x/week		2x/week	
Frequency of source meter reading	2-3x week		2-3x/week	

Well 1 is located in a wooden, locked enclosure on a concrete foundation. The lid lifts up for access.

There were openings in the electrical junction box at Well 1. Two screws were missing and the opening for the wires is unsealed. **These were sealed during the survey**, see photos on Page 11. Thank you!

Well 2 is located in a wooden, locked enclosure on a concrete foundation. More than half the enclosure lifts up for access. The enclosure is partially insulated with fiberglass batts that have deteriorated. Remove insulation. If worried about freezing, install rigid insulation or a heater. **Insulation was removed during the survey.**

WELL PUMP EQUIPMENT	Source ID #01		Source ID #02	
	Yes	No	Yes	No
*Functional and reliable pump and pump controls	☒	☐	☒	☐
Generator available	☒	☐	☒	☐
Generator has automatic startup	☐	☒	☐	☒
Generator fuel source	Propane		Propane	

There is a portable generator that can power either one of the submersible pumps or the fire pump or two of the distribution pumps. The operator will manually switch it as needed.

The sanitary control area (SCA) includes a garage that houses various types of equipment, such as a lawnmower. The operator has moved all extra fuel to be stored somewhere else and is not storing any other chemicals in this garage for increased SCA protection. The homes in the area have septic systems.

SECTION 2: DISINFECTION

No long-term treatment is provided in this system. Chlorine bleach is available if the water system has a total coliform positive sample.

SECTION 3: OTHER TREATMENTS

No treatment is provided in this system.

SECTION 4: DISTRIBUTION SYSTEM

The distribution consists of 4- to 6-inch PVC lines constructed in the 1970s and 1980s; the system provides limited fire flow. All customers are supplied by the booster pumps and there is only one pressure zone. The distribution has some looping. Pressures at the pump house vary between 40 and 60 pounds per square inch (psi). The highest distribution pressure is around 74 psi.

FEATURES	Yes	No
Service area and facility map	☒	☐
Minimum pressure requirements met	☒	☐
Service meters (reading frequency <u>every 2 months</u>)	☒	☐
Leak detection program	☒	☐
Water system leakage (%)	16.2% 3yr RAA 10.6%	
Adequate valving for flushing and pipe repair	☒	☐
Blow-offs on dead ends	☒	☐
Routine flushing (frequency <u>annually</u>)	☒	☐
Routine valve exercise (frequency <u>annually</u>)	☒	☐

System leakage has been improving since the last survey. Distribution system leakage (DSL) increased in 2017. Well 2 source meter was replaced which was about 20 years old; system will see how leakage numbers look with the new source meter.

2017 DSL = 16.2%
2016 DSL = 7.9%
2015 DSL = 7.5%
2014 DSL = 11.9%
2013 DSL = 15.1%

CROSS CONNECTION CONTROL (Community Systems)	**Yes**	**No**
System has enabling authority	☒	☐
Ongoing hazard inspections	☒	☐
High hazards identified	☒	☐
High hazards protected	☒	☐
Annual testing	☒	☐
System has installation standards	☒	☐
CCS on staff or under contract	☒	☐
Cross connections observed have been eliminated	N/A	

There is one cross connection specialist (CCS) on staff and one on contract as backup. The system has a cross connection control plan (CCCP) policy requiring all new connections to sign a contract to adhere to the CCCP.

SECTION 5: FINISHED WATER STORAGE

Two partially buried concrete tanks provide a total of 180,000 gallons of storage to the system. The tanks are tied together and have only one overflow and one drain. An audio alarm is installed for reservoir low and high levels.

RESERVOIR	RESERVOIR NAME	DESCRIPTION	YEAR BUILT	TOTAL VOLUME (GAL)
1	Tank 1	Partially Buried Concrete Tank	1972	30,000
2	Tank 2	Partially Buried Concrete Tank	1981	150,000

TOP OF RESERVOIR	Res #1		Res #2	
	Yes	No	Yes	No
**Hatch: Locked	☐	☒	☐	☒
*Hatch: Watertight seal or gasket	☒	☐	☐	☒
Hatch: Over-lapping cover	☒	☐	☒	☐
*Screened air vent	☒	☐	☒	☐
*Openings sealed/protected	☒	☐	☒	☐

The hatches are located inside a locked pump house.

Tank 1 has a double gasket. The outer gasket is in good shape. The inner gasket could be replaced on the far side of the hatch. See Page 14 for photo of gasket.

Replace a portion of the gasket on Tank 2 that no longer creates a seal. See Page 15 for photo of gasket.

FEATURES	Res #1		Res #2	
	Yes	No	Yes	No
Separate inlet/outlet	☒	☐	☒	☐
Protected drain outlet	UNK		UNK	
*Protected overflow outlet	☒	☐	☒	☐
*Overflow line discharges into a sanitary sewer with an air gap	N/A		N/A	
Operational water level gauge	☐	☒	☐	☒
Bypass piping or isolation possibility	☒	☐	☒	☐
**Protected from unauthorized entry	☒	☐	☒	☐
Low level alarms	☒	☐	☒	☐
Sample tap at outlet	☒	☐	☒	☐

According to the system drawings, the reservoirs have drains, but the current owner has never been able to locate them. Only Tank 1 appears to have a drain. The tanks can be emptied down to about a foot from the bottom with the booster pumps and there is an internal sump to which a sump pump can be placed for emptying most of the water out.

MAINTENANCE	Res #1		Res #2	
	Yes	No	Yes	No
Frequency of structural and coating inspection	5 years		5 years	
Frequency of cleaning	5 years		5 years	
Frequency of appurtenance inspection	2x/week		2x/week	
Frequency of routine site visit	2x/week		2x/week	
**Structure in good condition	☒	☐	☒	☐
Clear of excessive vegetation	☒	☐	☒	☐

The operator sprays concrete sealant on top of the reservoirs yearly. Tank 1 was sealed in 2007 at the roof-wall joint and on top where needed. Contact a concrete tank manufacturer for recommendations for exterior sealant for drinking water tanks. Talk with Sophia Petro, (360) 236-3046 or sophia.petro@doh.wa.gov, to discuss volatile organic chemical (VOC) testing after sealing the top of the reservoirs.

SECTION 6: PRESSURE TANKS

This system has two hydropneumatic tanks. One is 940 gallons and the other is 1300 gallons.

Site	Location	# and size of Hydropneumatic Tanks
1	Pump Station	1 – 940 gal, 1 – 1300 gal

HYDROPNEUMATIC	Site: 1	
	Yes	No
Pressure relief valve	☒	☐
Pressure gauge	☒	☐
Water level sight glass	☐	☒
Can be isolated	☒	☐
**Oilless Air compressor	☒	☐
In good condition	☒	☐

BUILDINGS/ENCLOSURE	Site: 1	
	Yes	No
**Facility secure	☒	☐
Structure in good condition	☒	☐

SECTION 7: BOOSTER PUMPS AND FACILITIES

The pump house has three 5-horsepower (hp) service pumps and one 10-hp fire pump controlled by the distribution system pressure. The pumps are attached to the top of the reservoirs. Two pumps draw water from each reservoir and are alternated manually. Pumps 1 and 2 pull from Tank 1. Pumps 3 and 4 pull from Tank 2.

Facility	Name	Description	Total Capacity (gpm)
1	Pump Station	(3) 5 HP, 100 gpm service pumps; (1) 10 HP, 250 gpm fire pump	550

BOOSTER PUMPS	Facility 1	
	Yes	No
Number of pumps	4	
Frequency of routine site visit	2x/Week	
Isolation valves	☒	☐
Pressure gauge(s)	☐	☒
Pressure relief valve	☐	☒
Pump failure alarm	☐	☒
*Functional pump and pump controls	☒	☐
Protected from flooding	☒	☐
Redundant pumps	☒	☐

BOOSTER PUMPS	Facility 1	
	Yes	No
Equipment in good condition	☒	☐
Generator available	☒	☐
Generator has automatic startup	☒	☐
Generator fuel source	Propane	

Same enclosure as the pressure tanks.

SECTION 8: WATER QUALITY MONITORING AND REPORTING

Refer to the Water Quality Monitoring Schedule for your monitoring requirements and status. If you have any questions on source monitoring, please contact Sophia Petro at (360) 236-3046.

CHEMICAL	
Sample Point	Description
1	Wellfield S03 sample tap at Tank 1

CHEMICAL	Sample Point 1	
	Yes	No
Monitoring adequate	☒	☐
ODW WQ data reviewed	☒	☐
Sample collection sites correct	☒	☐
System has prior: ☐ Nitrate results above 5 mg/L ☐ Nitrite results above 0.5 mg/L ☐ Primary MCL ☐ Secondary MCL exceedance(s) ☐ Organic detections ☐ Other _____		

COLIFORM	Yes	No
Monitoring adequate	☒	☐
Monitoring plan adequate	☐	☒
Monitoring plan followed	☐	☒
# of violations since last survey	2	

The system had two positive coliform samples confirmed. One was in November 2013 and the other was in September 2014.

Routine coliform samples must be in the distribution system. If any of the routine samples are unsatisfactory, a sample from the wellfield sample tap may be taken, but it is recommended a sample be taken from each individual source active during that time. Update CMP to meet RTC and GWR regulations. Contact Charese Cryderman at (360) 236-3045 or Charese.cryderman@doh.wa.gov for assistance.

LEAD & COPPER	Yes	No
Monitoring adequate	☐	☒
Results below action level	☒	☐

Lead and copper samples are due this year. Please collect 10 samples between June and September. A lead and copper monitoring plan needs to be created that identifies monitoring locations.

Sites to be selected for monitoring should include, in this order:

1. Sites that exceeded lead or copper sampling in the past, and
2. Single family residences built between 1982 and 1986 that contain copper pipes with lead solder or lead pipes, or
3. Single family residences built before 1983 that contain copper pipes with lead solder or lead pipes, or
4. Representative sites throughout the distribution.

Contact Kay Rottell at (360) 236-3037 or kay.rottell@doh.wa.gov for assistance.

SECTION 9: SYSTEM MANAGEMENT AND OPERATIONS

The system is privately owned and managed. If the water system does not expect to expand beyond the approved 480 connections, it can convert the WSP to a SWSMP. Please contact Mark Mazeski, Regional Planner, at mark.mazeski@doh.wa.gov or (360) 236-3038 to discuss planning requirements for this system.

Please develop an Operations & Maintenance Program along with an Emergency Response Plan.

PROJECT/PLANNING	Yes	No
System approved	☒	☐
Current WSP	☐	☒
Year WSP approved	1994	
Emergency response plan	☐	☒

REPORTING	Yes	No	N/A
WFI reviewed and updated with purveyor	☒	☐	---
Consumer confidence report (Community only)	☒	☐	☐
Water use efficiency report (Municipal Water Suppliers)	☒	☐	☐

REPORTING	Yes No	N/A
Cross connection control annual report (> 1000 conn)	☐ ☐	☒

Thank you for submitting your WUE reports this year for the past several years. The WUE goals must be adopted in a public forum. Please schedule a public forum for your WUE goals. There is space in your annual Consumer Confidence Report (CCR) to report the annual WUE data and goals to your consumers. You would not have to send out a separate notice as you currently do to meet both requirements.

The CCR must include the most current sampling data, particularly for nitrate and coliform.

The owner is working on a rate study with Solmar Water Company as requested by the Utility Transportation Commission (UTC) in order to raise rates for the first time in 20 years. Assistance from the regional planner may be appreciated. Contact Mark Mazeski, the Regional Planner.

The owner is in discussions with prospective buyers to sell the water system. Review WAC 246-290-035 for requirements for notifying ODW and customers. Comply with any UTC requirements for ownership transfer. If the system does sell, please contact ODW with a Bill of Sale, Transfer of Ownership, and an updated water facilities inventory (WFI) form.

OPERATOR CERTIFICATION

This system is required to have a WDM1 certified operator. Eric Thomas meets this requirements and Dale Metzger provides backup coverage.

If you have any questions or this information is inaccurate, please contact Operator Certification at (800) 525-2536.

Name of Operator	Certification Number	Certifications	Mandatory Operator
Eric Thomas	010646	WDM2, WTPO2, CCS	☒
Dale Metzger	011895	WDM1, CCS	☐

WDS-Water Distribution Specialist; WDM-Water Distribution Manager; WTPO-Water Treatment Plant Operator, BTO-Basic Treatment Operator; CCS-Cross Connection Specialist; BAT-Backflow Assembly Tester

OPERATIONS	Yes No
Operational records maintained	☒ ☐
Complaints followed up	☒ ☐
Complaints documented	☒ ☐
# of complaints recorded at ODW (since last survey)	0
Operation and maintenance program	☐ ☒
Previous survey deficiencies/findings corrected, if no list below.	☒ ☐

CLOSING

Your system does not qualify for the reduced frequency of sanitary surveys under WAC 246-290-416.

Your next survey is due in 3 years.

Regulations establishing a schedule of fees, including fees for sanitary surveys, were adopted March 18, 2012 (WAC 246-290-990). The amount due is $1,020. An itemized worksheet is enclosed with the invoice.

If you have any questions, please contact me at (360) 236-3034 or by e-mail at jocelyne.gray@doh.wa.gov.

Sincerely,

Jocelyne Gray

Jocelyne Gray, PE
Office of Drinking Water, Regional Engineer

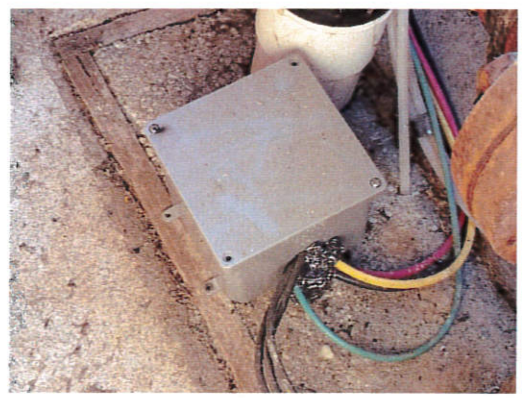
Enclosures

cc: Sue Waldrip, Clallam County Health and Human Services
Charese Cryderman, ODW
Mark Mazeski, ODW
Denise Miles, ODW
Kay Rottell, ODW

Water facility site

Well 1, S01

S01 well tag



S01 junction box plugged

S01 junction box plugged

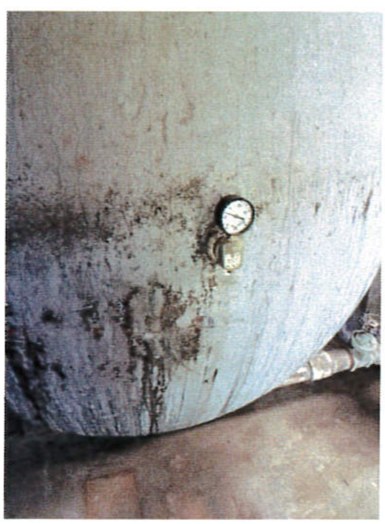
S01 source meter inside pump house

Well 2, S02

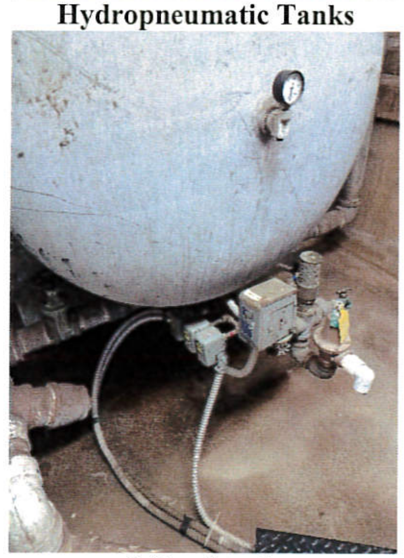
S02

S02 source meter

Hydropneumatic Tanks



1300 gal tank



940 gal tank

Back of hydropneumatic tanks

Generator control

Oiless air compressor

S01 plumbing

S01 plumbing

Pump 1 on Tank 1

Pump 3 on Tank 2

Pump 4 on Tank 2

Tank 1 hatch

Tank 1 hatch double gasket

Tank 1

Tank 1

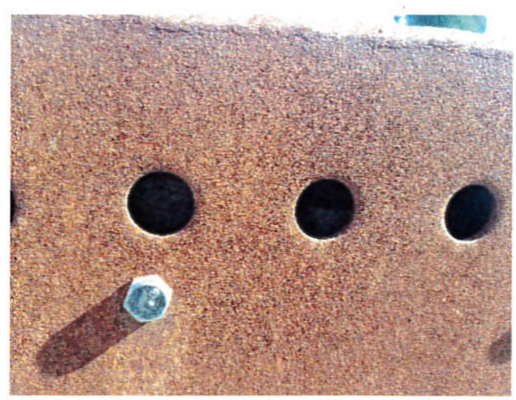
Tank 2

Tank 2 hatch gasket

Tank 2

Tank 2

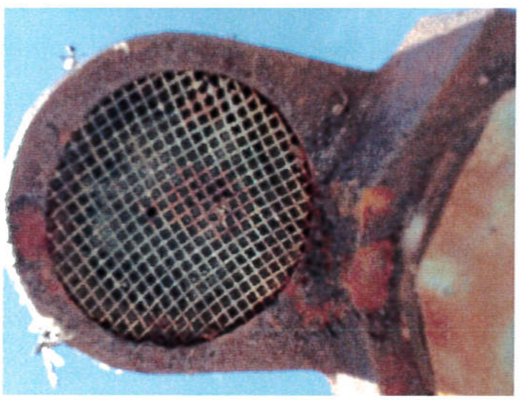
Tank 2 vent cover



Tank 2 vent cover

Tank 2 vent

Tank 2 vent



Tank 2 vent

Exhibit II-7: Tiering Classification	
If you are a CWS	***If you are an NTNCWS***
Tier 1 sampling sites are single family structures: • with copper pipes with lead solder installed after 1982 *(but before the effective date of your State's lead ban)* or contain lead pipes; and/or • that are served by a lead service line. **Note:** When multiple-family residences (MFRs) comprise at least 20% of the structures served by a water system, the system may count them as Tier 1 sites.	**Tier 1** sampling sites consist of buildings: • with copper pipes with lead solder installed after 1982 *(but before the effective date of your State's lead ban)* or contain lead pipes; and/or • that are served by a lead service line.
Tier 2 sampling sites consist of buildings, including MFRs: • with copper pipes with lead solder installed after 1982 *(but before effective date of your State's lead ban)* or contain lead pipes; and/or • that are served by a lead service line.	**Tier 2** sampling sites consist of buildings with copper pipes with lead solder installed before 1983.
Tier 3 sampling sites are single family structures with copper pipes having lead solder installed before 1983.	**Tier 3**: Not applicable.
Representative Sample: If a CWS or NTNCWS cannot collect enough samples from tiered sites, it must collect them from sites where the plumbing is similar to that used at other sites served by the water system.	

Once monitoring begins, you must use the same sites, unless a site is no longer accessible to you or no longer fits the requirements of a priority site (e.g., the lead service lines that served the site have been removed).

Sites chosen for reduced monitoring (i.e., monitoring that is conducted at a one-year, three-year, or nine-year frequency) must be representative of those sites that were used during standard monitoring and must follow tiering requirements. For example, if a system has 100 sites, of which 75 are Tier 1 and 25 are Tier 2, it must collect all 50 reduced sites from Tier 1 sites if they are available. Otherwise, the rule does not specify which sites must be chosen for reduced monitoring. You may wish to randomly select the reduced number of sites from the larger pool used during standard monitoring. The intent of the rule is that you do not use only those sampling locations with the lowest lead or copper levels. Your State may determine which sample locations you must use. Before proceeding, check with your State to find out what method the State uses in selecting reduced monitoring sampling sites.

<u>Sources of Information That You Should Review</u>

To identify enough sites that meet targeting criteria, you should survey all records documenting the materials used to construct and repair your distribution system and buildings connected to your distribution system. Relevant information can be attained through the following sources:

- Plumbing Codes;

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: ERIC THOMAS
ESTATES INC
PO BOX 3246
SEQUIM WA 983825016

ATTN: ACCOUNTS PAYABLE DEPT

Invoice Number	SW2151	
Invoice Date	May 15, 2018	
Billing Period	30 days	SW

DATE	DESCRIPTION	QTY	COST	AMOUNT
5/15/2018	SURVEY FEE ESTATES INC CLALLAM COUNTY PWS ID 08166 DATE OF SURVEY: 5/2/2018	1	1	$1,020.00
	DOH Share			0
	Total Payment due within 30 days. Interest shall accrue at 1% per month after 30 days.			$1,020.00

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	ESTATES INC	
INVOICE NUMBER	SW2151	
INVOICE DATE	May 15, 2018	SW
AMOUNT	$1,020.00	

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

SANITARY SURVEY FEE WORKSHEET

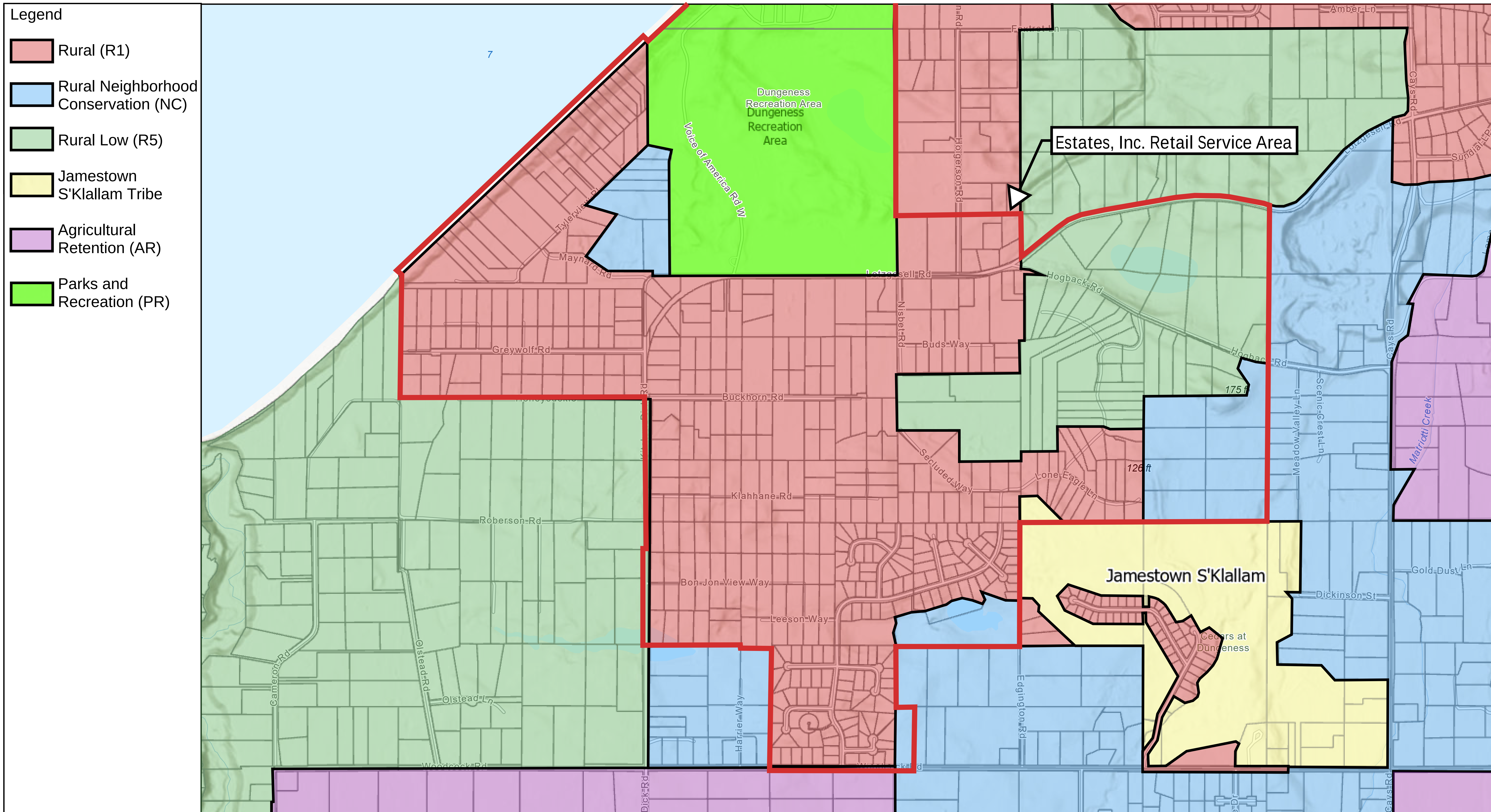
Department of Health
Office of Drinking Water
Sanitary Survey Time Tracking

System Name: Estates Inc. — PWS ID # 8166
County: Clallam County
Surveyor: Jocelyne Gray — Date: 05/02/18

System over 10,000 Connections?	NO		
Department of Health Paid Costs	**Quantity Hours/Miles**		**Cost**
Survey program RO Coordination	1	$ 102	$ 102.00
Survey Program Administrative Support	1	$ 102	$ 102.00
Travel expenses (Mileage)	91	(# Miles) x ($.56/Mile)	$ 30.64
Technical Assistance	0.5	$ 102	$ 51.00
Travel Time <10,000	2.75	102	$ 280.50
Total Department of Health Costs to Perform All Surveys			$ 566.14
Water System Paid Costs	**Hours**		
Scheduling, research, prep	4	$ 102	$ 408.00
Survey Field Work	2	$ 102	$ 204.00
Survey documentation – preparation of survey report to the purveyor	4	$ 102	$ 408.00
Additional Water System Paid Costs for systems serving 10,000 or more connections	**Hours**		
	0	$ -	$ -

NOTES: Split travel distance and time with Bell Woods, AB228 survey. 0.5 hrs TA for: ownership transfer discussion, Consumer Confidence Report, Lead and Copper Sampling Locations, and UTC Rate Setting.	Total Cost of Survey	$ 1,586.14
	Costs Covered by DOH	$ 566.14
	Invoice amount due (Less than 10,000 Connections)	**$ 1,020.00**

APPENDIX D
County Zoning and Land Use Maps



Estates, Inc. - Zoning Map

9/6/2023 2:20 PM

0 0.1 0.2 mi

N W E S

1:18,056

We are happy to share our maps and hope that you find them helpful. Please be
general location of features shown. The accuracy of the individual layers varies and layers may not align with one another. Determination of actual regulatory location of features shown on this map typically requires a field examination by qualified staff. Any person or entity that relies on any information contained herein does so at their own risk. Clallam County makes no warranty of the accuracy or usefulness of this data.

APPENDIX E
Water Right Certificates

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
February 14, 1989	G2-27484	G2-27484 P	

NAME
Estates Water Systems, Inc.

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
474 W. Hemlock	Sequim	Washington	98382

The applicant is, pursuant to the Report of Examination which has been accepted by the applicant, hereby granted a permit to appropriate the following described public waters of the State of Washington, subject to existing rights and to the limitations and provisions set out herein.

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Two wells

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	500	240 (supplemental)

QUANTITY, TYPE OF USE, PERIOD OF USE

240 acre-feet per year (supplemental to existing rights)	Community domestic supply (480 services)	Year-round as needed

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
1. 880 feet west and 490 feet north of the southeast corner of Section 4.
2. 900 feet west and 490 feet north of the southeast corner of Section 4.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SE¼SE¼	4	30	4W	18	Clallam

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Divisions 1,2, and 3 of Blue Ribbon Farms; Matriotti's Mountain Park Village; divisions 1,2, and 3 of Dungeness Estates, and the NW¼ of Sec. 3, T. 30 N., R. 4 W.W.M.

DESCRIPTION OF PROPOSED WORKS

Well #1: 6" x 607 '
Well #2 6" x 463 '
Covered reservoirs totalling 185,000 gallons; distribution system pressurized by three 5-hp, 167-gpm booster pumps; 10-hp backup pump.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	Complete	September 1, 1991

PROVISIONS

In accordance with WAC 173-160-205, wells (shall/should) not be located within certain minimum distances of potential sources of contamination. These minimum distances shall comply with local health regulations, as appropriate. In general, wells shall be located at least 100 feet from a sewer, septic tank, privy, or other source of contamination. Wells shall not be located within 1,000 feet of a solid waste landfill.

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.

An approved measuring device shall be installed and maintained in accordance with RCW 90.03.360, WAC 508-64-020 through -040 (installation, operation, and maintenance requirements are attached).

The Water Resources Act of 1971 specifies certain criteria regarding utilization and management of the waters of the state in the best public interest. Favorable consideration of this application has been based on sufficient waters available, at least during portions of the year. However, it is pointed out to the applicant that this use of water may be subject to regulation at certain times, based on the necessity to maintain water quantities sufficient for preservation of the natural environment.

The applicant is advised that notice of proof of appropriation of water (under final certificate of water right issue) should not be filed until the permanent diversion facilities have been installed, together with a mainline system capable of delivering the recommended quantity of water to an existing or proposed distribution system within the area to be served.

In conjunction with the State Department of Health bacteriological sampling, the applicant shall test water quality for chloride concentration once every three months. When chloride concentration exceeds 125 mg/L, the withdrawal rate shall be reduced or the pump setting raised to reduce the chloride level to below 125 mg/L.

Under RCW 90.03.005 and 90.54.020 (6), conservation and improved water use efficiency must be emphasized in the management of the state's water resources, and must be considered as a potential new source of water. Accordingly, as part of the terms of this permit, the applicant shall prepare and implement a water conservation plan approved by Ecology. The standards for such a plan will be circulated shortly by the Departments of Health and Ecology.

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 14th *day of* November *, 19* 90 .

Christine O. Gregoire, Director
Department of Ecology

ENGINEERING DATA
OK gb

by Gale Blomstrom

No. G2-27484 P

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
June 6, 1988	G 2-27344	G 2-27344 P	

NAME
Estates Water Systems, Inc.

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
474 W. Hemlock Street	Sequim	Washington	98382

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
2 wells

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	250	240

QUANTITY, TYPE OF USE, PERIOD OF USE

215 acre-feet per year (supplemental)	community domestic supply (480 services)	as needed
25 acre-feet per year (primary)		

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL

1. 880 feet West and 490 feet North of Southeast corner of Section 4.
2. 900 feet West and 490 feet North of Southeast corner of Section 4.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SE¼SE¼	4	30	4W	18	Clallam

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Divisions 1, 2 and 3 of Blue Ribbon Farms; Matriottis' Mountain View Park Village; Divisions 1, 2 and 3 of Dungeness Estates; and ~~SW¼~~NW¼ Section 3, T. 30 N., R. 4 W.W.M.

* Per my Phone call to Tom Letterman
4/24/90
V.W.

DESCRIPTION OF PROPOSED WORKS

Class I water system. Well logs for existing wells on file.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	September 1, 1990	September 1, 1991

PROVISIONS

The access port shall be maintained at all times on the well (s).

Issued as a primary right in the amount of 25 acre-feet per year with the total annual withdrawal under all rights not to exceed 240 acre-feet.

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* 17 *day*

of October, *19* 88

Christine O. Gregoire, Director
Department of Ecology

ENGINEERING DATA

OK

by

Gary E. Hanson, Resource Management Supervisor

APPENDIX F
Water Right Self-Assessment

Water Right Self-Assessment Form for Estates, Inc.

Mouse-over any link for more information. Click on any link for more detailed instructions.

Water Right Permit, Certificate, or Claim # *If water right is interruptible, identify limitation in yellow section below	WFI Source # If a source has multiple water rights, list each water right on separate line	Existing Water Rights Qi= Instantaneous Flow Rate Allowed (GPM or CFS) Qa= Annual Volume Allowed (Acre-Feet/Year) This includes wholesale water sold				Current Source Production – Most Recent Calendar Year Qi = Max Instantaneous Flow Rate Withdrawn (GPM or CFS) Qa = Annual Volume Withdrawn (Acre-Feet/Year) This includes wholesale water sold				10-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold				20-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold			
		Primary Qi Maximum Rate Allowed	Non-Additive Qi Maximum Rate Allowed	Primary Qa Maximum Volume Allowed	Non-Additive Qa Maximum Volume Allowed	Total Qi Maximum Instantaneous Flow Rate Withdrawn	Current Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume Withdrawn	Current Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 10 Years	10-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 10 Years	10-Year Forecasted Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 20 Years	20-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 20 Years	20-Year Forecasted Excess or (Deficiency) Qa
1 G2-27344P	Two Wells	250 gpm	---	240.0 ac-ft	---												
2 G2-27484C	Two Wells	250 gpm	---	---	240.0 ac-ft	250 gpm	250 gpm	104.9 ac-ft	135.1 ac-ft	250 gpm	250 gpm	145.1 ac-ft	94.9 ac-ft	250 gpm	0 gpm	157.2 ac-ft	82.8 ac-ft
3																	
4																	
5																	
6																	
	TOTALS =	500 gpm		240.0 ac-ft		250 gpm	250 gpm	104.9 ac-ft	135.1 ac-ft	250 gpm	250 gpm	145.1 ac-ft	94.9 ac-ft	250 gpm	0 gpm	157.2 ac-ft	82.8 ac-ft
Column Identifiers for Calculations:		A		B		C	=A-C	D	=B-D	E	= A-E	F	=B-F	G	=A-G	H	=B-H

PENDING WATER RIGHT APPLICATIONS: Identify any water right applications that have been submitted to Ecology.

Application Number	New or Change Application?	Date Submitted	Quantities Requested			
			Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa
n/a						

INTERTIES: Systems receiving wholesale water complete this section. Wholesaling systems must include water sold through intertie in the current and forecasted source production columns above.

Name of Wholesaling System Providing Water	Quantities Allowed In Contract		Expiration Date of Contract	Currently Purchased Current quantity purchased through intertie				10-Year Forecasted Purchase Forecasted quantity purchased through intertie				20-Year Forecasted Purchase Forecasted quantity purchased through intertie			
	Maximum Qi Instantaneous Flow Rate	Maximum Qa Annual Volume		Maximum Qi Instantaneous Flow Rate	Current Excess or (Deficiency) Qi	Maximum Qa Annual Volume	Current Excess or (Deficiency) Qa	Maximum Qi 10-Year Forecast	Future Excess or (Deficiency) Qi	Maximum Qa 10-Year Forecast	Future Excess or (Deficiency) Qa	Maximum Qi 20-Year Forecast	Future Excess or (Deficiency) Qi	Maximum Qa 20-Year Forecast	Future Excess or (Deficiency) Qa
1 n/a															
2															
3															
TOTALS =															
Column Identifiers for Calculations:	A	B		C	=A-C	D	=B-D	E	=A-E	F	=B-F	G	=A-G	H	=B-H

INTERRUPTIBLE WATER RIGHTS: Identify limitations on any water rights listed above that are interruptible.

Water Right #	Conditions of Interruption	Time Period of Interruption
1		
2		
3		

ADDITIONAL COMMENTS:

Estates, Inc. (Water System ID: 08166 9)

APPENDIX G
Well Logs

Well 1 (ACA 573)

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. G2-26157

Bruce Cramer

(1) OWNER: Name Dungeness Estates Blue Ribbon Farms Water System Address 187 Lautier Rd Sequim, WA 98382

(2) LOCATION OF WELL: County Clallam — ¼ SE ¼ Sec 4 T 30 N., R 4 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 .... inches.
Drilled .... 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 ....
SIZE of perforations .... in. by .... in.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.

Screens: Yes ☐ No ☐
Manufacturer's Name ....
Type .... Model No. ....
Diam. .... 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 .... 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: .... 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.
Artesian flow .... g.p.m. Date ....
Temperature of water .... Was a chemical analysis made? Yes ☐ No ☐

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DEC 1982
DEPARTMENT OF ECOLOGY
SOUTHWEST REGIONAL OFFICE

(10) WELL LOG: ~~PAGE NO. 1~~

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.

~~DRILLED BY VAN AUSDLE~~
~~YEAR UNKNOWN~~

MATERIAL	FROM	TO
Gray Clay	90	110
Silty Sand w/Clay Layers	110	164
More Gravel Showing	164	182
Producing a Small Amt. of H2O	182	183
Silt & Clay Layers	183	211
Thin Layers of Shale in	211	
The Blue Clay		224
Sand, Gravel & Clay Layers	224	229
Muddy Sand Gravel	229	244
Sand & Some Fine Gravel	244	248
Clay W/ Layers of Sand & Gravel	248	274
Brown Clay & Gravel	274	320
Yellow Clay with Layers	320	
of Gravel		380
Less Clay, More Sand & Gravel	380	385
Clay Sand & Gravel	385	407
W.B. Fine-Medium Sand	407	410
Gray Clay Sand & Gravel	410	428
W.B. Coarse Sand & Gravel	428	442
Finer Sand & Grvel W/ Clay	442	456
Gravel w/Less Sand W.B.	456	460
Sandy Clay w/Less Gravel	460	472
Cemented Sand & Gravel	472	485
Sand, Clay, Gravel Hard Places	485	540
Olive Clay	540	548
Blue Cemented Sand & Gravel	548	564
Blue Clay	564	568
Blue Clay & Gravel Seams	568	577
Continued on Page 2		

Work started Aug. 31, 19 82. 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 Stelcan Drilling Co. Inc. (Person, firm, or corporation) (Type or print)

Address P.O. Box 161 Sequim, WA 98382

Tim Ketchenberg

[Signed] By [signature] (Well Driller)

License No. 240 Date 12-3-, 19 82

(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 BRUCE CRAMER

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....
Permit No. 62-26151

(1) OWNER: Name DUNGENESS ESTATES BLUE RIBBON FARMS WATER SYSTEM Address 181 LAUTHER RD SEQUIM, WA. 98382

LOCATION OF WELL: County CLALLAM — SE ¼ Sec 4 T 30 N., R 4 W 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) 1
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☒ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 & 4" inches.
Drilled ....ft. Depth of completed well 607 ft.

(6) CONSTRUCTION DETAILS: SEE DIAGRAM ON RIGHT
Casing installed: ......" Diam. from ...... ft. to ...... ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☐ ......" Diam. from ...... ft. to ...... ft.

RECEIVED
DEC 6 1982
DEPARTMENT OF ECOLOGY
SOUTHWEST REGIONAL OFFICE

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 ☐ SEE DIAGRAM ON RIGHT
Manufacturer's Name U.O.P. JOHNSON
Type STAINLESS STEEL Model No. WIRE W.
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? 30 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 ......

(7) PUMP: Manufacturer's Name BERKLEY
Type: SUB MERSIBLE H.P. 5

(8) WATER LEVELS: Land-surface elevation above mean sea level ...... ft.
Static level 58 ft. below top of well Date 11-24-82
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? STOICAN DRILLING
Yield: gal./min. with ft. drawdown after hrs.
" " SEE ATTACHED PUMPING "
" " LOG "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

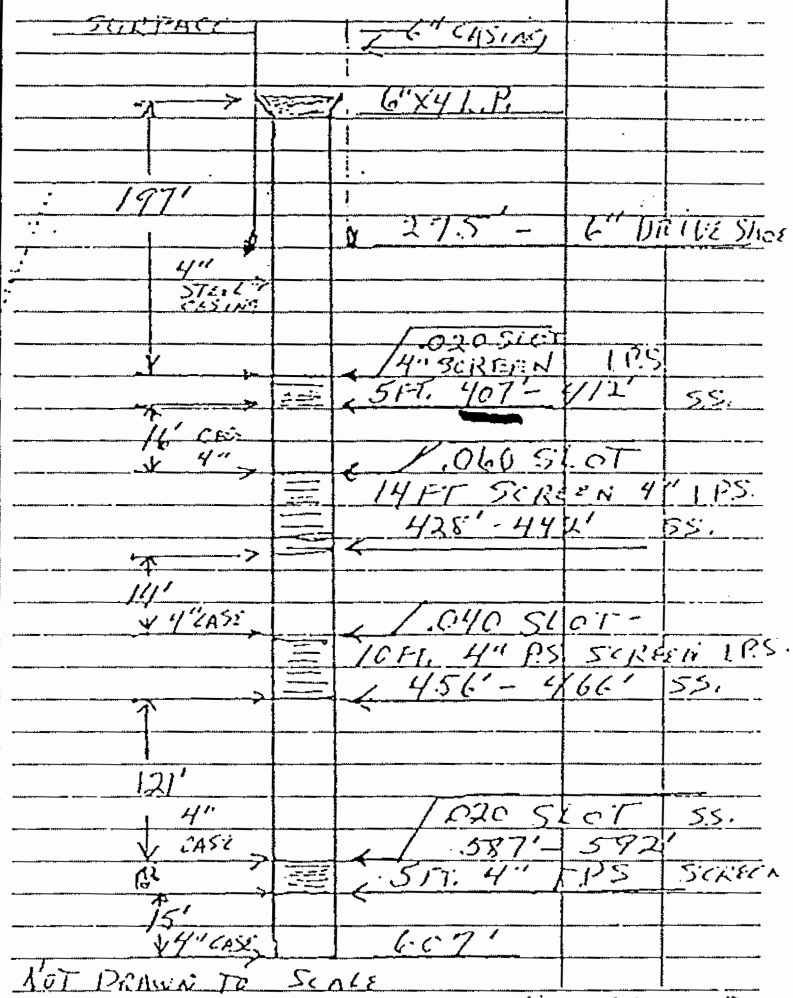
Time	Water Level	Time	Water Level	Time	Water Level

Date of test 11-22-82
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: PAGE NO. 2

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
GRAY SILTY SAND WITH	577	
GRAVEL SEAMS		587
SILTY BLUE CLAY - SOME GRAVEL	587	591
GRAVEL W.B.	591	592
BLUE CLAY WITH SOME GRAVEL	592	607



Work started .... 19...... Completed NOV. 24, 1982

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 STOICAN DRILLING CO. INC. (Person, firm, or corporation) (Type or print)

Address P.O. BOX 161 SEQUIM, WA.

TOM KETCHUM

[Signed] By [signature] (Well Driller)

License No. 242 Date 12 3 -, 19 82

(USE ADDITIONAL SHEETS IF NECESSARY)

Page No. ....

Date ....

Static Water Level 58 FT.

PUMPING LOG No............

for ~~Bor~~ DUNGENESS ESTATES / MCCRANEY / McKIBBIN FARMS WATER SYSTEM

By STOICAN DRILLING COMPANY

P.O. Box 161, Sequim, Wash. - Phone 683-5580

Rt 3, Box 175, Port Orchard, Wash - Phone TR6-2057

Job No..............

Contract No..............

DATE: 11-22-82

G2-26151

TIME	G.P.M.	Pumping Level	DRAWDOWN	Water Temp.	Pump R.P.M.	Remarks	
12:30 PM	151					START	PUMP TEST
12:40		69 FT.					
12:42	180					INCREASE	RATE TO 180 gpm
12:45	180	72'			2400		
12:55	180	72'					
1:00	180	72'					
1:02	201					INCREASE	RATE TO 201 GPM
1:05	201	74'			2550		
1:30	201	75'					
2:00	201	75'					
2:30	201	75'					
3:00	201	75'					
3:30	201	75'					
4:00	201	75'					
4:30	201	75'					
5:00	201	75'					
5:30	201	75'					
5:31						STOP	TEST

RECOVERY DATA

TIME	WATER LEVEL	TIME	WATER LEVEL
5:32 PM	63 FT.	5:45	59 FT.
5:33	62	5:50	59
5:34	62	5:55	59
5:35	61	6:00	59
5:36	61	6:15	58
5:37	61		
5:38	60		
5:39	60		
5:40	60		

Well 2 (ACA 574)

F... nd First Copy with (Ecology
... py — Owner's Copy
... opy — Driller's Copy

Bruce Cramer

WATER WELL REPORT

STATE OF WASHINGTON

Application No. 6226151

Permit No. 6226151F

(1) OWNER: Name Dungeness Estates Blue Ridge Water System Address 182 Hatter Rd. Sequim Wash. 98382

(2) LOCATION OF WELL: County Clallam S½ - SE ¼ SE ¼ Sec. 4 T. 30 N., R. 4 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) #2
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☒ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 462 ft. Depth of completed well 462 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8" Diam. from 0 ft. to 76 ft.
Threaded ☐ 6" Diam. from 0 ft. to 431 ft.
Welded ☒ 5" Diam. from 433 ft. to 436 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.

RECEIVED ... 7 1983 DEPARTMENT OF ECOLOGY NORTHWEST REGIONAL OFFICE

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson U...
Type Stainless Model No.
Diam. 5½ Slot size 50 from 436 ft. to ... ft.
Diam. 4 Slot size 60 from 48 ft. to 446 ft.
80 ... 451
40 ... 451 ... 456

~~Gravel packed: Yes ☐~~ No ☒ Size of gravel:
~~Gravel placed from~~ 25 ft. 456 ft. to 462 ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bentonite + Puddle Clay
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 APPROX 120 ft.
Static level 57 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? Driller
Yield: gal./min. with ft. drawdown after hrs.
228 GPM " 29' " 3 Hrs 50 min
225 GPM " 31 " 2 Hr 30 min

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
735 PM Stopped Pump		737	63	740	63
736	65	738	63	757	61
737	63	739	63	9 PM	58

Date of test
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
~~Drilled By Stoican Drilling~~		
~~Aug 12-13-74~~	~~12-23-74~~	
~~Copy of well Log inclosed~~		
Work Started 3-3-83 to Deepen		
Blue Soft Clay	76	180
Gray Sandy Clay Gravel - W/B	180	204
Gray Clay Streaks with Gravel	204	252
Gray + Green Clay with Gravel	252	293
Brown Sandy Clay	293	306
Brown Course Sand + Gravel W/B	306	312
Yellow Clay + Gravel	312	322
Brown Medium Packed Sand	322	338
Brown Clay + Gravel	338	351
Brown Medium Sand W/B	351	372
Brown Course Sand + Gravel W/B	372	382
Brown Packed Sand Clay Binder	382	392
Brown Cemented Sand And Gravel	392	431
Brown Course Lose Sand And Gravel (very Little fine material	431	434
Brown firm Clay + Cobbles	434	436
Brown Lose Sand + Gravel W/B	436	446
Brown Open Sand + Gravel with Large Rocks W/B	446	451
Brown Course Clean Sand W/B	451	456
Brown W/B Sand + Gravel	456	463

Work started 3-3 1983 Completed 5/6 1983

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 Stoican Drilling Co inc (Person, firm, or corporation) (Type or print)

Address P.O. Box 161 Sequim, Wash - 98382

[Signed] Velies Stoican (President) (Well Driller)

Robert Tillia

License No. 0868 Date 5/6, 1983

Clinton Rushton 0619

(USE ADDITIONAL SHEETS IF NECESSARY)

Page No. 1
Date 5-6-85
Static Water Level 58

PUMPING LOG No. I Well #2
For Dungeness Estates Blue Ribbon Farms
By STOICAN DRILLING COMPANY Water System
P.O. Box 161, Sequim, Wash. - Phone 683-5580
Rt 3, Box 175, Port Orchard, Wash - Phone TR6-2057

Well - 2
Job No.
Permit # 2-26151
Contract No.

DATE: Clallam Wn 187 Vautier Rd - Sequim Wn. 98382.
SE¼ Sec 4 T30 N R4W M.

TIME	G.P.M.	Pumping Level	DRAWDOWN	Water Temp.	Pump R.P.M.	Remarks	
WELL #2 INFORMATION					WELL #1 INFORMATION		
					Draw Down		
1,00 PM	230	86	Well + Still Pumping			Stoped Pump	
103 "	230	86	28'			12,50 PM	
105 "	230	86	28		4 ft	1,04	
1,10	228	87	29		4 ft	1,30	
130	228	87	29		4 ft	2	
145	228	87	29		4 ft	230	
2 PM	228	87	29		4 ft	3	
230	228	87	29		4 ft	330	
3 PM	228	87	29'		5 ft	4	
330	228	87	29		5 ft	430	
4	228	87	29		5 ft	5	
430	229	87	29			535	
5	228	87	29			Start Pump	Well #1
536	225	89.	(535 Start Pump in Well #1)				
6 PM	225	89 →	Resorvor Has 1 Ft Water Above Pump Intake				
615	225	89			17 ft	536 -	140 GPM
630	225	89	31'		18	6:	"
7	225	89	31		18	617	"
730	225	89	31		18	630	"
					18	730'	"
Time	Recovery Data	W.L.					
735 PM	Stoped Pump					735 Stoped Pump	
736		65 ft					
737		63			69'	756	
738		63			62'	757	
739		63			61'	759	
740		63			60'	811	
741		63			58	9 PM	
745		63	755 PM. Stoped Well Pumping Well #1				
757		61					
758		61					
8 PM		60½					
820		59					
9 PM		58 ft					

Note
The Above State ments Is True
And Correct to The Best of My
Knowledge. Signed
Valiu Stoican (President)
P.O. Box 161
Sequim Wash 98382 - Lic # 0573

APPENDIX H
Well Site Approval

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
SOUTHWEST DRINKING WATER OPERATIONS
2411 Pacific Ave. • P.O. Box 47823 • Olympia, Washington 98504-7823 • (206) 664-0768

September 23, 1994

Thomas A. Lederman
Estates Water Systems, Inc.
474 West Hemlock Street
Sequim, Washington 98382

Subject: Estates Water System, ID #081669, Clallam County; Water System Plan; DOH Project #029303

Dear Mr. Lederman:

The water system plan for the above project has been reviewed, and in accordance with the provisions of WAC 246-290 is **APPROVED**. The approval issued herein is based on conformance with current standards outlined in WAC 246-290, revised April 1993. Future changes in the rules may be more stringent and require facility modification or corrective action.

This approval shall be in effect for six years from the date of this letter unless:

> Major system improvements are contemplated which are not addressed in the WSP; changes occur in the basic planning data affecting improvements identified in the WSP; and/or the Department requests an updated WSP.

This WSP shall be updated every six years. However, if only minor alterations to the existing WSP are considered necessary, a minor amendment may be submitted to the department for approval. Future project reports and construction documents submitted to this Department for approval will not be considered for approval unless the project is addressed in the WSP.

In addition to this approval, since this WSP was started the planning requirements have increased significantly. Therefore, the WSP that is being approved at this time does not meet the standards of WSP's that are being required today. The next update of this WSP in 6 years will be required to address all new requirements. Because the WSP does not include some of the new requirements please be aware that:

1. That all community water systems are now required to develop wellhead protection programs consistent with DOH guidelines (information enclosed). You should complete these requirements under the required time schedule provided in the enclosed information.

2. That there are new federal Safe Drinking Water Act (SDWA) requirements which there are significant financial impacts. The information below attempts to clarify some of the recent changes to the state regulations and the forthcoming requirements under the SDWA:

 Phase 2/5 Inorganic and Organic Monitoring: In addition to the triennial Phase 2/5 inorganics monitoring, beginning in 1993, annual nitrate samples are now required. Also, any systems which have asbestos cement (AC) pipe within the distribution will be required to sample for asbestos one time in 1995. Organics (VOC's and SOC's) monitoring will depend upon any applicable waivers resulting from a susceptibility assessment to be conducted by the system in 1994. If the system does not apply for a waiver and conduct a susceptibility assessment, increased organics monitoring may result at large cost. Please contact Belle Fuchs, Water Quality Program Manager, at (206) 586-5179 for more details regarding inorganics and organics monitoring.

 Lead and Copper Rule: Although DOH has not currently scheduled lead and copper monitoring for systems serving less than 500 people, the following information would be valuable for planning purposes: a discussion of the sample site selection process; the number of tap samples required under the Lead and Copper Rule; the cost of monitoring; and a discussion any historical corrosion-related problems. We have enclosed information on the Lead and Copper Rule for your reference.

Thank you for preparing and securing approval of the Estates Water System Plan. Regulations establishing a schedule of fees for review of planning, engineering and construction documents were adopted January 3, 1993 (WAC 246-290-990). An itemized bill for $850.00 is enclosed. If you have any questions or concerns please contact Sean Orr at (206) 664-3952).

Sincerely,

SOrr

Sean Orr
WSDOH Regional Planner
Southwest Drinking Water Operations

Simon T. Tung

Simon T. Tung, P.E.
WSDOH Special Projects Engineer
Southwest Drinking Water Operations

SO:STT:clu

Enclosures

cc: Clallam County Environmental Health
Polaris Engineering
Bill Liechty, DOH
Rich Siffert, DOH

APPENDIX I
Well Head Protection Plan

1. OVERVIEW

The Estates, Inc. Water System (system) is located in Clallam County west of Sequim, Washington. The service area includes portions of Sections 3 and 4 of Township 30 North, Range 4 West, and Sections 32, 33, and 34 of Township 31 North, Range 4 West of the Willamette Meridian. Groundwater is the single source of water currently used within the service area. The system is served by two (2) existing groundwater wells, Well 1 (S01 - DOE Well Tag ID #ACA573) and Well #2 (SO2 - DOE Well Tag ID #ACA574). The two sources are in the southern portion of the water system on Clallam County Parcel 043004-510880. Well #1 and Well 2 are designated as a well field (S03) with a capacity of 400 gpm. Well information is summarized in Table 1.

Table 1 – Well Information

	Well 1	Well 2
Source Type	Well (Non GWI)	Well (Non GWI)
DOE Tag	ACA573	ACA574
Source Location	Sec 4 T30N R04W	Sec 4 T30N R04W
Purpose of Use	Community Domestic Supply	Community Domestic Supply
Year Deepened	1982	1983
Pump Test Capacity (gpm)	201	225
Casing Size	6”/4”	8”/6”/5”
Ground Elev. (ft)	140	140
Bottom Well Depth (ft)	607	462
Static Water Depth (ft)	58	58
Depth to Top of Screen (ft)	197	436
Depth to Bottom of Screen (ft)	592	445
Drawdown (ft)	17	31

1.1 Well Information

Estates is served by two groundwater wells that are located on Clallam County parcel 043004510880. This parcel is owned by Cascadia Water and has access off of the water system located off Ridgeview Drive in the southern portion of the service area.

Well 1 was drilled in 1982 to a final depth of 607-feet to serve as a primary source. The initial pump test for Well 1 was conducted in November 1982. That test recorded a static water level of 58-feet below the top of well. It also conducted a stepped pump test with a maximum rate of withdrawal of 201 gpm with a corresponding drawdown of 17-feet. A copy of the well log and corresponding pump test is included in Appendix A. Currently Well 1 is served by a 7.5-HP Berkeley submersible pump (Model 6S2AH-2) which supplies approximately 180 gpm at a total dynamic head of 80 feet.

Well 2 was initially drilled in 1974 to a depth of 86-feet with a static water level of 41-feet 1-inch. Later in 1983 Well 2 was deepened to a depth of 462-feet with a static water level of 57-feet below the top of well. A stepped pump test was conducted in May 1983 with a rate of withdrawal of 225 gpm with a corresponding drawdown of 31-feet. A copy of the well log and corresponding pump test is included in

Appendix A. Currently Well 2 is served by a 7.5-HP Berkeley submersible pump (Model 6S2AM-3) which supplies approximately 180 gpm at a total dynamic head of 80 feet.

The wells alternate in operation and are triggered by the float switches in the storage reservoir. Both wells have dedicated fill lines to the reservoir. A aerial view of the well site with the reservoir and pumphouse is provided in Figure 1.

Figure 1 - Well Locations and Well Site Layout

1.1.1 Water Rights

The Washington State Department of Ecology (DOE) has issued two water rights to the Estates water system. Water Right Certificate G2-27344 C (Priority Date: June 6, 1988) and G2-27484 C (Priority Date: February 14,1989 allow the system a maximum instantaneous withdrawal (Qi) of 500 gpm and a maximum withdrawal volume (Qa) of 240 acre-feet per year (ac-ft/yr). The point of withdrawal for Well #1 is 880 feet west and 490 feet north of the southeast corner of Section 4, while the point of withdrawal for Well #2 is 900 feet west and 490 feet north of the southeast corner of Section 4. Copies of the system's certificates are provided in Appendix B.

1.1.2 Seawater Intrusion

Due to the existence of seawater intrusion (SWI) in many wells located on the shorelines of Washington State, the possibility of seawater intrusion into the potable water aquifers must be investigated on a regular basis. The DOE may condition water right permits to provide for reduced pumping rates or may require a water system to abandon sources if seawater intrusion threatens senior water right permits.

Department of Health Water System Design Manual 2019 hereon will be referred to as The Design Manual, identifies wells are at risk for intrusion if the well is located within ½ mile of the shoreline and pump water from a depth below sea level, and within ½ mile of a groundwater source with chloride concentrations over 100 mg/L.

Both of the Estates wells are located over 1 mile from the shoreline of the Puget Sound and pump water from a depth below sea level, so they are not considered "at risk for intrusion" per the DOH Design Manual criteria. In addition, the most recent Chloride values from the combined sources was less than 20 gm/L.

1.2 Sanitary Control Area

Clallam County (the County) has inspected and approved Well #1 and Well #2 well site locations. A copy of the well site approval and the sanitary survey is provided in Appendix A. The wells are located to minimize the possibility of contamination and to prevent surface water from entering the well. The existing wells have an established declaration of covenant recorded with the County, which is included in Appendix A. The 100-foot pollution control radius for Well 1 is contained within the system controlled parcel. The 100-foot pollution control radius for Well 2 is partially within the system controlled parcel but extends into neighboring parcels where homes are located.

Each well has a casing that extends 1-foot above the ground surface and a small shed that surrounds it, preventing surface water from affecting the well. Additionally, the wells are completed in a confined aquifer whose confining layer protects the wells from surface water contamination. The potential for subsurface domestic contamination from the nearby residence is also low because of the confining layer protecting the aquifer. If domestic contamination did occur, it could include septic, gas, pesticides, fertilizers, etc. See the Contaminant Source Inventory in Appendix D for more information regarding potential contaminants. The 100-footsanitary control radius for each well is shown in Figure 2.

Figure 2 - Sanitary Control Area

2. WELLHEAD PROTECTION AREA

2.1 Wellhead Protection Area Delineation

The wellhead protection area (WHPA) delineation was calculated using the calculated fixed radius method. The following equation from the DOH Wellhead Protection Program Guidance Document was used to calculate the Wellhead Protection Area Zones, using the fixed radii method, as follows:

$$r = \sqrt{\frac{Q\,t}{\pi\, n\, H}}$$

Where:

r = Calculated Fixed Radii (feet)
Q = Pumping Rate of Well (cubic feet per year)
t = Travel Time to Well (0.5, 1, 5, 10 years)
π = pi
n = Aquifer Porosity = 0.22
H = Open Interval of Length of Well Perforations (feet)

The pumping rate for the well (Q) was calculated from the system's total annual demand at full build-out at 1,463,904 cubic feet (cf). Assuming a 50% split between the two wells, since the existing wells share the annual demand, the estimated annual volume of water pumped from each well is about 2,576,470 cf/year. This was determined using the following equation:

$$ADD\left(\frac{gpd}{ERU}\right) * Maximum\ ERUs * 365\ days\ /\ 2$$

$$\frac{220\,\frac{gpd}{ERU} * 480\ ERUs * 365\ days}{2} = 19{,}272{,}000\ gallons\ = 2{,}576{,}470\ cf\ per\ year$$

Table 2 shows the results of the well's calculated fixed radius based on the different travel times. The site topology indicated no complicated geologic factors or ground/surface water interactions that would necessitate a calculation method other than the calculated fixed radius method for delineating the source water protection areas. The resulting wellhead protection area zones (based on travel times) are shown in Figure 4 below.

Table 2 – Calculated Fixed Radii

					Calculated Fixed Radius (feet) Based on Travel Times			
Condition	Source	Water Demand (cf/yr)	n	H (ft)	6 mo	1-yr	5-yr	10-yr
Anticipated Withdrawal	S03	2,576,470	.22	10	611	863	1,931	2,730

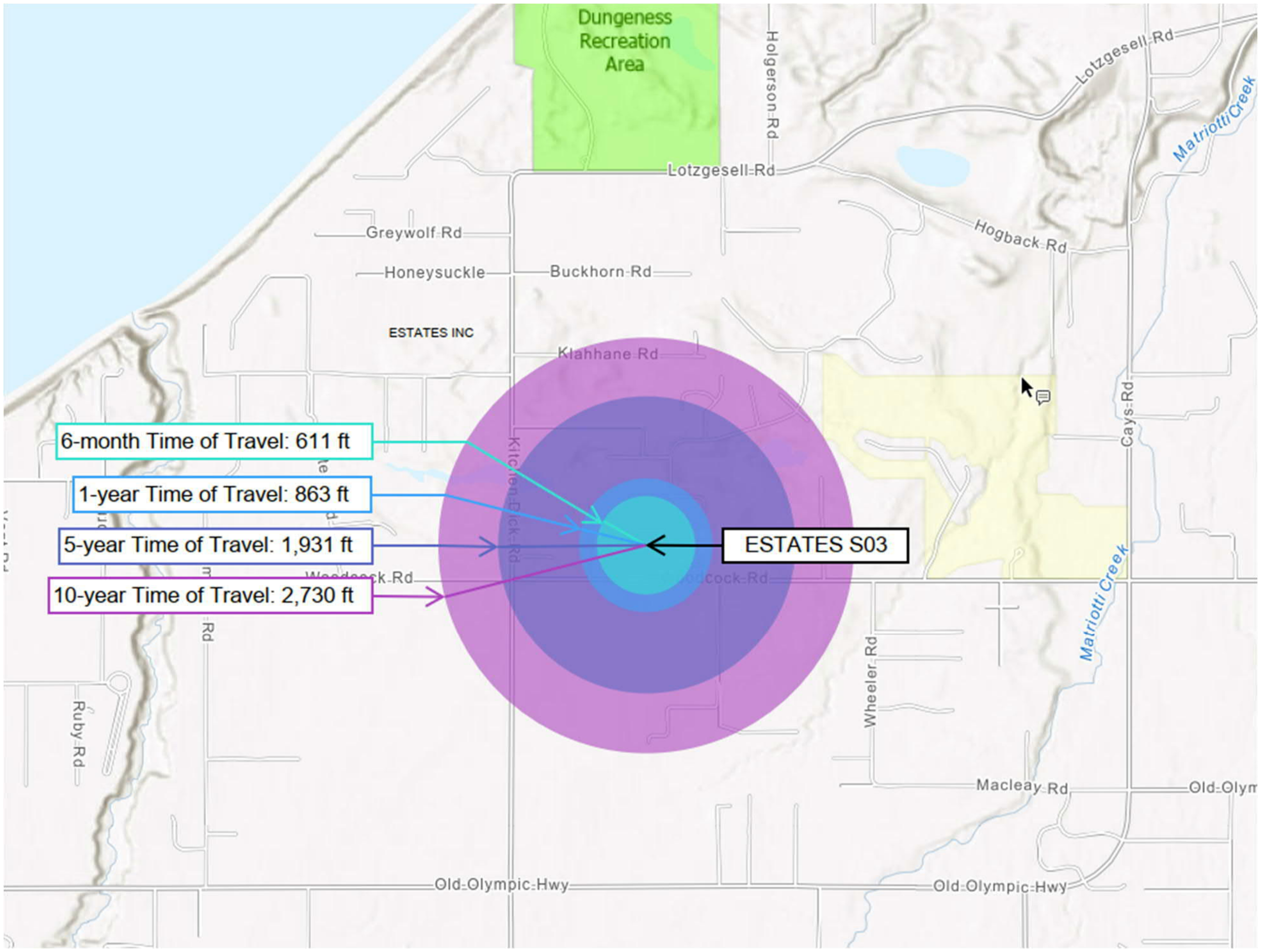


Figure 4 – Wellhead Protection Areas

2.2 Land Use and Zoning

Land use and zoning within the wellhead protection areas can help identify contaminants related to certain land uses. The land use within Zone 1 (1 year) and Zone 3 (10 year) wellhead protection areas of the existing sources is residential and parkland. The zoning is also R1, AR, NC, and R5. The results are summarized in Table 3. The land contained within the wellhead protection areas is mostly residential. This poses some risk from on-site septic systems, storage of household chemicals, and fertilizers as detailed in Appendix D.

Table 2-1 - Land Use Within Wellhead Protection Areas

	Zone 1 (1 year travel time)	Zone 3 (10 year travel time)
Source	R1, AR, NC	R1, AR, NC, R5
S03	54 acres	538 acres

2.3 Potential Contaminants

A Contaminant Source Inventory was completed to best account for any possible sources of groundwater contamination within the wellhead protection area for the two wells. The inventory includes all potential contaminant sources within Zone 1 (the 1-year time of travel (total)) and high-risk potential contaminant sources within Zone 3 (the 10-year time of travel (total)).

The following information was used for developing the contaminant source inventory:

- Department of Health Source Water Assessment Program (SWAP) maps
- US EPA Drinking Water Mapping Application to Protect Source Waters (DWMAPS)
- Department of Ecology Toxic Cleanup Program maps
- Jefferson County Public Land Records GIS Maps and Aerial Imagery
- Knowledge of Septic System Use in the Area

The potential contaminants list from the Washington State Department of Health (WSDOH) Wellhead Protection Program Guidance Document (June 2017) was used in identifying the potential contaminants near the wells. The potential contaminants grouped in a high, medium, and low risk ranking and prioritization system are included in the Contaminant Source Inventory, which is found in Appendix D. Additional descriptions are provided in the 'Description' column in the inventory for each item as applicable.

2.4 Groundwater Contaminant Susceptibility Assessment

A susceptibility assessment form was prepared to support this plan and to determine susceptibility level of each well. This form is required of all groundwater-based Group A systems and is useful in determining the minimum delineation for the WHPA. The well field is classified as low susceptibility. This form is attached in Appendix E.

2.5 Notifications

Regulatory agencies, local government entities, facility operators, customers, and landowners within the identified capture zones will receive the WHPA notification letters. Sample letters can be found in Appendix F. All notification letters should discuss the well's susceptibility rating, what the rating means, and the number of people the System serves.

Within one year of defining WHPA boundaries, water systems must notify in writing the potential groundwater contaminant sources identified within their WHPA – and the agencies or jurisdictions that regulate those sources within the WHPA. The potential groundwater contaminant sources identified within the System's WHPA are listed in Table 3 along with the relevant regulators. In summary, Cascadia Water LLC, as the water system's owner should notify the residents of the Discovery Bay Village water system of their responsibility to protect their drinking water supply (groundwater wells) by properly managing potential contaminates.

Table 3 – Potential Groundwater Contaminant Sources and Regulators

Potential Groundwater Contaminant Source	Owner/Operator of Source	Regulatory Agency
Septic Tanks/Pipes, Lawn Fertilizers/Pesticides, Hazardous Waste, Residential Disposal, Burn Sites, etc	Residents of Discovery Bay Village Community	Cascadia Water, LLC

Appendix A – Source Information

See Appendix G of Estates - Water System Plan for Well Logs

See Appendix E of Estates - Water System Plan
for Water RIghts

Appendix C – Fixed Radii Calculations

FIXED RADIUS CALCULATIONS

System: Estates Inc.
PWS ID: 08166 9
Location: Clallam County, Washington

Equation:
CR = sqrt[(prod.)/(n*H)]

Where:
H = Height of open interval (well screen)
n = Porosity (assumed value of 0.22)
Annual production assumed 1/2 of average production.

Source: Well 1

Interval (year)	Production (ft^3)	Porosity (n)	Height (H) of Open Interval (ft)	Capture Radius (feet)
0.5	3,162,032	0.22	5	1,695
1	6,324,064	0.22	5	2,398
5	31,620,321	0.22	5	5,362
10	63,240,642	0.22	5	7,582

Source: Well 2

Interval (year)	Production (ft^3)	Porosity (n)	Height (H) of Open Interval (ft)	Capture Radius (feet)
0.5	3,162,032	0.22	5	1,695
1	6,324,064	0.22	5	2,398
5	31,620,321	0.22	5	5,362
10	63,240,642	0.22	5	7,582

Appendix B – Contamination Source Inventory

Groundwater Contaminant Source Inventory
Project: Estates Water System Plan
Water System Name: Estates, Inc.
Water System ID No. : 08166 9
Source: S03 (Well field)

Description: List of potential groundwater contaminants for well(s) in Zone 1 (1-yr radius) and Zone 3 (10-yr radius). All contaminants are grouped into categories (see category definitions at bottom of this page), assigned a level of threat (low, medium, or high) based on the risk each potential contaminant poses to the wellhead, and ranked from highest threat to lowest threat with 1 being the highest.

		Source 1						
		Zone 1 (863 feet)			Zone 3 (2730 feet)			
Potential Groundwater Contaminant	Category	Existence	Threat	Rank	Existence	Threat	Rank	Description
Subsurface Percolation (Septic Tanks and Cesspools)	Category 1	X	1	Low	X	1	Low	Residential homes in the surrounding areas
Injection Wells - Hazardous Waste								
Injection Wells - Non-Hazardous Waste (Brine Disposal and Drainage)								
Injection Wells - Non-Waste (e.g. Enhanced Recovery, Artificial Recharge Solution Mining, and In-Site Mining)								
Land Application - Wastewater (e.g. Spray Irrigation)								
Land Application - Wastewater By-Products (e.g. Sludge)								
Land Application - Hazardous Waste					X	4	Medium	see link
Land Application - Non-Hazardous Waste								
Landfills - Industrial Hazardous Waste	Category 2							
Landfills - Industrial Non-Hazardous Waste								
Landfills - Municipal Sanitary								
Open Dumps, Including Illegal Dumping (Waste)								
Residential (or local) Disposal (Waste)		X	4	Low	X	4	Low	Multiple residential homes in the surrounding areas with potenital to dispose waste
Surface Impoundments - Hazardous Waste								
Surface Impoundments - Non-Hazardous Waste								
Materials Stockpiles (Non-Waste)					X	4	Low	Multiple residential homes in the surrounding areas with potenital to stock pile materials
Graveyards								
Animal Burial								
Above Ground Storage Tanks - Hazardous Waste								
Above Ground Storage Tanks - Non-Hazardous Waste								
Above Ground Storage Tanks - Non-Waste								
Underground Storage Tanks - Hazardous Waste								
Underground Storage Tanks - Non-Hazardous Waste								
Underground Storage Tanks - Non-Waste								
Containers - Hazardous Waste								
Containers - Non-Hazardous Waste								
Containers - Non-Waste								
Open-Burning Sites		X	3	Low	X	3	Low	Multiple residential homes in the surrounding areas with potenital to have open-burning sites
Detonation Sites								
Radioactive Disposal Sites								
Pipelines - Hazardous Waste	Category 3							
Pipelines - Non-Hazardous Waste		X	4	Low	X	4	Low	Multiple residential homes in the surrounding areas with distribution water piping & potential for gas piping
Pipelines - Non-Waste		X	1	Low	X	1	Low	Multiple residential homes in the surrounding areas with distribution water piping & potential for gas piping
Materials Transport and Transfer Operations - Hazardous Waste								
Materials Transport and Transfer Operations - Non-Hazardous Waste								
Materials Transport and Transfer Operations - Non-Waste								
Irrigation Practices (e.g. Return Flow)	Category 4	X	1	Medium	X	1	Medium	Large surrounding area of open land with high potential of irrigation practices
Pesticide Applications		X	1	Medium	X	1	Medium	Large surrounding area of open land with high potential of pesticide applications see link
Fertilizer Applications		X	1	Medium	X	1	Medium	Large surrounding area of open land with high potential of fertilizer applications
Animal Feeding Operations		X	1	Low				Large surrounding area of open land with high potential of animal feeding
De-icing Salts Application					X	4	Low	Multiple residential homes in the surronding areas with potenital to de-ice during winter months
Urban Runoff		X	4	Low	X	4	Low	Multiple residential homes in the surronding areas with potenital of urban runoff from surrounding homes
Percolation of Atmospheric Pollutants								
Mining and Mine Drainage - Surface Mine-Related								
Mining and Mine Drainage - Underground Mine-Related								
Productions Wells - Oil (and Gas) Wells	Category 5							
Productions Wells - Geothermal and Heat Recovery Wells								
Productions Wells - Water Supply Wells								
Other Wells (Non-Waste) - Monitoring Wells								
Other Wells (Non-Waste) - Exploration Wells								
Construction Excavation								
Improperly Abandoned Wells								
Groundwater - Surface Water Interactions	Category 6							
Natural Leaching								
Saltwater Intrusion/Brackish Water Upconing (or Intrusion of Other Poor-Quality Natural Water)					X	2	Low	Ocean area nearby wells with potential for seawater intrustion
Total Number of Potential Groundwater Contaminants			10			13		

Potential Groundwater Contaminants Categories (From DOH Wellhead Protection Program Guidance Document, June 2017):
Category 1 - Sources Designed to Discharge Substances
Category 2 - Sources Designed to Store, Treat, and/or Dispose of Substances; Discharge through Unplanned Release
Category 3 - Sources Designed to Retain Substances During Transport or Transmission
Category 4 - Sources Discharging Substances as a Consequence of Other Planned Activities
Category 5 - Sources Providing Conduit or Inducing Discharge through Altered Flow Patterns
Category 6 - Naturally Occurring Sources whose Discharge is Created and/or Exacerbated by Human Activity

Appendix C – Susceptibility Assessment

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

Ground Water Contamination
Susceptibility Assessment Survey Form

Complete **one** form for **eac**h ground water source (well, wellfield, spring) used in your water system (photocopy as necessary).

PART I: **System Information**

Well owner/manager: Cascadia Water, LLC

Water system name: Estates, Inc.

County: Clallam

Water system ID number: 08166 9 Source number: S03

Well depth: 467 feet

Source name: WF (S01 & S02)

WA well identification tag number: ACA573 ACA574

❑ Well not tagged

Number of connections: 367 Population served: 913

Township: 30N Range: 04W

Section: 04 ¼ ¼ Section: SE SE

Latitude/longitude (if available):_______________/_______________

How was latitude/longitude determined?

_______Global positioning device_________survey________topographical map
_______other:______________________________

*Please refer the instructions for details and explanations of all questions in Parts II through V.

PART II: Well Construction and Source Information

1) Date well originally constructed: Well 1: Unknown Well 2: 12 / 23 / 1974

last reconstruction: Well 1: 12 / 3 / 1982 Well 2: 5 / 6 / 1983

❑ Information unavailable

2) Well driller: Stoican Drilling Co, Inc.

❑ Well driller unknown

3) Type of well: x Drilled: ☒ rotary ❑ bored ☒ cable (percussion) ❑ Dug

___ other: ❑ spring(s) ❑ lateral collector (Ranney)

❑ driven ❑ jetted ❑ other:___________________________

4) Well report available ☒ Yes (attach copy to form) ❑ No

5) Average pumping rate: 400 (gallons/min)

Source of information WFI, Pump Tests

If not documented, how was pumping rate determined?______________________________

____

❑ Pumping rate unknown

6) Is this source treated?

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):

Chlorine is available if coliform is detected.

____

7) If source is chlorinated, is a chlorine residual maintained: ❑ Yes ☒ No

Residual level:________ (At the point closest to the source.)

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

☐ <20 ft ☐ 20-50ft ☐ 50-100ft ☐ 100-200ft ☒ >200ft

☐ information unavailable

2) Depth to ground water (static water level):

☐ <20ft ☐ 20-50ft ☒ 50-100ft ☐ >100ft

☐ flowing well/spring (artesian)

How was water level determined?

☒ well log ☐ other ______________________________

☐ depth to ground water unknown

3) If source is a flowing well or spring, what is the confining pressure:

_____________ psi (pounds per square inch) **or**

_____________feet above wellhead

4) If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source: ☐ Yes ☐ No

5) Wellhead elevation (height above mean sea level): 140 feet

How was elevation determined? ☒ topographic map ☐ 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 **bottom** of the **lowest confining layer**? ☒ Yes ☐ No

☐ information unavailable

7) Sanitary setback:

☐ < 100ft* ☒ 100-120ft ☐ 120-200 ft ☐ >200ft

* If less than 100ft, describe the site conditions:

____

____

____

____

8) Wellhead construction:

☒ wellhead enclosed in a wellhouse

☒ controlled access (describe): Wellhouse is locked and can only be accessed by owner/operator.

☐ other uses for wellhouse (describe): ____________________

____

☐ no wellhead control

9) Surface seal:

☒ >18 ft

☐ <18 ft (no Department of Ecology approval)

☐ <18 ft (Approved by Ecology, include documentation)

☐ depth of seal unknown

☐ no surface seal

10) Annual rainfall (inches per year):

☐ <10 in/yr ☒ 10-25 in/yr ☐ >25 in/yr

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 4,165,000 (gallons)

How was this determined?

☒ 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: 611 feet

1-year ground water travel time: 863 feet

5-year ground water travel time: 1,931 feet

10-year ground water travel time: 2,730 feet

Information available on length of screened/open interval?
☒ Yes ☐ No

Length of screened/open interval: Well 1: 186 ft Well 2: 10 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 ☐ 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. If you do not know if one of the following is present, mark the "unknown" space.

	6-month	1-year	5-year	unknown
• likely pesticide application		x	x	x
• stormwater injection wells				
• other injection wells				
• abandoned ground water well				
• landfills, dumps, disposal areas				
• known hazardous materials clean-up site			x	
• water system(s) with known quality problems				
• population density >1 house/acre	x	x	x	x
• residences commonly have septic tanks	x	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.)

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**: For each type of test below, mark the row that applies to the sample results for this source. Consider all the sample results from the past 12 years. (MCLs are noted next to the specific test or listed in assistance package.)

A. **Nitrate:** (Nitrate MCL = 10 mg/l)

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 is 0.5 ug/l or 0.0005 mg/l)

Results greater than MCL or SAL _______

VOCs detected at least once _______

VOCs never detected x

VOC sampling records unavailable _______

C. **EDB/DBCP:**

(EDB MCL = 0.05 ug/l or 0.00005 mg/l. DBCP MCL = 0.2 ug/l or 0.0002 mg/l.)

EDB/DBCP detected below MCL at least once _______

EDB/DBCP detected above MCL at least once _______

EDB/DBCP never detected _______

EDB/DBCP tests required but not yet completed _______

EDB/DBCP tests not required x

D. **Other SOCs (Pesticides):**

Other SOCs detected

(pesticides and other synthetic organic chemicals) _______

Other SOC tests performed but none detected

(list test methods in comments) 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:

HERB1, INSECT1, PEST1 test panels used

E. **Bacterial contamination:**

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 these sources, a more detailed delineation method should be considered.

1) Is there evidence of obvious hydrologic boundaries within the 10-year time of travel zone of the CFR? (Does the largest circle extend over a stream, river, lake, up a steep hillside, and/or over a mountain or ridge?)

☐ Yes ☒ No

Describe with references to map produced in Part IV:

____

____

____

2) Aquifer Material:

A) Does the drilling log, well log or other geologic/engineering reports identify that the well is located in an area where the underground conditions are identified as fractured rock and/or basalt terrain?

☐ Yes ☒ No

B) Does the drilling log, well log or other geologic/engineering reports indicate that the well is located in an area where the underground conditions are primarily identified as coarse sand and gravel?

☐ Yes ☒ No

3) Is the source located in an aquifer with a high horizontal flow rate? (These can include sources located on flood plains of large rivers, artesian wells with high water pressure, and/or shallow flowing wells and springs.)

☐ Yes ☒ No

4) Are there other high capacity wells (agricultural, municipal and/or industrial) located within the CFRs?

a) Presence of ground water extraction wells removing more than approximately 500 gal/min within…

	YES	NO	unknown
<6-month travel time		x	
6 month—1 year travel time		x	
1—5 year travel time		x	
5—10 year travel time		x	

b) Presence of ground water recharge wells (dry wells) or heavy irrigation within…

	YES	NO	unknown
<1-year travel time		x	
1—5 year travel time		x	
5—10 year travel time		x	

Please identify or describe additional hydrologic or geographic conditions that you believe may affect the shape of the zone of contribution for this source. Where possible, reference them to locations on the map produced in Part IV.

____

____

____

____

____

____

____

FORM COMPLETED BY:

______________________________ ______________________________
Print Name Date

____
Signature

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

Ground Water Contamination
Susceptibility Assessment Survey Form

Complete **one** form for **eac**h ground water source (well, wellfield, spring) used in your water system (photocopy as necessary).

PART I: **System Information**

Well owner/manager: Cascadia Water, LLC

Water system name: Estates, Inc.

County: Clallam

Water system ID number: 08166 9 Source number: S03

Well depth: 467 feet

Source name: WF (S01 & S02)

WA well identification tag number: ACA573 ACA574

❑ Well not tagged

Number of connections: 367 Population served: 913

Township: 30N Range: 04W

Section: 04 ¼ ¼ Section: SE SE

Latitude/longitude (if available):________/________

How was latitude/longitude determined?

_______Global positioning device_________survey________topographical map
_______other:____________________

*Please refer the instructions for details and explanations of all questions in Parts II through V.

PART II: Well Construction and Source Information

1) Date well originally constructed: Well 1: Unknown Well 2: 12 / 23 / 1974

last reconstruction: Well 1: 12 / 3 / 1982 Well 2: 5 / 6 / 1983

☐ Information unavailable

2) Well driller: Stoican Drilling Co, Inc.

☐ Well driller unknown

3) Type of well: x Drilled: ☒ rotary ☐ bored ☒ cable (percussion) ☐ Dug

___ other: ☐ spring(s) ☐ lateral collector (Ranney)

☐ driven ☐ jetted ☐ other:___________________

4) Well report available ☒ Yes (attach copy to form) ☐ No

5) Average pumping rate: 400 (gallons/min)

Source of information WFI, Pump Tests

If not documented, how was pumping rate determined?___________________

____

☐ Pumping rate unknown

6) Is this source treated?

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):

Chlorine is available if coliform is detected.

____

7) If source is chlorinated, is a chlorine residual maintained: ☐ Yes ☒ No

Residual level:________ (At the point closest to the source.)

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

☐ <20 ft ☐ 20-50ft ☐ 50-100ft ☐ 100-200ft ☒ >200ft

☐ information unavailable

2) Depth to ground water (static water level):

☐ <20ft ☐ 20-50ft ☒ 50-100ft ☐ >100ft

☐ flowing well/spring (artesian)

How was water level determined?

☒ well log ☐ other ______________________________

☐ depth to ground water unknown

3) If source is a flowing well or spring, what is the confining pressure:

_____________ psi (pounds per square inch) **or**

_____________feet above wellhead

4) If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source: ☐ Yes ☐ No

5) Wellhead elevation (height above mean sea level): 140 feet

How was elevation determined? ☒ topographic map ☐ 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 **bottom** of the **lowest confining layer**? ☒ Yes ☐ No

☐ information unavailable

7) Sanitary setback:

☐ < 100ft* ☒ 100-120ft ☐ 120-200 ft ☐ >200ft

* If less than 100ft, describe the site conditions:

____

____

____

____

8) Wellhead construction:

☒ wellhead enclosed in a wellhouse

☒ controlled access (describe): Wellhouse is locked and can only be accessed by owner/operator.

☐ other uses for wellhouse (describe): ____________________

____

☐ no wellhead control

9) Surface seal:

☒ >18 ft

☐ <18 ft (no Department of Ecology approval)

☐ <18 ft (Approved by Ecology, include documentation)

☐ depth of seal unknown

☐ no surface seal

10) Annual rainfall (inches per year):

☐ <10 in/yr ☒ 10-25 in/yr ☐ >25 in/yr

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 4,165,000 (gallons)

How was this determined?

☒ 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: 611 feet

1-year ground water travel time: 863 feet

5-year ground water travel time: 1,931 feet

10-year ground water travel time: 2,730 feet

Information available on length of screened/open interval?

☒ Yes ☐ No

Length of screened/open interval: Well 1: 186 ft Well 2: 10 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 ☐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. If you do not know if one of the following is present, mark the “unknown” space.

	6-month	1-year	5-year	unknown
• likely pesticide application		x	x	x
• stormwater injection wells				
• other injection wells				
• abandoned ground water well				
• landfills, dumps, disposal areas				
• known hazardous materials clean-up site			x	
• water system(s) with known quality problems				
• population density >1 house/acre	x	x	x	x
• residences commonly have septic tanks	x	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.)

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**: For each type of test below, mark the row that applies to the sample results for this source. Consider all the sample results from the past 12 years. (MCLs are noted next to the specific test or listed in assistance package.)

A. **Nitrate:** (Nitrate MCL = 10 mg/l)

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 is 0.5 ug/l or 0.0005 mg/l)

Results greater than MCL or SAL	_______
VOCs detected at least once	_______
VOCs never detected	x
VOC sampling records unavailable	_______

C. **EDB/DBCP:**
(EDB MCL = 0.05 ug/l or 0.00005 mg/l. DBCP MCL = 0.2 ug/l or 0.0002 mg/l.)

EDB/DBCP detected below MCL at least once	_______
EDB/DBCP detected above MCL at least once	_______
EDB/DBCP never detected	_______
EDB/DBCP tests required but not yet completed	_______
EDB/DBCP tests not required	x

D. **Other SOCs (Pesticides):**

Other SOCs detected (pesticides and other synthetic organic chemicals)	______
Other SOC tests performed but none detected (list test methods in comments)	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:

HERB1, INSECT1, PEST1 test panels used

E. **Bacterial contamination:**

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 these sources, a more detailed delineation method should be considered.

1) Is there evidence of obvious hydrologic boundaries within the 10-year time of travel zone of the CFR? (Does the largest circle extend over a stream, river, lake, up a steep hillside, and/or over a mountain or ridge?)

❑ Yes ☒ No

Describe with references to map produced in Part IV:

____

____

____

2) Aquifer Material:

A) Does the drilling log, well log or other geologic/engineering reports identify that the well is located in an area where the underground conditions are identified as fractured rock and/or basalt terrain?

❑ Yes ☒ No

B) Does the drilling log, well log or other geologic/engineering reports indicate that the well is located in an area where the underground conditions are primarily identified as coarse sand and gravel?

❑ Yes ☒ No

3) Is the source located in an aquifer with a high horizontal flow rate? (These can include sources located on flood plains of large rivers, artesian wells with high water pressure, and/or shallow flowing wells and springs.)

❑ Yes ☒ No

4) Are there other high capacity wells (agricultural, municipal and/or industrial) located within the CFRs?

a) Presence of ground water extraction wells removing more than approximately 500 gal/min within…

	YES	NO	unknown
<6-month travel time	_______	x______	_______
6 month—1 year travel time	_______	x______	_______
1—5 year travel time	_______	x______	_______
5—10 year travel time	_______	x______	_______

b) Presence of ground water recharge wells (dry wells) or heavy irrigation within…

	YES	NO	unknown
<1-year travel time	_______	x______	_______
1—5 year travel time	_______	x______	_______
5—10 year travel time	_______	x______	_______

Please identify or describe additional hydrologic or geographic conditions that you believe may affect the shape of the zone of contribution for this source. Where possible, reference them to locations on the map produced in Part IV.

____

____

____

____

____

____

____

FORM COMPLETED BY:

______________________________ ______________________________
Print Name Date

____
Signature

Appendix D – Notifications

Cascadia Water, LLC
PO Box 549
Freeland, WA 98249
Phone: (360) 661-7781

Date: 5/1/2025

Re: Estates Inc – Wellhead Protection Program

Dear Emergency Responders,

Estates Inc is updating their wellhead protection program as required by DOH. The Estates Inc source wells are located on a parcel on the west side of Ridge View Drive approximately 450-feet north of Woodcock Lane in Clallam County, Washington.

As part of this program, we are required to provide wellhead protection information to agencies responsible for incident/spill response procedures. Attached are copies of our wellhead protection area boundaries, a potential contaminant source inventory, a groundwater contamination susceptibility assessment survey, and our emergency response plan.

Local emergency responders are asked to review these documents and evaluate whether changes in incident/spill response procedures are needed to better protect groundwater within our wellhead protection area. As stated in the Washington State Department of Health's *Wellhead Protection Program Guidance Document, June 2010*: "If a public water system's source water is determined to be vulnerable to surface activities, special procedures may need to be incorporated into local emergency response plans."

The Estates Inc system has 404 service connections and serves about 960 people. The wells have been given a "low" susceptibility rating. This means that based on location, well construction, local geological factors, and regional sources of risk to groundwater, there is low risk of the well becoming contaminated.

Thank you for your support in protecting our drinking water. If you have any questions regarding the documents included or would like to collaborate on further development of incident/spill response procedures, you may contact us at the listed address or phone number.

Sincerely,

Culley Lehman
General Manager

Cascadia WATER™

NAME
ADDRESS
CITY, STATE, ZIP CODE

Cascadia WATER™

NAME
ADDRESS
CITY, STATE, ZIP CODE

Cascadia WATER™

NAME
ADDRESS
CITY, STATE, ZIP CODE

Cascadia WATER™

NAME
ADDRESS
CITY, STATE, ZIP CODE

Date: 7/22/2025

Re: Estates Inc – Wellhead Protection Program

Dear Property Owner,

To protect the drinking water supply for the customers of Estates Inc, we are developing a wellhead protection program as required by state law. As part of our wellhead protection program, we mapped the area overlying the short-term recharge zone of our drinking water supply wells. This is called our wellhead protection area. Following the mapping of the wellhead protection area, we conducted an inventory of potential groundwater contamination sources within the area. Your residential property is located within the wellhead protection area. The following features/activities on residential properties have the potential to affect groundwater quality and our customers' drinking water supply.

Septic tanks/drainfields
Open dumps
Animal burial
Open burning
Pesticide/fertilizer application

To prevent groundwater contamination, customers should:

Be aware of common household hazardous chemicals, such as gasoline, household cleaning products, paint, anti-freeze, pesticides, fertilizers, batteries, etc.
Properly dispose of all hazardous wastes including leftover chemicals and their storage containers.
Avoid spilling chemicals by utilizing proper storage containers.
Avoid applying hazardous chemicals during rainy weather.
When applicable, use non-toxic alternatives.

We realize you are already careful to protect the environmental character of your residential property and the surrounding area. We hope that learning that you are in our wellhead protection area will result in more precautions to ensure that your activities will not affect our drinking water quality.

Sincerely,
Culley Lehman
General Manager

Date: 7/22/2025

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General Manager

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Sincerely,
Culley Lehman
General Manager

First Name	Last Name	Adress	City	State	Zip
EDWARD AND MARY	KEYSER AND UELTZEN	10 E ROBERT PL	SEQUIM	WA	98382-9541
PAULETTE D	ACHE TTE	PO BOX 655	BORREGO SPRINGS	CA	92004
GEORGE AND NINA	ADAMS	11 RIDGE PL	SEQUIM	WA	98382-9539
MARK AND LORI	BARTHLOW	272695 HWY 101	SEQUIM	WA	98382
CHRISTOPHER AND SHAUNNA	BAUER	93 RIDGE PL	SEQUIM	WA	98382-9539
KENNETH AND MARY	BROWN	PO BOX 605	CARLSBORG	WA	98324
GERALD D AND SUE E	CARPENTER	248 BON JON VIEW WAY	SEQUIM	WA	98382
CHRISTINA	CHITWOOD	62 RIDGE PLACE	SEQUIM	WA	98382
STEN AND LISA	CHRISTIANSEN	PO BOX 1145	CARLSBORG	WA	98324-1145
SHERRY AND MICHAEL	CHURCHILL	PO BOX 1163	SEQUIM	WA	98382
JAMES B AND CINDY D	CRAWFORD	31 E ROBERT PL	SEQUIM	WA	98382-9541
JACQUELIN M	DAWLEY	101 E ROBERT PL	SEQUIM	WA	98382-7346
MICHAEL O AND ESTER	DE WEESE	140 HARRIER WAY	SEQUIM	WA	98382
LAURALEE	DELUCA	71 JUNE PL	SEQUIM	WA	98382
WILLIAM R	DONALD	70 RIDGE PLACE	SEQUIM	WA	98382
YVONNE	DRYKE	PO BOX 1251	CARLSBORG	WA	98324
ELIZABETH L AND RODNEY D	ENGEL	111 E ROBERT PL	SEQUIM	WA	98382
MELVIN AND WANDA	FRAZIER	13 LEESON WAY	SEQUIM	WA	98382
JOHN A	GAVIN	91 W ROBERT PL	SEQUIM	WA	98382-9548
SCOTT A/LI-HUI Y	GORDON	PO BOX 25	CARLSBORG	WA	98324
GROVER E	GRADY III	90 W ROBERT PL	SEQUIM	WA	98382
RAMI AND GALYA	GRUNBAUM AND DIMENT	7533 43RD AVE NE	SEATTLE	WA	98115
CYNTHIA L	HEDGECOCK	130 RIDGEVIEW DR	SEQUIM	WA	98382
ROGER E AND JULIE A	HETCHLER	21 RIDGE VIEW DR	SEQUIM	WA	98382
SIMPLE SALE	HOMEBUYERS	917 122ND AVE EAST	EDGEWOOD	WA	98372
DEVIN S	HUNT	4409 SW DAWSON ST	SEATTLE	WA	98136
JANICE ELAINE	HUNT	4833 OLD OLYMPIC HWY	SEQUIM	WA	98382
PETER T	JACOBCHUK	PO BOX 328	ROSLYN	WA	98941
LEONARD E	JOHNSON	81 RIDGE PL	SEQUIM	WA	98382-9539
RON AND KATHLEEN	JOSLIN	51 W ROBERT PL	SEQUIM	WA	98382
ROBERT J AND MARGARET A	KELLY KELLY	42 JUNE PL	SEQUIM	WA	98382-9549
HELEN BERTRAM	KENOYER BROWN	91 E ROBERT PL	SEQUIM	WA	98382
JOSHUA D AND KIMBERLY M	KING	130 E ROBERTS PLACE	SEQUIM	WA	98382
JOHN F	LASHUA	150 RIDGE VIEW DR	SEQUIM	WA	98382-9540
BRADLEY AND AUDREY	LATO	30 W ROBERT PL	SEQUIM	WA	98382-7896
ROBERT AND DENISE	LEE	PO BOX 3842	SEQUIM	WA	98382
PAUL AND LAURIE	LEWIS	132 JUNE PLACE	SEQUIM	WA	98382
JAMI R	LOCHOW	1071 WOODCOCK RD	SEQUIM	WA	98382
FLORIZA GARRETT	LONG	71 E ROBERT PL	SEQUIM	WA	98382
ALICE R	LOOMIS	PO BOX 1692	SEQUIM	WA	98382
FELIPE B	MABELIN	11 JUNE PL	SEQUIM	WA	98382-9549
ELLANE	MACHENHEIMER	70 W ROBERT PL	SEQUIM	WA	98382-9548
LARRY	MARTIN	1132 WOODCOCK ROAD	SEQUIM	WA	98382
MARY D	MCLANE-WALLACKER TRUST	C/O GERALD A HUNT JR TTE	CAMANO ISLAND	WA	98282
KIMBERLY HAWN	MEEHAN GARTEN	81 RIDGE VIEW DR	SEQUIM	WA	98382
EDWARD C	MINTURN	100 E ROBERT PL	SEQUIM	WA	98382-7346
MICHAEL SANDRA	MORATTI	83 HARRIER WAY	SEQUIM	WA	98382-6938
SHANE P AND ALICIA KUZNEK	NEAL	50 W ROBERTS PL	SEQUIM	WA	98382
RYAN SARAH	OASE	82 RIDGE PL	SEQUIM	WA	98382
CIARA	OWEN	72 JUNE PL	SEQUIM	WA	98382
LINDA R	OWENS	170 RIDGE VIEW DR	SEQUIM	WA	98382-9540
	PARKER SEQUIM PROPERTIES LLC	5415 CALHOUN AVE	SHERMAN OAKS	CA	91401
LEWIS H AND NORA L	POLIZZI	3345 W SEQUIM BAY ROAD	SEQUIM	WA	98382
KRISTIN DAVID	RAMEY DIXON	1900 BLACK LAKE BLVD APT LL-12	OLYMPIA	WA	98512
NICHOLAS AND AMBUR	RAMPP AND TAFT JT	92 RIDGE PL	SEQUIM	WA	98382-9539
BONNIE	RICHARDSON ETAL	51 E ROBERT PL	SEQUIM	WA	98382
RICHARD AND ELIZABETH RENEE	ROGERS AND MARTUCCI	100 W ROBERT PL	SEQUIM	WA	98382
FREMAN AND GENA	ROYAL	100 RIDGE VIEW DR	SEQUIM	WA	98382-9540
RICHARD AND ANNE	SACHS	43 LEESON WAY	SEQUIM	WA	98382
DENISE L	SCHLEVE	81 W ROBERT PL	SEQUIM	WA	98382-9548

TERESA	SHARPE	61 E ROBERT PL	SEQUIM	WA	98382
JONATHAN AND KENDA	SIMONSON	10 WEST ROBERT PL	SEQUIM	WA	98382
MATTHEW E	SMITH	20 RIDGE PLACE	SEQUIM	WA	98382
TRACY L AND DORIS A	SMITH AND DOUGHERTY	137 EDGINGTON DR	SEQUIM	WA	98382
MATTHEW	STEWART	100 JUNE PLACE	SEQUIM	WA	98382
JULIE E	STOLTZ	120 JUNE PL	SEQUIM	WA	98382
DAVID	SWINFORD	1275 WOODCOCK RD	SEQUIM	WA	98382
TASHA NICOHLE	TAYLOR	1051 WOODCOCK RD	SEQUIM	WA	98382
LANE	THOMAS	61 RIDGE VIEW DR	SEQUIM	WA	98382-9587
NELSON J	TOPPER JR	621 PINNELL RD	SEQUIM	WA	98382-7585
PEDER A	UNDERDAHL	21 W ROBERT PL	SEQUIM	WA	98382
RUSSELL AND SUZQNNE	VAN GELDER AND DINTZIS	7525 MERCER TERRACE DR	MERCER ISLAND	WA	98040
PATRICIA MICHAEL	VILLIEN	102 HARRIER WAY	SEQUIM	WA	98382
JOSHUA ALYSHA	VOGEL	1031 WOODCOCK RD	SEQUIM	WA	98382
JODY R AND KYLE B	VOREIS	81 E ROBERTS PL	SEQUIM	WA	98382
BARBARA L	WALBERG	83 RIDGE VIEW DR	SEQUIM	WA	98382-9587
LARRY	WALKER	12701 RIMFIRE DR	WILTON	CA	95693
RAYMOND BARBARA	WARD	85 HARRIER WAY	SEQUIM	WA	98382
RANDALL E	WASHBURN	121 E ROBERT PL	SEQUIM	WA	98382-7346
WILLIAM J AND SHARON	WESTREM TTES	PO BOX 2829	SEQUIM	WA	98382
LAURA	WHEELER	214 TOOKALOOK	SEQUIM	WA	98382
DAVID C AND CAROL R	WILLIS	73 LEESON WAY	SEQUIM	WA	98382
ANDREA	WITTENBERG	995 E CEDAR ST	SEQIM	WA	98382
WILLARD J	WOODS JR	72 RIDGE VIEW DR	SEQUIM	WA	98382

APPENDIX J
Water Loss Control Action Plan

1. WATER LOSS CONTROL ACTION PLAN (WLCAP)

The Distribution System Leakage (DSL) of the Estates, Inc. water system (Estates) has been noted at just under 10% per the annual Water Use Efficiency (WUE) reports in recent years with an average DSL of 9.1% over the past three years. A water system's DSL of greater than 10% is greater than the threshold which requires a Water Loss Control Action Plan (WLCAP). This document is a preventative measure to safeguard this critical resource for the community.

Cascadia is required to establish a water use reduction goal as part of its WLCAP to address distribution system losses. The action plan to be implemented contains various aspects with the intent of obtaining accurate data, identifying real losses, and improving the system efficiency. The water systems will implement several water use efficiency measures

1.1 History of Past WLCAP Goals

Prior to ownership transferring to Cascadia Water, the system had not adopted a Water Use Efficiency (WUE) goal for over a decade. However, their yearly water use efficiency reports had noted that they had been "been sending out water conservation cards in their bills since 2001." The newly developed Water System Plan being submitted in 2024 implements new goals for the system.

2. WATER LOSS CONTROL ACTION ITEMS

2.1 Accurate Data Collection – Water Metering

The System sources and treatment facilities are metered. The source meters are multiple times a week for the production wells. The meters are periodically tested and repaired or replaced as needed.

Cascadia requires the installation of water meters on all service connections. An estimate is made for the water used for flushing, system cleaning, and fire department use. Meter readings are taken on a bimonthly basis and are used to determine customer water use and charges. Replacement of old/outdated meters on an on-going basis will occur to assist in obtaining accurate consumption usage data. The replacement of meters will be incorporated into the system's WLCAP.

2.2 Identify Real Water Losses

With the newly installed, accurate meters Cascadia will be able to identify real water losses in the system. The accurate data will allow the prioritization of proposed water line replacement projects. Accurate consumption data will also allow for large consumers of the water to be billed appropriate for their water use and encourage conservancy throughout the systems.

2.3 Leak Detection Program

Water lost through a utility's transmission and distribution system is typically referred to as "Distribution System Leakage (DSL)". A system audit compares the amount of water produced from the source to the amount of water sold to customers. Cascadia performs a bimonthly analysis of source water produced in comparison with water sold to detect increases in the DSL.

Cascadia's leak detection program includes monitoring for leaks in the system and quickly repairing them when identified. Cascadia promptly investigates any reports of leaks from customers and actively investigates aberrations in consumption by customers.

The WUE Annual Performance Reports for the system is submitted to the state. The most recent WUE indicates that the 3-year annual average for DSL at Estates is 9.1% which is below the 10% DSL threshold indicated by the

DOH. However, the data for the most recently reported year reports a DSL of 10.5%. This WLCAP has been developed as Cascadia to ensure proper stewardship of this valuable resource for the water system.

This Water System Plan includes various projects to assess and reduce potential factors contributing to the water loss in Cascadia's distribution systems including replacement of aging water lines and replacement of older meters that may no longer be functioning properly.

2.4 Water Pressure

The water pressure within the system must be at a minimum of 30-psi at all service connections during peak demand. The System is also required to provide fire flow maintain a minimum of 20-psi at all points throughout the distribution system during a fire suppression event. A maximum pressure of 80-psi in the distribution system is advisable to prevent water loss through over-pressurized services.

2.5 Flushing Mains

A portion of the routine maintenance performed on the System is to periodically flush the distribution systems. Silt and organic debris accumulate in the system over time and must be flushed out on a regular basis. Estimates on the amount of water used during flushing operations will be used to determine the DSL rate.

2.6 Informational Messages

Cascadia will include informational brochures and/or letters on the need for conservation with customer billing statements on occasion. Billing statements will also include periodic messages encouraging conservation.

Cascadia will relay information about upcoming water conservation meetings to their customers. Cascadia will capitalize on studies conducted by larger water systems, such as the Snohomish County PUD and the City of Everett, and the DOH. These studies will be used to evaluate the latest water conservation techniques. These techniques will be analyzed for their applicability to the Water System and how they may best be implemented.

2.7 Plumbing Fixture Replacement

Cascadia, through the attachment of informational literature to the customer billing statement, can encourage the use of low water use fixtures in homes. It also plans to provide new customers with informational materials on water saving plumbing.

2.8 Water Use For Landscaping

Lawn and landscape watering are the largest uses of water during the summer months. Education on the amount of water needed to sustain healthy plant life is an effective conservation tool. Cascadia plans to provide customers with literature on lawn watering during the spring of each year. Cascadia also plans to distribute literature offering recommendations for establishing a water conserving landscape. A listing of drought tolerant plants will be provided along with suggestions for plant placement and watering.

Cascadia has also established a rate structure, as shown in their tariff, that encourages prudent use of water in the yard and garden. This is particularly important for the Estates system since there are a appreciable number of connections who have high seasonal usage.

3. WATER USE EFFICIENCY GOALS

The Estates has two major goals with their conservation program: further reduction in distribution system leakage and the reduction of the growth adjusted maximum day demand.

The System would like to reduce distribution system losses below 8.0% within five years. Reductions in the DSL will be accomplished though the capital improvements outlined in Chapter 8 which proposes the replacement of aging infrastructure in the water system based on analyzed and observed deficiencies.

The second goal is to reduce the growth adjusted maximum day demand by a minimum of 1.5% within ten years. Cascadia plans on accomplishing this goal by reducing DSL as part of their first goal and as they further educate customers regarding the resource and methods for conservation

APPENDIX K
Water Quality Monitoring Schedule

Generated on: 07/26/2023

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

Water Quality Monitoring Schedule

System: ESTATES INC
Contact: Dale L Metzger
SMA ID: 168

PWS ID: 08166 9
Group: A - Comm
SMA Name: Cascadia Water, LLC

Region: SOUTHWEST
County: CLALLAM

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

Coliform Monitoring Requirements

	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024	Apr 2024	May 2024	Jun 2024
Coliform Monitoring Population	946	946	971	946	946	946	946	946	946	946	971	946
Number of Routine Samples Required	1	1	1	1	1	1	1	1	1	1	1	1

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

Chemical Monitoring Requirements

Distribution Monitoring

Test Panel/Analyte	# Samples Required	Compliance Period	Frequency	Last Sample Date	Next Sample Due	
Lead and Copper	10	Jan 2022 - Dec 2024	standard - 3 year	07/19/2021	Jul 2024	
Asbestos	0	Jan 2020 - Dec 2028	waiver - 9 year			

Notes on Distribution System Chemical Monitoring

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

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

Washington State Department of Health
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Water Quality Monitoring Schedule

Source Monitoring

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

Source S03 — WF (S01 & S02) — Well Field — Use - Permanent — Susceptility - Low

Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Nitrate	1	Jan 2023 - Dec 2023	standard - 1 year	08/16/2022	***Aug 2023***
Complete Inorganic (IOC)	1	Jan 2020 - Dec 2028	waiver - 9 year	08/19/2019	Aug 2028
Manganese	1	Jan 2023 - Dec 2025	standard - 3 year	08/16/2022	Aug 2025
Volatile Organics (VOC)	1	Jan 2020 - Dec 2025	waiver - 6 year	09/28/2021	
Herbicides	1	Jan 2023 - Dec 2031	waiver - 9 year	04/10/2023	
Pesticides	0	Jan 2023 - Dec 2025	waiver - 3 year	04/10/2023	
PFAS	1	Jan 2023 - Dec 2025	standard - 3 year		May 2025
Soil Fumigants	0	Jan 2023 - Dec 2025	waiver - 3 year		
Gross Alpha	1	Jan 2020 - Dec 2025	standard - 6 year	05/19/2020	
Radium 228	1	Jan 2020 - Dec 2025	standard - 6 year	05/19/2020	

Water Quality Monitoring Schedule

Other Information

Other Reporting Schedules	***Due Date***
Submit Consumer Confidence Report (CCR) to customers and ODW (Community systems only):	07/01/2023
Submit CCR certification form to ODW (Community systems only):	10/01/2023
Submit Water Use Efficiency report online to ODW and to customers (Community and other municipal water systems only):	07/01/2023
Send notices of lead and copper sample results to the customers sampled:	30 days after you receive the laboratory results
Submit Certification of customer notification of lead and copper results to ODW:	90 days after you notify customers

Special Notes

None

Southwest Regional Water Quality Monitoring Contacts

For questions regarding chemical monitoring:	Sophia Petro: (564) 669-0856 or sophia.petro@doh.wa.gov
For questions regarding DBPs:	Regina Grimm, p.e.: (360) 236-3035 or regina.grimm@doh.wa.gov
For questions regarding coliform bacteria and microbial issues:	Southwest Office: (360) 236-3030 or SWRO.Coli@doh.wa.gov

Additional Notes

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

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

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

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

APPENDIX L
Water Quality Results

Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

View Sample Detail - WSID 081669 - ESTATES INC

Collect Date	8/11/2021
Lab Number	010
Lab Name	Spectra Laboratories - Kitsap, LLC
Sample Number	97001
Source	03
Analyte Group	IOC-INORGANIC CONTAMINANTS
Test Panel	NIT-NITRATE SUITE
Sample Location	wh
Sample Type	Pre-Treatment / Raw

Result Range, A/P, Units: Mouse over for full description

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	State Reporting Limit	Units
0020	NITRATE-N	LT	0.5000	10.0000	0.5000	mg/L

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Department of Health, Office of Drinking Water

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243 Israel Road S.E. 2nd floor
Tumwater, WA 98501

Mail:
PO BOX 47822
Olympia, WA 98504-7822

Comments or questions regarding this Web site? Send email to Environmental Health Application Testing and Support

Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

View Sample Detail - WSID 081669 - ESTATES INC	
Collect Date	8/11/2021
Lab Number	010
Lab Name	Spectra Laboratories - Kitsap, LLC
Sample Number	97001
Source	03
Analyte Group	IOC-INORGANIC CONTAMINANTS
Test Panel	NIT-NITRATE SUITE
Sample Location	wh
Sample Type	Pre-Treatment / Raw

Result Range, A/P, Units: Mouse over for full description

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	State Reporting Limit	Units
0020	NITRATE-N	LT	0.5000	10.0000	0.5000	mg/L

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Department of Health, Office of Drinking Water

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243 Israel Road S.E. 2nd floor
Tumwater, WA 98501

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PO BOX 47822
Olympia, WA 98504-7822

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Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

View Sample Detail - WSID 081669 - ESTATES INC

Collect Date	8/19/2019
Lab Number	010
Lab Name	Spectra Laboratories - Kitsap, LLC
Sample Number	43102
Source	03
Analyte Group	IOC-INORGANIC CONTAMINANTS
Test Panel	IOC-COMPLETE INORGANIC ANALYSIS
Sample Location	wh
Sample Type	Unknown

Result Range, A/P, Units: Mouse over for full description

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	State Reporting Limit	Units
0010	MANGANESE	EQ	0.1800	0.0500	0.0100	mg/L
0009	LEAD	EQ	0.0010		0.0010	mg/L
0014	SODIUM	EQ	11.3000		5.0000	mg/L
0015	HARDNESS	EQ	162.0000		10.0000	mg/L
0016	CONDUCTIVITY	EQ	316.0000	700.0000	70.0000	Umhos/cm
0017	TURBIDITY	EQ	0.3000		0.1000	NTU
0024	ZINC	EQ	0.6200	5.0000	0.2000	mg/L
0004	ARSENIC	LT	0.0010	0.0104	0.0010	mg/L
0005	BARIUM	LT	0.1000	2.0000	0.1000	mg/L
0006	CADMIUM	LT	0.0010	0.0050	0.0010	mg/L
0007	CHROMIUM	LT	0.0070	0.1000	0.0070	mg/L
0008	IRON	LT	0.1000	0.3000	0.1000	mg/L
0011	MERCURY	LT	0.0002	0.0020	0.0002	mg/L
0012	SELENIUM	LT	0.0020	0.0500	0.0020	mg/L
0013	SILVER	LT	0.1000	0.1000	0.1000	mg/L
0018	COLOR	LT	15.0000	15.0000	15.0000	CU
0019	FLUORIDE	LT	0.2000	4.0000	0.2000	mg/L
0020	NITRATE-N	LT	0.5000	10.0000	0.5000	mg/L
0021	CHLORIDE	LT	20.0000	250.0000	20.0000	mg/L
0022	SULFATE	LT	50.0000	250.0000	50.0000	mg/L
0023	COPPER	LT	0.0200		0.0200	mg/L
0110	BERYLLIUM	LT	0.0003	0.0040	0.0003	mg/L
0111	NICKEL	LT	0.0050	0.1000	0.0050	mg/L
0112	ANTIMONY	LT	0.0030	0.0060	0.0030	mg/L
0113	THALLIUM	LT	0.0010	0.0020	0.0010	mg/L

Records 1 - 25 of 28

View Sample Detail - WSID 081669 - ESTATES INC

Collect Date	8/19/2019
Lab Number	010
Lab Name	Spectra Laboratories - Kitsap, LLC
Sample Number	43102
Source	03
Analyte Group	IOC-INORGANIC CONTAMINANTS
Test Panel	IOC-COMPLETE INORGANIC ANALYSIS
Sample Location	wh
Sample Type	Unknown

Result Range, A/P, Units: Mouse over for full description

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	State Reporting Limit	Units
0114	NITRITE-N	LT	0.1000	1.0000	0.1000	mg/L
0116	CYANIDE	LT	0.0500	0.2000	0.0500	mg/L
0161	TOTAL NITRATE/NITRITE	LT	0.5000		0.5000	mg/L

Department of Health, Office of Drinking Water

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Tumwater, WA 98501

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Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

View Sample Detail - WSID 081669 - ESTATES INC

Collect Date	5/19/2020
Lab Number	094
Lab Name	Eurofins Eaton LLC - Pomona
Sample Number	30025
Source	03
Analyte Group	RAD-RADIONUCLIDES
Test Panel	RAD-RADIONUCLIDES
Sample Location	wh
Sample Type	Pre-Treatment / Raw

Result Range, A/P, Units: Mouse over for full description

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	State Reporting Limit	Units
0165	GROSS ALPHA	LT	3.0000		3.0000	pCi/L
0166	RADIUM 228	LT	1.0000	5.0000	1.0000	pCi/L

Records 1 - 2 of 2

Department of Health, Office of Drinking Water

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View Sample Detail - WSID 081669 - ESTATES INC

Collect Date	4/10/2023
Lab Number	218
Lab Name	BSK Associates
Sample Number	26001
Source	03
Analyte Group	SOC-SYNTHETIC ORGANIC CONTAMINANTS
Test Panel	HERB1-CHLOROPHENOXY HERBICIDES
Sample Location	wh
Sample Type	Unknown

Result Range, A/P, Units: Mouse over for full description

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	State Reporting Limit	Units
0037	2,4 - D	LT	0.1000	70.0000	0.1000	ug/L
0038	2,4,5 TP (SILVEX)	LT	0.2000	50.0000	0.2000	ug/L
0134	PENTACHLOROPHENOL	LT	0.0400	1.0000	0.0400	ug/L
0135	2,4 DB	LT	1.0000		1.0000	ug/L
0136	2,4,5 T	LT	0.4000		0.4000	ug/L
0137	DALAPON	LT	1.0000	200.0000	1.0000	ug/L
0138	DICAMBA	LT	0.2000		0.2000	ug/L
0139	DINOSEB	LT	0.2000	7.0000	0.2000	ug/L
0140	PICLORAM	LT	0.1000	500.0000	0.1000	ug/L
0220	BENTAZON	LT	0.5000		0.5000	ug/L
0221	DICHLORPROP	LT	0.5000		0.5000	ug/L
0223	ACIFLUORFEN	LT	2.0000		2.0000	ug/L
0225	DCPA ACID METABOLITES	LT	0.1000		0.1000	ug/L
0226	3,5 DICHLORBENZOIC ACID	LT	0.5000		0.5000	ug/L

Records 1 - 14 of 14

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View Sample Detail - WSID 081669 - ESTATES INC	
Collect Date	4/10/2023
Lab Number	218
Lab Name	BSK Associates
Sample Number	26001
Source	03
Analyte Group	SOC-SYNTHETIC ORGANIC CONTAMINANTS
Test Panel	PEST1-GENERAL PESTICIDE SUITE
Sample Location	wh
Sample Type	Unknown

Result Range, A/P, Units: Mouse over for full description

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	State Reporting Limit	Units
0033	ENDRIN	LT	0.0100	2.0000	0.0100	ug/L
0034	LINDANE (BHC - GAMMA)	LT	0.0200	0.2000	0.0200	ug/L
0035	METHOXYCHLOR	LT	0.1000	40.0000	0.1000	ug/L
0036	TOXAPHENE	LT	1.0000	3.0000	1.0000	ug/L
0118	ALDRIN	LT	0.1000		0.1000	ug/L
0122	CHLORDANE (TOTAL)	LT	0.2000	2.0000	0.2000	ug/L
0123	DIELDRIN	LT	0.1000		0.1000	ug/L
0126	HEPTACHLOR	LT	0.0400	0.4000	0.0400	ug/L
0127	HEPTACHLOR EPOXIDE	LT	0.0200	0.2000	0.0200	ug/L
0128	HEXACHLOROBENZENE	LT	0.1000	1.0000	0.1000	ug/L
0129	HEXACHLOROCYCLO PENTADIENE	LT	0.1000	50.0000	0.1000	ug/L
0173	AROCHLOR 1221	LT	20.0000		20.0000	ug/L
0174	AROCHLOR 1232	LT	0.5000		0.5000	ug/L
0175	AROCHLOR 1242	LT	0.3000		0.3000	ug/L
0176	AROCHLOR 1248	LT	0.1000		0.1000	ug/L
0177	AROCHLOR 1254	LT	0.1000		0.1000	ug/L
0178	AROCHLOR 1260	LT	0.2000		0.2000	ug/L
0180	AROCHLOR 1016	LT	0.0800		0.0800	ug/L

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Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

View Sample Detail - WSID 081669 - ESTATES INC

Collect Date	9/28/2021
Lab Number	094
Lab Name	Eurofins Eaton LLC - Monrovia
Sample Number	80713
Source	03
Analyte Group	VOC-VOLATILE ORGANIC CONTAMINANTS
Test Panel	VOC1-VOLATILE ORGANIC
Sample Location	wh
Sample Type	Pre-Treatment / Raw

Result Range, A/P, Units: Mouse over for full description

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	State Reporting Limit	Units
0027	CHLOROFORM	LT	0.5000		0.5000	ug/L
0028	BROMODICHLOROMETHANE	LT	0.5000		0.5000	ug/L
0029	DIBROMOCHLOROMETHANE	LT	0.5000		0.5000	ug/L
0030	BROMOFORM	LT	0.5000		0.5000	ug/L
0045	VINYL CHLORIDE	LT	0.5000	2.0000	0.5000	ug/L
0046	1,1 DICHLOROETHYLENE	LT	0.5000	7.0000	0.5000	ug/L
0047	1,1,1 TRICHLOROETHANE	LT	0.5000	200.0000	0.5000	ug/L
0048	CARBON TETRACHLORIDE	LT	0.5000	5.0000	0.5000	ug/L
0049	BENZENE	LT	0.5000	5.0000	0.5000	ug/L
0050	1,2 DICHLOROETHANE	LT	0.5000	5.0000	0.5000	ug/L
0051	TRICHLOROETHYLENE	LT	0.5000	5.0000	0.5000	ug/L
0052	1,4 DICHLOROBENZENE	LT	0.5000	75.0000	0.5000	ug/L
0053	CHLOROMETHANE	LT	0.5000		0.5000	ug/L
0054	BROMOMETHANE	LT	0.5000		0.5000	ug/L
0056	METHYLENE CHLORIDE(DICHLOROMETHANE)	LT	0.5000	5.0000	0.5000	ug/L
0057	TRANS- 1,2 DICHLOROETHYLENE	LT	0.5000	100.0000	0.5000	ug/L
0058	1,1 DICHLOROETHANE	LT	0.5000		0.5000	ug/L
0060	CIS- 1,2 DICHLOROETHYLENE	LT	0.5000	70.0000	0.5000	ug/L
0062	1,1 DICHLOROPROPENE	LT	0.5000		0.5000	ug/L
0063	1,2 DICHLOROPROPANE	LT	0.5000	5.0000	0.5000	ug/L
0064	DIBROMOMETHANE	LT	0.5000		0.5000	ug/L
0066	TOLUENE	LT	0.5000	1000.0000	0.5000	ug/L
0067	1,1,2 TRICHLOROETHANE	LT	0.5000	5.0000	0.5000	ug/L
0068	TETRACHLOROETHYLENE	LT	0.5000	5.0000	0.5000	ug/L
0070	1,3 DICHLOROPROPANE	LT	0.5000		0.5000	ug/L

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Division of Environmental Health
Office of Drinking Water

Help

View Sample Detail - WSID 081669 - ESTATES INC

Collect Date	9/28/2021
Lab Number	094
Lab Name	Eurofins Eaton LLC - Pomona
Sample Number	80713
Source	03
Analyte Group	VOC-VOLATILE ORGANIC CONTAMINANTS
Test Panel	VOC1-VOLATILE ORGANIC
Sample Location	wh
Sample Type	Pre-Treatment / Raw

Result Range, A/P, Units: Mouse over for full description

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	State Reporting Limit	Units
0071	CHLOROBENZENE	LT	0.5000	100.0000	0.5000	ug/L
0072	1,1,1,2 TETRACHLOROETHANE	LT	0.5000		0.5000	ug/L
0073	ETHYLBENZENE	LT	0.5000	700.0000	0.5000	ug/L
0074	M/P XYLENES (MCL FOR TOTAL)	LT	0.5000		0.5000	ug/L
0075	O- XYLENE (MCL FOR TOTAL)	LT	0.5000		0.5000	ug/L
0076	STYRENE	LT	0.5000	100.0000	0.5000	ug/L
0078	BROMOBENZENE	LT	0.5000		0.5000	ug/L
0079	1,2,3 TRICHLOROPROPANE	LT	0.5000		0.5000	ug/L
0080	1,1,2,2 TETRACHLOROETHANE	LT	0.5000		0.5000	ug/L
0081	O- CHLOROTOLUENE	LT	0.5000		0.5000	ug/L
0082	P- CHLOROTOLUENE	LT	0.5000		0.5000	ug/L
0083	M- DICHLOROBENZENE	LT	0.5000		0.5000	ug/L
0084	1,2 DICHLOROBENZENE	LT	0.5000	600.0000	0.5000	ug/L
0085	TRICHLOROFLUOROMETHANE	LT	0.5000		0.5000	ug/L
0086	BROMOCHLOROMETHANE	LT	0.5000		0.5000	ug/L
0087	ISOPROPYLBENZENE	LT	0.5000		0.5000	ug/L
0088	N-PROPYLBENZENE	LT	0.5000		0.5000	ug/L
0089	1,3,5 TRIMETHYLBENZENE	LT	0.5000		0.5000	ug/L
0090	TERT- BUTYLBENZENE	LT	0.5000		0.5000	ug/L
0091	1,2,4 TRIMETHYLBENZENE	LT	0.5000		0.5000	ug/L
0092	SEC- BUTYLBENZENE	LT	0.5000		0.5000	ug/L
0093	P-ISOPROPYLTOLUENE	LT	0.5000		0.5000	ug/L
0094	N-BUTYLBENZENE	LT	0.5000		0.5000	ug/L
0095	1,2,4 TRICHLOROBENZENE	LT	0.5000	70.0000	0.5000	ug/L
0096	NAPHTHALENE	LT	0.5000		0.5000	ug/L

Records 26 - 50 of 56

Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

View Sample Detail - WSID 081669 - ESTATES INC

Collect Date	9/28/2021
Lab Number	094
Lab Name	Eurofins Eaton LLC - Pomona
Sample Number	80713
Source	03
Analyte Group	VOC-VOLATILE ORGANIC CONTAMINANTS
Test Panel	VOC1-VOLATILE ORGANIC
Sample Location	wh
Sample Type	Pre-Treatment / Raw

Result Range, A/P, Units: Mouse over for full description

Analyte DOH Num	Analyte Name	Result Range	Result Quantity	Maximum Contaminant Level	State Reporting Limit	Units
0097	HEXACHLOROBUTADIENE	LT	0.5000		0.5000	ug/L
0098	1,2,3 TRICHLOROBENZENE	LT	0.5000		0.5000	ug/L
0104	DICHLORODIFLUOROMETHANE	LT	0.5000		0.5000	ug/L
0154	1,3 DICHLOROPROPENE	LT	0.5000		0.5000	ug/L
0160	TOTAL XYLENES	LT	0.5000	10000.0000	0.5000	ug/L
0031	TOTAL TRIHALOMETHANE	ND		80.4000		ug/L

Records 51 - 56 of 56

Department of Health, Office of Drinking Water

Street Address:
243 Israel Road S.E. 2nd floor
Tumwater, WA 98501

Mail:
PO BOX 47822
Olympia, WA 98504-7822

APPENDIX M
Coliform Monitoring Plan

Coliform Monitoring Plan for: Estates, Inc.

A. System Information

Plan Date: 2024

Water System Name: Estates	**County:** Clallam	**System I.D. Number:** 08166 9
Name of Plan Preparer: Culley Lehman	**Position:** General Manager	**Daytime Phone:** (360) 331-5336
Sources: DOH Source Number, Source Name, Well Depth, Pumping Capacity	S01 – Well #1 WW (ACA573) – 407 feet – 200 gpm S02 – Well #2 WW (ACA574) – 436 feet – 200 gpm S03 – WF (S01 & S02)	
Storage: List and Describe	160,000-gallon – Concrete Reservoir	
Treatment: Source Number & Process	S02 – Chlorination/Filtration	
Pressure Zones: Number and name	One	
Population by Pressure Zone	913	
Number of Routine Samples Required Monthly by Regulation:	1 (One)	
Number of Sample Sites Needed to Represent the Distribution System:	1 (One)	
***Request DOH Approval of Triggered Source Monitoring Plan?**	**Yes** ☐ **No** ☒	

*If approval is requested a fee will be charged for the review.

B. Laboratory Information

Laboratory Name Spectra Laboratories	**Office Phone:** (360) 779-5141 **After Hours Phone**
Address 26276 Twelve Trees Ln NW Ste. C Poulsbo, WA 98370	**Email:** AngelaK@Spectra-Lab.com
Hours of Operation: 8 am – 5 pm	
Contact Name: Angie Barcus	
Emergency Laboratory Name Clallam County Enviro Health Services	**Office Phone:** (360) 417-2258 **After Hours Phone:** n/a
Address 223 E 4th Street, Room 130 Port Angeles, WA 98362	**Cell Phone:** (360) 417-2334 **Email:**
Hours of Operation: 8 am – 3:30 pm (Mon – Wed), 8 am – 12 pm (Thur)	
Contact Name:	

C. Wholesaling of Groundwater

	Yes	No
We are a consecutive system and purchase groundwater from another water system.	☐	☒
If yes, Water System Name: n/a		
We sell groundwater to other public water systems.	☐	☒
If yes, Water System Name: n/a		

D. Routine, Repeat, and Triggered Source Sample Locations

Location/Address for **<u>Routine</u> Sample Sites**	Location/Address for **<u>Repeat</u> Sample Sites**	Groundwater Sources for **Triggered Sample Sites****
X1. 60 Air Park	**1-1. 60 Airpark Road** Front hose bibb	**S01, S02**
	1-2. 460 Greywolf Road Front hose bibb	
	1-3. 52 Greywolf Road Front hose bibb	
X2. 100 Steve Place	**2-1. 90 Nicole Place** Front hose bibb	**S01, S02**
	2-2. 176 Nicole Place Front hose bibb	
	2-3. 381 Ridge View Drive Front hose bibb	
X3. 353 Dungeness Greens Way	**3-1. 353 Dungeness Greens Way** Front hose bibb	**S01, S02**
	3-2. 772 Ridge View Drive Front hose bibb	
	3-3. 103 Dungeness Greens Way Front hose bibb	

** When you collect the repeats, you must sample every groundwater source that was in use when the original routine sample was collected.

E. Routine Sample Rotation Schedule

Month	Routine Site(s)	Month	Routine Site(s)
January	X1	July	X1
February	X2	August	X2
March	X3	September	X3
April	X1	October	X1
May	X2	November	X2
June	X3	December	X3

F. Level 1 and Level 2 Assessment Contact Information

Name: Culley Lehman	**Office Phone:** (360) 331-7388 **After Hours Phone:** (360) 661-7781
Address 18181 State Route 525 Freeland, WA 98249	**Email:** Culley@cascadiawater.com
Name: Dale Metzger	**Office Phone:** (360) 477-9704 **After Hours Phone:**
Address PO Box 92 Sequim, WA 98382	**Email:** djmetzger5@gmail.com

G. *E. coli*-Present Sample Response

Distribution System *E. coli* Response Checklist				
Background Information	**Yes**	**No**	**N/A**	**To Do List**
We inform staff members about activities within the distribution system that could affect water quality.	☒	☐	☐	☐
We document all water main breaks, construction & repair activities, and low pressure and outage incidents.	☒	☐	☐	☐
We can easily access and review documentation on water main breaks, construction & repair activities, and low pressure and outage incidents.	☒	☐	☐	☐
Our Cross-Connection Control Program is up-to-date.	☒	☐	☐	☐
We test all cross-connection control devices annually as required, with easy access to the proper documentation.	☒	☐	☐	☐
We routinely inspect all treatment facilities for proper operation.	☐	☐	☒	☐
We identified one or more qualified individuals who are able to conduct a Level 2 assessment of our water system.	☒	☐	☐	☐
We have procedures in place for disinfecting and flushing the water system if it becomes necessary.	☒	☐	☐	☐
We can activate an emergency intertie with an adjacent water system in an emergency.	☐	☒	☐	☐
We have a map of our service area boundaries.	☒	☐	☐	☐
We have consumers who may not have access to bottled or boiled water.	☐	☒	☐	☐
There is a sufficient supply of bottled water immediately available to our customers who are unable to boil their water.	☐	☒	☐	☐
We have identified the contact person at each day care, school, medical facility, food service, and other customers who may have difficulty responding to a Health Advisory.	☒	☐	☐	☐
We have messages prepared and translated into different languages to ensure our consumers will understand them.	☐	☐	☒	☐
We have the capacity to print and distribute the required number of notices in a short time period.	☒	☐	☐	☐
Policy Direction	**Yes**	**No**	**N/A**	**To Do List**
We have discussed the issue of *E. coli*-present sample results with our policy makers.	☒	☐	☐	☐
If we find *E. coli* in a routine distribution sample, the policy makers want to wait until repeat test results are available before issuing advice to water system customers.	☐	☒	☐	☐
(Cont.)				

Distribution System *E. coli* Response Checklist

Potential Public Notice Delivery Methods	Yes	No	N/A	To Do List
It is feasible to deliver a notice going door-to-door.	☒	☐	☐	☐
We have a list of all of our customers' addresses.	☒	☐	☐	☐
We have a list of customer telephone numbers or access to a Reverse 9-1-1 system.	☒	☐	☐	☐
We have a list of customer email addresses.	☐	☒	☐	☐
We encourage our customers to remain in contact with us using social media.	☐	☐	☒	☐
We have an active website we can quickly update to include important messages.	☒	☐	☐	☐
Our customers drive by a single location where we could post an advisory and expect everyone to see it.	☐	☒	☐	☐
We need a news release to supplement our public notification process.	☒	☐	☐	☐

Distribution System *E. coli* Response Plan

If we have *E. coli* in our distribution system we will immediately:

1. Call DOH.
2. Collect repeat and triggered source samples per Part D. Collect additional investigative samples as necessary.
3. If samples confirm E. Coli, immediately send out a Health Advisory to alert all users that there is a health risk associated with the water supply and the use of boiled or bottled water is strongly recommended.
4. Schedule inspection of system with Department of Health representative.
5. Flush and chlorinate the entire system.
6. After chlorine is eliminated from the system, schedule two sets of five coliform tests to confirm elimination of contamination.
7. After two sets of five coliform tests come back clear and DOH confirms elimination, lift advisory.

____

E. coli-Present Triggered Source Sample Response Checklist – All Sources

Background Information	Yes	No	N/A	To Do List
We review our sanitary survey results and respond to any recommendations affecting the microbial quality of our water supply.	☒	☐	☐	☐
We address any significant deficiencies identified during a sanitary survey.	☒	☐	☐	☐
There are contaminant sources within our Wellhead Protection Area that could affect the microbial quality of our source water, and	☐	☒	☐	☐
If yes, we can eliminate them.	☐	☐	☐	☐
We routinely inspect our well site(s).	☒	☐	☐	☐
We have a good raw water sample tap installed at each source.	☒	☐	☐	☐
After we complete work on a source, we disinfect the source, flush, and collect an investigative sample.	☒	☐	☐	☐
Public Notice	**Yes**	**No**	**N/A**	**To Do List**
We discussed the requirement for immediate public notice of an *E. coli*-present source sample result with our water system's governing body (board of directors or commissioners) and received direction from them on our response plan.	☒	☐	☐	☐
We discussed the requirement for immediate public notice of an *E. coli*-present source sample result with our wholesale customers and encouraged them to develop a response plan.	☐	☐	☒	☐
We have prepared templates and a communications plan that will help us quickly distribute our messages.	☒	☐	☐	☐

E. coli-Present Triggered Source Sample Response Checklist – Sources

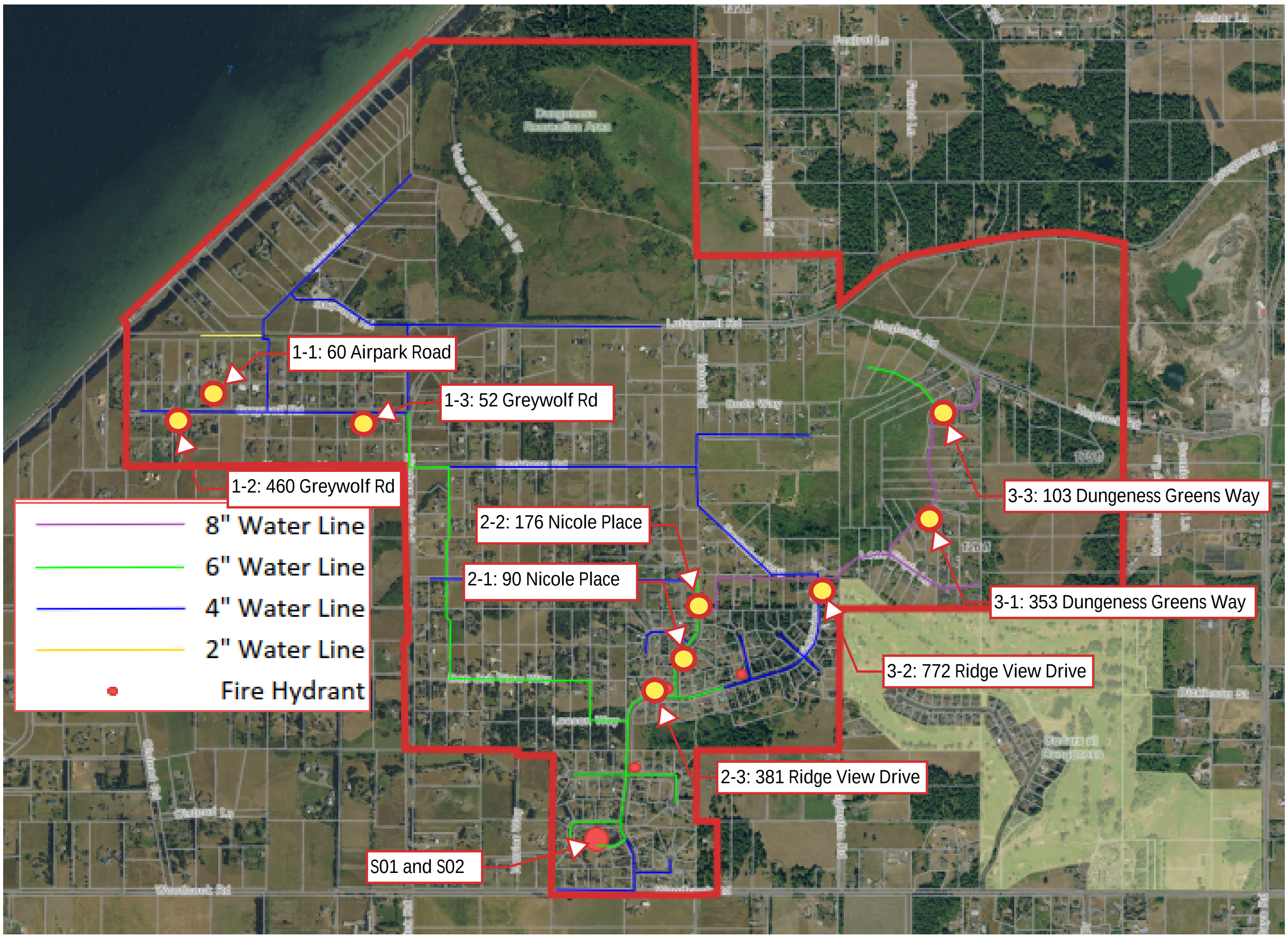
Alternate Sources	Yes	No	N/A	To Do List
We can stop using this source and still provide reliable water service to our customers.	☐	☒	☐	☐
We have an emergency intertie with a neighboring water system that we can use until corrective action is complete (perhaps for several months).	☐	☒	☐	☐
We can provide bottled water to all or part of the distribution system for an indefinite period.	☐	☒	☐	☐
We can quickly replace our existing source of supply with a more protected new source.	☐	☒	☐	☐
Temporary Treatment	**Yes**	**No**	**N/A**	**To Do List**
This source is continuously chlorinated, and our existing facilities can provide 4-log virus treatment (CT = 6) before the first customer. If yes, at what concentration? _____ mg/L	☐	☒	☐	☐
We can quickly introduce chlorine into the water system and take advantage of the existing contact time to provide 4-log virus treatment to a large portion of the distribution system.	☒	☐	☐	☐
We can reduce the production capacity of our pumps or alter the configuration of our storage quantities (operational storage) to increase the amount of time the water stays in the system before the first customer to achieve CT = 6.	☒	☐	☐	☐
We can alter the demand for drinking water (maximum day or peak hour) through conservation messages to increase the time the water is in the system prior to the first customer in order to achieve 4-log virus treatment with chlorine.	☒	☐	☐	☐

*NOTE: If your system has multiple sources, you may want to complete a separate checklist for each source.

E. coli-Present Triggered Source Sample Response Plan – Sources

If we have *E. coli* in a source we will immediately:

Notify DOH and discuss how to proceed.


1-1: 60 Airpark Road
1-3: 52 Greywolf Rd
1-2: 460 Greywolf Rd
8" Water Line
6" Water Line
4" Water Line
2" Water Line
Fire Hydrant
2-2: 176 Nicole Place
2-1: 90 Nicole Place
3-3: 103 Dungeness Greens Way
3-1: 353 Dungeness Greens Way
3-2: 772 Ridge View Drive
2-3: 381 Ridge View Drive
S01 and S02

APPENDIX N
Water System Inventory

Component Inventory and Assessment

Operator:	Cascadia Water
Operator Address:	PO Box 549, Freeland, WA 98249
Prepared By:	Robert Bennion, PE.

Water System:	Estates
System ID:	08166 9

Component	Component Information	Installed Date	Effective Life	Condition Rating	Critical Number	Remaining Life	Replacement Cost/Unit	Quantity	Unit	Total Cost	Inflation Rate	Replace in 6 Years?	Future Cost	6-Year Replacement Cost
Well #1	6" x 4", 607' Depth	1982	80	2	2	39.9	$ 30,000	1	LS	$ 30,000	2.0%	No	$ 66,110	$ -
Well #1 Pump	Berkeley Model 6SAH-2, 7.5 HP	2015	20	1	2	15	$ 6,000	1	LS	$ 6,000	2.0%	No	$ 8,075	$ -
Well #2	6", 46.2' Depth	1974	80	1	2	34	$ 30,000	1	LS	$ 30,000	2.0%	No	$ 58,820	$ -
Well #2 Pump	Berkeley Model 6S2AM-3, 7.5 HP	2015	20	1	2	15	$ 6,000	1	LS	$ 6,000	2.0%	No	$ 8,075	$ -
Well Meter	Sensus OMNI 2" Meter	2023	25	2	1	26.6	$ 2,500	2	EA	$ 5,000	2.0%	No	$ 8,467	$ -
Well Controls		2023	15	1	2	18	$ 5,000	1	LS	$ 5,000	2.0%	No	$ 7,141	$ -
Wellhouse Enclosure (4'x4')		1982	75	5	5	18.5	$ 1,000	2	EA	$ 2,000	2.0%	No	$ 2,885	$ -
Reservoir	30' Diameter x 33' Tall 158,000 Gallons	2023	80	1	1	83	$ 2	158,000	GAL	$ 316,000	2.0%	No	$ 1,634,938	$ -
Reservoir Controls		2023	25	1	2	28	$ 5,000	1	LS	$ 5,000	2.0%	No	$ 8,705	$ -
Pressure Tanks	370 Gallon	2023	30	1	3	33	$ 12,500	3	EA	$ 37,500	2.0%	No	$ 72,084	$ -
Booster Pumps	(4) 10 HP, Grundfos	2023	25	1	2	28	$ 20,000	4	EA	$ 80,000	2.0%	No	$ 139,282	$ -
Booster Pump Controls		2023	25	1	2	28	$ 25,000	1	LS	$ 25,000	2.0%	No	$ 43,526	$ -
Distribution System Piping	8" PVC	1994	85	3	4	47	$ 175	5,520	LF	$ 966,000	2.0%	No	$ 2,459,831	$ -
Distribution System Piping	6" PVC	1982	85	3	4	38	$ 150	9,695	LF	$ 1,454,250	2.0%	No	$ 3,062,002	$ -
Distribution System Piping	4" PVC	1975	85	4	5	28	$ 150	23,220	LF	$ 3,483,000	2.0%	No	$ 6,063,987	$ -
Distribution System Piping	2" PVC	1975	85	4	5	28	$ 100	2,850	LF	$ 285,000	2.0%	No	$ 496,192	$ -
Hydrants		1982	50	4	4	8	$ 5,000	3	EA	$ 15,000	2.0%	No	$ 17,715	$ -
Gate Valves	8" Valve	1994	75	3	4	39.2	$ 2,500	4	EA	$ 10,000	2.0%	No	$ 21,733	$ -
Gate Valves	6" Valve	1986	75	3	4	32.8	$ 2,500	6	EA	$ 15,000	2.0%	No	$ 28,720	$ -
Gate Valves	4" Valve	1975	75	4	5	21	$ 2,500	15	EA	$ 37,500	2.0%	No	$ 56,837	$ -

Gate Valves	2" Valve	1975	75	4	5	21	$ 2,500	9	EA	$ 22,500	2.0%	No	$ 34,102	$ -
Meters		2020	20	4	5	14	$ 250	367	EA	$ 91,750	2.0%	No	$ 121,062	$ -
Air-release Valves		1982	20	3	4	0	$ 5,000	1	EA	$ 5,000	2.0%	Yes	$ 5,000	$ 5,000
Blow-offs		1982	20	3	4	0	$ 5,000	3	EA	$ 15,000	2.0%	Yes	$ 15,000	$ 15,000
Treatment System		2023	80	1	3	83	$ 150,000	3	EA	$ 450,000	2.0%	No	$ 2,328,235	$ -
Pumphouse (20'x20' Pole Building)		1994	50	2	4	22.8	$ 175	400	SF	$ 70,000	2.0%	No	$ 109,947	$ -
Generator		2023	50	1	3	53	$ 10,000	1	EA	$ 10,000	2.0%	No	$ 28,563	$ -
Propane Tank		2020	30	1	3	30	$ 5,000	1	EA	$ 5,000	2.0%	No	$ 9,057	$ -
Total System Value:										$ 7,482,500	Estimated Near-Term Upgrade Costs:			$ 20,000

APPENDIX O
System Equipment Specifications

Well Pump - Pump Curves

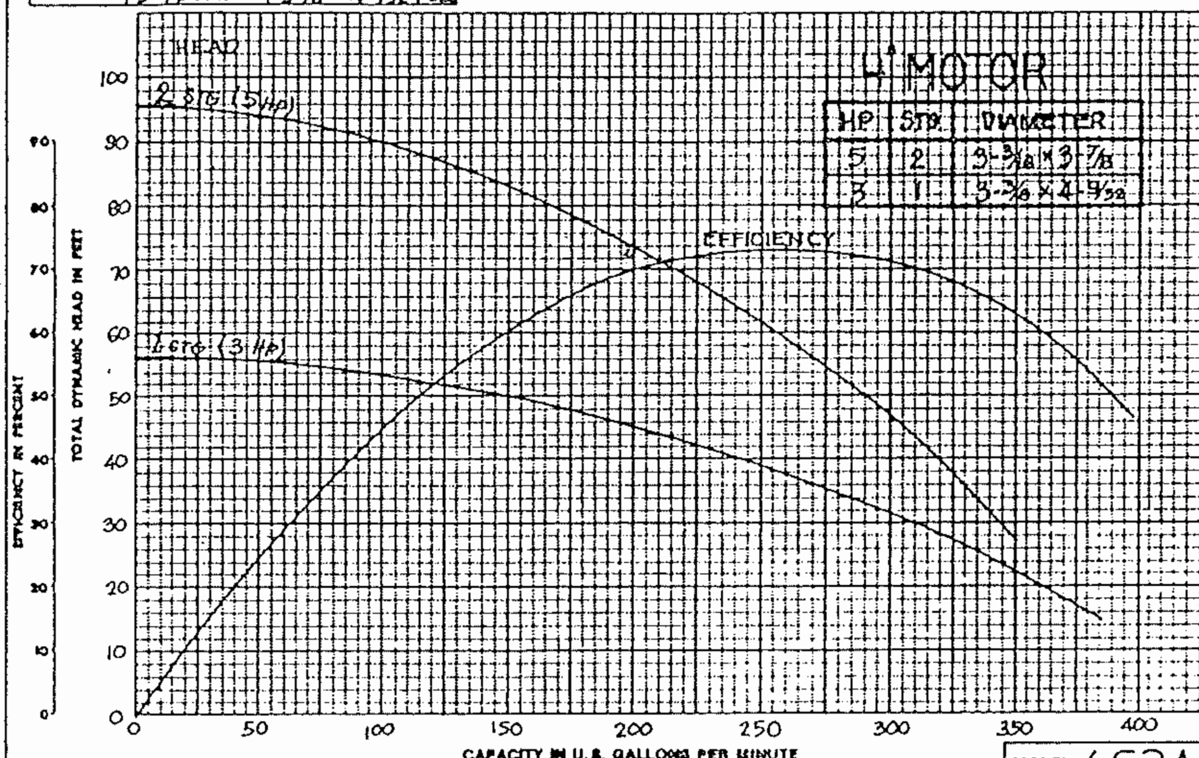
BERKELEY PUMP COMPANY

SUBMERSIBLE TURBINE PUMPS
6" AND 7" BOWLS
PERFORMANCE CURVES

CURVE	2500
DATE	6-5-78
PAGE	1.81
SUPERSEDES	
NEW	

	Bowl	Impeller
Material	C.I.	BRZ.
Patt. No.	M-4039	M-4044
Mach. No.	M-4461	M-4044
Diameter	5-3/4" UNIT DIA	3-7/8" x 4-17/32" FULL

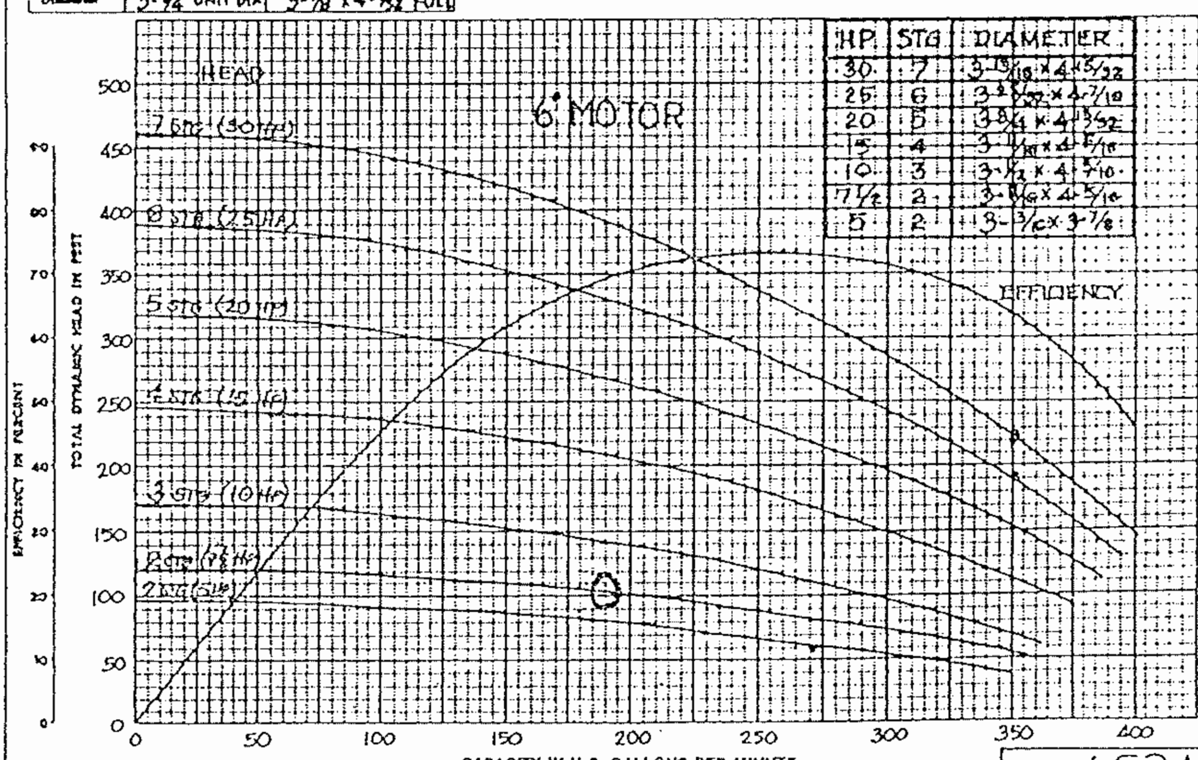
Based on T- 8229 Test of Stage Pump. Performance for MULTI- Stage Pump.



C-5695 Issue Date 5-18-78 (Supersedes C-5695 Dated 7-27-77) 3600 NOMINAL R.P.M. MODEL 6S2AH

	Bowl	Impeller
Material	C.I.	BRZ.
Patt. No.	M-4039	M-4044
Mach. No.	M-4461	M-4044
Diameter	5-3/4" UNIT DIA	3-7/8" x 4-17/32" FULL

Based on T- 8229 Test of Stage Pump. Performance for MULTI- Stage Pump.



C-5696 Issue Date 5-18-78 (Supersedes C-5696 Dated 7-27-77) 3600 NOMINAL R.P.M. MODEL 6S2AH

X

Well Pump

South Well Pump #1

BERKELEY PUMP COMPANY

BERKELEY®

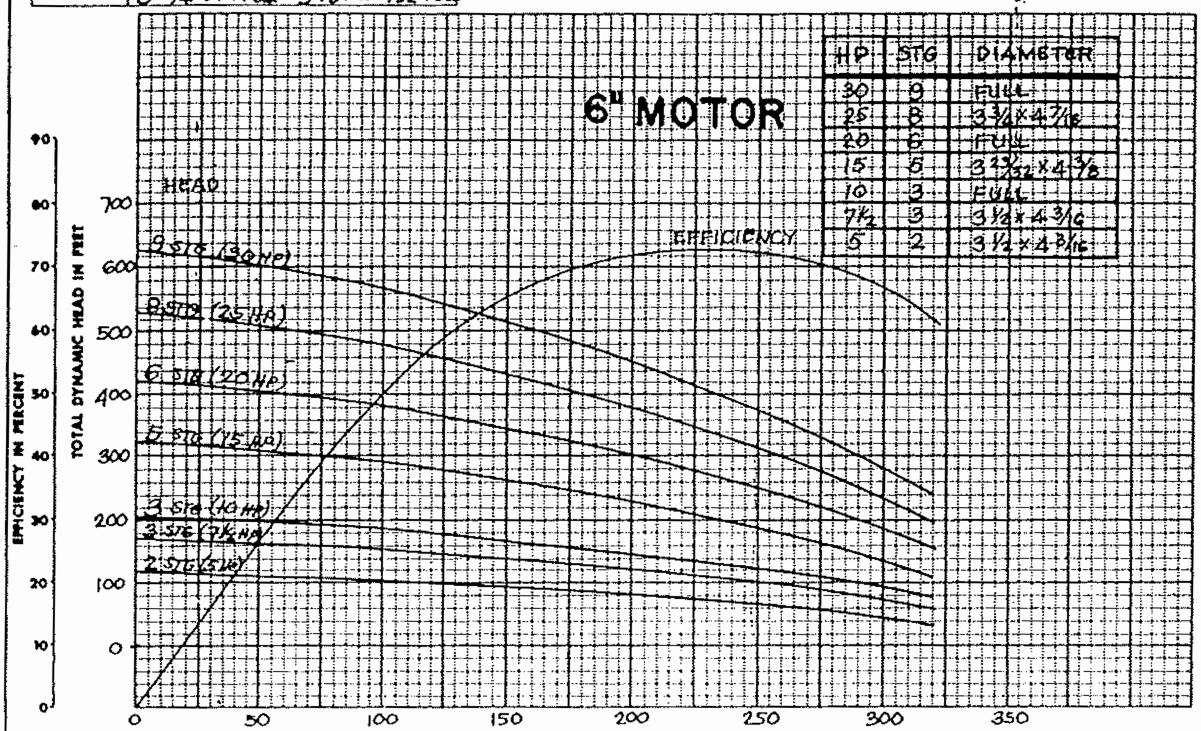
SUBMERSIBLE TURBINE PUMPS
6" AND 7" BOWLS
PERFORMANCE CURVES

CURVE	2500
DATE	6-5-78
PAGE	1.72
SUPERSEDES	
NEW	

NORTH WELL PUMP #2

	Bowl	Impeller
Material	C.I.	BRZ.
Patt. No.	M-4039	M-4043
Mech. No.	M-4461	M-4043
Diameter	5-3/4" UNIT OD	3-7/8 x 4-17/32" FULL

Based on T- 3230 Test of Stage Pump.
Performance for MULTI Stage Pump.



HP	STG	DIAMETER
30	9	FULL
25	8	3 3/4 x 4 7/16
20	6	FULL
15	5	3 23/32 x 4 3/8
10	3	FULL
7½	3	3 1/2 x 4 3/16
5	2	3 1/2 x 4 3/16

CAPACITY IN U.S. GALLONS PER MINUTE

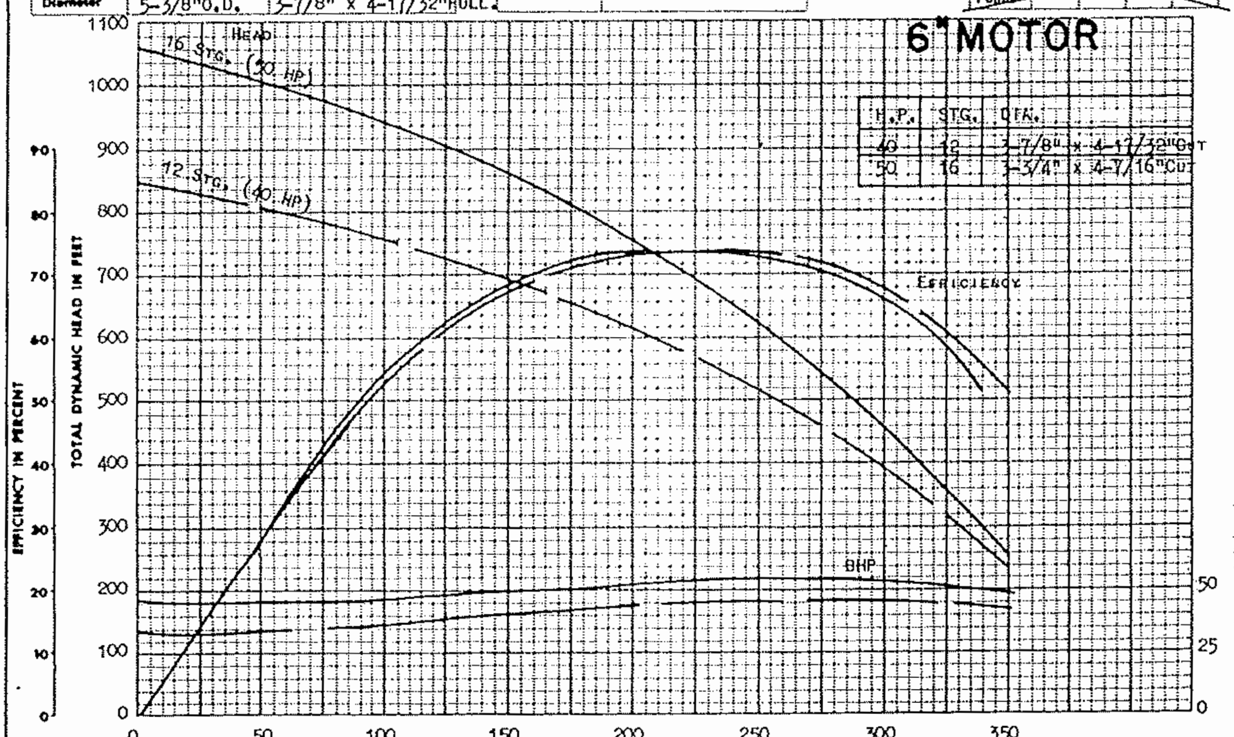
C-5694 Issue Date 5-18-78 (Supersedes C-5694 Dated 2-2-78) NOMINAL 3600 R.P.M. MODEL 6S2AM

	Bowl	Impeller
Material	C.I.	BRZ.
Patt. No.	M-4039	M-4043
Mech. No.	M-4461	M-4043
Diameter	5-3/8" O.D.	3-7/8" x 4-17/32" FULL

Letter	Impeller Diameter

Based on T- 3230 Test of 6 Stage Pump.
Performance for 12 & 16 Stage Pump.
~~Adjust Efficiency for Stages Used:~~

~~Stages~~	
~~Points~~	



H.P.	STG.	DIA.
40	12	3-7/8" x 4-17/32" CUT
50	16	3-3/4" x 4-7/16" CUT

CAPACITY IN U.S. GALLONS PER MINUTE

C-8140 Issue Date 4-2-76 (Supersedes NEW Dated -) 3600 Nom. R.P.M. MODEL 6S2AM

Booster Pump - Pump Curves

Pump Performance Datasheet

Customer	:	Quote Number / ID	: 176676
Customer ref. / PO	:	Model	: 20709 LC
Tag Number	: 005	Stages	: 1
Service	:	Based on curve number	: RC9912-1-SS Rev May22
Quantity	: 1	Basic model number	: -
		Date last saved	: 07/19/2023 1:44 PM

Operating Conditions

Flow, rated	: 269.7 USgpm
Differential head / pressure, rated (requested)	: 135.2 ft
Differential head / pressure, rated (actual)	: 135.9 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed, rated	: 3530 rpm
Impeller diameter, rated	: 6.16 in
Impeller diameter, maximum	: 7.10 in
Impeller diameter, minimum	: 5.00 in
Efficiency	: 79.18 %
NPSH required / margin required	: 12.88 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 26 / 120 Metric units
MCSF	: 89.31 USgpm
Head, maximum, rated diameter	: 157.9 ft
Head rise to shutoff	: 13.01 %
Flow, best eff. point	: 269.7 USgpm
Flow ratio, rated / BEP	: 99.99 %
Diameter ratio (rated / max)	: 86.76 %
Head ratio (rated dia / max dia)	: 65.38 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Energy Indexes

PEI (CL)	: 0.88
ER (CL)	: 12

Liquid

Liquid type	: Cold Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

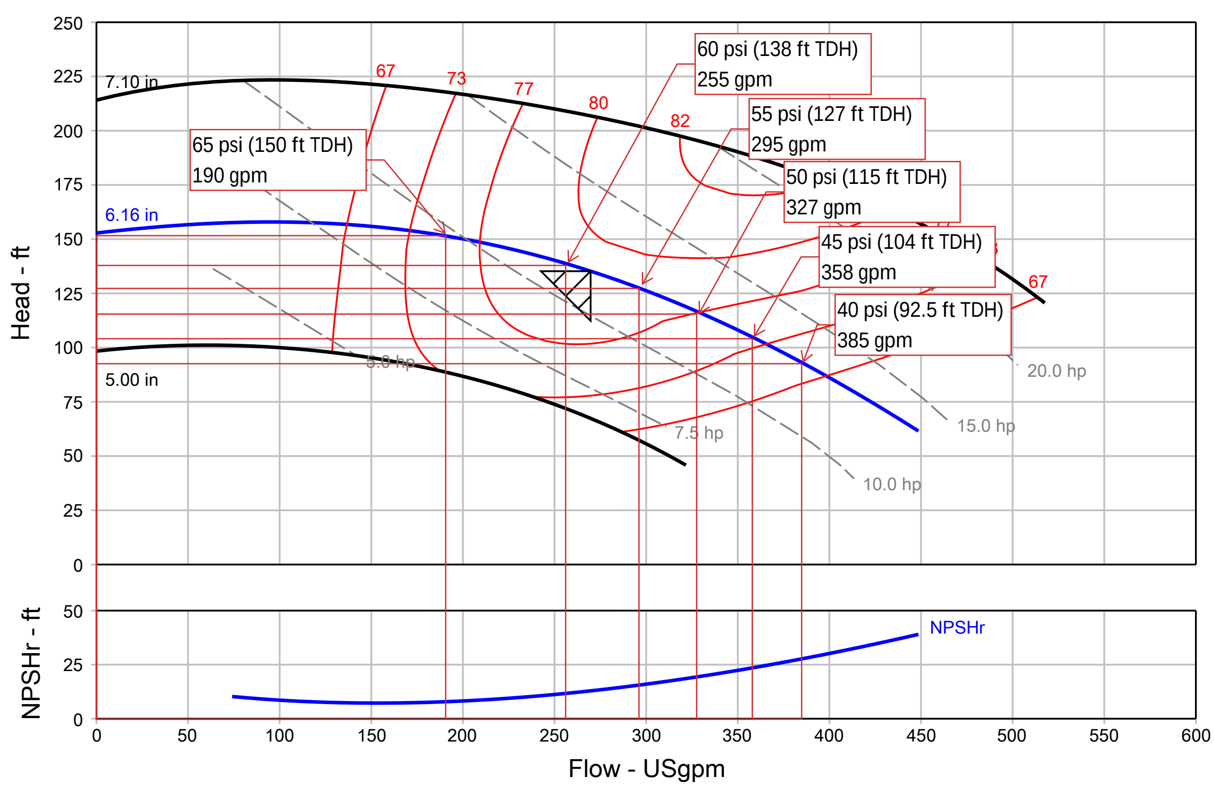
Material selected	: Cast iron

Pressure Data

Maximum working pressure	: 68.35 psi.g
Maximum allowable working pressure	: 175.0 psi.g
Maximum allowable suction pressure	: 175.0 psi.g
Hydrostatic test pressure	: 263.0 psi.g

Driver & Power Data (@Max density)

Motor sizing specification	: Rated power (based on duty point)
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 9.21 hp
Rated power (based on duty point)	: 11.63 hp
Max power (non-overloading)	: 13.55 hp
Nameplate motor rating	: 15.00 hp / 11.19 kW



Construction Datasheet

Project name	: Cascadia Water Sequim	Tag Number	: 005
Consulting engineer	:	Service	:
Customer	: PUMPTECH INC	Model	: 20709 LC
Customer ref. / PO	:	Quantity	: 1
Quote Number / ID	: 176676	Quoted By (Sales Office)	: PUMPTECH INC
Date last saved	: 07/19/2023 1:44 PM	Quoted By (Sales Engineer)	: Kenneth Sluis

Construction

Nozzle	Size (in.)	Nozzle Configuration	Pos'n
Suction	2.5	NPS	End
Discharge	2	NPS	Top

Orientation / Configuration	: Horizontal
Rotation	: Clockwise
Wear Ring Configuration	: Single - Case
Discharge Elbow Size	: -
Subplate	: -
Sump Depth (feet)	: -
Bearing Frame	: -
Bearing Frame Foot	: -
Bearing Type (Radial/Thrust)	: In motor
Bearing Lubrication	: -
Thrust Bearing	: -
Intermediate Bearing	: -
Lower Bearing	: -
Bearing Housing Accessories	: -
PACO Construction Code	: 10N6-20709-130008-XXXX

Baseplate, Coupling and Guard

Baseplate	: Not Applicable
Drip Pan	: -
Coupling	: -
Guard	: Not Applicable

Seal & Packing Construction

Sealing Method	: Single Seal, Type 21S
Seal Material	: Buna Carbon Ceramic SS-Spring and Hardware
Packing Gland	: -
Lantern Ring	: -
Recirculation Lines	: None

Weights (Approx.)

Pump	: 45.10 lb
Baseplate	: -
Driver	: 0
Estimated Shipping gross weight	: 44.10 lb

Motor Information

Manufacturer	: Baldor
Frame Size	: 213JM
Power	: 15.00 hp
RPM	: 3600
Enclosure	: ODP
Operating Power Supply	: 230/3/60hz
Efficiency	: Premium
Service factor	: -
Motor Application	: Suitable for Variable Speed Drive
Motor Options/Accessories	: -
Cord Length (feet)	: -

Materials

Case	: Cast Iron, ASTM A48 - Class 30
Motor Bracket	: Cast Iron, ASTM-A48, CL 30
Impeller	: Stainless Steel, AISI-304 (H304)
Impeller Cap Screw and Washer	: Stainless Steel, AISI-303
Impeller Key	: Stainless Steel, AISI 316
Case wear ring	: Tin Bronze, ASTM B584-90500 (B18)
Impeller wear ring	: -
Pump Shaft	: Steel, AISI-1040
Sleeve	: Bronze, III932, C89835
Line Shaft	: -
Column	: -
Discharge Pipe	: -
Discharge Elbow	: -
Suction Elbow	: -
Subplate	: -
Hardware	: Steel, Grade 5
O Rings	: Buna N
Pump Coatings	: Standard Manufacturer's Paint

Pressure Tanks

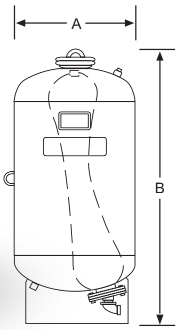
Commercial Water Systems Tanks

AMTROL

Full Acceptance Bladder Models

- Larger sizes for high flow systems.
- Replaceable bladder; full acceptance design.
- Industry's thickest heavy duty butyl bladder.
- NSF/ANSI/CAN STD 61.

NSF
Certified to NSF/ANSI/CAN 61
Bladder Only



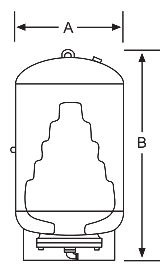
ASME Full Acceptance Bladder Series Specifications

Model Number	Tank Volume (Gallons)	Max. Accept. Volume (Gallons)	A Diameter (Inches)	B Height (Inches)	System Conn.[1] NPTF (Inches)	Shipping Weight (lbs.) Max. Working Pressure				
						125 PSI	150 PSI	175 PSI	250 PSI	300 PSI
WX-447C	53	53	24	45	2	263	289	368	420	462
WX-448C	80	80	24	59	2	315	338	430	492	540
WX-449C	106	106	24	73	2	319	350	440	507	557
WX-450C	132	132	24	87	2	351	392	454	570	627
WX-451C	158	158	30	73	2	493	587	680	813	894
WX-452C	211	211	30	91	2	602	627	694	1,007	1,107
WX-453C	264	264	36	86	3	676	752	846	1,095	1,204
WX-454C	317	317	36	98	3	762	840	959	1,264	1,390
WX-455C	370	370	36	110	3	843	930	1,060	1,350	1,485
WX-456C	422	422	48	82	3	1,154	1,418	1,655	1,700	1,826
WX-457C	528	528	48	97	3	1,331	1,500	1,870	2,231	2,450
WX-458C	660	660	60	84	4	1,450	1,740	2,030	2,320	2,750
WX-459C	792	792	60	99	4	2,169	2,385	3,036	3,470	3,690
WX-460C	925	925	60	107	4	2,300	2,530	3,220	3,680	3,910
WX-461C	1,056	1,056	60	121	4	2,638	2,900	3,695	4,220	4,485
WX-462C	1,320	1,320	72	104	4	3,500	3,850	4,900	5,600	5,950
WX-463C	1,980	1,980	72	140	4	4,100	4,510	5,740	6,560	6,970

[1]Malleable Iron System Connection.
Maximum Operating Temperature: 240°F. Factory Pre-charge: 25 PSIG.

Partial Acceptance Bladder Models

- Replaceable bladder; partial acceptance design.
- Industry's thickest heavy duty butyl bladder.
- Available in compact sizes for limited space.



ASME Partial Acceptance Bladder Series Specifications

Model Number	Tank Volume (Gallons)	Max. Accept. Volume (Gallons)	A Diameter (Inches)	B Height (Inches)	System Conn.[1] NPTF (Inches)	Shipping Weight (lbs.) Max. Working Pressure
						125 PSI
WX-35CL	10	10	10	37	1¼	69
WX-50CL	13	11	12	37	1¼	76
WX-85CL	22	11	16	35	1¼	92
WX-100CL	26	11	16	39	1¼	98
WX-130CL	34	27	20	35	1½	136
WX-165CL	44	27	20	40	1½	146
WX-200CL	53	27	24	41	1½	198
WX-300CL	80	27	24	56	1½	236
WX-400CL	106	53	24	69	2	282
WX-500CL	132	53	24	83	2	316
WX-600CL	158	53	30	67	2	450

[1]Malleable Iron System Connection.
Maximum Operating Temperature: 240°F. Factory Pre-charge: 25 PSIG

WORTHINGTON INDUSTRIES
1400 Division Road, West Warwick, RI 02893 USA
T: 800.426.8765 **www.amtrol.com**

Turbulator. DeepDrawn.
188 AntiLegionella.
LOW-LEAD IAPMO R&T

MC10008 (02/21)

ATEC Filter System

ATEC Filters
SUBMITTAL

Cascadia
Water Estates

ATEC
A Cadiz Solution

3/25/2024

RE: ATEC SCOPE Letter, Cascadia Water Estates

ATEC Water Systems LLC scope of supply includes the following items:

ITEM	TYPE/DESCRIPTION/MODEL
PROJECT NAME:	North and South Wells Water Treatment Facility
DELIVERY DATE:	TBD
OPERATING PRESSURE	>120 PSI
CONTRACTOR NAME	Justin Madsen
CONTRACTOR CONTACT	
ATEC MODEL	5-60-30
CONTACT TANK	None
FILTER SIZE/SIDEWALL HEIGHT	60"
FILTER BACKWASH VALVE	Bermad 3x3x3-350-P 3-Way valves
FILTER CONTROLLER	FM8 UL
FILTER SOLENOID TREE	5 standard peterpaul 24 volt
MEDIA TYPE	Pyrolox
MEDIA VOLUME/WEIGHT	86 cu ft/11,000 lbs
MEDIA BAGS/SUPERSACKS	4 Supersacks
INLET HEADER PIPING SIZE/ARRANGEMENT	4" Epoxy Coated Steel headers with 6” flange connection
OUTLET HEADER PIPING SIZE ARRANGEMENT	4” Epoxy Coated Steel headers with 6” flange connection
BACKWASH HEADER PIPING SIZE	3" Epoxy Coated Steel Headers
BACKWASH SPOOL	1 included
BACKWASH FLOW METER	Provided by Contractor
□**PRESSURE GAUGE:**	1 set- 1/2" SST pipe & fittings, 4 1/2" dial face
□**EQUIPMENT COLOR:**	TBD
SAMPLE PORTS:	
□**TREATED:**	standard
□**COMPOSITE:**	2 - 3/4” threaded ports on Inlet and Outlet
□**OTHER:**	
OPTIONAL VALVES:	
□**AIR RELIEF VACUUM BREAKER:**	
□**PRESSURE RELIEF:**	
□**PRESSURE SUSTAINING:**	
□**OTHER:**	

□**SPECIAL REQUIREMENTS:**	
□**PILOT TEST:**	Included
DRAWING DATED/ATTACHED	03/25/2024
WARRANTY	Per Specification 461000
ADDITIONAL ITEMS	Per Specification 461000

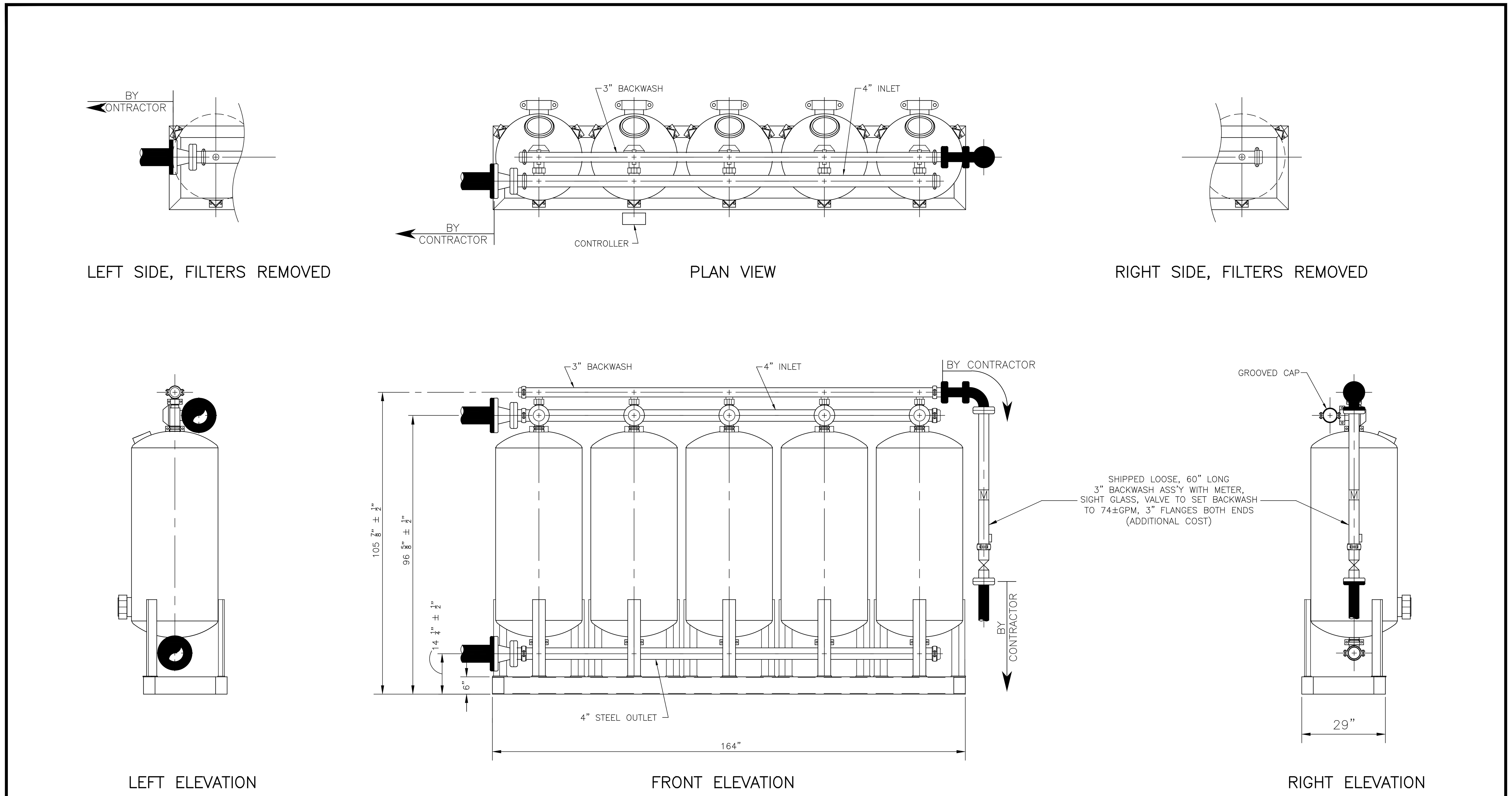
ATEC's Scope includes the following exceptions to the project specifications:

1. None

ATEC Water Systems
1690 Lana Way, Bldg A
Hollister, CA 95023

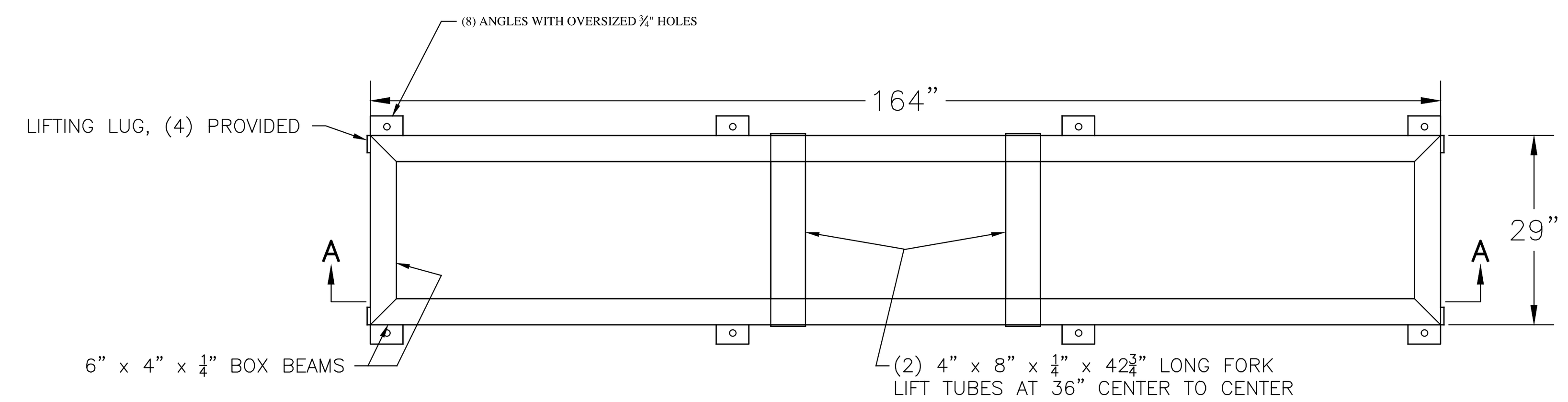
Phone (831) 637-9264

Contact:
Lee Odell
COO
lodell@atecwatersystems.com



NOTE: A 60" LONG, 3-INCH BACKWASH FLANGED BACKWASH ASSEMBLY WITH REGULATING VALVE, METER AND SIGHT GLASS CAN BE SHIPPED LOOSE TO REGULATE BACKWASH TO 137 GPM, (EXTRA COST ITEM).

DESIGN BY: -					SCALE IN FEET (0, 1', 2')	IRON AND MANGANESE TREATMENT	FILTER DETAILS	SHEET NO. 1 of 1
DRAWN BY: -					NOTE: CHECK SCALE	ESTATES WATER SYSTEM		DWG. NO.
CHECKED BY: -					SCALEABLE IN 22x34 – 1" = 1'-0"	NORTH AND SOUTH WELLS		DATE: 8/20/2021
APR'D BY: -	NO.	DATE	BY	APVD	SCALEABLE IN 11x17 – 1/2" = 1'-0"			FILE: Estates Water System N & S

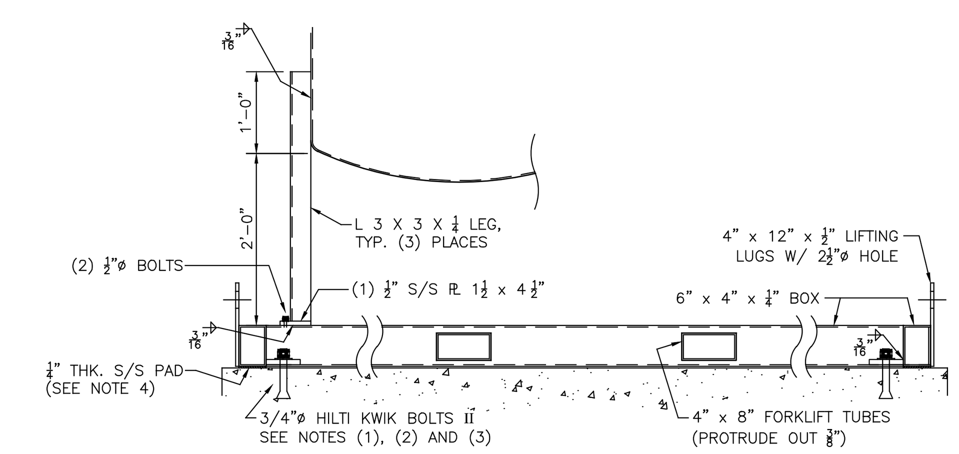


SKID PLAN
(5 FILTER)

0 1' 2'
SCALE IN FEET
NOTE: CHECK SCALE
SCALEABLE IN 22x34 – 1" = 1'–0"
SCALEABLE IN 11x17 – 1/2" = 1'–0"

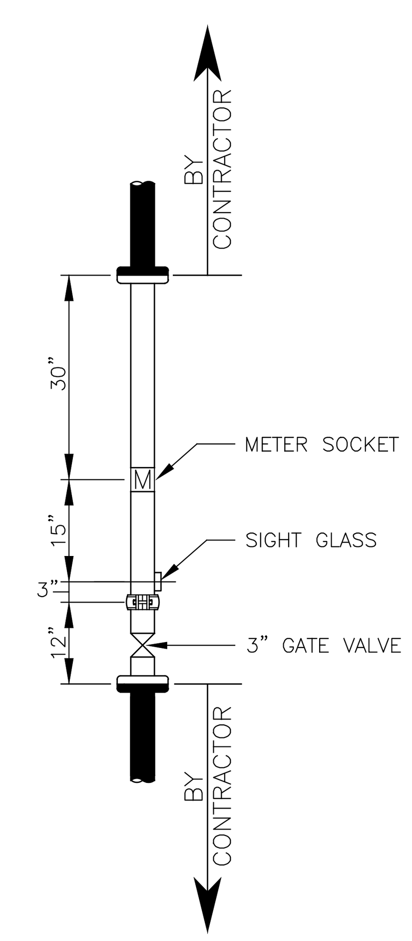
BILL OF MATERIAL			
ITEM	QTY	PART NO.	DESCRIPTION
1	1	PFS–CPL03	3" GROOVED COUPLING, CAST IRON W/ BOLTS & GASKET
2	3	PFS–CPL04	4" GROOVED COUPLING, CAST IRON W/ BOLTS & GASKET
3	1	PFS–CAP08	8" GROOVED END CAP
4	1	PFS–CPL08	8" GROOVED COUPLING, CAST IRON W/ BOLTS & NUTS
5	1	PFS=HHP11	11"x15" HAND HOLE PLATE
6	1	PFS–HHG11	11"x15" HAND HOLE GASKET
7	1	PFS–HHGS11	11"x15" HAND HOLE BOLT SET
8	1	PFS–HHCR11	11"x15" HAND HOLE HOLD DOWN CRAB
9	1	UA SS48	3"x3"x3" SERIES 350 BERMAD BACKWASH VALVE
10	1	V–BF4	UNDER–DRAIN ASSEMBLY 316L SS W/ SCH 80 PVC CAP COMPLETE

NOTE: QUANTITIES FOR ONE (1) TANK

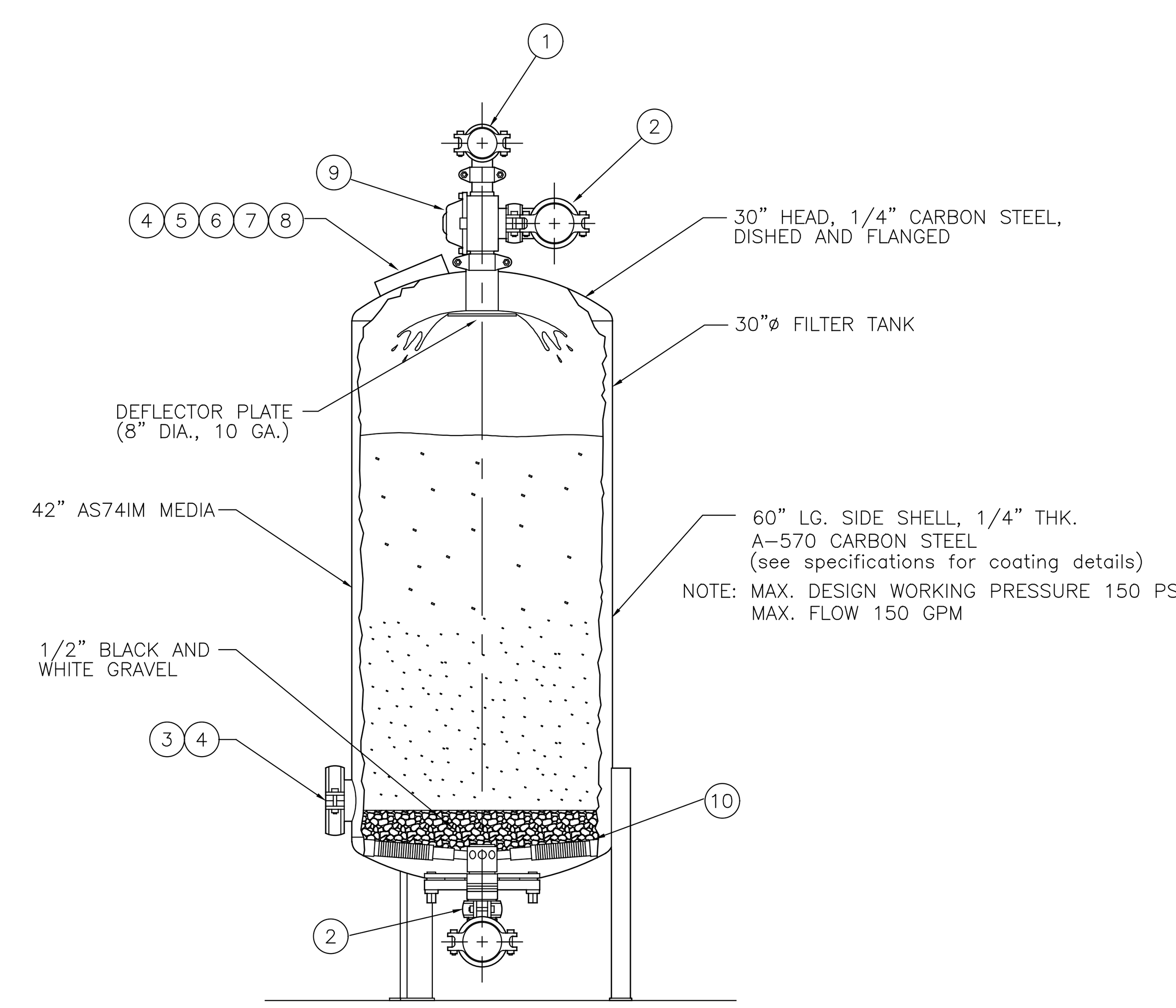


SECTION A–A
SCALE 1" = 1'–0"

0 1' 2'
SCALE IN FEET
NOTE: CHECK SCALE
SCALEABLE IN 22x34 – 1" = 1'–0"
SCALEABLE IN 11x17 – 1/2" = 1'–0"



BACKWASH ASSEMBLY
(SHIPPED LOOSE)
(ADDITIONAL COST)



TANK SECTION

NOTES:
(1) DESIGNER SHALL DETERMINE NO. AND DEPTH OF ANCHOR BOLTS TO SUIT LOCAL CODE REQUIREMENTS. FOUR BOLTS ARE REQUIRED AS A MINIMUM AT EXTERIOR GUSSETS.
(2) ANCHOR BOLT HOLES ARE TO BE DRILLED INTO CONCRETE FOUNDATION THROUGH OVERSIZED DRILL HOLES IN GUSSETS IN SKID ASSEMBLY BY INSTALLATION CONTRACTOR.
(3) 1/4" THICK S/S PADS ARE PROVIDED UNDER SKIDS FOR CLEARANCE BETWEEN SKIDS AND CONCRETE FOUNDATION. SIX PADS ARE PROVIDED FOR 2 & 3 FILTER SKIDS, EIGHT PADS FOR 3–14 FILTER SKIDS

FILTER TANKS AND MANIFOLDS ON THIS SHEET SUPPLIED BY ATEC SYSTEMS:

THE CONTRACTOR WILL BE RESPONSIBLE FOR:
1. UNLOADING THE UNITS AND PLACING THEM IN THE CORRECT INSTALLED LOCATION.
2. ATTACH MANIFOLDS CONNECTING THE TWO BANKS OF FILTERS.
3. LOADING THE TWO TYPE OF MEDIA INTO THE FILTER.
4. CONNECTING POWER SUPPLY TO FILTER BACKWASH PLC (120 VAC, SWITCHED CIRCUIT).

NOTE:
DIMENSIONS GIVEN ARE FOR THE CONTRACTOR'S INFORMATION BUT WILL VARY BECAUSE OF NORMAL FABRICATION TOLERANCES. CONTRACTOR SHALL CONNECT EXTERIOR PIPING TO FIT THE ATEC UNIT AS SHIPPED.

DESIGN BY: .
DRAWN BY: .
CHECKED BY: .
APR'D BY: .

NO.	DATE		BY	APVD

0 1' 2'
SCALE IN FEET
NOTE: CHECK SCALE
SCALEABLE IN 22x34 – 1" = 1'–0"
SCALEABLE IN 11x17 – 1/2" = 1'–0"

IRON AND MANGANESE TREATMENT
ESTATES WATER SYSTEM
NORTH AND SOUTH WELLS

FILTER DETAILS

SHEET NO. 2 of 1
DWG. NO.
DATE: 8/20/2021
FILE: Estates Water System N & S

APPENDIX P
System Capacity Calculations

WATER SYSTEM INFORMATION

System:	Estates Inc.
PWS ID:	08166 9
Location:	Clallam County, Washington
Owner:	Cascadia Water
Operator:	Dale Metzger

Operating Permit	
Issue Date	9/1/2022
Color	Green

Water Facilities Inventory (WFI) Form	
Date Printed	3/8/2022
Active Residential Connections	365
Active Residential Population	913
Active Non-Residential Connections	2
Average Non-Residential Population	1000
Approved Connections	480

WATER RIGHTS SUMMARY

System: Estates Inc.
PWS ID: 08166 9
Location: Clallam County, Washington

Certificate #	Name	Priority Date	Source Name	Primary or Supplemental	Q_i (gpm) Additive	Q_i (gpm) Non-Additive	Q_a (acre-ft) Additive	Q_a (acre-ft) Non-Additive
G2-27484C	Estates Water System, Inc.	02/14/89	2 Wells	Primary	500		240.0	
				Total	500		240	
				max flow per day (gal)	600,000		10,454,400	
				max flow per year (gal)	219,000,000		78,198,912	
							214,244	

Q_i = Maximum Instantaneous Flow Rate
V_a = Maximum Annual Withdrawal

Conversion Factors	
square feet per acre	43,560
gallons per CF	7.48
days per year	365
hours per day	24

Pump	
pump cycles per hour	6
pump run per hour (min)	50
pump run per day (min)	1200

SOURCE INFORMATION

System: Estates Inc.
PWS ID: 08166 9
Location: Clallam County, Washington

Source						
Status	Active					Emergency
Source ID	Well 1	Well 2				
IC Hydrogeo ID						
DOE Well Tag	ACA573	ACA574				
Category	Well	Well				
Use	Permanent	Permanent				
Treatment	None	None				
Capacity (gpm)	180	180				
Depth to First Interval (ft)	407	436				
Casing (in)	6"/4"	8"/6"/4"				
Screen Diameter (in)	4	5.5				
Location						
1/4, 1/4	SE SE	SE SE				
Section	4	4				
Township	30N	30N				
Range	04W	04W				
Elevations						
Ground	140	140				
Top of Casing	141	141				
Top of Screen	-266	-295				
Bottom of Screen	-452	-305				
Bottom of Well	-467	-321				

Account	2020 No. Bills	2020 Usage (cu.ft.)	2020 Usage (gallons)	2020 Monthly Average	2021 No. Bills	2021 Usage (cu.ft.)	2021 Usage (gallons)	2021 Monthly Average	2022 No. Bills	2022 Usage (cu.ft.)	2022 Usage (gallons)	2022 Monthly Average
000000003001	6	11,500	86,020	7,168	6	15,100	112,948	9,412	6	5,700	42,636	3,553
000000003002	6	7,300	54,604	4,550	6	6,800	50,864	4,239	6	6,600	49,368	4,114
000000003003	6	6,400	47,872	3,989	6	5,400	40,392	3,366	6	6,200	46,376	3,865
000000003004	6	1,600	11,968	997	6	1,300	9,724	810	6	1,800	13,464	1,122
000000003005	6	16,900	126,412	10,534	6	15,000	112,200	9,350	6	12,200	91,256	7,605
000000003006	6	5,100	38,148	3,179	6	5,000	37,400	3,117	6	5,100	38,148	3,179
000000003007	6	4,800	35,904	2,992	6	5,300	39,644	3,304	6	6,200	46,376	3,865
000000003008	6	6,200	46,376	3,865	6	5,000	37,400	3,117	6	3,800	28,424	2,369
000000003009	6	2,400	17,952	1,496	6	1,800	13,464	1,122	6	2,000	14,960	1,247
000000003010	6	8,500	63,580	5,298	6	9,600	71,808	5,984	6	9,900	74,052	6,171
000000003011	6	8,600	64,328	5,361	6	6,800	50,864	4,239	6	3,400	25,432	2,119
000000003012	6	2,600	19,448	1,621	6	5,200	38,896	3,241	6	4,800	35,904	2,992
000000003013	6	8,700	65,076	5,423	6	5,900	44,132	3,678	6	4,300	32,164	2,680
000000003014	4	2,100	15,708	1,964	6	2,800	20,944	1,745	6	3,200	23,936	1,995
000000003015	6	11,600	86,768	7,231	6	10,300	77,044	6,420	6	11,700	87,516	7,293
000000003016	6	3,900	29,172	2,431	6	6,000	44,880	3,740	6	8,000	59,840	4,987
000000003017	0	0	0	0	0	0	0	0	2	800	5,984	1,496
000000003018	6	4,400	32,912	2,743	6	5,100	38,148	3,179	6	3,000	22,440	1,870
000000003019	6	11,100	83,028	6,919	6	6,900	51,612	4,301	6	4,700	35,156	2,930
000000003020	6	8,000	59,840	4,987	6	9,000	67,320	5,610	6	6,300	47,124	3,927
000000003021	6	7,900	59,092	4,924	6	9,100	68,068	5,672	6	7,800	58,344	4,862
000000003022	6	7,300	54,604	4,550	6	8,600	64,328	5,361	6	8,600	64,328	5,361
000000003023	6	9,600	71,808	5,984	6	6,500	48,620	4,052	6	6,000	44,880	3,740
000000003024	6	5,100	38,148	3,179	6	5,700	42,636	3,553	6	3,100	23,188	1,932
000000003025	6	9,800	73,304	6,109	6	8,900	66,572	5,548	6	8,100	60,588	5,049
000000003026	6	12,300	92,004	7,667	6	15,300	114,444	9,537	6	12,300	92,004	7,667
000000003027	6	8,800	65,824	5,485	6	10,300	77,044	6,420	6	12,500	93,500	7,792
000000003028	6	5,600	41,888	3,491	6	3,600	26,928	2,244	6	3,100	23,188	1,932
000000003029	6	4,800	35,904	2,992	6	4,300	32,164	2,680	6	3,700	27,676	2,306
000000003030	6	16,700	124,916	10,410	6	17,800	133,144	11,095	6	19,000	142,120	11,843
000000003031	6	26,600	198,968	16,581	6	12,000	89,760	7,480	6	7,700	57,596	4,800
000000003032	6	17,900	133,892	11,158	6	22,800	170,544	14,212	6	14,400	107,712	8,976
000000003033	6	2,400	17,952	1,496	6	2,300	17,204	1,434	6	2,800	20,944	1,745
000000003034	6	6,700	50,116	4,176	6	7,200	53,856	4,488	6	7,500	56,100	4,675
000000003035	6	4,900	36,652	3,054	6	5,500	41,140	3,428	6	4,300	32,164	2,680
000000003036	6	3,900	29,172	2,431	6	3,500	26,180	2,182	6	3,300	24,684	2,057
000000003037	6	8,300	62,084	5,174	6	7,100	53,108	4,426	6	11,700	87,516	7,293
000000003038	6	2,600	19,448	1,621	6	1,900	14,212	1,184	6	1,700	12,716	1,060
000000003039	0	0	0	0	2	1,300	9,724	2,431	6	4,900	36,652	3,054
000000003040	6	14,400	107,712	8,976	6	9,200	68,816	5,735	6	8,200	61,336	5,111
000000003041	6	7,400	55,352	4,613	6	7,800	58,344	4,862	6	8,100	60,588	5,049
000000003042	6	3,800	28,424	2,369	6	3,000	22,440	1,870	6	3,500	26,180	2,182
000000003043	6	4,400	32,912	2,743	6	3,400	25,432	2,119	6	3,200	23,936	1,995
000000003044	6	7,300	54,604	4,550	6	11,700	87,516	7,293	6	9,300	69,564	5,797
000000003045	6	7,200	53,856	4,488	6	7,600	56,848	4,737	6	8,200	61,336	5,111
000000003046	6	8,300	62,084	5,174	6	8,600	64,328	5,361	6	20,500	153,340	12,778
000000003047	6	5,900	44,132	3,678	6	5,600	41,888	3,491	6	4,800	35,904	2,992
000000003048	0	0	0	0	0	0	0	0	4	13,900	103,972	12,997
000000003049	6	15,100	112,948	9,412	6	11,900	89,012	7,418	6	6,400	47,872	3,989
000000003050	6	22,500	168,300	14,025	6	19,900	148,852	12,404	6	21,000	157,080	13,090
000000003051	1	5,100	38,148	19,074	6	12,900	96,492	8,041	6	15,300	114,444	9,537
000000003052	6	5,200	38,896	3,241	6	7,800	58,344	4,862	6	3,800	28,424	2,369
000000003053	5	4,300	32,164	3,216	6	7,200	53,856	4,488	6	7,200	53,856	4,488
000000003054	6	16,500	123,420	10,285	6	12,400	92,752	7,729	6	10,500	78,540	6,545
000000003055	4	5,100	38,148	4,769	6	13,100	97,988	8,166	6	11,700	87,516	7,293
000000003056	0	0	0	0	0	0	0	0	1	100	748	374
000000003057	0	0	0	0	0	0	0	0	3	4,800	35,904	5,984
000000003058	6	6,100	45,628	3,802	6	5,700	42,636	3,553	6	5,700	42,636	3,553
000000003059	6	35,300	264,044	22,004	6	28,500	213,180	17,765	6	26,200	195,976	16,331
000000003060	6	7,100	53,108	4,426	6	6,000	44,880	3,740	6	17,800	133,144	11,095
000000003061	6	8,400	62,832	5,236	6	5,300	39,644	3,304	6	3,000	22,440	1,870
000000003062	6	12,100	90,508	7,542	6	11,400	85,272	7,106	6	11,300	84,524	7,044
000000003063	0	0	0	0	2	100	748	187	6	3,400	25,432	2,119
000000003064	6	6,700	50,116	4,176	6	9,000	67,320	5,610	6	6,900	51,612	4,301
000000003065	0	0	0	0	1	3,500	26,180	13,090	6	21,800	163,064	13,589
000000003066	6	7,600	56,848	4,737	6	10,900	81,532	6,794	6	7,300	54,604	4,550
000000003067	6	5,600	41,888	3,491	6	5,800	43,384	3,615	6	5,700	42,636	3,553
000000003068	6	11,000	82,280	6,857	6	13,300	99,484	8,290	6	16,700	124,916	10,410
000000003069	6	3,100	23,188	1,932	6	2,000	14,960	1,247	6	1,800	13,464	1,122
000000003070	6	13,300	99,484	8,290	6	10,600	79,288	6,607	6	5,500	41,140	3,428
000000003071	6	4,900	36,652	3,054	6	4,400	32,912	2,743	6	3,400	25,432	2,119
000000003072	6	6,400	47,872	3,989	6	10,000	74,800	6,233	6	10,000	74,800	6,233
000000003073	6	2,800	20,944	1,745	6	0	0	0	6	400	2,992	249
000000003074	0	0	0	0	6	8,500	63,580	5,298	6	6,200	46,376	3,865
000000003075	6	7,700	57,596	4,800	6	5,700	42,636	3,553	6	2,500	18,700	1,558
000000003076	6	1,700	12,716	1,060	6	1,800	13,464	1,122	6	2,000	14,960	1,247
000000003077	0	0	0	0	1	600	4,488	2,244	6	7,500	56,100	4,675
000000003078	6	3,750	28,050	2,338	6	6,200	46,376	3,865	6	8,000	59,840	4,987
000000003079	6	30,100	225,148	18,762	6	40,500	302,940	25,245	6	37,200	278,256	23,188
000000003080	6	23,200	173,536	14,461	6	23,800	178,024	14,835	6	21,400	160,072	13,339
000000003081	6	5,300	39,644	3,304	6	4,500	33,660	2,805	6	4,300	32,164	2,680
000000003082	6	8,500	63,580	5,298	6	9,600	71,808	5,984	6	8,500	63,580	5,298
000000003083	6	13,000	97,240	8,103	6	12,000	89,760	7,480	6	10,100	75,548	6,296
000000003084	0	0	0	0	5	4,100	30,668	3,067	6	5,700	42,636	3,553

Account	2020 No. Bills	2020 Usage (cu.ft.)	2020 Usage (gallons)	2020 Monthly Average	2021 No. Bills	2021 Usage (cu.ft.)	2021 Usage (gallons)	2021 Monthly Average	2022 No. Bills	2022 Usage (cu.ft.)	2022 Usage (gallons)	2022 Monthly Average
000000003085	6	7,900	59,092	4,924	6	5,900	44,132	3,678	6	6,200	46,376	3,865
000000003086	6	2,700	20,196	1,683	6	2,200	16,456	1,371	6	2,200	16,456	1,371
000000003087	0	0	0	0	0	0	0	0	2	1,900	14,212	3,553
000000003088	6	16,600	124,168	10,347	6	12,400	92,752	7,729	6	7,000	52,360	4,363
000000003089	6	8,500	63,580	5,298	6	6,100	45,628	3,802	6	7,100	53,108	4,426
000000003090	6	2,500	18,700	1,558	6	2,300	17,204	1,434	6	1,400	10,472	873
000000003091	6	11,900	89,012	7,418	6	6,700	50,116	4,176	6	5,200	38,896	3,241
000000003092	0	0	0	0	4	9,500	71,060	8,883	6	8,900	66,572	5,548
000000003093	0	0	0	0	0	0	0	0	3	1,100	8,228	1,371
000000003094	6	8,600	64,328	5,361	6	4,800	35,904	2,992	6	3,300	24,684	2,057
000000003095	1	900	6,732	3,366	6	5,700	42,636	3,553	6	5,400	40,392	3,366
000000003096	6	10,100	75,548	6,296	6	8,300	62,084	5,174	6	8,000	59,840	4,987
000000003097	6	1,800	13,464	1,122	6	1,600	11,968	997	6	3,400	25,432	2,119
000000003098	6	7,100	53,108	4,426	6	7,300	54,604	4,550	6	7,800	58,344	4,862
000000003099	6	6,200	46,376	3,865	6	5,900	44,132	3,678	6	5,000	37,400	3,117
000000003100	6	4,800	35,904	2,992	6	4,700	35,156	2,930	6	3,700	27,676	2,306
000000003101	6	9,700	72,556	6,046	6	12,300	92,004	7,667	6	10,600	79,288	6,607
000000003103	6	6,200	46,376	3,865	6	6,600	49,368	4,114	6	7,300	54,604	4,550
000000003104	0	0	0	0	0	0	0	0	3	2,600	19,448	3,241
000000003105	6	10,000	74,800	6,233	6	10,100	75,548	6,296	6	9,300	69,564	5,797
000000003106	6	4,800	35,904	2,992	6	5,600	41,888	3,491	6	3,900	29,172	2,431
000000003107	6	10,200	76,296	6,358	6	8,100	60,588	5,049	6	7,000	52,360	4,363
000000003108	6	2,400	17,952	1,496	6	9,000	67,320	5,610	6	4,800	35,904	2,992
000000003109	6	7,300	54,604	4,550	6	7,900	59,092	4,924	6	6,800	50,864	4,239
000000003110	6	7,800	58,344	4,862	6	7,700	57,596	4,800	6	6,000	44,880	3,740
000000003111	6	6,900	51,612	4,301	6	5,200	38,896	3,241	6	4,300	32,164	2,680
000000003112	6	2,100	15,708	1,309	6	1,600	11,968	997	6	1,600	11,968	997
000000003113	6	4,700	35,156	2,930	6	6,700	50,116	4,176	6	5,300	39,644	3,304
000000003114	6	6,200	46,376	3,865	6	5,700	42,636	3,553	6	6,000	44,880	3,740
000000003115	6	13,400	100,232	8,353	6	9,900	74,052	6,171	5	7,500	56,100	5,610
000000003116	6	19,200	143,616	11,968	6	19,700	147,356	12,280	6	13,000	97,240	8,103
000000003117	6	43,500	325,380	27,115	6	18,800	140,624	11,719	6	19,500	145,860	12,155
000000003118	6	2,700	20,196	1,683	6	3,000	22,440	1,870	6	6,700	50,116	4,176
000000003119	6	3,700	27,676	2,306	6	6,200	46,376	3,865	6	3,600	26,928	2,244
000000003120	6	2,700	20,196	1,683	6	2,400	17,952	1,496	6	1,700	12,716	1,060
000000003121	6	8,800	65,824	5,485	6	9,200	68,816	5,735	6	6,900	51,612	4,301
000000003122	6	43,000	321,640	26,803	6	56,700	424,116	35,343	6	39,600	296,208	24,684
000000003123	6	5,800	43,384	3,615	6	5,900	44,132	3,678	6	6,200	46,376	3,865
000000003124	6	4,400	32,912	2,743	6	3,300	24,684	2,057	6	3,000	22,440	1,870
000000003125	6	20,800	155,584	12,965	6	37,800	282,744	23,562	6	36,100	270,028	22,502
000000003126	6	6,000	44,880	3,740	6	9,200	68,816	5,735	6	6,500	48,620	4,052
000000003127	6	6,900	51,612	4,301	6	11,400	85,272	7,106	6	11,000	82,280	6,857
000000003128	2	2,200	16,456	4,114	6	6,300	47,124	3,927	6	4,200	31,416	2,618
000000003129	6	2,100	15,708	1,309	6	1,100	8,228	686	6	4,300	32,164	2,680
000000003130	6	15,300	114,444	9,537	6	19,800	148,104	12,342	6	25,100	187,748	15,646
000000003131	0	0	0	0	0	0	0	0	4	15,200	113,696	14,212
000000003132	0	0	0	0	3	2,400	17,952	2,992	6	7,900	59,092	4,924
000000003133	6	23,600	176,528	14,711	6	26,400	197,472	16,456	6	22,600	169,048	14,087
000000003134	0	0	0	0	3	1,400	10,472	1,745	6	8,100	60,588	5,049
000000003135	6	8,000	59,840	4,987	6	8,000	59,840	4,987	6	5,400	40,392	3,366
000000003136	6	9,600	71,808	5,984	6	13,400	100,232	8,353	6	18,600	139,128	11,594
000000003137	2	2,700	20,196	5,049	6	3,500	26,180	2,182	6	11,800	88,264	7,355
000000003138	6	38,400	287,232	23,936	6	39,700	296,956	24,746	6	34,129	255,285	21,274
000000003139	6	6,300	47,124	3,927	6	6,400	47,872	3,989	6	5,700	42,636	3,553
000000003140	6	5,000	37,400	3,117	6	3,500	26,180	2,182	6	6,500	48,620	4,052
000000003141	6	15,500	115,940	9,662	6	13,900	103,972	8,664	6	10,000	74,800	6,233
000000003142	6	2,100	15,708	1,309	6	1,500	11,220	935	6	1,600	11,968	997
000000003143	6	5,100	38,148	3,179	6	3,100	23,188	1,932	6	5,000	37,400	3,117
000000003144	0	0	0	0	2	1,000	7,480	1,870	6	10,200	76,296	6,358
000000003145	6	9,900	74,052	6,171	6	5,200	38,896	3,241	6	2,400	17,952	1,496
000000003146	6	4,000	29,920	2,493	6	2,800	20,944	1,745	6	15,700	117,436	9,786
000000003147	1	300	2,244	1,122	6	3,900	29,172	2,431	6	3,500	26,180	2,182
000000003148	6	10,300	77,044	6,420	6	10,800	80,784	6,732	6	10,200	76,296	6,358
000000003149	6	6,700	50,116	4,176	6	16,500	123,420	10,285	6	7,300	54,604	4,550
000000003150	6	13,800	103,224	8,602	6	17,700	132,396	11,033	6	15,700	117,436	9,786
000000003151	6	81,200	607,376	50,615	6	103,100	771,188	64,266	6	88,500	661,980	55,165
000000003152	6	11,000	82,280	6,857	6	8,600	64,328	5,361	6	6,000	44,880	3,740
000000003153	6	4,400	32,912	2,743	6	3,200	23,936	1,995	6	2,800	20,944	1,745
000000003154	6	12,900	96,492	8,041	6	13,300	99,484	8,290	6	12,400	92,752	7,729
000000003155	6	4,500	33,660	2,805	6	5,300	39,644	3,304	6	6,600	49,368	4,114
000000003156	6	4,500	33,660	2,805	6	8,800	65,824	5,485	6	10,400	77,792	6,483
000000003157	6	14,900	111,452	9,288	6	16,000	119,680	9,973	6	16,000	119,680	9,973
000000003158	6	9,100	68,068	5,672	6	9,500	71,060	5,922	6	26,400	197,472	16,456
000000003159	6	7,300	54,604	4,550	6	5,200	38,896	3,241	6	5,100	38,148	3,179
000000003160	6	17,000	127,160	10,597	6	15,600	116,688	9,724	6	10,700	80,036	6,670
000000003161	6	7,900	59,092	4,924	6	5,500	41,140	3,428	6	5,400	40,392	3,366
000000003162	6	6,600	49,368	4,114	6	6,400	47,872	3,989	6	11,800	88,264	7,355
000000003163	6	13,700	102,476	8,540	6	15,400	115,192	9,599	6	12,500	93,500	7,792
000000003164	6	2,500	18,700	1,558	6	2,400	17,952	1,496	6	2,200	16,456	1,371
000000003165	6	7,500	56,100	4,675	6	7,600	56,848	4,737	6	7,500	56,100	4,675
000000003166	6	20,900	156,332	13,028	6	25,200	188,496	15,708	6	27,400	204,952	17,079
000000003167	6	7,100	53,108	4,426	6	4,600	34,408	2,867	6	3,100	23,188	1,932
000000003168	6	34,700	259,556	21,630	6	29,800	222,904	18,575	6	21,700	162,316	13,526
000000003169	6	11,500	86,020	7,168	6	8,500	63,580	5,298	6	6,000	44,880	3,740

Account	2020				2021				2022			
	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average
000000003170	6	22,000	164,560	13,713	6	7,700	57,596	4,800	6	2,500	18,700	1,558
000000003172	6	12,500	93,500	7,792	6	14,000	104,720	8,727	6	12,900	96,492	8,041
000000003173	6	6,100	45,628	3,802	6	9,100	68,068	5,672	6	11,800	88,264	7,355
000000003174	1	200	1,496	748	6	4,600	34,408	2,867	6	4,500	33,660	2,805
000000003175	6	1,200	8,976	748	6	2,000	14,960	1,247	6	900	6,732	561
000000003176	6	3,200	23,936	1,995	6	3,000	22,440	1,870	6	3,100	23,188	1,932
000000003177	6	34,700	259,556	21,630	6	29,200	218,416	18,201	6	31,100	232,628	19,386
000000003178	6	2,600	19,448	1,621	6	2,100	15,708	1,309	6	1,800	13,464	1,122
000000003179	6	8,600	64,328	5,361	6	6,200	46,376	3,865	6	6,100	45,628	3,802
000000003180	6	8,200	61,336	5,111	6	7,000	52,360	4,363	6	8,600	64,328	5,361
000000003181	6	7,000	52,360	4,363	6	7,600	56,848	4,737	6	7,700	57,596	4,800
000000003182	6	12,100	90,508	7,542	6	11,400	85,272	7,106	6	7,000	52,360	4,363
000000003183	6	7,100	53,108	4,426	6	6,600	49,368	4,114	6	8,300	62,084	5,174
000000003184	6	3,900	29,172	2,431	6	4,900	36,652	3,054	6	2,800	20,944	1,745
000000003185	6	5,300	39,644	3,304	6	8,200	61,336	5,111	6	5,900	44,132	3,678
000000003186	0	0	0	0	0	0	0	0	3	4,700	35,156	5,859
000000003187	6	7,800	58,344	4,862	6	8,500	63,580	5,298	6	7,300	54,604	4,550
000000003188	6	1,700	12,716	1,060	6	1,600	11,968	997	6	1,300	9,724	810
000000003189	6	15,500	115,940	9,662	6	6,500	48,620	4,052	6	9,100	68,068	5,672
000000003190	6	5,600	41,888	3,491	6	5,000	37,400	3,117	6	4,400	32,912	2,743
000000003191	6	2,300	17,204	1,434	6	2,400	17,952	1,496	6	2,900	21,692	1,808
000000003192	0	0	0	0	0	0	0	0	3	200	1,496	249
000000003193	6	16,000	119,680	9,973	6	12,000	89,760	7,480	6	6,600	49,368	4,114
000000003194	6	38,600	288,728	24,061	6	30,100	225,148	18,762	6	5,000	37,400	3,117
000000003195	6	5,800	43,384	3,615	6	6,100	45,628	3,802	6	7,200	53,856	4,488
000000003196	6	15,500	115,940	9,662	6	13,000	97,240	8,103	6	21,200	158,576	13,215
000000003197	6	56,500	422,620	35,218	6	29,500	220,660	18,388	6	32,800	245,344	20,445
000000003198	6	13,600	101,728	8,477	6	14,700	109,956	9,163	6	9,700	72,556	6,046
000000003199	6	18,700	139,876	11,656	6	17,500	130,900	10,908	6	16,300	121,924	10,160
000000003200	6	3,700	27,676	2,306	6	7,700	57,596	4,800	6	6,300	47,124	3,927
000000003201	6	23,100	172,788	14,399	6	26,100	195,228	16,269	6	21,000	157,080	13,090
000000003202	6	14,700	109,956	9,163	6	26,800	200,464	16,705	6	11,900	89,012	7,418
000000003203	6	29,700	222,156	18,513	6	13,900	103,972	8,664	6	10,400	77,792	6,483
000000003204	6	7,100	53,108	4,426	6	8,800	65,824	5,485	6	11,200	83,776	6,981
000000003205	6	8,500	63,580	5,298	6	7,600	56,848	4,737	6	6,600	49,368	4,114
000000003206	6	5,500	41,140	3,428	6	5,100	38,148	3,179	6	3,300	24,684	2,057
000000003207	6	40,000	299,200	24,933	6	47,200	353,056	29,421	6	37,800	282,744	23,562
000000003208	6	1,500	11,220	935	6	2,500	18,700	1,558	6	3,500	26,180	2,182
000000003209	1	100	748	374	6	4,100	30,668	2,556	6	3,200	23,936	1,995
School	6	7,400	55,352	4,613	6	14,500	108,460	9,038	6	16,300	121,924	10,160
000000003211	6	7,800	58,344	4,862	6	44,100	329,868	27,489	6	13,420	100,382	8,365
000000003212	6	7,900	59,092	4,924	6	6,000	44,880	3,740	6	5,300	39,644	3,304
000000003213	6	3,900	29,172	2,431	6	2,600	19,448	1,621	6	3,900	29,172	2,431
000000003214	6	11,600	86,768	7,231	6	10,700	80,036	6,670	6	6,200	46,376	3,865
000000003216	6	6,300	47,124	3,927	6	43,400	324,632	27,053	6	33,500	250,580	20,882
000000003217	6	4,300	32,164	2,680	6	4,600	34,408	2,867	6	4,200	31,416	2,618
000000003218	6	16,300	121,924	10,160	5	4,100	30,668	3,067	5	3,900	29,172	2,917
000000003219	6	3,900	29,172	2,431	6	5,100	38,148	3,179	6	5,500	41,140	3,428
000000003220	6	3,300	24,684	2,057	6	2,900	21,692	1,808	6	3,300	24,684	2,057
000000003221	0	0	0	0	0	0	0	0	6	3,300	24,684	2,057
000000003222	6	5,400	40,392	3,366	6	4,400	32,912	2,743	6	3,600	26,928	2,244
000000003223	6	10,500	78,540	6,545	6	10,500	78,540	6,545	6	11,400	85,272	7,106
000000003224	6	7,300	54,604	4,550	6	6,600	49,368	4,114	6	9,500	71,060	5,922
000000003225	6	35,100	262,548	21,879	6	44,800	335,104	27,925	6	48,200	360,536	30,045
000000003226	6	2,300	17,204	1,434	6	5,300	39,644	3,304	6	3,800	28,424	2,369
000000003227	6	5,700	42,636	3,553	6	6,200	46,376	3,865	6	6,300	47,124	3,927
000000003228	6	9,200	68,816	5,735	6	8,700	65,076	5,423	6	6,700	50,116	4,176
000000003229	6	700	5,236	436	6	33,000	246,840	20,570	6	53,700	401,676	33,473
000000003230	3	400	2,992	499	6	3,100	23,188	1,932	6	3,200	23,936	1,995
000000003231	6	7,200	53,856	4,488	6	10,200	76,296	6,358	6	9,500	71,060	5,922
000000003232	6	11,900	89,012	7,418	6	12,700	94,996	7,916	6	9,900	74,052	6,171
000000003233	6	2,200	16,456	1,371	6	1,700	12,716	1,060	6	6,500	48,620	4,052
000000003234	6	10,200	76,296	6,358	6	17,000	127,160	10,597	6	10,200	76,296	6,358
000000003235	6	15,800	118,184	9,849	6	14,700	109,956	9,163	6	12,700	94,996	7,916
000000003236	6	16,200	121,176	10,098	6	3,400	25,432	2,119	6	4,300	32,164	2,680
000000003237	6	5,200	38,896	3,241	6	9,200	68,816	5,735	6	4,100	30,668	2,556
000000003238	0	0	0	0	2	2,300	17,204	4,301	6	6,500	48,620	4,052
000000003239	6	7,900	59,092	4,924	6	6,700	50,116	4,176	6	5,200	38,896	3,241
000000003240	3	1,400	10,472	1,745	4	3,000	22,440	2,805	5	4,700	35,156	3,516
000000003241	6	4,600	34,408	2,867	6	4,300	32,164	2,680	6	4,500	33,660	2,805
000000003242	6	24,300	181,764	15,147	6	27,700	207,196	17,266	6	28,300	211,684	17,640
000000003243	0	0	0	0	0	0	0	0	3	5,600	41,888	6,981
000000003245	2	2,900	21,692	5,423	6	10,100	75,548	6,296	6	5,200	38,896	3,241
000000003246	3	0	0	0	3	0	0	0	2	0	0	0
000000003247	6	3,400	25,432	2,119	5	2,600	19,448	1,945	6	2,000	14,960	1,247
000000003248	6	4,200	31,416	2,618	6	4,800	35,904	2,992	6	2,200	16,456	1,371
000000003249	6	13,100	97,988	8,166	6	8,900	66,572	5,548	6	8,300	62,084	5,174
000000003250	6	29,300	219,164	18,264	6	33,200	248,336	20,695	6	41,900	313,412	26,118
000000003251	6	13,100	97,988	8,166	6	20,100	150,348	12,529	6	18,100	135,388	11,282
000000003252	1	600	4,488	2,244	6	4,800	35,904	2,992	6	4,300	32,164	2,680
000000003253	6	12,900	96,492	8,041	6	8,100	60,588	5,049	6	6,200	46,376	3,865
000000003254	7	6,700	50,116	3,580	6	5,200	38,896	3,241	6	4,700	35,156	2,930
000000003255	0	0	0	0	1	500	3,740	1,870	6	10,700	80,036	6,670
000000003256	6	10,200	76,296	6,358	6	11,800	88,264	7,355	6	12,600	94,248	7,854

Account	2020				2021				2022			
	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average
000000003258	6	14,100	105,468	8,789	6	9,600	71,808	5,984	6	7,500	56,100	4,675
000000003259	6	7,100	53,108	4,426	6	6,800	50,864	4,239	6	6,700	50,116	4,176
000000003261	6	2,900	21,692	1,808	6	2,700	20,196	1,683	6	2,100	15,708	1,309
000000003262	6	5,900	44,132	3,678	6	6,000	44,880	3,740	6	4,700	35,156	2,930
000000003263	0	0	0	0	0	0	0	0	3	2,800	20,944	3,491
000000003264	6	4,100	30,668	2,556	6	3,900	29,172	2,431	6	3,600	26,928	2,244
000000003265	6	2,100	15,708	1,309	6	6,900	51,612	4,301	6	5,400	40,392	3,366
000000003266	6	45,400	339,592	28,299	6	41,600	311,168	25,931	6	46,400	347,072	28,923
000000003267	5	9,200	68,816	6,882	6	13,000	97,240	8,103	6	11,700	87,516	7,293
000000003268	6	4,700	35,156	2,930	6	5,000	37,400	3,117	6	3,400	25,432	2,119
000000003269	6	15,100	112,948	9,412	6	11,800	88,264	7,355	6	11,300	84,524	7,044
000000003270	6	30,000	224,400	18,700	6	65,300	488,444	40,704	6	73,100	546,788	45,566
000000003272	6	4,700	35,156	2,930	6	5,200	38,896	3,241	6	5,200	38,896	3,241
000000003273	6	26,400	197,472	16,456	6	16,000	119,680	9,973	6	22,600	169,048	14,087
000000003274	6	150	1,122	94	6	60	449	37	6	2,090	15,633	1,303
000000003275	5	33,200	248,336	24,834	6	33,600	251,328	20,944	6	26,600	198,968	16,581
000000003276	0	0	0	0	4	200	1,496	187	6	3,300	24,684	2,057
000000003277	6	8,100	60,588	5,049	6	9,300	69,564	5,797	6	8,500	63,580	5,298
000000003278	6	6,200	46,376	3,865	6	5,900	44,132	3,678	6	5,600	41,888	3,491
000000003279	0	0	0	0	5	21,300	159,324	15,932	6	13,400	100,232	8,353
000000003280	6	10,900	81,532	6,794	6	7,300	54,604	4,550	6	6,200	46,376	3,865
000000003281	4	2,600	19,448	2,431	6	7,400	55,352	4,613	6	5,300	39,644	3,304
000000003282	6	5,500	41,140	3,428	6	3,900	29,172	2,431	6	4,000	29,920	2,493
000000003283	6	6,400	47,872	3,989	6	5,000	37,400	3,117	6	3,400	25,432	2,119
000000003284	6	3,300	24,684	2,057	6	3,100	23,188	1,932	6	2,500	18,700	1,558
000000003285	6	400	2,992	249	6	1,000	7,480	623	6	200	1,496	125
000000003286	6	27,200	203,456	16,955	6	12,400	92,752	7,729	6	9,700	72,556	6,046
000000003288	0	0	0	0	0	0	0	0	6	16,200	121,176	10,098
000000003289	6	300	2,244	187	6	5,200	38,896	3,241	6	7,200	53,856	4,488
000000003290	0	0	0	0	4	10,800	80,784	10,098	6	15,000	112,200	9,350
000000003291	6	5,100	38,148	3,179	6	2,600	19,448	1,621	6	2,100	15,708	1,309
000000003292	6	8,300	62,084	5,174	6	7,800	58,344	4,862	6	7,200	53,856	4,488
000000003293	6	10,300	77,044	6,420	6	11,600	86,768	7,231	6	12,200	91,256	7,605
000000003294	6	3,700	27,676	2,306	6	3,100	23,188	1,932	6	4,100	30,668	2,556
000000003295	0	0	0	0	3	5,200	38,896	6,483	6	6,800	50,864	4,239
000000003296	6	24,900	186,252	15,521	6	20,800	155,584	12,965	6	13,900	103,972	8,664
000000003297	0	0	0	0	1	0	0	0	6	5,200	38,896	3,241
000000003298	6	49,700	371,756	30,980	6	64,400	481,712	40,143	6	64,800	484,704	40,392
000000003299	6	4,500	33,660	2,805	5	4,500	33,660	3,366	5	3,200	23,936	2,394
000000003301	6	7,000	52,360	4,363	6	6,600	49,368	4,114	6	6,700	50,116	4,176
000000003302	1	0	0	0	0	0	0	0	0	0	0	0
000000003303	0	0	0	0	2	1,300	9,724	2,431	6	5,200	38,896	3,241
000000003304	6	11,200	83,776	6,981	6	12,200	91,256	7,605	6	8,800	65,824	5,485
000000003305	6	9,800	73,304	6,109	6	10,500	78,540	6,545	6	11,600	86,768	7,231
000000003307	6	2,800	20,944	1,745	6	3,000	22,440	1,870	6	2,900	21,692	1,808
000000003308	6	1,300	9,724	810	6	3,400	25,432	2,119	6	3,000	22,440	1,870
000000003309	6	3,500	26,180	2,182	6	3,300	24,684	2,057	6	3,400	25,432	2,119
000000003310	0	0	0	0	0	0	0	0	4	4,000	29,920	3,740
000000003311	6	4,300	32,164	2,680	6	2,800	20,944	1,745	6	3,500	26,180	2,182
000000003312	6	14,100	105,468	8,789	6	10,500	78,540	6,545	6	10,200	76,296	6,358
000000003313	6	22,800	170,544	14,212	6	24,800	185,504	15,459	6	7,600	56,848	4,737
000000003314	6	5,300	39,644	3,304	6	6,100	45,628	3,802	6	5,702	42,651	3,554
000000003315	6	6,000	44,880	3,740	6	5,700	42,636	3,553	6	5,500	41,140	3,428
000000003316	0	0	0	0	2	400	2,992	748	6	3,300	24,684	2,057
000000003317	6	9,400	70,312	5,859	6	5,700	42,636	3,553	6	4,400	32,912	2,743
000000003318	6	37,600	281,248	23,437	6	20,700	154,836	12,903	6	63,900	477,972	39,831
000000003319	6	7,100	53,108	4,426	6	7,100	53,108	4,426	6	5,600	41,888	3,491
000000003320	6	5,500	41,140	3,428	6	4,300	32,164	2,680	6	0	0	0
000000003321	6	5,500	41,140	3,428	6	5,100	38,148	3,179	6	4,100	30,668	2,556
000000003322	6	5,200	38,896	3,241	6	4,300	32,164	2,680	6	4,300	32,164	2,680
000000003323	3	0	0	0	6	100	748	62	6	2,100	15,708	1,309
000000003324	6	8,600	64,328	5,361	6	7,000	52,360	4,363	6	6,600	49,368	4,114
000000003325	0	0	0	0	1	300	2,244	1,122	6	5,600	41,888	3,491
000000003326	6	4,300	32,164	2,680	6	4,000	29,920	2,493	6	2,600	19,448	1,621
000000003327	6	6,100	45,628	3,802	6	4,900	36,652	3,054	6	4,800	35,904	2,992
000000003328	6	28,000	209,440	17,453	6	25,900	193,732	16,144	6	22,000	164,560	13,713
000000003329	6	19,200	143,616	11,968	6	17,000	127,160	10,597	6	15,400	115,192	9,599
000000003330	2	0	0	0	6	0	0	0	7	1,500	11,220	801
000000003331	0	0	0	0	0	0	0	0	4	0	0	0
000000003332	6	0	0	0	6	0	0	0	6	0	0	0
000000003333	6	0	0	0	6	0	0	0	6	1,400	10,472	873
000000003334	0	0	0	0	0	0	0	0	4	0	0	0
000000003335	0	0	0	0	0	0	0	0	2	1,400	10,472	2,618
000000003336	0	0	0	0	0	0	0	0	4	364	2,723	340
000000003337	6	9,500	71,060	5,922	6	11,200	83,776	6,981	6	8,700	65,076	5,423
000000003338	0	0	0	0	0	0	0	0	4	2,700	20,196	2,525
000000003339	3	33,000	246,840	41,140	5	19,400	145,112	14,511	6	13,700	102,476	8,540
000000003340	6	9,500	71,060	5,922	6	34,300	256,564	21,380	6	30,600	228,888	19,074
000000003341	6	31,400	234,872	19,573	6	32,200	240,856	20,071	6	28,900	216,172	18,014
000000003342	6	7,100	53,108	4,426	6	10,800	80,784	6,732	6	6,900	51,612	4,301
000000003343	6	4,800	35,904	2,992	6	5,300	39,644	3,304	6	5,400	40,392	3,366
000000003344	6	4,700	35,156	2,930	6	4,300	32,164	2,680	6	5,800	43,384	3,615
000000003345	6	39,000	291,720	24,310	6	32,100	240,108	20,009	6	32,400	242,352	20,196
000000003346	6	21,200	158,576	13,215	6	27,900	208,692	17,391	6	25,600	191,488	15,957

Account	2020				2021				2022			
	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average
000000003347	6	1,800	13,464	1,122	6	900	6,732	561	6	10,000	74,800	6,233
000000003348	6	4,800	35,904	2,992	6	3,600	26,928	2,244	6	3,500	26,180	2,182
000000003349	0	0	0	0	0	0	0	0	3	5	37	6
000000003350	6	22,500	168,300	14,025	6	32,800	245,344	20,445	6	25,800	192,984	16,082
000000003351	6	5,800	43,384	3,615	6	5,500	41,140	3,428	6	6,100	45,628	3,802
000000003352	6	1,100	8,228	686	6	5,500	41,140	3,428	6	4,600	34,408	2,867
Fish & Wild	6	4,500	33,660	2,805	6	7,800	58,344	4,862	6	7,400	55,352	4,613
000000003354	0	0	0	0	3	9,700	72,556	12,093	6	21,200	158,576	13,215
000000003355	6	17,100	127,908	10,659	6	12,400	92,752	7,729	6	9,600	71,808	5,984
000000003356	0	0	0	0	2	1,000	7,480	1,870	6	6,000	44,880	3,740
Fish & Wild	4	45,400	339,592	42,449	6	22,100	165,308	13,776	2	2,000	14,960	3,740
000000003358	6	4,200	31,416	2,618	6	3,600	26,928	2,244	6	2,700	20,196	1,683
000000003359	6	1,900	14,212	1,184	6	3,800	28,424	2,369	6	1,100	8,228	686
000000003360	6	33,500	250,580	20,882	6	38,700	289,476	24,123	6	30,300	226,644	18,887
000000003361	6	9,000	67,320	5,610	6	7,300	54,604	4,550	6	6,800	50,864	4,239
000000003362	0	0	0	0	2	1,800	13,464	3,366	6	2,500	18,700	1,558
000000003363	0	0	0	0	0	0	0	0	2	0	0	0
000000003364	6	3,900	29,172	2,431	6	4,200	31,416	2,618	6	4,200	31,416	2,618
000000003365	6	20,300	151,844	12,654	6	16,500	123,420	10,285	6	17,100	127,908	10,659
000000003366	6	15,000	112,200	9,350	6	11,400	85,272	7,106	6	11,800	88,264	7,355
000000003367	6	4,000	29,920	2,493	6	4,300	32,164	2,680	6	4,800	35,904	2,992
000000003368	6	6,100	45,628	3,802	6	5,400	40,392	3,366	6	5,000	37,400	3,117
000000003369	6	7,000	52,360	4,363	6	6,600	49,368	4,114	6	5,600	41,888	3,491
000000003371	6	4,000	29,920	2,493	6	4,600	34,408	2,867	6	4,600	34,408	2,867
000000003372	6	0	0	0	6	0	0	0	6	0	0	0
000000003373	6	8,000	59,840	4,987	6	10,700	80,036	6,670	6	16,100	120,428	10,036
000000003374	6	27,800	207,944	17,329	6	23,100	172,788	14,399	6	20,400	152,592	12,716
000000003375	6	7,900	59,092	4,924	6	26,400	197,472	16,456	6	7,800	58,344	4,862
000000003377	6	6,700	50,116	4,176	6	8,600	64,328	5,361	6	10,700	80,036	6,670
000000003378	6	6,400	47,872	3,989	6	6,500	48,620	4,052	6	6,700	50,116	4,176
000000003379	6	2,000	14,960	1,247	6	4,700	35,156	2,930	6	1,700	12,716	1,060
000000003380	6	29,900	223,652	18,638	6	25,000	187,000	15,583	6	14,900	111,452	9,288
000000003381	0	0	0	0	0	0	0	0	1	0	0	0
000000003382	0	0	0	0	3	8,500	63,580	10,597	6	11,000	82,280	6,857
000000003383	5	17,200	128,656	12,866	6	9,900	74,052	6,171	6	14,500	108,460	9,038
000000003384	0	0	0	0	2	8,100	60,588	15,147	6	11,500	86,020	7,168
000000003385	6	9,400	70,312	5,859	6	5,000	37,400	3,117	6	7,400	55,352	4,613
000000003386	0	0	0	0	6	3,900	29,172	2,431	6	5,600	41,888	3,491
000000003387	6	6,300	47,124	3,927	6	33,600	251,328	20,944	6	17,700	132,396	11,033
000000003388	6	2,200	16,456	1,371	6	4,400	32,912	2,743	6	600	4,488	374
000000003389	1	100	748	374	6	12,800	95,744	7,979	6	14,800	110,704	9,225
Clallam Co	6	112,000	837,760	69,813	6	123,000	920,040	76,670	6	87,500	654,500	54,542
000000003999	0	0	0	0	1	12,390	92,677	46,339	0	0	0	0
3014.01	3	1,100	8,228	1,371	0	0	0	0	0	0	0	0
3017.01	6	2,700	20,196	1,683	6	2,400	17,952	1,496	5	1,100	8,228	823
3039.01	6	3,200	23,936	1,995	4	1,600	11,968	1,496	0	0	0	0
3048.01	6	14,800	110,704	9,225	6	18,700	139,876	11,656	2	500	3,740	935
3051.01	5	23,000	172,040	17,204	0	0	0	0	0	0	0	0
3053.01	2	500	3,740	935	0	0	0	0	0	0	0	0
3055.01	2	2,300	17,204	4,301	0	0	0	0	0	0	0	0
3056.01	6	4,600	34,408	2,867	6	5,200	38,896	3,241	7	7,800	58,344	4,167
3057.01	6	8,000	59,840	4,987	6	4,300	32,164	2,680	4	1,500	11,220	1,403
3063.01	6	3,200	23,936	1,995	4	3,200	23,936	2,992	0	0	0	0
3065.01	2	1,100	8,228	2,057	0	0	0	0	0	0	0	0
3065.02	6	8,000	59,840	4,987	2	2,100	15,708	3,927	0	0	0	0
3065.03	0	0	0	0	3	1,600	11,968	1,995	0	0	0	0
3074.01	6	7,400	55,352	4,613	0	0	0	0	0	0	0	0
3077.01	6	6,900	51,612	4,301	4	7,600	56,848	7,106	0	0	0	0
3084.01	6	15,700	117,436	9,786	2	0	0	0	0	0	0	0
3087.01	6	29,600	221,408	18,451	6	31,000	231,880	19,323	5	10,500	78,540	7,854
3092.01	6	9,800	73,304	6,109	3	2,900	21,692	3,615	0	0	0	0
3093.01	6	9,700	72,556	6,046	6	8,800	65,824	5,485	4	5,600	41,888	5,236
3095.01	5	8,800	65,824	6,582	0	0	0	0	0	0	0	0
3102.01	6	2,600	19,448	1,621	6	100	748	62	6	2,400	17,952	1,496
3104.01	6	11,600	86,768	7,231	6	7,600	56,848	4,737	1	400	2,992	1,496
3128.01	2	1,100	8,228	2,057	0	0	0	0	0	0	0	0
3128.02	3	0	0	0	0	0	0	0	0	0	0	0
3131.01	6	21,600	161,568	13,464	6	25,500	190,740	15,895	2	1,400	10,472	2,618
3132.01	6	8,900	66,572	5,548	3	2,400	17,952	2,992	0	0	0	0
3134.01	6	44,200	330,616	27,551	2	900	6,732	1,683	0	0	0	0
3137.01	4	200	1,496	187	0	0	0	0	0	0	0	0
3144.01	6	3,800	28,424	2,369	4	2,300	17,204	2,151	0	0	0	0
3144.02	0	0	0	0	1	200	1,496	748	0	0	0	0
3147.01	6	3,500	26,180	2,182	0	0	0	0	0	0	0	0
3171.01	6	7,000	52,360	4,363	6	4,200	31,416	2,618	4	0	0	0
3174.01	6	700	5,236	436	0	0	0	0	0	0	0	0
3186.01	6	15,600	116,688	9,724	6	7,600	56,848	4,737	4	2,200	16,456	2,057
3192.01	6	14,400	107,712	8,976	3	3,400	25,432	4,239	0	0	0	0
3192.02	0	0	0	0	4	5,200	38,896	4,862	5	7,700	57,596	5,760
3209.01	5	3,200	23,936	2,394	0	0	0	0	0	0	0	0
3215.01	6	19,000	142,120	11,843	6	26,200	195,976	16,331	7	31,900	238,612	17,044
3221.01	6	6,600	49,368	4,114	5	9,400	70,312	7,031	0	0	0	0
3221.02	0	0	0	0	1	500	3,740	1,870	0	0	0	0
3230.01	3	0	0	0	0	0	0	0	0	0	0	0

Account	2020				2021				2022			
	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average	No. Bills	Usage (cu.ft.)	Usage (gallons)	Monthly Average
3238.01	6	13,200	98,736	8,228	4	8,400	62,832	7,854	0	0	0	0
3240.01	3	3,200	23,936	3,989	0	0	0	0	0	0	0	0
3243.01	6	1,900	14,212	1,184	1	0	0	0	0	0	0	0
3243.02	0	0	0	0	5	2,000	14,960	1,496	3	900	6,732	1,122
3244.01	6	26,000	194,480	16,207	6	18,100	135,388	11,282	6	11,000	82,280	6,857
3245.02	5	3,300	24,684	2,468	0	0	0	0	0	0	0	0
3252.01	5	4,200	31,416	3,142	0	0	0	0	0	0	0	0
3255.01	6	4,300	32,164	2,680	6	5,600	41,888	3,491	0	0	0	0
3260.01	6	9,200	68,816	5,735	6	3,300	24,684	2,057	6	1,800	13,464	1,122
3263.01	6	18,900	141,372	11,781	6	16,100	120,428	10,036	4	3,000	22,440	2,805
3271.01	6	4,600	34,408	2,867	3	1,500	11,220	1,870	0	0	0	0
3271.02	0	0	0	0	3	1,700	12,716	2,119	6	6,900	51,612	4,301
3279.01	6	10,700	80,036	6,670	1	200	1,496	748	0	0	0	0
3281.01	2	900	6,732	1,683	0	0	0	0	0	0	0	0
3287.01	0	0	0	0	4	400	2,992	374	6	2,000	14,960	1,247
3288.01	6	24,500	183,260	15,272	6	35,200	263,296	21,941	0	0	0	0
3290.02	6	16,100	120,428	10,036	3	4,400	32,912	5,485	0	0	0	0
3295.01	2	400	2,992	748	0	0	0	0	0	0	0	0
3295.02	5	400	2,992	299	2	200	1,496	374	0	0	0	0
3297.01	6	5,800	43,384	3,615	5	4,200	31,416	3,142	0	0	0	0
3300.01	6	8,400	62,832	5,236	6	6,400	47,872	3,989	6	4,700	35,156	2,930
3303.01	6	3,900	29,172	2,431	4	1,500	11,220	1,403	0	0	0	0
3306.01	6	5,200	38,896	3,241	6	4,800	35,904	2,992	6	900	6,732	561
3310.01	6	4,800	35,904	2,992	6	5,000	37,400	3,117	2	1,100	8,228	2,057
3316.01	6	10,300	77,044	6,420	4	6,300	47,124	5,891	0	0	0	0
3325.01	6	7,300	54,604	4,550	5	6,800	50,864	5,086	0	0	0	0
3335.01	6	3,000	22,440	1,870	3	800	5,984	997	0	0	0	0
3335.02	0	0	0	0	3	3,300	24,684	4,114	4	2,700	20,196	2,525
3335.03	0	0	0	0	0	0	0	0	2	0	0	0
3338.01	6	6,700	50,116	4,176	6	5,700	42,636	3,553	2	1,500	11,220	2,805
3339.01	3	1,500	11,220	1,870	0	0	0	0	0	0	0	0
3354.01	4	7,400	55,352	6,919	0	0	0	0	0	0	0	0
3354.02	2	4,100	30,668	7,667	3	3,800	28,424	4,737	0	0	0	0
3356.01	6	3,900	29,172	2,431	4	2,200	16,456	2,057	0	0	0	0
3362.01	6	6,600	49,368	4,114	4	2,600	19,448	2,431	0	0	0	0
3381.01	6	46,400	347,072	28,923	6	20,800	155,584	12,965	6	5,500	41,140	3,428
3382.02	6	14,700	109,956	9,163	3	1,900	14,212	2,369	0	0	0	0
3384.01	6	22,000	164,560	13,713	4	17,500	130,900	16,363	0	0	0	0
3386.01	6	11,600	86,768	7,231	1	800	5,984	2,992	0	0	0	0
3389.01	5	8,600	64,328	6,433	0	0	0	0	0	0	0	0
TOTAL:	2,270	4,140,200	30,968,696		2,278	4,164,750	31,152,330		2,302	3,753,310	28,074,759	
Act Accounts:	2,121	4,117,850	30,801,518	367	2,131	4,143,890	30,996,297	380	2,129	3,724,941	27,862,559	367
Full Time SFR:	2,099	3,948,550	29,535,154	363	2,107	3,976,490	29,744,145	376	2,109	3,611,741	27,015,823	363
Non-Residential:	22	169,300	1,266,364	4	24	167,400	1,252,152	4	20	113,200	846,736	4
Part-Time Acct:	149	22,350	167,178		147	20,860	156,033		173	28,369	212,200	

DEMAND BASED ON WATER USE DATA

System:
PWS ID:
Location:

Year	Annual Withdrawal (gal)	Annual Withdrawal (ac-ft)	Annual Usage (gal)	DSL	Acitve SFR Accounts [A]	Active Billed Months	Annual Usage Active SRF (gal)	Active SRF Max Bill Period [B]	Annual ADD (gpd/ERU)	MMADD (gpd/ERU)	MDD [C] (gpd/ERU)
2020	34,169,631	104.9	30,968,696	9.4%	363	4,198	29,535,154	7,957,972	235	359	593
2021	33,432,421	102.6	31,152,330	6.8%	376	4,214	29,744,145	7,790,855	235	340	560
2022	31,027,488	95.2	28,074,759	9.5%	363	4,218	27,015,823	6,935,373	213	313	517
Average	32,876,513	100.9	30,065,262	8.6%	367	4,210	28,765,041	7561399.73	228	337	557
Minimum	31,027,488	95.23	28,074,759	6.8%	363	4,198	27,015,823	6935372.60	213	313	517
Maximum	34,169,631	104.87	31,152,330	9.5%	376	4,218	29,744,145	7957972.00	235	359	593

A: Single-Family Residences averaging more than 1,200 gallons/pay period
B: Each bill period covers 2 months of consumption
C: MDD = 1.65 (MMADD) for fewer than 1,000 people (Per Section 3.4.1)
D: A safety factor of 1.1 appied for accurate data.
E: A safety factor of 1.2 appied for data accuracy for a 2 month average.

	Proposed	
ADD [D]	260	gpd/ERU
MDD [E]	720	gpd/ERU

ERU Calculations

Connection Type	Connection	Avg Annual Usage (gal)	Avg ADD (gpd/conn)	Avg Max Bill Usage [B] (gal)	Avg MDD (gpd/conn)	ERUs
Residential	400	28,943,511	260	4,955,250	720	400
Park	1	804,100	2,203	240,856	3,948	8
School	1	175,032	480	28,424	466	2
Fish & Wildlife (2 meters)	2	222,405	305	29,172	239	2
Distibution System Leakage	-	2,811,252	-	-	-	19
					Total	431

SOURCE-BASED PHYSICAL CAPACITY

System: Estates Inc.
PWS ID: 08166 9
Location: Clallam County, Washington

WATER RIGHT CALCULATIONS

Based on Annual Volume & Average Day Demand (Section 4.4.2.7 - Equation 4-4b):

$N = Q_a/(ERU_{ADD}*365)$

Where: N = Number of Service Connections, ERUs
Q_a = Annual Volume of Water Available from All Sources, as limited by Water Right (gallons/year)
ERU_{ADD} = Average Daily Demand per ERU (gpd/ERU)

	V_a (gal/year)	ADD (gpd/ERU)	N (ERUs)
Potential Connections	78,198,912	260	824

Based on Instantaneous Flow & Maximum Day Demand (Section 4.4.2.7 - Equation 4-4a):

$N = Q_i/(ERU_{MDD}/1440)$

Where: N = Number of Service Connections, ERUs
V_d = Total Volume of Water Available for Maximum Day's Demand (gpd)
ERU_{MDD} = Maximum Daily Demand per ERU (gpd/ERU)
Q_i = Instantaneous Maximum Water Right Flow Rate (gpm)
t_d = Time that source operates per day (minutes/day)

	Q_i (gpm)	Minutes Pumped/Hr	t_d (min/day)	MDD (gpd/ERU)	N (ERUs)
Potential Connections	500	60	1,440	720	1,000

SOURCE CALCULATIONS

Individual Source Capacity (Section 4.4.2.7 - Equation 4-1):

$V_i = Q_i*t_i$

Where: V_i = Total volume for source "j" over a specified period of time (gal/specified time period)
Q_j = Delivery rate of source (gal/unit time)
t_j = Time that flow (Qj) was delivered from source "j"

Total Source Capacity (Section 4.4.2.7 - Equation 4-2):

$V_T = \sum(Q_i*T_i) = \sum V_i$

Where: V_T = Total volume of water available to the system over a specified period of time (gal/specified time period)
Q_j = Delivery rate of source (gal/unit time)
t_j = Time that flow (Q_j) was delivered from source "j"

Source ID	Well 1	Well 2			
Q_j Delivery Rate (gpm)	180	180			
Max Pump Time (min/day) *	1,200	1,200			
Max Days Pumped (days/yr)	365	365			
V_j Source Capacity (gal/yr)	78,840,000	78,840,000			

* *Per Section 4.5.2.7: The DOH recommends assessing daily source capacity based on 20 hours of pumping per day.*

Q_s = 360 gpm

V_T = 157,680,000 gal/yr

Based on Source Production & Maximum Day Demand (Section 4.4.2.7 - Equation 4-3):

$N = V_T/ERU_{MDD} = (Q_s*t_d)/MDD$

Where: N = Number of Service Connections, ERUs
V_T = Total Volume of Water Available for Maximum Day's Demand (gpd)
ERU_{MDD} = Max Daily Demand per ERU (gpd/ERU)
Q_s = Total Well Production Flow rate (gpm)
t_d = Time that source operates per day (minutes/day)

	Q_s (gpm)	Minutes Pumped/Hr	t_d (min/day)	MDD (gpd/ERU)	N (ERUs)
Potential Connections	360	50	1,200	720	600

SOURCE-BASED PHYSICAL CAPACITY

System: Estates Inc.
PWS ID: 08166 9
Location: Clallam County, Washington

BOOSTER PUMP CALCULATIONS

Based on Booster Pump Production & Maximum Day Demand (Derived from Equation 3-1):

N= [(PHD - 18)1440/MDD -F]/C

Where: N = Number of Service Connections, ERUs
$PHD = Q_B$ = Peak Hour Demand (gallons/minute) (Booster Pump Capacity)
MDD =Maximum Daily Demand per ERU (gpd/ERU)
F = PHD Coefficient from Table 3-1
C = PHD Coefficient from Table 3-1

	Q_B* (gpm)	C	F	MDD** (gpd/ERU)	N (ERUs)
Potential Connections	655.00	1.60	225.00	720.00	656

** Capacity of the combined booster pumps (with the largest out of service) minus the flow associated with fire flow.*
*** MDD Value should be modified to PHD if the system does not provide fire flow.*

TREATMENT CALCULATIONS

Based on Treatment Max Design Flow & Maximum Day Demand (Section 4.4.2.7 - Equation 4-4a):

$N = V_d/MDD = (Q_t * t_d)/MDD$

Where: N = Number of Service Connections, ERUs
V_d = Total Volume of Water Available for Maximum Day's Demand (gallons/day)
MDD = Maximum Daily Demand per ERU (gpd/ERU)
Q_t = Treatment System Maximum Design Flow Rate (gpm)
t_d = Time that source operates per day (minutes/day)

	Q_t (gpm)	Minutes Pumped/Hr	t_d (min/day)	MDD (gpd/ERU)	N (ERUs)
Potential Connections	380	60	1,440	720	760

* Treatment only required for Well 1. Q_t is the comined production from Mn Treatment System & Well 2.

SUMMARY

ERUs	Condition	Limiting Factor
824	Water Right	V_a & ADD
1,000	Water Right	Q_i & MDD
600	Source	Q_s & MDD
656	Booster Pumps	Q_B & MDD
760	Treatment	Q_t & MDD

System Capacity: 600 ERUs

Limited by: Qs & MDD *Source*
Proposed connections: 600 ERUs

PEAK HOUR DEMAND (PHD) CALCULATION

System: Estates Inc.
PWS ID: 08166 9
Location: Clallam County, Washington

From DOH Water System Design Manual (Section 3.4.2)

Equation 3-1: PHD = (MDD/1440)[(C)(N) + F] + 18

Where:
PHD = Peak Hourly Demand, (gpm)
C = Coefficient Associated with Ranges of ERUs
N = Number of Service Connections, ERUs
F = Factor Associated with Ranges of ERUs
MDD = Maximum Day Demand, (gpd/ERU)

Table 3-1:

Range of N (ERUs)		C	F
15	50	3.0	0
51	100	2.5	25
101	250	2.0	75
251	500	1.8	125
501	1,000,000	1.6	225

MDD (gpd/ERU)	N (ERUs)	C	F	PHD (gpm)	
720	412	1.8	125	442	Current ERUs without DSL
720	420	1.8	125	459	2023 ERUs
720	469	1.8	125	503	2029 ERUs
720	539	1.6	225	562	2043 ERUs
720	600	1.6	225	611	Capacity Limit

STORAGE CAPACITY CALCULATIONS

System: Estates Inc.
ID No.: 08166 9
Location: Clallam County, Washington

Demands	
N (ERUs)	539
ADD (gpd/ERU)	260
MDD (gpd/ERU)	720
PHD (gpm)	562

Sources		
Source ID	Delivery Rate (gpm)	
Well 1	180	
Well 2	180	
0	0	
0	0	
Q_S =	360	
Q_S =	500	*water right limited*
Q_L =	180	*largest source*

Reservoirs						
Reservoir ID	Diameter (ft)	Area (ft^2)	Height (ft)	Base Elevation (ft)	Volume (gal)	VF (gal/ft)
Reservoir 1 (Circular)	30	706.9	33	132	174,481	5,287
					0	0
				Total	174,481	5,287

Top Dead Storage (TDS)	
Depth (ft)	Volume (gal)
0.75	3,965

Operational Storage (OS)	
Depth (ft)	Volume (gal)
1.5	7,931

Required Equalizing Storage (ES)			
PHD (gpm)	Q_S (gpm)	Volume (gal)	Depth (ft)
562	360	30,255	5.7

*ES = (PHD-Q_s)*150 or Zero*

Standby Storage (SB)*						
	N (ERU)	Sbi (gal/day/ERU)	Q_S (gpm)	Q_L (gpm)	SB Volume (gallons)	Depth (ft)
Recommended **	539	720	n/a	n/a	388,080	73.4
Minimum ***	539	200	n/a	n/a	107,800	20.4

** (Section 7.1.1.3 Equation 7-2) SB = (N)(SB_i)(T_d)*
*** (Section 4.4.3.2) Sbi=ERU_{MDD} and T_d=1 day*
**** (Section 4.4.3.2) Sbi=200 gpd/ERU and T_d=1 day*
***** Optional Reduction (Section 7.1.1.3) SB = (N)(ERU_{MDD})-[1200(Q_S-Q_L)]*

STORAGE CAPACITY CALCULATIONS

System: Estates Inc.
ID No.: 08166 9
Location: Clallam County, Washington

Available Standby Storage (SB)			
Volume (gallons)	Depth (ft)	N (ERUs)	SB_i (gal/ERU)
129,686	24.5	539	241

SB = Total Storage Volume -TDS-OS -ES-BDS

Fire Suppression Storage (FSS)		
Fire Flow (gpm)	t_m (min)	Volume (gal)
500	45	22,500

FSS = FFt_m*

Where: FF = Required fire flow rate (gpm)
t_m = Duration of FF rate (minutes)

Bottom Dead Storage (BDS)	
Depth (ft)	Volume (gal)
0.5	2,644

Available Storage Summary		
Component	Volume (gal)	Depth of Storage Component (ft)
TDS	3,965	0.8
OS	7,931	1.5
ES	30,255	5.7
SB/FSS	129,686	24.5
BDS	2,644	0.5
Total	174,481	33.0

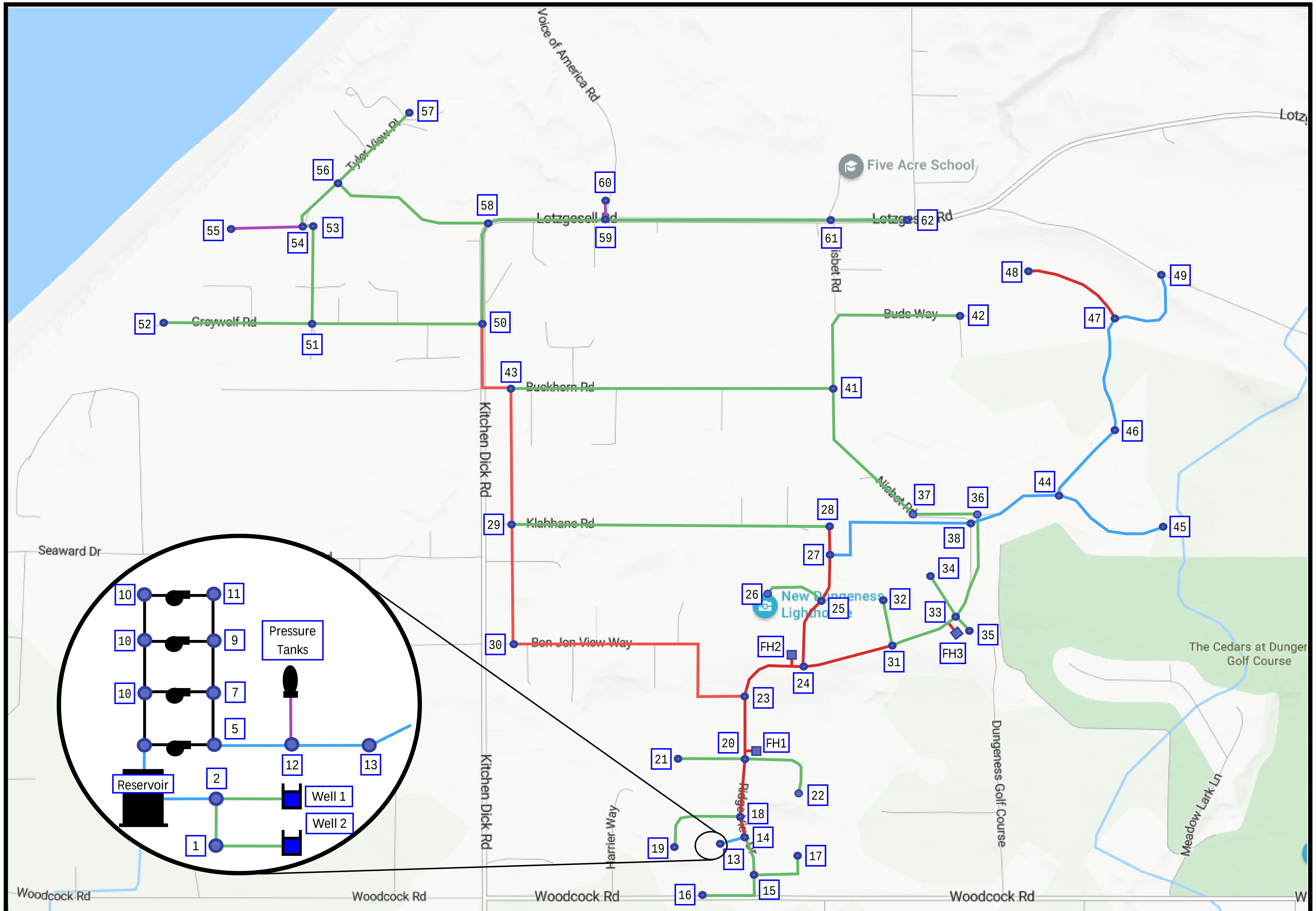
Is the available SB/FSS...	
greater than recommended SB?	greater than required FSS?
no	yes

APPENDIX Q
Hydraulic Models

Hydraulic Modeling - 2024 Distribution System

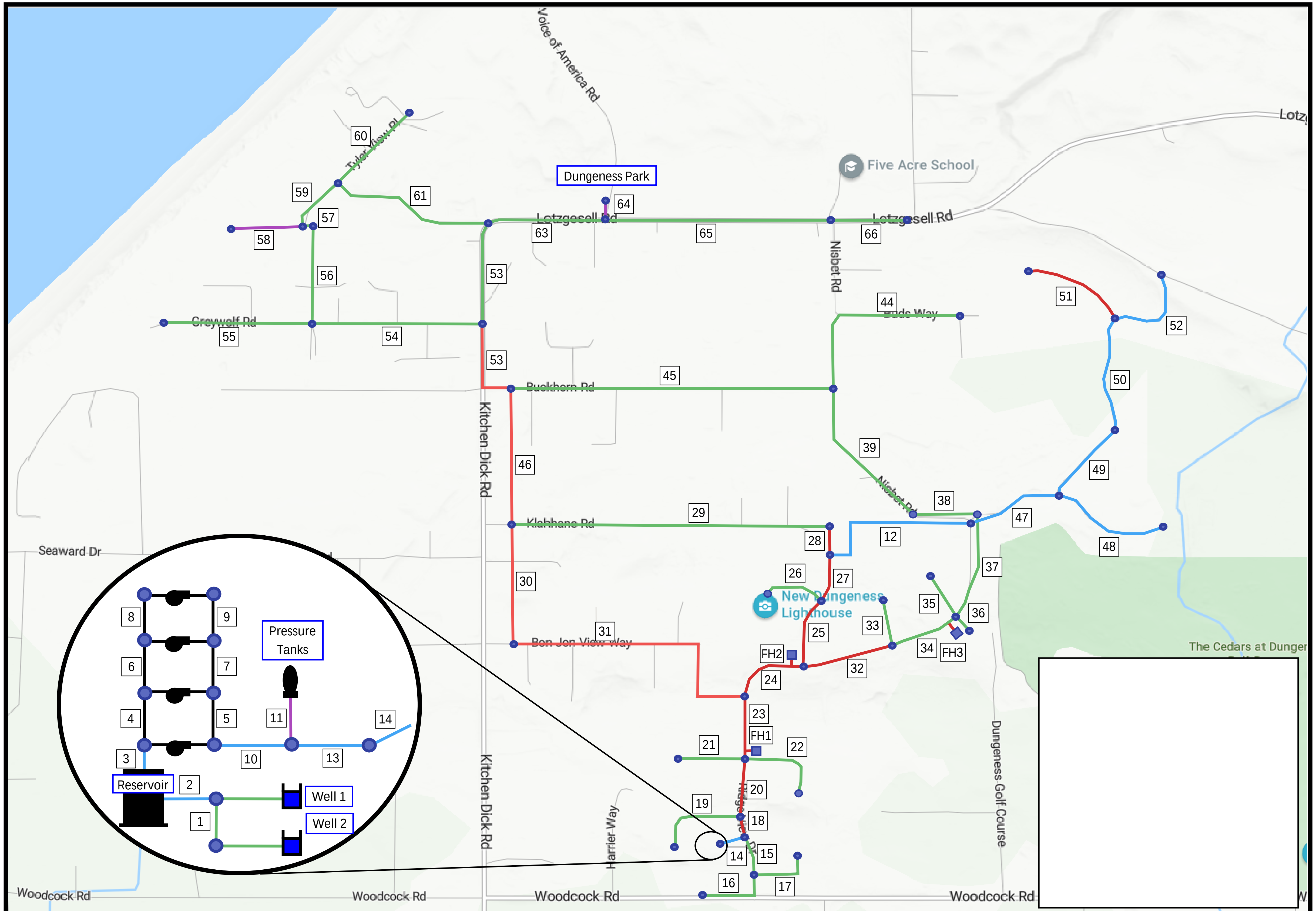
Estates, Inc. - Hydraulic Model Existing System

EPANET v2.2 - Pipes Map



Estates, Inc. - Hydraulic Model Existing System

EPANET v2.2 - Pipes Map



Estates, Inc. - Hydraulic Model

Existing Conditions - Peak Hour Demand

Estates Reservoir Replacement - Peak Hour Demand Scenario

Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 18	130	11	226.09	41.63
Junc 14	130	12	229.13	42.95
Junc 23	110	0	217.82	46.72
Junc 24	120	14	216.11	41.64
Junc 31	120	8	215.83	41.52
Junc 33	120	0	215.02	41.17
Junc 38	110	19	214.84	45.43
Junc 43	95	19	212.77	51.03
Junc 29	120	19	213.91	40.69
Junc 28	120	7	214.96	41.15
Junc 30	125	24	214.86	38.94
Junc 50	95	6	212.06	50.72
Junc 58	95	5	210.89	50.21
Junc 61	90	0	210.65	52.28
Junc 53	100	7	210.30	47.79
Junc 51	95	19	210.31	49.97
Junc 15	130	6	228.96	42.88
Junc 16	130	6	228.95	42.88
Junc 17	130	11	228.93	42.86
Junc 13	140	0	230.02	39.00
Junc 19	130	11	226.03	41.61
Junc 20	120	6	221.56	44.00
Junc 22	120	14	221.47	43.97
Junc 21	120	14	221.47	43.97
Junc 25	120	10	215.42	41.35
Junc 26	120	12	215.30	41.29
Junc 32	120	8	215.77	41.50
Junc 34	120	6	214.98	41.16

Estates Reservoir Replacement - Peak Hour Demand Scenario

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 35	120	5	214.99	41.16
Junc 41	90	17	212.83	53.22
Junc 44	100	5	214.82	49.75
Junc 42	100	10	212.69	48.83
Junc 62	90	5	210.64	52.27
Junc 45	100	12	214.82	49.75
Junc 46	95	10	214.81	51.92
Junc 47	95	4	214.81	51.91
Junc 48	90	4	214.81	54.08
Junc 49	90	6	214.81	54.08
Junc 54	100	0	210.30	47.79
Junc 55	100	2	210.30	47.79
Junc 52	95	19	210.01	49.83
Junc 56	100	11	210.31	47.80
Junc 57	100	7	210.28	47.78
Junc 59	95	0	210.69	50.13
Junc 60	95	12	210.31	49.96
Junc 12	140	0	230.17	39.07
Junc 11	140	0	230.17	39.07
Junc 9	140	0	230.17	39.07
Junc 7	140	0	230.17	39.07
Junc 5	140	0	230.17	39.07
Junc 4	140	0	170.00	13.00
Junc 6	140	0	170.00	13.00
Junc 8	140	0	170.00	13.00
Junc 10	140	0	200.08	26.03
Junc 2	52	0	170.23	51.23
Junc 1	52	0	171.48	51.77
Junc FH1	120	0	221.56	44.00

Estates Reservoir Replacement - Peak Hour Demand Scenario

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc FH2	120	0	216.11	41.64
Junc FH3	120	0	215.02	41.17
Junc 36	110	0	214.32	45.20
Junc 37	115	0	213.92	42.86
Junc 27	120	0	214.97	41.15
Resvr Well_1	52	#N/A	52.00	0.00
Resvr Well2	52	#N/A	52.00	0.00
Tank Tank_1	140	#N/A	170.00	13.00
Tank HPT1	140	#N/A	255.50	50.05

Estates Reservoir Replacement - Peak Hour Demand Scenario

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 18	300	6	140	-368.00	4.18	10.15	0.019
Pipe 24	600	6	140	185.45	2.10	2.85	0.021
Pipe 32	800	6	140	58.74	0.67	0.34	0.025
Pipe 34	600	4	140	42.74	1.09	1.36	0.024
Pipe 37	900	4	140	31.74	0.81	0.78	0.026
Pipe 30	1000	6	140	102.55	1.16	0.95	0.023
Pipe 31	2100	6	140	126.55	1.44	1.41	0.022
Pipe 53	900	6	140	93.00	1.06	0.79	0.023
Pipe 62	800	4	140	44.54	1.14	1.46	0.024
Pipe 56	700	4	140	4.46	0.11	0.02	0.034
Pipe 54	1300	4	140	42.46	1.08	1.34	0.024
Pipe 29	2300	4	140	23.70	0.61	0.46	0.027
Pipe 46	1100	6	140	107.26	1.22	1.04	0.023
Pipe 15	400	4	140	23.00	0.59	0.43	0.027
Pipe 16	100	4	140	6.00	0.15	0.04	0.033
Pipe 17	300	4	140	11.00	0.28	0.11	0.030
Pipe 14	300	8	140	403.00	2.57	2.96	0.019
Pipe 20	500	6	140	346.00	3.93	9.06	0.019
Pipe 21	500	4	140	14.00	0.36	0.17	0.029
Pipe 22	500	4	140	14.00	0.36	0.17	0.029

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 23	500	6	140	312.00	3.54	7.48	0.019
Pipe 25	600	6	140	112.70	1.28	1.13	0.022
Pipe 27	600	6	140	90.70	1.03	0.76	0.023
Pipe 26	1000	4	140	12.00	0.31	0.13	0.030
Pipe 35	1000	4	140	6.00	0.15	0.04	0.033
Pipe 33	1000	4	140	8.00	0.20	0.06	0.031
Pipe 36	1000	4	140	5.00	0.13	0.03	0.034
Pipe 45	2400	4	140	4.74	0.12	0.02	0.034
Pipe 66	100	4	140	5.00	0.13	0.03	0.034
Pipe 44	1500	4	140	10.00	0.26	0.09	0.030
Pipe 47	500	8	140	41.00	0.26	0.04	0.027
Pipe 48	500	8	140	12.00	0.08	0.00	0.032
Pipe 49	500	8	140	24.00	0.15	0.02	0.029
Pipe 50	600	8	140	14.00	0.09	0.01	0.032
Pipe 51	300	6	140	4.00	0.05	0.00	0.037
Pipe 52	400	8	140	6.00	0.04	0.00	0.036
Pipe 19	500	4	140	11.00	0.28	0.11	0.030
Pipe 55	1000	4	140	19.00	0.49	0.30	0.028
Pipe 57	50	4	140	-2.54	0.06	0.01	0.036
Pipe 58	700	4	140	2.00	0.05	0.00	0.038
Pipe 61	1400	4	140	22.54	0.58	0.41	0.027

EPANET 2.2

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 59	200	4	140	-4.54	0.12	0.02	0.034
Pipe 60	500	4	140	7.00	0.18	0.05	0.032
Pipe 63	800	4	140	-17.00	0.43	0.25	0.028
Pipe 65	1700	4	140	5.00	0.13	0.03	0.034
Pipe 64	100	2	140	12.00	1.23	3.78	0.027
Pipe 11	10	2	140	403.00	41.16	2533.38	0.016
Pipe 10	10	8	140	0.00	0.00	0.00	0.000
Pipe 5	10	8	140	0.00	0.00	0.00	0.000
Pipe 9	10	8	140	0.00	0.00	0.00	0.000
Pipe 4	10	8	140	0.00	0.00	0.00	0.000
Pipe 8	10	8	140	0.00	0.00	0.00	0.000
Pipe 3	150	8	140	0.00	0.00	0.00	0.000
Pipe 7	10	8	140	0.00	0.00	0.00	0.000
Pipe 2	100	8	140	347.65	2.22	2.25	0.020
Pipe 13	50	8	140	403.00	2.57	2.96	0.019
Pipe 6	10	8	140	0.00	0.00	0.00	0.000
Pipe FH1	10	6	140	0.00	0.00	0.00	0.000
Pipe FH2	10	6	140	0.00	0.00	0.00	0.000
Pipe FH3	10	6	140	0.00	0.00	0.00	0.000
Pipe 38	500	4	140	31.74	0.81	0.78	0.026
Pipe 28	100	6	140	30.70	0.35	0.10	0.027

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 12	1450	8	140	60.00	0.38	0.09	0.025
Pipe 39	1400	4	140	31.74	0.81	0.78	0.026
Pipe 1	50	4	140	206.74	5.28	25.15	0.019
Pump Pump1	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump2	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump3	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump4	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump WPump1	#N/A	#N/A	#N/A	140.92	0.00	-118.23	0.000
Pump WPump2	#N/A	#N/A	#N/A	206.74	0.00	-119.48	0.000

Estates, Inc. - Hydraulic Model

Existing Conditions - Fire Flow & Max Day Demand

Estates Reservoir Replacement - Peak Hour Demand Scenario

Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 18	130	5	229.62	43.17
Junc 14	130	0	238.94	47.20
Junc 23	110	0	200.13	39.05
Junc 24	120	6	191.29	30.89
Junc 31	120	3	182.19	26.95
Junc 33	120	0	134.41	6.24
Junc 38	110	9	190.98	35.09
Junc 43	95	9	187.35	40.02
Junc 29	120	9	190.63	30.60
Junc 28	120	3	191.00	30.77
Junc 30	125	11	193.48	29.67
Junc 50	95	6	187.16	39.93
Junc 58	95	2	186.88	39.81
Junc 61	90	0	186.83	41.96
Junc 53	100	3	186.74	37.59
Junc 51	95	9	186.75	39.75
Junc 15	130	3	238.89	47.18
Junc 16	130	3	238.89	47.18
Junc 17	130	5	238.88	47.18
Junc 13	140	0	241.30	43.89
Junc 19	130	5	229.61	43.16
Junc 20	120	3	214.52	40.95
Junc 22	120	7	214.49	40.94
Junc 21	120	7	214.49	40.94
Junc 25	120	4	191.12	30.82
Junc 26	120	5	191.10	30.81
Junc 32	120	3	182.18	26.94
Junc 34	120	3	134.40	6.24

Estates Reservoir Replacement - Peak Hour Demand Scenario

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 35	120	2	134.41	6.24
Junc 41	90	11	160.03	30.34
Junc 44	100	2	190.97	39.42
Junc 42	100	4	160.01	26.00
Junc 62	90	2	186.83	41.95
Junc 45	100	5	190.97	39.42
Junc 46	95	4	190.97	41.58
Junc 47	95	2	190.97	41.58
Junc 48	90	2	190.97	43.75
Junc 49	90	3	190.97	43.75
Junc 54	100	0	186.74	37.59
Junc 55	100	1	186.74	37.59
Junc 52	95	9	186.67	39.72
Junc 56	100	5	186.74	37.59
Junc 57	100	3	186.74	37.58
Junc 59	95	0	186.84	39.79
Junc 60	95	6	186.73	39.75
Junc 12	140	0	241.69	44.06
Junc 11	140	0	241.69	44.06
Junc 9	140	0	241.69	44.06
Junc 7	140	0	241.69	44.06
Junc 5	140	0	241.69	44.06
Junc 4	140	0	170.00	13.00
Junc 6	140	0	170.00	13.00
Junc 8	140	0	170.00	13.00
Junc 10	140	0	205.85	28.53
Junc 2	52	0	170.23	51.23
Junc 1	52	0	171.48	51.77
Junc FH1	120	0	214.52	40.95

Estates Reservoir Replacement - Peak Hour Demand Scenario

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc FH2	120	0	191.29	30.89
Junc FH3	120	500	134.23	6.17
Junc 36	110	0	142.65	14.15
Junc 37	115	0	147.22	13.96
Junc 27	120	0	191.01	30.77
Resvr Well_1	52	#N/A	52.00	0.00
Resvr Well2	52	#N/A	52.00	0.00
Tank Tank_1	140	#N/A	170.00	13.00
Tank HPT1	140	#N/A	244.00	45.06

Estates Reservoir Replacement - Peak Hour Demand Scenario

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 18	300	6	140	-673.00	7.64	31.05	0.017
Pipe 24	600	6	140	449.83	5.10	14.72	0.018
Pipe 32	800	6	140	391.24	4.44	11.37	0.019
Pipe 34	600	4	140	385.24	9.84	79.64	0.018
Pipe 37	900	4	140	-119.76	3.06	9.15	0.021
Pipe 30	1000	6	140	185.17	2.10	2.85	0.021
Pipe 31	2100	6	140	196.17	2.23	3.17	0.021
Pipe 53	900	6	140	46.00	0.52	0.22	0.026
Pipe 62	800	4	140	20.43	0.52	0.35	0.027
Pipe 56	700	4	140	1.57	0.04	0.00	0.040
Pipe 54	1300	4	140	19.57	0.50	0.32	0.027
Pipe 29	2300	4	140	13.59	0.35	0.16	0.029
Pipe 46	1100	6	140	189.76	2.15	2.98	0.021
Pipe 15	400	4	140	11.00	0.28	0.11	0.030
Pipe 16	100	4	140	3.00	0.08	0.01	0.036
Pipe 17	300	4	140	5.00	0.13	0.03	0.034
Pipe 14	300	8	140	684.00	4.37	7.88	0.018
Pipe 20	500	6	140	663.00	7.52	30.20	0.017
Pipe 21	500	4	140	7.00	0.18	0.05	0.032
Pipe 22	500	4	140	7.00	0.18	0.05	0.032

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 23	500	6	140	646.00	7.33	28.79	0.017
Pipe 25	600	6	140	52.59	0.60	0.28	0.025
Pipe 27	600	6	140	43.59	0.49	0.20	0.026
Pipe 26	1000	4	140	5.00	0.13	0.03	0.034
Pipe 35	1000	4	140	3.00	0.08	0.01	0.036
Pipe 33	1000	4	140	3.00	0.08	0.01	0.036
Pipe 36	1000	4	140	2.00	0.05	0.00	0.038
Pipe 45	2400	4	140	-134.76	3.44	11.39	0.021
Pipe 66	100	4	140	2.00	0.05	0.00	0.038
Pipe 44	1500	4	140	4.00	0.10	0.02	0.035
Pipe 47	500	8	140	18.00	0.11	0.01	0.030
Pipe 48	500	8	140	5.00	0.03	0.00	0.037
Pipe 49	500	8	140	11.00	0.07	0.00	0.033
Pipe 50	600	8	140	7.00	0.04	0.00	0.035
Pipe 51	300	6	140	2.00	0.02	0.00	0.041
Pipe 52	400	8	140	3.00	0.02	0.00	0.040
Pipe 19	500	4	140	5.00	0.13	0.03	0.034
Pipe 55	1000	4	140	9.00	0.23	0.08	0.031
Pipe 57	50	4	140	-1.43	0.04	0.00	0.039
Pipe 58	700	4	140	1.00	0.03	0.00	0.043
Pipe 61	1400	4	140	10.43	0.27	0.10	0.030

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 59	200	4	140	-2.43	0.06	0.01	0.038
Pipe 60	500	4	140	3.00	0.08	0.01	0.036
Pipe 63	800	4	140	-8.00	0.20	0.06	0.031
Pipe 65	1700	4	140	2.00	0.05	0.00	0.039
Pipe 64	100	2	140	6.00	0.61	1.05	0.030
Pipe 11	10	4	140	684.00	17.46	230.61	0.016
Pipe 10	10	8	140	0.00	0.00	0.00	0.000
Pipe 5	10	8	140	0.00	0.00	0.00	0.000
Pipe 9	10	8	140	0.00	0.00	0.00	0.000
Pipe 4	10	8	140	0.00	0.00	0.00	0.000
Pipe 8	10	8	140	0.00	0.00	0.00	0.000
Pipe 3	150	8	140	0.00	0.00	0.00	0.000
Pipe 7	10	8	140	0.00	0.00	0.00	0.000
Pipe 2	100	8	140	347.65	2.22	2.25	0.020
Pipe 13	50	8	140	684.00	4.37	7.88	0.018
Pipe 6	10	8	140	0.00	0.00	0.00	0.000
Pipe FH1	10	6	140	0.00	0.00	0.00	0.000
Pipe FH2	10	6	140	0.00	0.00	0.00	0.000
Pipe FH3	10	6	140	500.00	5.67	17.91	0.018
Pipe 38	500	4	140	-119.76	3.06	9.15	0.021
Pipe 28	100	6	140	16.59	0.19	0.03	0.030

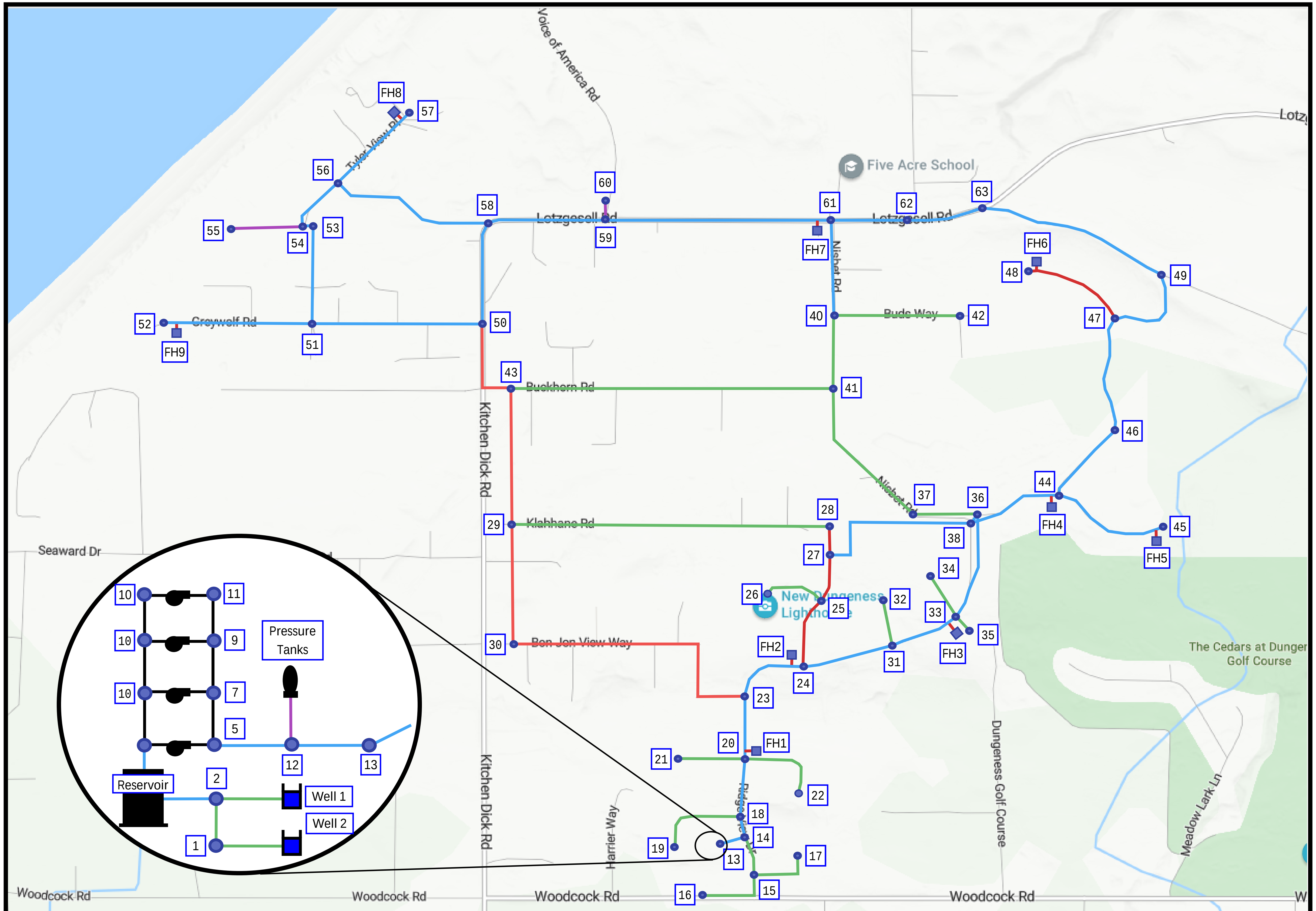
Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 12	1450	8	140	27.00	0.17	0.02	0.029
Pipe 39	1400	4	140	-119.76	3.06	9.15	0.021
Pipe 1	50	4	140	206.74	5.28	25.15	0.019
Pump Pump1	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump2	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump3	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump4	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump WPump1	#N/A	#N/A	#N/A	140.92	0.00	-118.23	0.000
Pump WPump2	#N/A	#N/A	#N/A	206.74	0.00	-119.48	0.000

Hydraulic Modeling - 2044 Distribution System

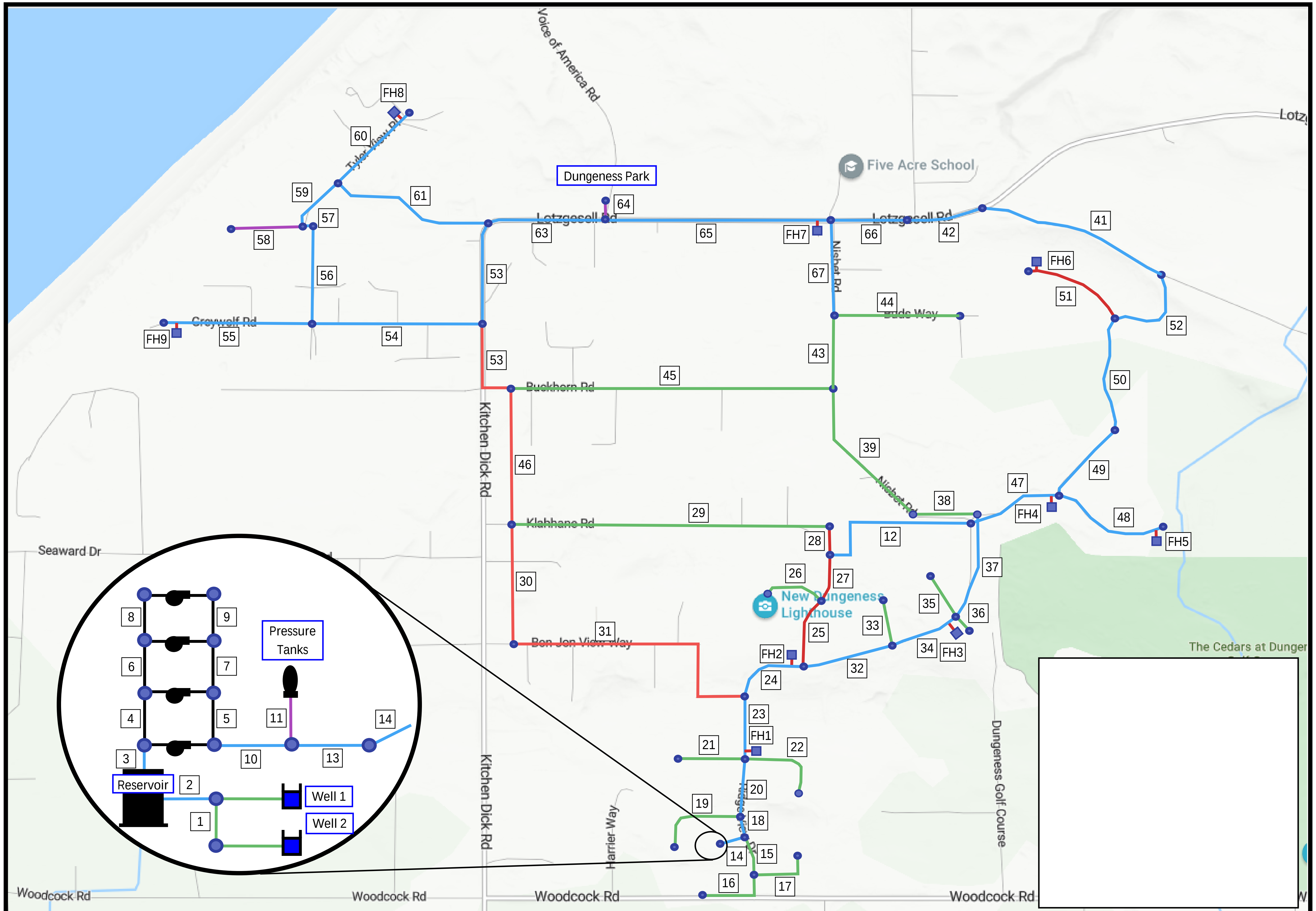
Estates, Inc. - Hydraulic Model Existing System

EPANET v2.2 - Pipes Map



Estates, Inc. - Hydraulic Model Existing System

EPANET v2.2 - Pipes Map



Estates, Inc. - Hydraulic Model

Future Conditions - Peak Hour Demand

Estates Reservoir Replacement - Peak Hour Demand Scenario

Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 18	130	11	218.65	38.41
Junc 14	130	0	219.75	38.89
Junc 23	110	0	215.57	45.75
Junc 24	120	14	214.62	41.00
Junc 31	120	7	214.16	40.80
Junc 33	120	0	213.86	40.67
Junc 38	110	18	213.46	44.83
Junc 43	95	23	212.44	50.89
Junc 29	120	29	212.90	40.25
Junc 28	120	11	213.57	40.54
Junc 30	125	29	213.46	38.33
Junc 50	95	6	212.24	50.80
Junc 58	95	5	212.26	50.81
Junc 61	90	0	212.44	53.05
Junc 53	100	7	212.18	48.61
Junc 51	95	23	212.18	50.77
Junc 15	130	6	219.56	38.81
Junc 16	130	7	219.56	38.80
Junc 17	130	11	219.53	38.79
Junc 13	140	0	220.95	35.08
Junc 19	130	11	218.60	38.39
Junc 20	120	5	216.99	42.03
Junc 22	120	15	216.90	41.98
Junc 21	120	15	216.90	41.98
Junc 25	120	9	214.00	40.73
Junc 26	120	11	213.89	40.68
Junc 32	120	7	214.11	40.78
Junc 34	120	6	213.83	40.65

Estates Reservoir Replacement - Peak Hour Demand Scenario

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 35	120	5	213.84	40.66
Junc 41	90	18	212.45	53.06
Junc 44	100	11	213.21	49.05
Junc 42	100	18	212.18	48.61
Junc 62	90	5	212.45	53.06
Junc 45	100	11	213.20	49.05
Junc 46	95	18	213.01	51.14
Junc 47	95	14	212.84	51.06
Junc 48	90	14	212.83	53.22
Junc 49	90	6	212.77	53.19
Junc 54	100	0	212.19	48.61
Junc 55	100	3	212.18	48.61
Junc 52	95	23	212.16	50.77
Junc 56	100	11	212.21	48.62
Junc 57	100	14	212.20	48.62
Junc 59	95	0	212.30	50.83
Junc 60	95	12	211.92	50.66
Junc 12	140	0	221.15	35.16
Junc 11	140	0	221.15	35.16
Junc 9	140	0	221.15	35.16
Junc 7	140	0	221.15	35.16
Junc 5	140	0	221.15	35.16
Junc 4	140	0	170.00	13.00
Junc 6	140	0	170.00	13.00
Junc 8	140	0	170.00	13.00
Junc 10	140	0	195.58	24.08
Junc 2	52	0	170.23	51.23
Junc 1	52	0	171.48	51.77
Junc FH1	120	0	216.99	42.03

Estates Reservoir Replacement - Peak Hour Demand Scenario

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc FH2	120	0	214.62	41.00
Junc FH3	120	0	213.86	40.67
Junc 36	110	0	213.47	44.84
Junc 37	115	0	213.21	42.55
Junc 27	120	0	213.58	40.55
Junc FH4	100	0	213.21	49.05
Junc FH5	100	0	213.20	49.05
Junc FH6	90	0	212.83	53.22
Junc FH7	90	0	212.44	53.05
Junc 63	90	6	212.53	53.09
Junc 40	95	0	212.44	50.89
Junc FH8	100	0	212.20	48.62
Junc FH9	95	0	212.16	50.77
Resvr Well_1	52	#N/A	52.00	0.00
Resvr Well2	52	#N/A	52.00	0.00
Tank Tank_1	140	#N/A	170.00	13.00
Tank HPT1	140	#N/A	255.50	50.05

Estates Reservoir Replacement - Peak Hour Demand Scenario

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 18	300	8	140	-451.00	2.88	3.64	0.019
Pipe 24	600	8	140	288.30	1.84	1.59	0.020
Pipe 32	800	8	140	167.11	1.07	0.58	0.022
Pipe 34	600	8	140	153.11	0.98	0.49	0.022
Pipe 37	900	8	140	142.11	0.91	0.43	0.022
Pipe 30	1000	6	140	76.70	0.87	0.56	0.024
Pipe 31	2100	6	140	105.70	1.20	1.01	0.023
Pipe 53	900	6	140	45.82	0.52	0.21	0.026
Pipe 62	800	4	140	-4.40	0.11	0.02	0.034
Pipe 56	700	4	140	-1.78	0.05	0.00	0.039
Pipe 54	1300	8	140	44.22	0.28	0.05	0.027
Pipe 29	2300	4	140	18.54	0.47	0.29	0.028
Pipe 46	1100	6	140	66.24	0.75	0.42	0.024
Pipe 15	400	4	140	24.00	0.61	0.47	0.027
Pipe 16	100	4	140	7.00	0.18	0.05	0.032
Pipe 17	300	4	140	11.00	0.28	0.11	0.030
Pipe 14	300	8	140	475.00	3.03	4.01	0.019
Pipe 20	500	8	140	429.00	2.74	3.32	0.019
Pipe 21	500	4	140	15.00	0.38	0.20	0.029
Pipe 22	500	4	140	15.00	0.38	0.20	0.029

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 23	500	8	140	394.00	2.51	2.84	0.019
Pipe 25	600	6	140	107.18	1.22	1.03	0.023
Pipe 27	600	6	140	87.18	0.99	0.71	0.023
Pipe 26	1000	4	140	11.00	0.28	0.11	0.030
Pipe 35	1000	4	140	6.00	0.15	0.04	0.033
Pipe 33	1000	4	140	7.00	0.18	0.05	0.032
Pipe 36	1000	4	140	5.00	0.13	0.03	0.034
Pipe 45	2400	4	140	2.58	0.07	0.01	0.037
Pipe 66	100	8	140	-70.85	0.45	0.12	0.025
Pipe 47	500	8	140	155.85	0.99	0.51	0.022
Pipe 48	500	8	140	11.00	0.07	0.00	0.033
Pipe 49	500	8	140	133.85	0.85	0.38	0.023
Pipe 50	600	8	140	115.85	0.74	0.29	0.023
Pipe 51	300	6	140	14.00	0.16	0.02	0.030
Pipe 52	400	8	140	87.85	0.56	0.18	0.024
Pipe 19	500	4	140	11.00	0.28	0.11	0.030
Pipe 55	1250	8	140	23.00	0.15	0.01	0.029
Pipe 57	50	4	140	-8.78	0.22	0.07	0.031
Pipe 58	700	4	140	3.00	0.08	0.01	0.036
Pipe 61	1400	8	140	36.78	0.23	0.04	0.027
Pipe 59	200	4	140	-11.78	0.30	0.12	0.030

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 60	1150	8	140	14.00	0.09	0.01	0.032
Pipe 63	800	8	140	46.18	0.29	0.05	0.026
Pipe 65	1700	8	140	-58.18	0.37	0.08	0.026
Pipe 64	100	2	140	12.00	1.23	3.78	0.027
Pipe 11	10	2	140	475.00	48.51	3434.88	0.016
Pipe 10	10	8	140	0.00	0.00	0.00	0.000
Pipe 5	10	8	140	0.00	0.00	0.00	0.000
Pipe 9	10	8	140	0.00	0.00	0.00	0.000
Pipe 4	10	8	140	0.00	0.00	0.00	0.000
Pipe 8	10	8	140	0.00	0.00	0.00	0.000
Pipe 3	150	8	140	0.00	0.00	0.00	0.000
Pipe 7	10	8	140	0.00	0.00	0.00	0.000
Pipe 2	100	8	140	347.65	2.22	2.25	0.020
Pipe 13	50	8	140	475.00	3.03	4.01	0.019
Pipe 6	10	8	140	0.00	0.00	0.00	0.000
Pipe FH1	50	6	140	0.00	0.00	0.00	0.000
Pipe FH2	50	6	140	0.00	0.00	0.00	0.000
Pipe FH3	50	6	140	0.00	0.00	0.00	0.000
Pipe 38	500	4	140	25.91	0.66	0.54	0.026
Pipe 28	100	6	140	29.54	0.34	0.09	0.027
Pipe 12	1450	8	140	57.64	0.37	0.08	0.026

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 39	1400	4	140	25.91	0.66	0.54	0.026
Pipe 1	50	4	140	206.74	5.28	25.15	0.019
Pipe 40	50	8	140	116.21	0.74	0.30	0.023
Pipe FH4	50	6	140	0.00	0.00	0.00	0.000
Pipe FH5	50	6	140	0.00	0.00	0.00	0.000
Pipe FH6	50	6	140	0.00	0.00	0.00	0.000
Pipe FH7	50	6	140	0.00	0.00	0.00	0.000
Pipe 41	1500	8	140	81.85	0.52	0.15	0.024
Pipe 42	600	8	140	75.85	0.48	0.13	0.025
Pipe 43	550	4	140	5.33	0.14	0.03	0.033
Pipe 44	950	4	140	18.00	0.46	0.27	0.028
Pipe 67	740	8	140	-12.67	0.08	0.00	0.032
Pipe FH8	50	6	140	0.00	0.00	0.00	0.000
Pipe FH9	50	6	140	0.00	0.00	0.00	0.000
Pump Pump1	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump2	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump3	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump4	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump WPump1	#N/A	#N/A	#N/A	140.92	0.00	-118.23	0.000
Pump WPump2	#N/A	#N/A	#N/A	206.74	0.00	-119.48	0.000

Estates, Inc. - Hydraulic Model

Future Conditions - Fire Flow & Max Day Demand

Estates Reservoir Replacement - Peak Hour Demand Scenario

Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 18	130	5	186.51	24.49
Junc 14	130	0	189.06	25.59
Junc 23	110	0	178.40	29.64
Junc 24	120	7	175.83	24.19
Junc 31	120	3	174.46	23.60
Junc 33	120	0	173.48	23.17
Junc 38	110	9	172.00	26.87
Junc 43	95	10	165.31	30.47
Junc 29	120	14	169.24	21.33
Junc 28	120	5	172.50	22.75
Junc 30	125	14	171.92	20.33
Junc 50	95	3	162.16	29.10
Junc 58	95	2	158.96	27.71
Junc 61	90	0	164.27	32.18
Junc 53	100	3	156.46	24.46
Junc 51	95	10	161.71	28.90
Junc 15	130	3	189.02	25.57
Junc 16	130	3	189.02	25.57
Junc 17	130	5	189.01	25.57
Junc 13	140	0	191.69	22.40
Junc 19	130	5	186.50	24.48
Junc 20	120	3	182.36	27.02
Junc 22	120	7	182.34	27.01
Junc 21	120	7	182.34	27.01
Junc 25	120	4	174.10	23.44
Junc 26	120	5	174.07	23.43
Junc 32	120	3	174.45	23.60
Junc 34	120	3	173.47	23.17

Estates Reservoir Replacement - Peak Hour Demand Scenario

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 35	120	2	173.48	23.17
Junc 41	90	9	165.46	32.70
Junc 44	100	5	170.94	30.74
Junc 42	100	9	164.24	27.83
Junc 62	90	3	164.44	32.26
Junc 45	100	5	170.94	30.74
Junc 46	95	8	169.94	32.47
Junc 47	95	7	168.79	31.97
Junc 48	90	7	168.78	34.14
Junc 49	90	3	168.08	33.83
Junc 54	100	0	156.11	24.31
Junc 55	100	1	156.10	24.31
Junc 52	95	10	161.70	28.90
Junc 56	100	5	154.71	23.71
Junc 57	100	7	149.50	21.45
Junc 59	95	0	160.63	28.44
Junc 60	95	5	160.55	28.40
Junc 12	140	0	192.13	22.59
Junc 11	140	0	192.13	22.59
Junc 9	140	0	192.13	22.59
Junc 7	140	0	192.13	22.59
Junc 5	140	0	192.13	22.59
Junc 4	140	0	170.00	13.00
Junc 6	140	0	170.00	13.00
Junc 8	140	0	170.00	13.00
Junc 10	140	0	181.06	17.79
Junc 2	52	0	170.23	51.23
Junc 1	52	0	171.48	51.77
Junc FH1	120	0	182.36	27.02

Estates Reservoir Replacement - Peak Hour Demand Scenario

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc FH2	120	0	175.83	24.19
Junc FH3	120	0	173.48	23.17
Junc 36	110	0	172.05	26.89
Junc 37	115	0	170.32	23.97
Junc 27	120	0	172.52	22.76
Junc FH4	100	0	170.94	30.74
Junc FH5	100	0	170.94	30.74
Junc FH6	90	0	168.78	34.14
Junc FH7	90	5	164.27	32.18
Junc 63	90	0	165.48	32.71
Junc 40	95	0	164.31	30.03
Junc FH8	100	500	148.61	21.06
Junc FH9	95	0	161.70	28.90
Resvr Well_1	52	#N/A	52.00	0.00
Resvr Well2	52	#N/A	52.00	0.00
Tank Tank_1	140	#N/A	170.00	13.00
Tank HPT1	140	#N/A	267.10	55.07

Estates Reservoir Replacement - Peak Hour Demand Scenario

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 18	300	8	140	-713.00	4.55	8.51	0.018
Pipe 24	600	8	140	492.56	3.14	4.29	0.019
Pipe 32	800	8	140	299.13	1.91	1.70	0.020
Pipe 34	600	8	140	293.13	1.87	1.64	0.020
Pipe 37	900	8	140	288.13	1.84	1.59	0.020
Pipe 30	1000	6	140	179.44	2.04	2.68	0.021
Pipe 31	2100	6	140	193.44	2.19	3.09	0.021
Pipe 53	900	6	140	207.19	2.35	3.50	0.020
Pipe 62	800	4	140	76.69	1.96	4.01	0.022
Pipe 56	700	4	140	107.51	2.74	7.49	0.021
Pipe 54	1300	8	140	127.51	0.81	0.35	0.023
Pipe 29	2300	4	140	43.74	1.12	1.42	0.024
Pipe 46	1100	6	140	209.18	2.37	3.57	0.020
Pipe 15	400	4	140	11.00	0.28	0.11	0.030
Pipe 16	100	4	140	3.00	0.08	0.01	0.036
Pipe 17	300	4	140	5.00	0.13	0.03	0.034
Pipe 14	300	8	140	724.00	4.62	8.76	0.018
Pipe 20	500	8	140	703.00	4.49	8.29	0.018
Pipe 21	500	4	140	7.00	0.18	0.05	0.032
Pipe 22	500	4	140	7.00	0.18	0.05	0.032

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 23	500	8	140	686.00	4.38	7.92	0.018
Pipe 25	600	6	140	186.44	2.12	2.88	0.021
Pipe 27	600	6	140	177.44	2.01	2.63	0.021
Pipe 26	1000	4	140	5.00	0.13	0.03	0.034
Pipe 35	1000	4	140	3.00	0.08	0.01	0.036
Pipe 33	1000	4	140	3.00	0.08	0.01	0.036
Pipe 36	1000	4	140	2.00	0.05	0.00	0.039
Pipe 45	2400	4	140	8.01	0.20	0.06	0.031
Pipe 66	100	8	140	-298.88	1.91	1.70	0.020
Pipe 47	500	8	140	336.88	2.15	2.12	0.020
Pipe 48	500	8	140	5.00	0.03	0.00	0.036
Pipe 49	500	8	140	326.88	2.09	2.01	0.020
Pipe 50	600	8	140	318.88	2.04	1.92	0.020
Pipe 51	300	6	140	7.00	0.08	0.01	0.034
Pipe 52	400	8	140	304.88	1.95	1.76	0.020
Pipe 19	500	4	140	5.00	0.13	0.03	0.034
Pipe 55	1250	8	140	10.00	0.06	0.00	0.033
Pipe 57	50	4	140	104.51	2.67	7.11	0.021
Pipe 58	700	4	140	1.00	0.03	0.00	0.043
Pipe 61	1400	8	140	408.49	2.61	3.03	0.019
Pipe 59	200	4	140	103.51	2.64	6.98	0.021

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 60	1150	8	140	507.00	3.24	4.53	0.019
Pipe 63	800	8	140	333.81	2.13	2.09	0.020
Pipe 65	1700	8	140	-338.81	2.16	2.15	0.020
Pipe 64	100	2	140	5.00	0.51	0.75	0.031
Pipe 11	10	2	140	724.00	73.94	7497.39	0.015
Pipe 10	10	8	140	0.00	0.00	0.00	0.000
Pipe 5	10	8	140	0.00	0.00	0.00	0.000
Pipe 9	10	8	140	0.00	0.00	0.00	0.000
Pipe 4	10	8	140	0.00	0.00	0.00	0.000
Pipe 8	10	8	140	0.00	0.00	0.00	0.000
Pipe 3	150	8	140	0.00	0.00	0.00	0.000
Pipe 7	10	8	140	0.00	0.00	0.00	0.000
Pipe 2	100	8	140	347.65	2.22	2.25	0.020
Pipe 13	50	8	140	724.00	4.62	8.76	0.018
Pipe 6	10	8	140	0.00	0.00	0.00	0.000
Pipe FH1	50	6	140	0.00	0.00	0.00	0.000
Pipe FH2	50	6	140	0.00	0.00	0.00	0.000
Pipe FH3	50	6	140	0.00	0.00	0.00	0.000
Pipe 38	500	4	140	70.94	1.81	3.47	0.023
Pipe 28	100	6	140	48.74	0.55	0.24	0.025
Pipe 12	1450	8	140	128.69	0.82	0.36	0.023

Estates Reservoir Replacement - Peak Hour Demand Scenario

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Friction Factor
Pipe 39	1400	4	140	70.94	1.81	3.47	0.023
Pipe 1	50	4	140	206.74	5.28	25.15	0.019
Pipe 40	50	8	140	217.18	1.39	0.94	0.021
Pipe FH4	50	6	140	0.00	0.00	0.00	0.000
Pipe FH5	50	6	140	0.00	0.00	0.00	0.000
Pipe FH6	50	6	140	0.00	0.00	0.00	0.000
Pipe FH7	50	6	140	5.00	0.06	0.00	0.034
Pipe 41	1500	8	140	301.88	1.93	1.73	0.020
Pipe 42	600	8	140	301.88	1.93	1.73	0.020
Pipe 43	550	4	140	53.93	1.38	2.09	0.024
Pipe 44	950	4	140	9.00	0.23	0.08	0.031
Pipe 67	740	8	140	44.93	0.29	0.05	0.027
Pipe FH8	50	6	140	500.00	5.67	17.91	0.018
Pipe FH9	50	6	140	0.00	0.00	0.00	0.000
Pump Pump1	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump2	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump3	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump Pump4	#N/A	#N/A	#N/A	0.00	0.00	0.00	0.000
Pump WPump1	#N/A	#N/A	#N/A	140.92	0.00	-118.23	0.000
Pump WPump2	#N/A	#N/A	#N/A	206.74	0.00	-119.48	0.000

APPENDIX R
Water Use Data

2022 Consumer Consumption

CASCADIA WATER
Average Usage
Grouped by: Account No
From 1/1/2022 Through 12/31/2022

Limited to : Route No 13 - OP-Estates

Service Account No	Units	No of Bills	Total Usage	Average
WATER (WTR)	**Cubic Ft**			
000000003001		6	5,700.0000	950.0000
000000003002		6	6,600.0000	1,100.0000
000000003003		6	6,200.0000	1,033.3333
000000003004		6	1,800.0000	300.0000
000000003005		6	12,200.0000	2,033.3333
000000003006		6	5,100.0000	850.0000
000000003007		6	6,200.0000	1,033.3333
000000003008		6	3,800.0000	633.3333
000000003009		6	2,000.0000	333.3333
000000003010		6	9,900.0000	1,650.0000
000000003011		6	3,400.0000	566.6667
000000003012		6	4,800.0000	800.0000
000000003013		6	4,300.0000	716.6667
000000003014		6	3,200.0000	533.3333
000000003015		6	11,700.0000	1,950.0000
000000003016		6	8,000.0000	1,333.3333
000000003017		2	800.0000	400.0000
000000003018		6	3,000.0000	500.0000
000000003019		6	4,700.0000	783.3333
000000003020		6	6,300.0000	1,050.0000
000000003021		6	7,800.0000	1,300.0000
000000003022		6	8,600.0000	1,433.3333
000000003023		6	6,000.0000	1,000.0000
000000003024		6	3,100.0000	516.6667
000000003025		6	8,100.0000	1,350.0000
000000003026		6	12,300.0000	2,050.0000
000000003027		6	12,500.0000	2,083.3333
000000003028		6	3,100.0000	516.6667
000000003029		6	3,700.0000	616.6667
000000003030		6	19,000.0000	3,166.6667
000000003031		6	7,700.0000	1,283.3333
000000003032		6	14,400.0000	2,400.0000
000000003033		6	2,800.0000	466.6667
000000003034		6	7,500.0000	1,250.0000

Service Account No	Units No of Bills	Total Usage	Average
000000003035	6	4,300.0000	716.6667
000000003036	6	3,300.0000	550.0000
000000003037	6	11,700.0000	1,950.0000
000000003038	6	1,700.0000	283.3333
000000003039	6	4,900.0000	816.6667
000000003040	6	8,200.0000	1,366.6667
000000003041	6	8,100.0000	1,350.0000
000000003042	6	3,500.0000	583.3333
000000003043	6	3,200.0000	533.3333
000000003044	6	9,300.0000	1,550.0000
000000003045	6	8,200.0000	1,366.6667
000000003046	6	20,500.0000	3,416.6667
000000003047	6	4,800.0000	800.0000
000000003048	4	13,900.0000	3,475.0000
000000003049	6	6,400.0000	1,066.6667
000000003050	6	21,000.0000	3,500.0000
000000003051	6	15,300.0000	2,550.0000
000000003052	6	3,800.0000	633.3333
000000003053	6	7,200.0000	1,200.0000
000000003054	6	10,500.0000	1,750.0000
000000003055	6	11,700.0000	1,950.0000
000000003056	1	100.0000	100.0000
000000003057	3	4,800.0000	1,600.0000
000000003058	6	5,700.0000	950.0000
000000003059	6	26,200.0000	4,366.6667
000000003060	6	17,800.0000	2,966.6667
000000003061	6	3,000.0000	500.0000
000000003062	6	11,300.0000	1,883.3333
000000003063	6	3,400.0000	566.6667
000000003064	6	6,900.0000	1,150.0000
000000003065	6	21,800.0000	3,633.3333
000000003066	6	7,300.0000	1,216.6667
000000003067	6	5,700.0000	950.0000
000000003068	6	16,700.0000	2,783.3333
000000003069	6	1,800.0000	300.0000
000000003070	6	5,500.0000	916.6667
000000003071	6	3,400.0000	566.6667
000000003072	6	10,000.0000	1,666.6667
000000003073	6	400.0000	66.6667
000000003074	6	6,200.0000	1,033.3333
000000003075	6	2,500.0000	416.6667
000000003076	6	2,000.0000	333.3333

Service Account No	Units No of Bills	Total Usage	Average
000000003077	6	7,500.0000	1,250.0000
000000003078	6	8,000.0000	1,333.3333
000000003079	6	37,200.0000	6,200.0000
000000003080	6	21,400.0000	3,566.6667
000000003081	6	4,300.0000	716.6667
000000003082	6	8,500.0000	1,416.6667
000000003083	6	10,100.0000	1,683.3333
000000003084	6	5,700.0000	950.0000
000000003085	6	6,200.0000	1,033.3333
000000003086	6	2,200.0000	366.6667
000000003087	2	1,900.0000	950.0000
000000003088	6	7,000.0000	1,166.6667
000000003089	6	7,100.0000	1,183.3333
000000003090	6	1,400.0000	233.3333
000000003091	6	5,200.0000	866.6667
000000003092	6	8,900.0000	1,483.3333
000000003093	3	1,100.0000	366.6667
000000003094	6	3,300.0000	550.0000
000000003095	6	5,400.0000	900.0000
000000003096	6	8,000.0000	1,333.3333
000000003097	6	3,400.0000	566.6667
000000003098	6	7,800.0000	1,300.0000
000000003099	6	5,000.0000	833.3333
000000003100	6	3,700.0000	616.6667
000000003101	6	10,600.0000	1,766.6667
000000003103	6	7,300.0000	1,216.6667
000000003104	3	2,600.0000	866.6667
000000003105	6	9,300.0000	1,550.0000
000000003106	6	3,900.0000	650.0000
000000003107	6	7,000.0000	1,166.6667
000000003108	6	4,800.0000	800.0000
000000003109	6	6,800.0000	1,133.3333
000000003110	6	6,000.0000	1,000.0000
000000003111	6	4,300.0000	716.6667
000000003112	6	1,600.0000	266.6667
000000003113	6	5,300.0000	883.3333
000000003114	6	6,000.0000	1,000.0000
000000003115	5	7,500.0000	1,500.0000
000000003116	6	13,000.0000	2,166.6667
000000003117	6	19,500.0000	3,250.0000
000000003118	6	6,700.0000	1,116.6667
000000003119	6	3,600.0000	600.0000

Service Account No	Units No of Bills	Total Usage	Average
000000003120	6	1,700.0000	283.3333
000000003121	6	6,900.0000	1,150.0000
000000003122	6	39,600.0000	6,600.0000
000000003123	6	6,200.0000	1,033.3333
000000003124	6	3,000.0000	500.0000
000000003125	6	36,100.0000	6,016.6667
000000003126	6	6,500.0000	1,083.3333
000000003127	6	11,000.0000	1,833.3333
000000003128	6	4,200.0000	700.0000
000000003129	6	4,300.0000	716.6667
000000003130	6	25,100.0000	4,183.3333
000000003131	4	15,200.0000	3,800.0000
000000003132	6	7,900.0000	1,316.6667
000000003133	6	22,600.0000	3,766.6667
000000003134	6	8,100.0000	1,350.0000
000000003135	6	5,400.0000	900.0000
000000003136	6	18,600.0000	3,100.0000
000000003137	6	11,800.0000	1,966.6667
000000003138	6	34,129.0000	5,688.1667
000000003139	6	5,700.0000	950.0000
000000003140	6	6,500.0000	1,083.3333
000000003141	6	10,000.0000	1,666.6667
000000003142	6	1,600.0000	266.6667
000000003143	6	5,000.0000	833.3333
000000003144	6	10,200.0000	1,700.0000
000000003145	6	2,400.0000	400.0000
000000003146	6	15,700.0000	2,616.6667
000000003147	6	3,500.0000	583.3333
000000003148	6	10,200.0000	1,700.0000
000000003149	6	7,300.0000	1,216.6667
000000003150	6	15,700.0000	2,616.6667
000000003151	6	88,500.0000	14,750.0000
000000003152	6	6,000.0000	1,000.0000
000000003153	6	2,800.0000	466.6667
000000003154	6	12,400.0000	2,066.6667
000000003155	6	6,600.0000	1,100.0000
000000003156	6	10,400.0000	1,733.3333
000000003157	6	16,000.0000	2,666.6667
000000003158	6	26,400.0000	4,400.0000
000000003159	6	5,100.0000	850.0000
000000003160	6	10,700.0000	1,783.3333
000000003161	6	5,400.0000	900.0000

Service Account No	Units No of Bills	Total Usage	Average
000000003162	6	11,800.0000	1,966.6667
000000003163	6	12,500.0000	2,083.3333
000000003164	6	2,200.0000	366.6667
000000003165	6	7,500.0000	1,250.0000
000000003166	6	27,400.0000	4,566.6667
000000003167	6	3,100.0000	516.6667
000000003168	6	21,700.0000	3,616.6667
000000003169	6	6,000.0000	1,000.0000
000000003170	6	2,500.0000	416.6667
000000003172	6	12,900.0000	2,150.0000
000000003173	6	11,800.0000	1,966.6667
000000003174	6	4,500.0000	750.0000
000000003175	6	900.0000	150.0000
000000003176	6	3,100.0000	516.6667
000000003177	6	31,100.0000	5,183.3333
000000003178	6	1,800.0000	300.0000
000000003179	6	6,100.0000	1,016.6667
000000003180	6	8,600.0000	1,433.3333
000000003181	6	7,700.0000	1,283.3333
000000003182	6	7,000.0000	1,166.6667
000000003183	6	8,300.0000	1,383.3333
000000003184	6	2,800.0000	466.6667
000000003185	6	5,900.0000	983.3333
000000003186	3	4,700.0000	1,566.6667
000000003187	6	7,300.0000	1,216.6667
000000003188	6	1,300.0000	216.6667
000000003189	6	9,100.0000	1,516.6667
000000003190	6	4,400.0000	733.3333
000000003191	6	2,900.0000	483.3333
000000003192	3	200.0000	66.6667
000000003193	6	6,600.0000	1,100.0000
000000003194	6	5,000.0000	833.3333
000000003195	6	7,200.0000	1,200.0000
000000003196	6	21,200.0000	3,533.3333
000000003197	6	32,800.0000	5,466.6667
000000003198	6	9,700.0000	1,616.6667
000000003199	6	16,300.0000	2,716.6667
000000003200	6	6,300.0000	1,050.0000
000000003201	6	21,000.0000	3,500.0000
000000003202	6	11,900.0000	1,983.3333
000000003203	6	10,400.0000	1,733.3333
000000003204	6	11,200.0000	1,866.6667

Service Account No	Units No of Bills	Total Usage	Average
000000003205	6	6,600.0000	1,100.0000
000000003206	6	3,300.0000	550.0000
000000003207	6	37,800.0000	6,300.0000
000000003208	6	3,500.0000	583.3333
000000003209	6	3,200.0000	533.3333
000000003210	6	16,300.0000	2,716.6667
000000003211	6	13,420.0000	2,236.6667
000000003212	6	5,300.0000	883.3333
000000003213	6	3,900.0000	650.0000
000000003214	6	6,200.0000	1,033.3333
000000003216	6	33,500.0000	5,583.3333
000000003217	6	4,200.0000	700.0000
000000003218	5	3,900.0000	780.0000
000000003219	6	5,500.0000	916.6667
000000003220	6	3,300.0000	550.0000
000000003221	6	3,300.0000	550.0000
000000003222	6	3,600.0000	600.0000
000000003223	6	11,400.0000	1,900.0000
000000003224	6	9,500.0000	1,583.3333
000000003225	6	48,200.0000	8,033.3333
000000003226	6	3,800.0000	633.3333
000000003227	6	6,300.0000	1,050.0000
000000003228	6	6,700.0000	1,116.6667
000000003229	6	53,700.0000	8,950.0000
000000003230	6	3,200.0000	533.3333
000000003231	6	9,500.0000	1,583.3333
000000003232	6	9,900.0000	1,650.0000
000000003233	6	6,500.0000	1,083.3333
000000003234	6	10,200.0000	1,700.0000
000000003235	6	12,700.0000	2,116.6667
000000003236	6	4,300.0000	716.6667
000000003237	6	4,100.0000	683.3333
000000003238	6	6,500.0000	1,083.3333
000000003239	6	5,200.0000	866.6667
000000003240	5	4,700.0000	940.0000
000000003241	6	4,500.0000	750.0000
000000003242	6	28,300.0000	4,716.6667
000000003243	3	5,600.0000	1,866.6667
000000003245	6	5,200.0000	866.6667
000000003246	2	0.0000	0.0000
000000003247	6	2,000.0000	333.3333
000000003248	6	2,200.0000	366.6667

Service Account No	Units No of Bills	Total Usage	Average
000000003249	6	8,300.0000	1,383.3333
000000003250	6	41,900.0000	6,983.3333
000000003251	6	18,100.0000	3,016.6667
000000003252	6	4,300.0000	716.6667
000000003253	6	6,200.0000	1,033.3333
000000003254	6	4,700.0000	783.3333
000000003255	6	10,700.0000	1,783.3333
000000003256	6	12,600.0000	2,100.0000
000000003258	6	7,500.0000	1,250.0000
000000003259	6	6,700.0000	1,116.6667
000000003261	6	2,100.0000	350.0000
000000003262	6	4,700.0000	783.3333
000000003263	3	2,800.0000	933.3333
000000003264	6	3,600.0000	600.0000
000000003265	6	5,400.0000	900.0000
000000003266	6	46,400.0000	7,733.3333
000000003267	6	11,700.0000	1,950.0000
000000003268	6	3,400.0000	566.6667
000000003269	6	11,300.0000	1,883.3333
000000003270	6	73,100.0000	12,183.3333
000000003272	6	5,200.0000	866.6667
000000003273	6	22,600.0000	3,766.6667
000000003274	6	2,090.0000	348.3333
000000003275	6	26,600.0000	4,433.3333
000000003276	6	3,300.0000	550.0000
000000003277	6	8,500.0000	1,416.6667
000000003278	6	5,600.0000	933.3333
000000003279	6	13,400.0000	2,233.3333
000000003280	6	6,200.0000	1,033.3333
000000003281	6	5,300.0000	883.3333
000000003282	6	4,000.0000	666.6667
000000003283	6	3,400.0000	566.6667
000000003284	6	2,500.0000	416.6667
000000003285	6	200.0000	33.3333
000000003286	6	9,700.0000	1,616.6667
000000003288	6	16,200.0000	2,700.0000
000000003289	6	7,200.0000	1,200.0000
000000003290	6	15,000.0000	2,500.0000
000000003291	6	2,100.0000	350.0000
000000003292	6	7,200.0000	1,200.0000
000000003293	6	12,200.0000	2,033.3333
000000003294	6	4,100.0000	683.3333

Service Account No	Units No of Bills	Total Usage	Average
000000003295	6	6,800.0000	1,133.3333
000000003296	6	13,900.0000	2,316.6667
000000003297	6	5,200.0000	866.6667
000000003298	6	64,800.0000	10,800.0000
000000003299	5	3,200.0000	640.0000
000000003301	6	6,700.0000	1,116.6667
000000003303	6	5,200.0000	866.6667
000000003304	6	8,800.0000	1,466.6667
000000003305	6	11,600.0000	1,933.3333
000000003307	6	2,900.0000	483.3333
000000003308	6	3,000.0000	500.0000
000000003309	6	3,400.0000	566.6667
000000003310	4	4,000.0000	1,000.0000
000000003311	6	3,500.0000	583.3333
000000003312	6	10,200.0000	1,700.0000
000000003313	6	7,600.0000	1,266.6667
000000003314	6	5,702.0000	950.3333
000000003315	6	5,500.0000	916.6667
000000003316	6	3,300.0000	550.0000
000000003317	6	4,400.0000	733.3333
000000003318	6	63,900.0000	10,650.0000
000000003319	6	5,600.0000	933.3333
000000003320	6	0.0000	0.0000
000000003321	6	4,100.0000	683.3333
000000003322	6	4,300.0000	716.6667
000000003323	6	2,100.0000	350.0000
000000003324	6	6,600.0000	1,100.0000
000000003325	6	5,600.0000	933.3333
000000003326	6	2,600.0000	433.3333
000000003327	6	4,800.0000	800.0000
000000003328	6	22,000.0000	3,666.6667
000000003329	6	15,400.0000	2,566.6667
000000003330	7	1,500.0000	214.2857
000000003331	4	0.0000	0.0000
000000003332	6	0.0000	0.0000
000000003333	6	1,400.0000	233.3333
000000003334	4	0.0000	0.0000
000000003335	2	1,400.0000	700.0000
000000003336	4	364.0000	91.0000
000000003337	6	8,700.0000	1,450.0000
000000003338	4	2,700.0000	675.0000
000000003339	6	13,700.0000	2,283.3333

Service Account No	Units No of Bills	Total Usage	Average
000000003340	6	30,600.0000	5,100.0000
000000003341	6	28,900.0000	4,816.6667
000000003342	6	6,900.0000	1,150.0000
000000003343	6	5,400.0000	900.0000
000000003344	6	5,800.0000	966.6667
000000003345	6	32,400.0000	5,400.0000
000000003346	6	25,600.0000	4,266.6667
000000003347	6	10,000.0000	1,666.6667
000000003348	6	3,500.0000	583.3333
000000003349	3	5.0000	1.6667
000000003350	6	25,800.0000	4,300.0000
000000003351	6	6,100.0000	1,016.6667
000000003352	6	4,600.0000	766.6667
000000003353	6	7,400.0000	1,233.3333
000000003354	6	21,200.0000	3,533.3333
000000003355	6	9,600.0000	1,600.0000
000000003356	6	6,000.0000	1,000.0000
000000003357	2	2,000.0000	1,000.0000
000000003358	6	2,700.0000	450.0000
000000003359	6	1,100.0000	183.3333
000000003360	6	30,300.0000	5,050.0000
000000003361	6	6,800.0000	1,133.3333
000000003362	6	2,500.0000	416.6667
000000003363	2	0.0000	0.0000
000000003364	6	4,200.0000	700.0000
000000003365	6	17,100.0000	2,850.0000
000000003366	6	11,800.0000	1,966.6667
000000003367	6	4,800.0000	800.0000
000000003368	6	5,000.0000	833.3333
000000003369	6	5,600.0000	933.3333
000000003371	6	4,600.0000	766.6667
000000003372	6	0.0000	0.0000
000000003373	6	16,100.0000	2,683.3333
000000003374	6	20,400.0000	3,400.0000
000000003375	6	7,800.0000	1,300.0000
000000003377	6	10,700.0000	1,783.3333
000000003378	6	6,700.0000	1,116.6667
000000003379	6	1,700.0000	283.3333
000000003380	6	14,900.0000	2,483.3333
000000003381	1	0.0000	0.0000
000000003382	6	11,000.0000	1,833.3333
000000003383	6	14,500.0000	2,416.6667

Service Account No	Units No of Bills	Total Usage	Average
000000003384	6	11,500.0000	1,916.6667
000000003385	6	7,400.0000	1,233.3333
000000003386	6	5,600.0000	933.3333
000000003387	6	17,700.0000	2,950.0000
000000003388	6	600.0000	100.0000
000000003389	6	14,800.0000	2,466.6667
000000003401	6	87,500.0000	14,583.3333
000003017.01	5	1,100.0000	220.0000
000003048.01	2	500.0000	250.0000
000003056.01	7	7,800.0000	1,114.2857
000003057.01	4	1,500.0000	375.0000
000003087.01	5	10,500.0000	2,100.0000
000003093.01	4	5,600.0000	1,400.0000
000003102.01	6	2,400.0000	400.0000
000003104.01	1	400.0000	400.0000
000003104.02	2	100.0000	50.0000
000003131.01	2	1,400.0000	700.0000
000003171.01	4	0.0000	0.0000
000003186.01	4	2,200.0000	550.0000
000003192.02	5	7,700.0000	1,540.0000
000003215.01	7	31,900.0000	4,557.1429
000003243.02	3	900.0000	300.0000
000003244.01	6	11,000.0000	1,833.3333
000003260.01	6	1,800.0000	300.0000
000003263.01	4	3,000.0000	750.0000
000003271.02	6	6,900.0000	1,150.0000
000003287.01	6	2,000.0000	333.3333
000003300.01	6	4,700.0000	783.3333
000003306.01	6	900.0000	150.0000
000003310.01	2	1,100.0000	550.0000
000003335.02	4	2,700.0000	675.0000
000003335.03	2	0.0000	0.0000
000003338.01	2	1,500.0000	750.0000
000003381.01	6	5,500.0000	916.6667
Grand Total for WATER - Cubic Ft	**2,304**	**3,753,410.0000**	**1,629.0842**

School & Campground Consumption Data

CASCADIA WATER
Meter Reading History
Sort Order: Customer No.
From: 1/1/2020 Through: 12/31/2020

Limited to : Account No 3210 Location No 3210

Location No. / Service Category	Customer No. / Serial No.	Customer Name / Read Type	Sequence	Service Address / Reading	Route No. / Read Date	Bill Date	Code
3210	3210	FIVE ACRE SCHOOL		515 LOTZGESELL ROAD	OP-Estates		
Water	03210	VOL	421	585,000.00	12/3/2020	12/4/2020	Actual Read
	03210	VOL	421	583,100.00	9/30/2020	10/7/2020	Actual Read
	03210	VOL	421	580,400.00	7/31/2020	8/7/2020	Actual Read
	03210	VOL	421	580,300.00	5/31/2020	6/5/2020	Actual Read
	03210	VOL	421	580,300.00	3/31/2020	4/10/2020	Actual Read
	03210	VOL	421	578,900.00	2/4/2020	2/11/2020	Actual Read

From: 1/1/2021 Through: 12/31/2021

Limited to : Account No 3210 Location No 3210

Location No. / Service Category	Customer No. / Serial No.	Customer Name / Read Type	Sequence	Service Address / Reading	Route No. / Read Date	Bill Date	Code
3210	3210	FIVE ACRE SCHOOL		515 LOTZGESELL ROAD	OP-Estates		
Water	03210	VOL	421	599,500.00	12/1/2021	12/14/2021	Actual Read
	03210	VOL	421	598,200.00	10/1/2021	10/7/2021	Actual Read
	03210	VOL	421	596,000.00	7/31/2021	8/15/2021	Actual Read
	03210	VOL	421	593,100.00	5/31/2021	6/7/2021	Actual Read
	03210	VOL	421	588,800.00	4/1/2021	4/7/2021	Actual Read
	03210	VOL	421	586,500.00	1/30/2021	2/4/2021	Actual Read

From: 1/1/2022 Through: 12/31/2022

Limited to : Account No 3210 Location No 3210

Location No. / Service Category	Customer No. / Serial No.	Customer Name / Read Type	Sequence	Service Address / Reading	Route No. / Read Date	Bill Date	Code
3210	3210	FIVE ACRE SCHOOL		515 LOTZGESELL ROAD	OP-Estates		
Water	03210	VOL	421	615,800.00	11/30/2022	12/8/2022	Actual Read
	03210	VOL	421	612,300.00	9/30/2022	10/13/2022	Actual Read
	03210	VOL	421	605,800.00	7/31/2022	8/22/2022	Actual Read
	03210	VOL	421	603,400.00	5/31/2022	6/14/2022	Actual Read
	03210	VOL	421	601,800.00	3/31/2022	4/12/2022	Actual Read
	03210	VOL	421	600,100.00	1/31/2022	2/2/2022	Actual Read

Cascadia WATER™

CASCADIA WATER
Meter Reading History
Sort Order: Customer No.

From: 1/1/2020 Through: 12/31/2020

Limited to : Account No 3401 Location No 3401

Location No. / Service Category	Customer No. / Serial No.	Read Type	Customer Name / Sequence	Service Address / Reading	Route No. / Read Date	Bill Date	Code
3401	3401		CLALLAM CO PARKS	430 LOTZGESELL ROAD	OP-Estates		
Water	03401	VOL	410	1,456,900.00	12/3/2020	12/4/2020	Actual Read
	03401	VOL	410	1,443,200.00	9/30/2020	10/7/2020	Actual Read
	03401	VOL	410	1,413,800.00	7/31/2020	8/7/2020	Actual Read
	03401	VOL	410	1,382,500.00	5/31/2020	6/5/2020	Actual Read
	03401	VOL	410	1,370,700.00	3/31/2020	4/10/2020	Actual Read
	03401	VOL	410	1,358,100.00	2/4/2020	2/11/2020	Actual Read

From: 1/1/2021 Through: 12/31/2021

Limited to : Account No 3401 Location No 3401

Location No. / Service Category	Customer No. / Serial No.	Read Type	Customer Name / Sequence	Service Address / Reading	Route No. / Read Date	Bill Date	Code
3401	3401		CLALLAM CO PARKS	430 LOTZGESELL ROAD	OP-Estates		
Water	03401	VOL	410	1,579,900.00	12/1/2021	12/14/2021	Actual Read
	03401	VOL	410	1,558,000.00	10/1/2021	10/7/2021	Actual Read
	03401	VOL	410	1,545,600.00	7/31/2021	8/15/2021	Actual Read
	03401	VOL	410	1,507,700.00	5/31/2021	6/7/2021	Actual Read
	03401	VOL	410	1,487,500.00	4/1/2021	4/7/2021	Actual Read
	03401	VOL	410	1,474,100.00	1/30/2021	2/4/2021	Actual Read

From: 1/1/2022 Through: 12/31/2022

Limited to : Account No 3401 Location No 3401

Location No. / Service Category	Customer No. / Serial No.	Read Type	Customer Name / Sequence	Service Address / Reading	Route No. / Read Date	Bill Date	Code
3401	3401		CLALLAM CO PARKS	430 LOTZGESELL ROAD	OP-Estates		
Water	03401	VOL	410	1,667,400.00	11/30/2022	12/8/2022	Actual Read
	03401	VOL	410	1,657,300.00	9/30/2022	10/13/2022	Actual Read
	03401	VOL	410	1,632,000.00	7/31/2022	8/22/2022	Actual Read
	03401	VOL	410	1,604,600.00	5/31/2022	6/14/2022	Actual Read
	03401	VOL	410	1,592,400.00	3/31/2022	4/12/2022	Actual Read
	03401	VOL	410	1,586,200.00	1/31/2022	2/2/2022	Actual Read

* Denotes Reversed Read

APPENDIX S
Emergency Response Plan

EMERGENCY RESPONSE PLAN

A. PLAN OVERVIEW

This is a general Emergency Response Plan to be implemented by Cascadia Water (hereinafter 'Cascadia') for the water systems they own and operate. This planning document is intended to assist Cascadia and their operators in protecting the health and safety of their customers, staff, and assets. The plan intends to provide general guidance to maintain or restore safe and reliable drinking water. The goals of the Emergency Response Plan are listed in Table 1. Due to the size of the majority of systems owned by Cascadia and most of their infrastructure, the primary vulnerabilities will be related to distribution system pressures, water main repairs, and resulting water quality contamination.

Table 1: Emergency Response Goals

Mission statement for emergency response	In an emergency, the primary objective of Cascadia Water is to protect the health of its customers by being prepared to respond immediately to a variety of events that may result in contamination of the water or disruption to supplying water.
Goal 1	Be able to quickly identify an emergency and initiate timely and effective response action.
Goal 2	Be able to quickly notify local, state, and federal agencies to assist in the response.
Goal 3	Protect public health by being able to quickly determine if the water is safe to drink and being able to immediately notify customers of a potentially unsafe condition and advise them of appropriate protective action.
Goal 4	To be able to quickly respond to and repair damages to minimize system down time.

B. WATER SYSTEM INFORMATION

Table 2 provides a quick reference for general information regarding a water system. Including, locations, primary assets, quantities, and primary contacts.

Table 2: System Information

System Name	Estates, Inc.
Population:	960 people – 404 connections
Owner Contract Information:	Cascadia Water, LLC PO Box 549 (18181 SR 525) Freeland, WA 98249 Phone: (888) 235-0510 Emergency/After Hours: (833) 591-3336
Operator Contact:	Dale Metzger Phone: (360) 477-9704
System Location:	Pumphouse, Reservoir, Source 85 Ridge View Drive Sequim, WA 98382
Directions	Traveling East/West on WA 101, turn North onto Kitchen-Dick Rd. Travel North approximately 2.2 miles, turn right onto Woodcock Rd, travel west on Woodcock Rd for 0.4 miles, turn left onto Ridge View Dr. The pumphouse and associated facilities are located about 500 feet north on the left hand side of the road.
Sources	Well 1 – Well Tag: ACA573 – 180 gpm – 607’ depth Well 2 – Well Tag: ACA574 – 180 gpm – 462’ depth
Reservoirs	174,500 gallons (30’ diameter x 33’ height)
Booster Pumps	(4) Goulds 6BF1MBB0 (15 hp) VFD Constant Pressure: 60 psi
Pressure Tanks	(3) Amtrol WX455C (370 gallons)
Distribution Piping	▪ 2” – 2,850 ft ▪ 4” – 21,600 ft ▪ 6” – 10,200 ft ▪ 8” – 5,900 ft Total: 40,550 ft

C. EMERGENCY TELEPHONE NUMBERS AND PERSONNEL

Response to all emergencies may be initiated by calling 9-1-1.

Clallam County Fire Protection District #3 serves Estates and the other areas located within the approved service areas. The Fire Protection District will respond to chemical spills and physical hazards such as downed trees and power lines, as well as fire emergencies.

General water system inquiries may be made to:

Cascadia Water
Mailing Address:
PO Box 549, Freeland, WA 98249
Physical Address:
18181 SR 525, Freeland, WA 98249
Telephone: 360.578.7044
E-Mail: info@cascadiawater.com

For assistance with emergency procedures, the following additional personnel may be contacted:

Culley Lehman, Manager
Cascadia Water, LLC
Cell: (360) 661.7781

Dale Metzger, Operator
Telephone: (360) 477-9704

The Estates system is equipped with a SCADA (Supervisory Control and Data Acquisition) system which provides monitoring and alarms for the system including system pressures, pump operations, reservoir levels, backwash activation, etc.

D. NOTIFICATION OF LOCAL AUTHORITIES

The following agencies shall be notified by Cascadia where required by statute, to request assistance, or to provide information for public inquiries:

Washington State Department of Health	
Andy Anderson, P.E.	
Southwest Regional Office Manager	Phone: (360) 236-3025
DOH After Hours Emergency Hotline	Phone: (877) 481-4901
Clallam County	
Clallam County Public Health	Phone: (360) 417-2274
Clallam County Public Works	Phone: (360) 417-2319
Clallam County Emergency Management	Phone: (360) 417-2525
Justine Chorley, Program Coordinator	
Clallam County Fire District #3 - Station 31	Phone: (360) 683.4242

Cascadia Water shall be responsible for contacting the above and notifying customers for all emergencies, including coliform monitoring violations.

E. Notification of the Public

For notification of the public during water emergencies such as issuance of an "Acute Health Advisory", Cascadia shall utilize the following methods to notify the public, as they are applicable:

- E-Mail notification
- Portable Signs at primary entry/exit roads
- Door-to-door notification/door hangers
- Website Updates
- News releases

F. Potential Emergency Events

The most likely emergencies will include the following:

- Low system pressure – customer complaint
- Water main break/leak – customer complaint, visual inspection/detection
- Water quality issues – customer complaint or positive test result from routine monitoring

Major and/or widespread system failure may occur from the following:

- Fire at pumphouse
- Earthquake
- Landslide in local area
- Flooding at pumphouse
- Other earth movement (e.g. landslide) causing a major water main break.
- Chemical contamination of sources of supply
- Ice Storm (freezing pipes)
- System Vandalism

G. Emergency Response

<u>Low pressure</u>

Complaints of low pressure should be referred to the system operator, Dale Metzger. Minimum actions include:

- Verify that the source of supply pressure is normal.
    - Reservoir levels are in a normal range
    - Booster pump discharge pressures are in normal range (check pressure gauges on hydropneumatic tanks)

- Establish if low pressure is isolated to the customer making the complaint. This may be done by checking the pressure at the meter of the customer making the complaint (remove meter and install pressure gauge), or by placing a pressure gauge on a neighboring customer’s hose bib.
- If low pressure occurs at more than one home, check for closed main valve or leaking water main.
- If pressure is normal at meter, recommend that customer contact plumber/private contractor.

Cascadia Water/Estates WILL NOT undertake work on private property to correct a problem with the customer’s plumbing system.

Water main leak or break

Cascadia Water will complete all system repairs where possible. Cascadia has the necessary equipment and parts to complete most repairs required in the system.

Cascadia should maintain the following minimum supply of materials to facilitate emergency repairs:

- Two lengths of 4-, 6- and 8-inch AWWA C-900 Class 150 PVC pipe
- Two 4-, 6- and 8-inch mechanical joint ductile iron sleeves with joint materials
- 20 feet each of ¾-inch and 1-inch HDPE service tubing
- Brass fittings, connectors, etc., for services
- Two each: 4-, 6- and 8-inch x ¾-inch service saddles and corporation stops
- 300 feet of 2.5-inch fire hose with two sets of coupling adapters to connect fire hose to 2-inch IPS fittings

When repairs cannot be accomplished by the system operator, Cascadia maintains a list of locally licensed and bonded general contractors that can provide additional support when necessary.

Whenever possible, leaks in mains and services should be repaired without the shutdown of the water main. A water main break may require that a section of the main be shut down for repair. When isolating the section of broken pipe, leave at least one gate valve slightly open to allow water to flow out of the broken section of pipe until dewatering equipment can remove the water surrounding the broken section of pipe. This is done to prevent groundwater and dirt from entering the broken section of pipe.

In the event of a water main break that shatters a section of pipe or otherwise allows groundwater to enter the main, contamination of the water pipe shall be assumed. As part of the repair procedure, the water system shall be disinfected with a high concentration of chlorine (e.g., 200 mg/L for 2 hours), and then flushed. Following flushing, a bacteriological sample will be collected from the customer at the downstream end of the broken section of water main.

Follow the emergency disinfection procedures outlined in DOH Publication 331-583 Water Main Break Response Protocol for Chlorinated Systems located at the end of this section.

Disinfect repair material with a 5 percent solution of sodium hypochlorite (bleach). Add chlorine to the open trench section as a precautionary measure, working in a wet trench exposes repair parts to groundwater, mud, etc.

If groundwater enters the broken pipe, a full disinfection by the "slug" method may be necessary. The chlorine dose for this method should be at least 500 mg/L.

Following the repair of a main break that requires dewatering of the system, confirm water quality is maintained by collecting investigative bacteriological samples, one upstream and one downstream of the break.

If a long period of time is required for the repair of a water main, it may be necessary to provide temporary water supply to customers by:

- Using garden hoses to connect homes with water to those without, usually through the backyard hose bibs, or
- Using fire hose to run a temporary service main and making connection to each meter setter.

All hoses used to provide temporary service connections should be disinfected.

Complaint about water quality or positive bacteriological result from routine monitoring

With respect to water quality issues, if a complaint indicates system contamination, or the results of water quality analysis show that any maximum contaminant level (MCL) is exceeded, the system operator and manager shall follow the procedures set forth in *WAC 246-290-320 Follow-up Action*.

Notification procedures may include any or all of the following, depending on the nature of the complaint or quality problem:

- Door-to-door or telephone notification of customers
- County and DOH notification
- Public notification per WAC 246-290-330 and the Coliform Monitoring Plan (Appendix M of the Estates, Inc. 2025 Water System Plan).

For the emergencies listed above, the impact on the system is likely to include loss of pressure due to line break, potential water quality contamination, loss of power or loss of water service. Main breaks, loss of pressure and water quality contamination are addressed above. Should loss of power or loss of source capacity occur the Water Shortage Response Plan should be implemented.

If a major emergency occurs, it is impossible to predict which portions of the system will be affected. Response procedures will be a variation of those listed above and will need to be tailored to the specific problem at the time of the emergency.

H. Backflow Incident

Whenever the initial evaluation of a water quality complaint indicates that a backflow incident has occurred (potable water supply has been contaminated/polluted), may have occurred, or the reason for the complaint cannot be explained as a "normal" aesthetic problem, a backflow incident investigation should be immediately initiated. It is wise to be conservative when dealing with public health matters.

Within 24 hours of knowledge of any incident of possible contamination of the potable water supply, either in the distribution system and/or in the customer's plumbing system, the state and county personnel listed above should be notified.

A backflow incident investigation is often a team effort. The investigation should be made or (initially) lead by the certified Cascadia.

Cascadia will use the manual Backflow Incident Investigation Procedures, First Edition, 1996, published by the PNWS-AWWA as a supplement to the Backflow Incident Response Plan. The following points are included for initial guidance during a backflow incident:

- As soon as possible, notify customers not to consume or use water. Start the notification with the customers nearest to the assumed source of contamination (usually the customer(s) making the water quality complaint).
- Consider the distribution system as a potential source of the contaminant (e. g., air valve inlet below ground).
- Do not start flushing the distribution system until the source of contamination is identified. Flushing may aggravate the backflow situation and will likely remove the contaminant before a water sample can be collected to fully identify the contaminant.
- Conduct a house-to-house survey to identify the source of contamination and the extent that the contaminant has spread through the distribution system.
- Isolate the portions of the system that are suspected of being contaminated by closing isolation valves; leaving one valve open to ensure that positive water pressure is maintained throughout the isolated system.
- Be sure to notify all affected customers in the isolated area, then the other customers in the system.
- The public health and plumbing authorities should work with all customers who may have consumed the contaminant, or had their plumbing systems contaminated.
- Develop and implement a program for cleaning the contaminated distribution system.

Identification of the source and type of contaminant, and cleaning of a distribution system could take several days.

Most chemical or physical contaminants can be flushed from the water distribution system or customer's plumbing system with adequate flushing velocity. This may not be the case where scale and corrosion deposits (e.g., tuberculation on old cast iron mains) restrict adequate flushing velocity, or a chemical deposit or bacteriological slime (biofilm) is present on which the chemical contaminant may adhere.

To remove a chemical or physical contaminant, it may be necessary to provide a physical cleaning, using foam swabs (pigs), and/or to alter the form or the chemical contaminant, e.g., through oxidation using chlorination, or addition of detergents.

When adding any chemical (including chlorine) to remove a contaminant, it is essential that the chemistry of the contaminant is fully understood. The wrong chemical reaction could make the contaminant more toxic, more difficult to remove, or both.

Where both a chemical and bacteriological contamination has occurred, disinfection should follow the removal of the chemical contaminant.

Where any bacteriological contamination is suspected, field disinfection should be done. To disinfect water mains using the "slug" or "continuous flow" method, a field unit should be used for chlorine injection, such as a chemical feed - metering or proportioning pump for sodium hypochlorite.

I. Natural Hazard Event

In the event of a natural hazard such as an earthquake, local landslide, flooding, fire, or freezing, Cascadia Water will implement responses per event, along with taking preliminary precautions.

In the event of a natural hazard where immediate help is required, Cascadia is a member of the Washington Water/Wastewater Agency Response Network (WAWARN) and could receive assistance and/or supplies from other utilities registered with WAWARN.

Cascadia's water system components are inspected daily to ensure equipment is at peak performance and that assets are protected in the case of a natural hazard event. All data is stored electronically, and facilities are guarded with proper fencing, and concrete structures to ensure safety of equipment and source water.

J. Contingency Plan

With one well out of service the other well has adequate capacity to support the system.

A short-term well pump failure or loss of a single well should have negligible impact on the system. Customers should be notified that water conservation measures should be implemented if the outage persists for an extended time period and the inoperable well impacts the system capacity or the quality of the delivered water. In the event of a short-term emergency such as source contamination, Cascadia will:

a) Assess the nature and extent of the contamination, its impact on water quality, and whether water treatment will allow continued use of the contaminated well. If not, discontinue use of the well and,
b) Initiate water conservation measures to conserve minimum storage in the system reservoir. The system's reservoirs has a storage capacity of 174,500-gallons. Assuming

that only a single source is compromised, the reservoir has capacity to provide approximately 430 gallons per connection.

Emergency water sources in order of priority are:

1. Hauled Water
2. Bottled Water
3. Emergency Intertie

If water service interruption is expected to be several days, bottled water may be necessary to meet customer minimum needs until other options are explored.

There are no interties or intertie agreements with other systems at this time. If the water service will be interrupted for longer than a 10-day period, Cascadia may explore the possibility of an emergency intertie with neighboring systems. Existing systems adjacent to the Estates distribution mains would be potential candidates for emergency interties. Should an intertie not be feasible, Cascadia will contract for hauled water to fill the storage tank until service can be restored.

Other emergencies to be addressed:

- Reservoir failure
- Booster Pump Failure
- Treatment Equipment Failure
- Spills around well head

K. General Reference

For general emergency planning, the following references should be studied before an emergency occurs:

Emergency Planning for Water and Wastewater Utilities (M19), Fifth Edition, 2018, published by the American Water Works Association.

APPENDIX T
Cross-Connection Control Program

Cross-Connection Control Program

- Estates, Inc. -

1 OVERVIEW

The Estates, Inc. Water System (Estates) is located in Clallam County west of Sequim, Washington. The service area includes portions of Sections 3 and 4 of Township 30 North, Range 4 West, and Sections 32, 33, and 34 of Township 31 North, Range 4 West of the Willamette Meridian.

Estates is owned and operated by Cascadia Water, LLC (Cascadia) which is a private, investor-owned utility company consisting of multiple water systems throughout the State of Washington. Estates currently has 400+ connections that are primarily single-family residential connections with four non-residential institutional and recreational connections.

2 REQUIREMENTS FOR PROGRAM

Cascadia Water, hereinafter referred to as the Purveyor, has the responsibility to protect their public water systems from contamination due to cross-connections. A cross-connection may be defined as "Any actual or potential physical connection between a potable water line and any pipe, vessel, or machine that contains or has a probability of containing a non-potable gas or liquid, such that it is possible for a non-potable gas or liquid to enter the potable water system by backflow".

3 PROGRAM OBJECTIVES

The objectives of the cross-connection control program are to:

1 Reasonably reduce the risk of contamination of the public water distribution system; and

2 Reasonably reduce the Purveyor's exposure to legal liability arising from the backflow of any contaminant originating from the customer's plumbing system and then supplied to other customers.

4 PROGRAM ELEMENTS

The following are excerpts from the Washington Administrative Code (WAC) 246-290-490 regarding the required elements of the cross-connection control program.

4.1 Element 1

The purveyor shall adopt a local ordinance, resolution, code, bylaw, or other written legal instrument that:

1. Establishes the purveyor's legal authority to implement a cross-connection control program.
2. Describes the operating policies and technical provisions of the purveyor's cross-connection control program.
3. Describes the corrective actions used to ensure that consumers comply with the purveyor's cross-connection control requirements.

4.2 Element 2

The purveyor shall develop and implement procedures and schedules for evaluating new and existing service connections to assess the degree of hazard posed by the consumer's premises to the purveyor's distribution system and notify the consumer within a reasonable time frame of the hazard evaluation results. At minimum, the program shall meet the following:

1. For new connections made on or after the effective date of these regulations, procedures shall ensure that an initial evaluation is conducted before service is provided.
2. For existing connections made prior to the effective date of these regulations, procedures shall ensure that an initial evaluation is conducted in accordance with a schedule acceptable to the Washington State Department of Health.
3. For all service connections, once an initial evaluation has been conducted, procedures shall ensure that periodic reevaluations are conducted in accordance with a schedule acceptable to the department and whenever there is a change in the use of the premises.

4.3 Element 3

The purveyor shall develop and implement procedures and schedules for ensuring that:

1. Cross-connections are eliminated whenever possible.
2. When cross-connections cannot be eliminated, they are controlled by installation of approved backflow preventers commensurate with the degree of hazard; and
3. Approved backflow preventers are installed in accordance with the requirements of WAC 246-290 subsection 6.

4.4 Element 4

The purveyor shall ensure that personnel, including at least one person certified as a cross-connection control specialist (CCS) are provided to develop and implement the cross-connection control program.

4.5 Element 5

The purveyor shall develop and implement procedures to ensure that approved backflow preventers are inspected and/or tested (as applicable) in accordance with WAC 246-290 subsection 7.

4.6 Element 6

The purveyor shall develop and implement a backflow prevention assembly testing quality control assurance program including, but not limited to documentation of tester certification and test kit calibration, test report contents, and time frames for submitting completed test reports.

4.7 Element 7

The purveyor shall develop and implement (when appropriate) procedures for responding to backflow incidents.

4.8 Element 8

The purveyor shall include information on cross-connection control in the purveyor's existing program for educating consumers about water system operations. Such a program may include periodic bill inserts, public service announcements, pamphlet distribution, notification of new consumers and consumer confidence reports.

4.9 Element 9

The purveyor shall develop and maintain cross-connection control records including, but not limited to, the following:

1) A master list of service connections and/or consumer's premises where the purveyor relies upon approved backflow preventers to protect the public water system from contamination, the assessed hazard level of each, and the required backflow preventer(s).
2) Inventory information on:
    a) Approved air gaps installed in lieu of approved assemblies including exact air gap location, assessed degree of hazard, installation date, history of inspections, inspection results, and person conducting inspections; and
    b) Approved backflow assemblies including exact assembly location, assembly description (type, manufacturer, model, size, and serial number), assessed degree of hazard, installation date, history of inspections, tests and repairs, test results, and person performing tests; and
    c) Approved AVBs used for irrigation system applications including location, description (manufacturer, model, and size), installation date, history of inspections, and person performing inspections.

A copy of the current Washington State Department of Health “Cross-Connection Program Summary Reports” and “Backflow” section WAC 246-290.

4.10 Element 10

Purveyors who distribute and/or have facilities that receive reclaimed water within their water service area shall meet any additional cross-connection control requirements imposed by the department under a permit issued in accordance with chapter 90.46 of the Revised Code of Washington (RCW).

5 PROGRAM OPERATIONS

5.1 Authority

The attached resolution establishes the authority for the program. The attached service contract referred to in the resolution shall be the primary enforcement authority for all new customers.

For customers supplied prior to the adoption of the attached resolution, an implied service contract allows the Purveyor to protect the distribution system from contamination through a Purveyor installed backflow preventer on a customer's service.

The written and implied contract terms are discussed further hereinafter under the section "Policy".

5.2 Program Administration

The responsibility for administration rests with the Purveyor, either as a body or to an individual director or employee, hereinafter referred to as the Director.

The administration of the program shall be periodically audited by a Washington State Department of Health (DOH) certified Cross-Connection Control Specialist (CCCS) employed by the Purveyor. At a minimum, the audit will occur every six years. For systems required to update a water system plan, the audit should be part of water system plan update. When requested, the CCCS shall also advise the Director on cross-connection-control matters.

The current CCCS employed by the Purveyor is:

Culley Lehman (360) 331-7388

5.3 Policy

The following service policy shall apply to all new and existing customers:

Water services to all non-single family or duplex residential customers, hereinafter referred to as "commercial customers", shall be isolated at the meter by a Purveyor approved, double check valve assembly (DCVA) or reduced pressure backflow assembly (RPBA). All customers described in Table 13 of WAC 246-290-490 shall be isolated with a RPBA. All other commercial customers shall be isolated with a DCVA.

Water services to all single family or duplex residential customers, hereafter referred to as "residential customers", shall be isolated at the meter by a Purveyor installed meter check valve (single or dual), except where the customer has special plumbing that increases the risk to the Purveyor's distribution system, such as, but not limited to, the following:

1. Lawn Irrigation System	4. Piping for hobby farming, etc.
2. Solar Heatin System	5. Residential fire sprinkler system
3. Auxiliary Source of supply (e.g. well)	6. Property containing small boat moorage

All residential customers described in Table 13 of WAC 246-290-490 shall be isolated with a RPBA. All other residential customers with special plumbing as described in “2”, above, shall be isolated with a DCVA. For all customers that have a written service contract with the Purveyor, the premises isolation DCVA or RPBA required above shall be:

1. Purchased and install by the customer (at the customer's expense) immediately downstream of the water meter in accordance with the Purveyor's standards described hereinafter;

2. Maintained, repaired, tested, and inspected in accordance with the Purveyor's standards described hereinafter;

For new customers, water shall not be turned on at the meter until the customer complies with the above requirements.

The failure of the customer to comply with the above installation and maintenance requirements shall constitute the customer's breach of contract. The Purveyor may then proceed with corrective action provisions stipulated in the contract.

Customers without a written contract shall be considered to have an implied contract that requires the customer to bear all reasonable costs of service. The Purveyor shall install the required DCVA or RPBA on the service, upstream of the meter, and charge the customer for the cost of the initial installation, and all future maintenance, testing and repair, as set forth in the Purveyor's schedule of rates and charges. The failure of the customer to pay these costs shall constitute the customer's breach of contract, and the Purveyor shall proceed with the established delinquency of payment procedures. As an alternative, the customer may sign a service contract, and install the required backflow preventer downstream of the meter.

The Purveyor has no regulatory responsibility or authority over the installation and operation of the customer's plumbing system. The customer is solely responsible for compliance with all applicable regulations, and for prevention of contamination of his plumbing system from sources within his premises. Any action taken by the Purveyor to survey plumbing, inspect or test backflow prevention assemblies, or to require premises isolation (installation of DCVA or RPBA on service) is solely for the purposes of reducing the risk of contamination of the Purveyor's distribution system.

No action by the Purveyor shall be construed by the customer to provide guidance to the customer on the safety or reliability of the plumbing system. Other than the general public education program discussed hereinafter, the Purveyor will provide no advice to the customer on the design and installation of plumbing.

Except for easements containing the Purveyor's distribution system, the Purveyor will not undertake work on the customer's premises.

5.4 Cross-Connection Surveys

The procedures for evaluating the backflow prevention requirements for new and existing customers are:

1. For all new commercial services, the customer shall submit with the application for water service an evaluation by a purveyor pre-approved, WA Department of Health certified CCS of the hazard posed by the proposed plumbing system, with recommendations for the installation at the meter of either a DCVA or RPBA. The Purveyor, at the discretion of the Director, may accept the recommendation or submit the recommendations to a CCCS employed by the Purveyor for peer review and concurrence, before acceptance.
2. For all new residential services, the customer shall submit with the application for water service a completed "Water Use Questionnaire", copy attached hereto. If the customer's reply indicate special plumbing, such as a lawn sprinkler system, the customer shall submit an evaluation by a purveyor pre-approved, DOH CCCS of the hazard posed by the proposed special plumbing system, with recommendations for the installation at the meter of either a DCVA or RPBA.

As an alternative to the above requirement for a survey by a CCCS, at the discretion of the Director, the Purveyor may specify the backflow preventer required to be installed as a condition of service.

For all existing commercial services, the customer shall be requested to submit within two years an evaluation by a purveyor pre-approved, DOH certified CCCS of the hazard posed by the proposed plumbing system, with recommendations for the installation at the meter of either a DCVA or RPBA. The Purveyor, at the discretion of the Director, may accept the recommendation or submit the recommendations to a CCS employed by the Purveyor for peer review and concurrence, before acceptance.

For all existing residential services, the customer shall be requested to submit within four months a completed "Water Use Questionnaire". If the customer's reply indicates special plumbing, the customer shall submit an evaluation by a purveyor pre-approved, DOH certified CCCS of the hazard posed by the proposed special plumbing system, with recommendations for the installation at the meter of either a DCVA or RPBA.

As an alternative to the above requirement for a survey by a CCCS, at the discretion of the Director, the Purveyor may specify the backflow preventer required to be installed as a condition of service. Guidance on the type of backflow preventer shall be provided by the Purveyor's CCCS.

For existing services, should the customer fail to supply the requested information for a hazard assessment, the Director may have the assessment made by a CCCS employed by the Purveyor, require the installation of an RPBA, or take other such actions consistent with the previously stated policies.

For subsequent cross-connection surveys, procedures for evaluating the backflow prevention requirements are:

1. For residential services not required to have a DCVA or RPBA, every two years and/or at the time of a change in ownership of the premises, the customer shall be requested to submit within two months a completed "Water Use Questionnaire". The procedure for evaluating the need to change the hazard assessment, and thus require a DCVA or RPBA shall be the same as the procedure for the initial assessment.
2. For residential services with a DCVA or RPBA, and for all commercial services, the customers shall be required to submit with the annual report on the testing of the DCVA or RPBA, a reevaluation of the hazard assessment. To facilitate the reevaluation, the customer should employ for testing the DCVA or RPBA a Purveyor pre-approved, DOH certified CCCS (dual CCCS and Backflow Assembly Tester (BAT) certification). Alternatively, the customer may employ a CCCS to accompany the BAT.

5.5 Testing of Assemblies

The following requirements apply to all backflow prevention assemblies and air gaps relied upon by the Purveyor to protect its public water system.

The DCVA or RPBA installed on the service for premises isolation shall be inspected and tested by a DOH certified BAT upon installation and at least annually thereafter, after repair, replacement or relocation, and upon the specific request of the Purveyor as a spot quality assurance check. As previously noted, the BAT shall also retain WA DOH certification as a CCCS.

For customer-owned assemblies, the customer shall employ a Purveyor pre-approved BAT to complete the inspection and test within 30 days of date of mailing by the Purveyor of a notification to test the assembly. The test report shall be completed and signed by the BAT, then countersigned and returned by the customer to the Purveyor within 45 days of the date of mailing of the notification to test the assembly. A request for an extension of the completion time for the return of a test report may be made in writing by the customer to the Purveyor. An extension up to 90 days may be granted at the discretion of the Director.

The DCVA, DCDA, RPBA and RPDA, shall be tested in accordance with the test performance criteria outlined in Chapter 8 "Assembly Test Procedures" in the PNWS-AWWA Cross-Connection Control Manual.

The test report form supplied by the Purveyor, copy attached hereto, shall be completed and returned.

5.6 Quality Assurance

The following requirements apply to all backflow prevention assemblies and air gaps relied upon by the Purveyor to protect its public water system.

The test report forms submitted by the customer shall be reviewed upon receipt by the Director, and periodically by a CCCS employed by the Purveyor to audit the cross-connection control program. Test reports should be reviewed by the CCCS at least annually.

To ensure that the equipment used to test assemblies has been checked for calibration within the last year, the Purveyor shall list as pre-approved those BATs listed by another water utility with greater than 1,000 connections that has a quality assurance program. Alternatively, the BAT may submit with a test report a report on the verification of the calibration of his test equipment and current certification status.

5.7 Approved Backflow Assemblies

The Purveyor shall rely upon the Washington Department of Health's published list of "Approved" backflow prevention assemblies. This list shall be obtained from the State of Washington annually.

5.8 Records

The Director shall maintain copies of all records, including but not limited to, correspondence, survey results, and backflow assembly test reports. The record form "Record of Backflow Prevention Assemblies" (Form B-1), included herewith, shall be used to record the location of all backflow prevention assemblies required by the Purveyor.

5.9 List of Certified Testers

The list of local certified BAT and CCS approved by the Purveyor is included herewith. Others may be added to this list upon written request. A list of all certified tester may be obtained from the DOH.

5.10 Coordination with Plumbing Authority

A copy of this cross-connection control program is provided to Clallam County Plumbing Inspector, hereinafter referred to as the local administrative authority, via a copy of the Purveyor's water system plan.

The Director shall provide information to the local administrative authority in a timely manner of:

1. Any requirement imposed on a residential customer for the installation of a DCVA or RPBA on the service, with a description of the cross-connection hazard identified,
2. Any upgrade of the premise’s isolation from a DCVA to a RPBA,
3. Any action taken to discontinue water supply, and
4. Any backflow incident.

The Purveyor's survey of a customer's premises, whether by a representative of the Purveyor or through the evaluation of a questionnaire completed by the customer, is for the sole purpose of establishing the

Purveyor's minimum requirements for the protection of the public water supply system, commensurate with the Purveyor's assessment of the degree of hazard. It shall not be assumed by the customer or any regulatory agencies that the Purveyor's survey, requirements for the installation of backflow prevention assemblies, lack of requirements for the installation of backflow prevention assemblies, or other actions by Purveyor personnel or agent constitutes an approval of the customer's plumbing system, or an assurance to the customer or any regulatory agency, of the absence of cross-connections therein.

5.11 Backflow Incident Response

The Purveyor's emergency procedures (cross-connection control section attached hereto) include a backflow incident response plan. The response plan is supplemented by the most recent version of the PNWS-AWWA Backflow Incident Investigation Procedures.

5.12 Public Education

The public education program for the Purveyor shall consist mainly of the distribution with water bills of information brochures describing the cross-connection hazards in homes and the recommended devices that should be installed by the homeowner to reduce the hazard. The education program emphasizes the responsibility of the customer in preventing the contamination of his water supply. The information brochures may be obtained from Pacific Northwest Section, American Water Works Association, PO Box 19581, Portland, Oregon, 97280, telephone 877-767-2992 (toll free), other backflow prevention associations and other water utilities.

The information brochure on thermal expansion, published by the Spokane Region Cross-connection Control Committee shall be included as part of the education program.

Information brochures shall be periodically distributed to all customers; the period between distributions of a brochure on the topic of cross-connection control shall not exceed three years.

5.13 Installation Standards

All DCVA and RPBA on the customer's service shall be installed in accordance with the recommendations outlined in the most recent version of the PNWS-AWWA Cross- Connection Control Manual.

REFERENCES:

PNWS-AWWA CROSS-CONNECTION CONTROL MANUAL, Sixth Edition, 1995, or latest edition thereof.

PNWS-AWWA BACKFLOW INCIDENT INVESTIGATION PROCEDURES, First Edition, 1996, or latest edition thereof.

WA DOH CROSS-CONNECTION CONTROL GUIDANCE MANUAL FOR SMALL WATER SYSTEMS, 2000, or latest edition thereof.

SCHEDULE FOR PROGRAM

IMPLEMENTATION AND OPERATION

TASK	SCHEDULE
Adoption of policy and administrative authority	March 2020
Assess purveyor's system hazards (e.g., air valves)	May 2020
BPAs installed in water distribution system	August 2020
New customer hazard assessment	Upon application
BPAs installed on new customers	Before service provided
Existing customer hazard assessment: Single family – questionnaire Commercial - survey	 July 2020 September 2020
Notification of assessment: High hazard (table 9) All others	 November 2020 January 2021
BPAs installed on existing customers: High hazard (table 9) Commercial Residential Commercial/residential fire systems	 December 2021 December 2022 December 2023 December 2024
Re-assessment of hazard: Commercial Residential	 Every 2 years Every 2 years
Distribution of education brochures	July each year
Annual BPA testing notification	March each year
CCCS review of program	April each year

Cascadia WATER™

Attachment A:

Cross-Connection Control Resolution

RESOLUTION
CROSS-CONNECTION CONTROL POLICY
(draft)

FINDING OF FACT:

Whereas it is the responsibility of a water purveyor to provide water to the customer that meet State water quality standards;

Whereas it is the water purveyor's responsibility to prevent the contamination of the public water supply system from the source of supply to the customer's connection to the service pipe or meter;

Whereas it is a requirement of the Washington Department of Health for the purveyor to establish a cross-connection control program satisfactory to the Department of Health, and

Whereas cross-connections within the customer's plumbing system pose a potential source for the contamination of the public water supply system;

Now be it resolved that Cascadia Water, hereinafter referred to as the Purveyor, establishes the following service policy to protect the Purveyor owned water supply system from the risk of contamination. For public health and safety, this policy shall apply equally to all new and existing customers.

PREVENTION OF CONTAMINATION:

The customer's plumbing system, starting from the termination of the Purveyor's water service pipe, shall be considered a potential high health hazard requiring the isolation of the customer's premises by a Purveyor approved, customer installed and maintained reduced pressure backflow assembly (RPBA) or detector derivative thereof. The RPBA shall be located at the end of the Purveyor's water service pipe (i.e., immediately downstream of the meter). Water shall only be supplied to the customer through a Purveyor an approved and customer installed and maintained RPBA.

Notwithstanding the aforesaid, the Purveyor, upon an assessment of the risk of contamination posed by the customer's plumbing system and use of water, may allow:

A. A single family or duplex residential customer to connect directly to the water service pipe, i.e., without a Purveyor approved DCVA or RPBA.
B. Any customer other than a single family or duplex residential customer, as a minimum, to be supplied through a Purveyor/WA DOH approved, customer installed and maintained double check valve assembly (DCVA) or double check detector assembly (DCDA).

CONDITIONS FOR PROVIDING SERVICE:

Water service is provided based on the following terms and limitations:

1) The customer agrees to take all measures necessary to prevent the contamination of the plumbing system within his premises and the Purveyor's distribution system that may occur from backflow through a cross-connection. These measures shall include the prevention of backflow under any back pressure or backsiphonage condition, including the disruption of supply from the Purveyor's system that may occur by reason of routine system maintenance or during emergency conditions, such as a water main break.

2) The customer agrees to install, operate and maintain at all times his plumbing system in compliance with the current edition of the Plumbing Code having jurisdiction as it pertains to the prevention of contamination, and protection from thermal expansion due to a closed system that could occur with the present or future installation of backflow preventers on the customer's service and/or at plumbing fixtures.

3) For cross-connection control or other public health related surveys, the customer agrees to provide free access for the employees or agents of the Purveyor to all parts of the premises during reasonable working hours of the day for routine surveys, and at all times during emergencies.

Where agreement for free access for the purveyor's survey is denied, water service may be supplied by the Purveyor, provided premises isolation is provided through a Purveyor/WA DOH approved reduced pressure backflow assembly (RPBA).

4) The customer agrees: (a) to have tested upon installation, annually thereafter or when requested by the Purveyor, after repair and after relocation his RPBA or DCVA installed to protect the Purveyor's distribution system, (b) to have all testing done by a Purveyor approved and State Department of Health currently certified Backflow Assembly Tester (BAT) with certification as a Cross-connection Control Specialist (CCS), (c) to have the RPBA or DCVA tested following the procedures approved by the WA DOH with the recommended additional procedures in the "Cross-connection Control Manual, Accepted Procedures and Practice", Sixth Edition, December 1995, or latest edition thereof, and (d) to submit to the Purveyor the results of the test(s) on the Purveyor supplied test report form within the time period specified by the Purveyor.

The customer agrees to bear all costs for the aforementioned installation, testing, repair, maintenance and replacement of the RPBA or DCVA or derivative thereof installed to protect the Purveyor's distribution system.

5) At the time of application for service, if required by the Purveyor, the customer agrees to submit plumbing plans and/or a cross-connection control survey

of the premises by a Purveyor approved and Washington Department of Health certified CCS.

The survey shall assess the cross-connection hazards and list the backflow prevention provided within the premises. The results of the survey shall be submitted prior to the Purveyor turning on water service to a new customer. The cost of the survey shall be borne by the customer.

6) For classes of customers other than single family residential, when required by the Purveyor, the customer agrees to submit a cross-connection control re-survey of the premises by the persons described above. The Purveyor may require the re-survey to be performed in response to changes in customer's plumbing or performed periodically (annual or less frequent) where the Purveyor considers the customer's plumbing system to be complex or subject to frequent changes in water use. The cost of the re-survey shall be borne by the customer.

7) Within 30 days of a request by the Purveyor, a residential customer shall agree to complete and submit to the Purveyor a "Water Use Questionnaire" for the purpose of surveying the health hazard posed by the customer's plumbing system on the Purveyor's distribution system. Further, the residential customer agrees to provide with 30 days of a request by the Purveyor a cross-connection control survey of the premises by a Purveyor approved and Washington Department of Health certified CCS.

8) The customer agrees to obtain the prior approval from the Purveyor for all changes in water use, and alterations and additions to the plumbing system, and shall comply with any additional requirements imposed by the Purveyor for cross-connection control.

9) The customer agrees to immediately notify the Purveyor and the local public health inspection jurisdiction of any backflow incident occurring within the premises, (i.e., entry into the potable water of any contaminant or pollutant) and shall cooperate fully with the Purveyor to determine the reason for the incident.

10) The customer acknowledges the right of the Purveyor to discontinue water supply within 72 hours of giving notice, or a lesser period of time if required to protect the public health, if the customers fails to cooperate with the Purveyor in the survey of premises, in the installation, maintenance, repair, inspection or testing of backflow prevention assemblies or air gaps required by the Purveyor, or in the Purveyor's effort to contain a contaminant or pollutant that is detected in the customer's system.

Without limiting the generality of the foregoing, in lieu of discontinuing water service the Purveyor may install a reduced pressure backflow assembly (RPBA) on its service pipe to provide premises isolation, and recover all of its costs for the installation and subsequent maintenance and repair of the assembly, appurtenances and enclosure from the customer as fees and charges for water. The failure of the customer to pay these fees and charges may result in termination of service in accordance with the Purveyor's water billing policies.

11) The customer agrees to indemnify and hold harmless the Purveyor for all contamination of the customer's plumbing system or the Purveyor's distribution system that results from an unprotected or inadequately protected cross-connection within his premises. This indemnification shall pertain to all backflow conditions that may arise from the Purveyor's suspension of water supply or reduction of water pressure, recognizing that the air gap separation otherwise required would require the customer to provide adequate facilities to collect, store and pump water for his premises.

12) The customer agrees that, in the event legal action is required and commenced between the Purveyor and the customer to enforce the terms and conditions herein, the substantially prevailing party shall be entitled to reimbursement of all its costs and expenses including but not limited to reasonable attorney's fees as determined by the Court.

13) The customer acknowledges that the Purveyor's survey of a customer's premises is for the sole purpose of establishing the Purveyor's minimum requirements for the protection of the public water supply system, commensurate with the Purveyor's assessment of the degree of hazard.

It shall not be assumed by the customer or any regulatory agency that the Purveyor's survey, requirements for the installation of backflow prevention assemblies, lack of requirements for the installation of backflow prevention assemblies, or other actions by Purveyor personnel constitutes an approval of the customer's plumbing system, or an assurance to the customer of the absence of cross-connections therein.

14) The customer acknowledges the right of the Purveyor, in keeping with changes to State regulations, industry standards, or the Purveyor's risk management policies, to impose retroactive requirements for additional cross-connection control measures.

The Purveyor shall record the customer's agreement to the above terms for service on an "Application for Water Service", "Application for Change of Water Service" or other such form prepared by the Purveyor and signed by the customer.

The definition of technical terms given in the "Cross-connection Control Manual, Accepted Procedures and Practice", Sixth Edition, December 1995 published by the Pacific Northwest Section, American Water Works Association, or latest edition thereof, shall apply herein.

APPLICATION FOR WATER SERVICE

OWNER'S NAME: ______________________________ TELEPHONE: ________________________

MAILING ADDRESS: ____

LOCATION ADDRESS: ____

LEGAL DESCRIPTION: ____

The undersigned applicant hereby applies for a water connection to the above described property. The applicant is the owner of the described property or the authorized agent of the owner. By signing this application, the property owner agrees, as a condition of the Cascadia Water, hereinafter referred to as the Purveyor, providing and continuing service to the above described property, to comply with all provisions of the attached Resolution or latest revision thereof, and other such attached rules and regulations now existing or which may be established from time to time governing the Purveyor's water system. The property owner specifically agrees:

a) To install and maintain at all times his plumbing system in compliance with the most current edition of the Island County Plumbing Code as it pertains to the prevention of potable water system contamination, prevention of pressure surges and thermal expansion in his water piping (for thermal expansion, it shall be assumed that a check valve is installed by the Purveyor on the water service pipe);

b) Within 30 days of the Purveyor's request, to install, test, maintain, and repair in accordance with the Purveyor's cross-connection control standards a reduced pressure backflow assembly or double check backflow assembly, or detector derivative thereof, on the customer's service pipe immediately downstream of the Purveyor's meter, or other Purveyor approved location; and to report to the Purveyor within 30 days of obtaining the results of all tests and repairs to aforementioned backflow prevention assemblies, and of making any change to the plumbing system.

c) Not to make a claim against the Purveyor or its agents or employees for damages and/or loss of production, sales or service, in case of water pressure variations, or the disruption of the water supply for water system repair, routine maintenance, power outages, and other conditions normally expected in the operation of a water system.

APPLICATION FOR SERVICE

d) To pay his water billing within thirty (30) days from the date of billing.

After thirty (30) days of the Purveyor mailing a written notice to the property owner of his breach of this agreement, the Purveyor may terminate water service. In the event legal action is required and commenced between the parties to this agreement to enforce the terms and conditions herein, the substantially prevailing party shall be entitled to reimbursement of all its costs and expenses including but not limited to reasonable attorney's fees as determined by the Court.

____________________________________ __________________

Applicant Signature Date

Water rates & charges
Water service connection information
Water Service Policy

PURVEYOR USE ONLY

_____ / _____ / ________ Date connection fee received

_____ / _____ / ________ Date Water Use Survey questionnaire received

_____ / _____ / ________ Date risk assessment completed; by

_____ / _____ / ________ Date customer notified of requirement for BPA

_____ / _____ / ________ Date BPA installation approved

_____ / _____ / ________ Date BPA test report accepted

_____ / _____ / ________ Date BPA information entered into database

_____ / _____ / ________ Date water service installed

_____ / _____ / ________ Date meter installed and water turned on

BACKFLOW INCIDENT RESPONSE PLAN
(supplement to the Emergency Plan)

A. General

This backflow incident response plan is a supplement to the Emergency Plan of Cascadia Water, hereinafter referred to as the Purveyor.

Whenever the initial evaluation of a water quality complaint indicates that a backflow incident has occurred (potable water supply has been contaminated/polluted), may have occurred, or the reason for the complaint can not be explained as a "normal" aesthetic problem, a backflow incident investigation should be immediately initiated. Whenever a water main break or power outage (pumped systems) causes a widespread loss of water pressure (backsiphonage conditions) it is prudent to initiate a check of distribution water quality as a precursor to the need for a backflow incident investigation. It is wise to be conservative when dealing with public health matters.

Within 24 hours of knowledge of any incident of possible contamination of the potable water supply, both in the distribution system and/or in the customer's plumbing system, the state and local county personnel should be notified (see list of emergency telephone numbers at the beginning of the M. & O. Manual).

A backflow incident investigation is often a team effort. The investigation should be made or (initially) lead by the certified Cross-connection Control Specialist employed by the Purveyor. The investigation team should include local health and plumbing inspectors.

General guidance on how to respond to a backflow incident may be obtained from the manual BACKFLOW INCIDENT INVESTIGATION PROCEDURES, First Edition, 1996, published by the Pacific Northwest Section, American Water Works Association, P. O. Box 19581, Portland, Oregon, 97280, telephone (877) 767-2992 (toll free).

B. Short-List of Tasks

The following points are included for initial guidance for dealing with a backflow incident; the above referenced manual BACKFLOW INCIDENT INVESTIGATION PROCEDURES should be consulted as soon as possible.

1) As soon as possible, notify customers not to consume or use water. Start the notification with the customers nearest the assumed source of contamination (usually the customer(s) making the water quality complaint).

The customer should be informed about the reason for the backflow incident investigation, and the Purveyor's efforts to restore water quality as soon as possible. State that the customer will be informed when he may use water, the need to boil water used for consumption until a satisfactory bacteriological test result is obtained from the lab, etc.

Where a customer cannot be contacted immediately, the Purveyor shall place a written notice on the front door handle, and a follow-up visit will be made to confirm that the customer received notice about the break and possible contamination of the water supply.

2) Give consideration to the distribution system as a potential source of the contaminant (e.g., air valve inlet below ground).

3) Do not start flushing the distribution system until the source of contamination is identified. Flushing may aggravate the backflow situation, and will likely remove the contaminant before a water sample can be collected to fully identify the contaminant.

4) Conduct a house-to-house survey to search for the source of contamination and the extent that the contaminant has spread through the distribution system. A check of water meters may show a return of water (meter running backward).

5) Isolate the portions of the system that are suspected of being contaminated by closing isolating valves; leave one valve open to ensure that positive water pressure is maintained throughout the isolated system.

6) Be sure to notify all affected customers in the isolated area, then the other customers in the system.

7) The public health and plumbing authorities should deal with all customers that may have consumed the contaminant, or had their plumbing systems contaminated.

8) Develop and implement a program for cleaning the contaminated distribution system.

9) For the customer where a cross-connection responsible for the system contamination is located, the Purveyor should discontinue water service until the Purveyor ordered corrective action is completed by the customer.

Identification of the source and type of contaminant, and cleaning of a distribution system could take several days.

Most chemical or physical contaminants can be flushed from the water distribution system or customer's plumbing system with adequate flushing velocity. This may not be the case where scale and corrosion deposits (e.g., tuberculation on old cast iron mains) provides a restriction to obtaining adequate flushing velocity, or a chemical deposit or bacteriological slime (biofilm) on which the chemical contaminant may adhere.

To remove a chemical or physical contaminant, it may be necessary to provide a physical cleaning, using foam swabs (pigs), and/or to alter the form or the chemical contaminant, e.g., through oxidation using chlorination, or addition of detergents.

When adding any chemical (including chlorine) to remove a contaminant, it is essential that the chemistry of the contaminant is fully understood. The wrong chemical reaction could make the contaminant more toxic, more difficult to remove, or both.

Where both a chemical and bacteriological contamination has occurred, disinfection should follow the removal of the chemical contaminant.

Where any bacteriological contamination is suspected, field disinfection should be done. To disinfect water mains using the "slug" or "continuous flow" method, a field units should be used for chlorine injection, such as a chemical feed - metering or proportioning pump for sodium hypochlorite.

CROSS-CONNECTION CONTROL
SURVEY REPORT – COMMERCIAL CUSTOMERS

Date of Survey: ____________________

CUSTOMER INFORMATION

Premises name: ______________________________ Telephone: ______________________

____
Address

____ ____________________
City, State Zip Code

Contact Person: ______________________________ Title: ______________________

Customer Type: ____

Description of Water Use: ____

Water Service and Backflow Prevention Assembly (BPA) Size / Type:

	Service Size	Meter Size	BPA Size	BPA Type
Domestic				
Fire line				
Irrigation				
Other				

CROSS-CONNECTION CONTROL SPECIALIST (CCCS) INFORMATION

Name: ______________________________________ Telephone: ______________________

Company Name: ____

____
Address

____ ____________________
City, State Zip Code

WA DOH Certif. #: ____________________________ Year Certified: ____________________

CROSS-CONNECTION CONTROL
SURVEY REPORT – COMMERCIAL CUSTOMERS

SURVEY RESULTS

Item	Location & Description of Cross-connection	Backflow Prevention Provided/Required

Attach additional sheets if needed

CROSS-CONNECTION CONTROL
SURVEY REPORT – COMMERCIAL CUSTOMERS

SURVEYOR'S COMMENTS

SURVEYOR'S RECOMMENDATIONS

I certify that this survey accurately reflects the overall risk posed to the Purveyor's distribution system by the customer's plumbing system and that the backflow prevention assembly is properly installed. Based on the above survey, I find that (check one):

__ The present ________ (RPBA or DCVA) is commensurate with the degree of hazard.

__ The premises isolation assembly or assemblies should be changed for the reasons stated under "Surveyor's Comments", above.

CCCS Signature	Date

This certifies receipt of this completed survey report and its submittal to Cascadia Water.

Customer Signature or Authorized Agent	Date

It shall not be assumed by the customer or any regulatory agencies that this requirement by the Purveyor for this survey, or for the installation of a specific backflow prevention assembly on a service pipe constitutes an approval of the customer's plumbing system, compliance with the customer's plumbing system with the plumbing code, or an assurance to the customer of the absence of cross-connections therein.

The completed survey report shall be first signed by the CCS conducting the survey, then counter-signed by the owner of the premises surveyed or his agent.

The survey shall include the inspection of the assembly installed on a service for premises isolation to verify its correct installation and status as a currently listed Approved assembly by the WA DOH.

CROSS-CONNECTION CONTROL
SURVEY REPORT – RESIDENTIAL QUESTIONAIRE

To: ______________________________ Date: ____________________

____

____

The attached brochure describes a "cross-connection" and the potential for contamination of the water system through unprotected cross-connections. The purpose of this questionnaire is to help determine if you have any special plumbing or activities that may pose an increased risk of contamination of the water distribution system. Please respond by checking the appropriate box below:

YES	NO	
☐	☐	Underground lawn sprinkler system
☐	☐	Water treatment system (e.g., water softener)
☐	☐	Solar heating system
☐	☐	Residential fire sprinkler system
☐	☐	Private well, including those not connected to your plumbing
☐	☐	Grey water system or cistern for irrigation water
☐	☐	Piping for livestock watering
☐	☐	Water supply to dock or small boat moorage
☐	☐	Grinder pump and/or off-site septic field

By: ____ Date: ________________

Customer Signature

Please return the completed questionnaire to the address on the letterhead.

If you have checked any of the above, we will contact you to request further information. Your cooperation in completing this questionnaire is most appreciated.

If you have any questions, please contact the undersigned.

Cascadia WATER™

Attachment B:

Backflow Prevention Assembly Test Report

Cascadia Water, LLC
PO Box 549
Freeland, WA 98249
Phone: (360) 661-7781

Backflow Prevention Assembly Test Report

TESTER ID: ____________ PERMIT NO: ____________ ACCOUNT NO: ____________

NAME OF PREMISES: ________________________ COMMERCIAL ☐ RESIDENTIAL ☐

SERVICE ADDRESS: ____________ CITY: ____________ ZIP CODE: ____________

CONTACT PERSON: ____________ PHONE: ____________ COUNTY: ____________

LOCATION OF ASSEMBLY: ________________________

DOWNSTREAM PROCESS: ____________ ASSE NO: ____________ DCVA ☐ RPZA ☐ PVBA ☐

NEW INSTALLATION ☐ EXISTING ☐ REPLACEMENT ☐ OLD ASSEMBLY SERIAL NO: ____________

MAKE OF ASSEMBLY: ____________ MODEL: ____________ SERIAL NO: ____________

	DCVA / RPBA CHECK VALVE #1	DCVA / RPBA CHECK VALVE #2	RPBA	PVBA/SVBA
INITIAL TEST PASSED ☐ FAILED ☐	CLOSED TIGHT ☐ LEAKED ☐ ________PSID	CLOSED TIGHT ☐ LEAKED ☐ ________PSID	OPENED AT_____PSID #1 CHECK_____PSID AIR GAP OK _____	AIR INET OPENED AT_____PSID DID NOT OPEN ☐
NEW PARTS AND REPAIRS	CLEAN - REPLACE - PART ☐ ☐ _____ ☐ ☐ _____ ☐ ☐ _____ ☐ ☐ _____	CLEAN - REPLACE - PART ☐ ☐ _____ ☐ ☐ _____ ☐ ☐ _____ ☐ ☐ _____	CLEAN - REPLACE - PART ☐ ☐ _____ ☐ ☐ _____ ☐ ☐ _____ ☐ ☐ _____	CHECK VALVE HELD AT _______ PSID LEAKED ☐ CLEANED ☐ REPAIRED ☐
TEST AFTER REPAIRS PASSED ☐ FAILED ☐	LEAKED ☐ ________ PSID	LEAKED ☐ ________ PSID	OPENED AT_____PSID #1 CHECK_____PSID	AIR INLET _____PSID CHECK VALVE _____PSID

AIR GAP INSPECTION: SUPPLY PIPE DIAMETER: ____________ SEPARATION: ____________ PASS ☐ FAIL ☐

REMARKS: ________________________ ☐ USC 10TH EDIT LINE PRESSURE: ________ PSI

____ ☐ CONFINED SPACE

TESTER SIGNATURE: ____________ CERT NO: ____________ DATE: ____________

TESTER NAME (PRINTED) ____________ TESTER PHONE: ( ) ____________

REPAIRED BY: ________________________ DATE: ____________

FINAL TEST BY: ____________ CERT NO: ____________ DATE: ____________

CALIBRATION DATE: ____________ MAKE/MODEL: ____________ GAUGE NO: ____________

APPENDIX U
Correspondence

DOH Correspondence

This page is a placeholder for future comments and communication with the Washington State Department of Health.

Adjacent System Notification Letters

June 20, 2024

DUNGENESS GOLF COURSE AND MT VISTA
ATTN: SOLMAR WATER SYSTEMS, INC.
KATE M O'CLAIRE, MANAGER
PO BOX 1989
SEQUIM, WA 98382

Re: Cascadia Water – Estates, Inc. - Water System Plan (WSP) Update

Dear Kate O'Claire,

Cascadia Water, which owns the Estates, Inc. water system, is in the process of updating their Water System Plan (WSP). The Washington State Department of Health requests that adjacent water systems be notified of the update process and be allowed to review and comment on the development of the WSP. A digital copy of the updated WSP can be made available upon request to Facet, Inc. by contacting Robert Bennion, P.E. using the information provided below.

Please let us know if you have any questions, comments, or concerns regarding the WSP update.

Sincerely,

Facet, Inc.

Robert Bennion, P.E.
Civil Engineer
p: (360) 331-4131 x206
e: rbennion@facetnw.com

June 20, 2024

MAINS FARM PROPERTY OWNERS
DALE METZGER, MANAGER
PO BOX 92
SEQUIM, WA 98382

Re: Cascadia Water – Estates, Inc. - Water System Plan (WSP) Update

Dear Mr. Metzger,

Cascadia Water, which owns the Estates, Inc. water system, is in the process of updating their Water System Plan (WSP). The Washington State Department of Health requests that adjacent water systems be notified of the update process and be allowed to review and comment on the development of the WSP. A digital copy of the updated WSP can be made available upon request to Facet, Inc. by contacting Robert Bennion, P.E. using the information provided below.

Please let us know if you have any questions, comments, or concerns regarding the WSP update.

Sincerely,

Facet, Inc.

Robert Bennion, P.E.
Civil Engineer
p: (360) 331-4131 x206
e: rbennion@facetnw.com

Fire Marshal - Fire Flow Requirements

CLALLAM COUNTY
DEPARTMENT OF COMMUNITY DEVELOPMENT
COUNTY COURTHOUSE
223 E. 4TH ST., SUITE 5
PORT ANGELES, WA 98362-3015
PHONE: (360) 417-2308
FAX: (360) 417-2443

GEORGE.BAILEY@CLALLAMCOUNTYWA.GOV

BRUCE EMERY
DIRECTOR

April 29, 2025

Robert Bennion
Facet NW
1796 East Main St, Suite 105
Freeland, WA 98249

RE: Fire flow requirements

Dear Mr. Bennion:

Clallam County Fire flow requirements do not apply to existing water systems such as Monterra system (ID # 55990Y, Diamond Point system (ID # 192104, and Estates system (ID # 081669) as they were constructed before any applicable county regulations were in effect.

Repairs and maintenance and minor upgrades to such water systems to serve existing buildings are regulated by WAC 246-290. Any proposed expansions to these systems, designed to serve commercial facilities, multifamily buildings, or newly created subdivisions or short subdivisions, large lot subdivisions would be required to meet fire flow provisions per Clallam County Fire Protection Ordinance and Clallam County Land Division Code.

Clallam County requires compliance with the following standards for new water system installations and expansions as noted above. Fire flow for commercial buildings is determined by Table B of the Clallam County Fire Protection Ordinance depending on the size and type of construction. Hydrant specifications and installation and spacing are regulated by Section 21.02.035 subsections (2), and (3) of the Clallam County Fire Protection Ordinance. Residential fire flow is regulated by Clallam County Fire Protection Ordinance Section 21.02.035 subsection

(1) (d) @ 500 gpm for 45 minutes for one and two family dwellings (R-3). In rural areas and where substantially open spaces exist between residential structures, a reduction in these requirements may be allowed.

If you have any questions regarding the above information, please feel free to contact me directly by phone @ 360-417-2308 or stop by the Clallam County Courthouse.

Sincerely,

George Bailey
Clallam County Fire Marshal
Plans Examiner
Building Inspector III

George P. Bailey

Local Government Consistency Determination

Local Government Consistency Determination Form

331-568 • 8/10/2023

Water System Name: Estates, Inc. PWS ID: 08166 9

Planning/Engineering Document Title: Estates, Inc. – Water System Plan – Part B Plan Date: May 2024

Local Government with Jurisdiction Conducting Review: Clallam County

Before the Department of Health (DOH) approves a planning or engineering submittal under Section 100 or Section 110, the local government must review the documentation the municipal water supplier provides to prove the submittal is consistent with **local comprehensive plans, land use plans and development regulations** (WAC 246-290-108). Submittals under Section 105 require a local consistency determination if the municipal water supplier requests a water right place-of-use expansion. The review must address the elements identified below as they relate to water service.

By signing this form, the local government reviewer confirms the document under review is consistent with applicable local plans and regulations. If the local government reviewer identifies an inconsistency, the reviewer should include the citation from the applicable comprehensive plan or development regulation and explain how to resolve the inconsistency, or confirm that the inconsistency is not applicable by marking N/A. See more instructions on page 2.

Local Government Consistency Statement	For Use by Water System Identify page(s) in submittal	For Use by Local Government Yes or Not Applicable
a) The water system service area is consistent with the adopted land use and zoning within the service area.	Appendix B	yes
b) The growth projection used to forecast water demand is consistent with the adopted city or county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	Section 2.2	yes
c) For cities and towns that provide water service: All water service area policies of the city or town described in the plan conform to all relevant utility service extension ordinances.	n/a	n/a
d) Service area policies for new service connections conform to the adopted local plans and adopted development regulations of all cities and counties with jurisdiction over the service area.	Chapter 1	yes
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable. This may include Coordinated Water System Plans, Regional Wastewater Plans, Reclaimed Water Plans, Groundwater Management Area Plans, and the Capital Facilities Element of local comprehensive plans.	-	—

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

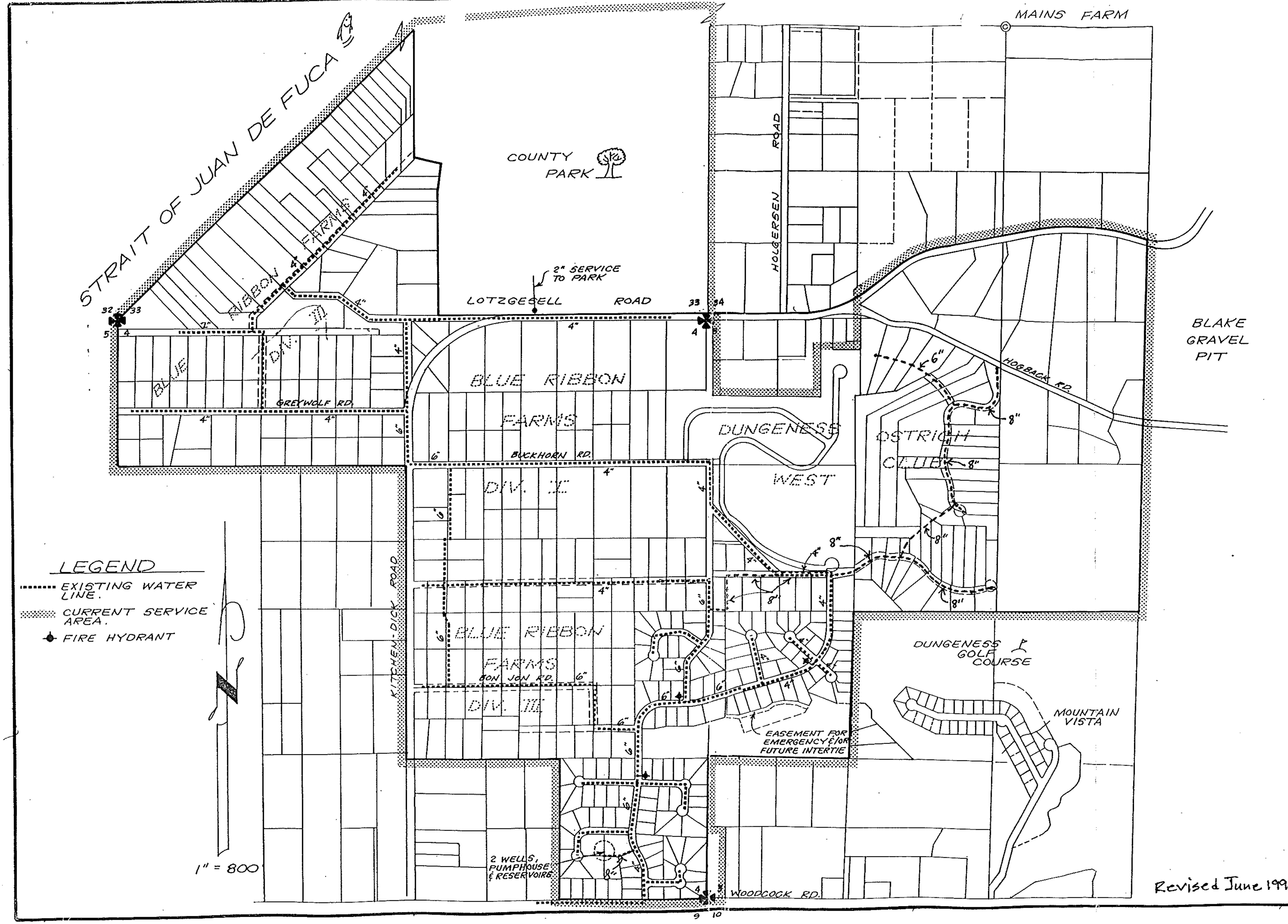
Signature: [signature] Date: 8-12-24

Printed Name, Title, & Jurisdiction: Donella Clark, Principal Planner, Clallam County

Public Meeting Notes

This page is a placeholder for future minutes from the Consumer Meeting

APPENDIX V
Water System Drawings



EXISTING SERVICE AREA - FIGURE 2

ESTATES WATER SYSTEM

1993 COMPREHENSIVE WATER PLAN

NORTHWESTERN TERRITORIES, INC.
Engineers • Land Surveyors • Planners
Construction Coordination • Materials Testing
717 SOUTH PEABODY • PORT ANGELES, WASHINGTON 98362 • (206) 452-8491