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

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August 2025

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CERTIFICATE OF ENGINEER
Water System Plan for Monterra
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 Monterra (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 condition of service.

1.1 Ownership and Management

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: Monterra
Water System ID No: 55990 Y

1.1.2 Type of Ownership and Management

Monterra 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 Monterra 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 Town 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

Monterra is located within unincorporated Clallam County, encompassed within Sections 5, 6, 7, and 8 of Township 30 North, Range 4 West, of the Willamette Meridian. The Water System serves residentials homes and is classified as a Group A water system. Figure 1-1 shows the location of Monterra and its associated service area boundary.

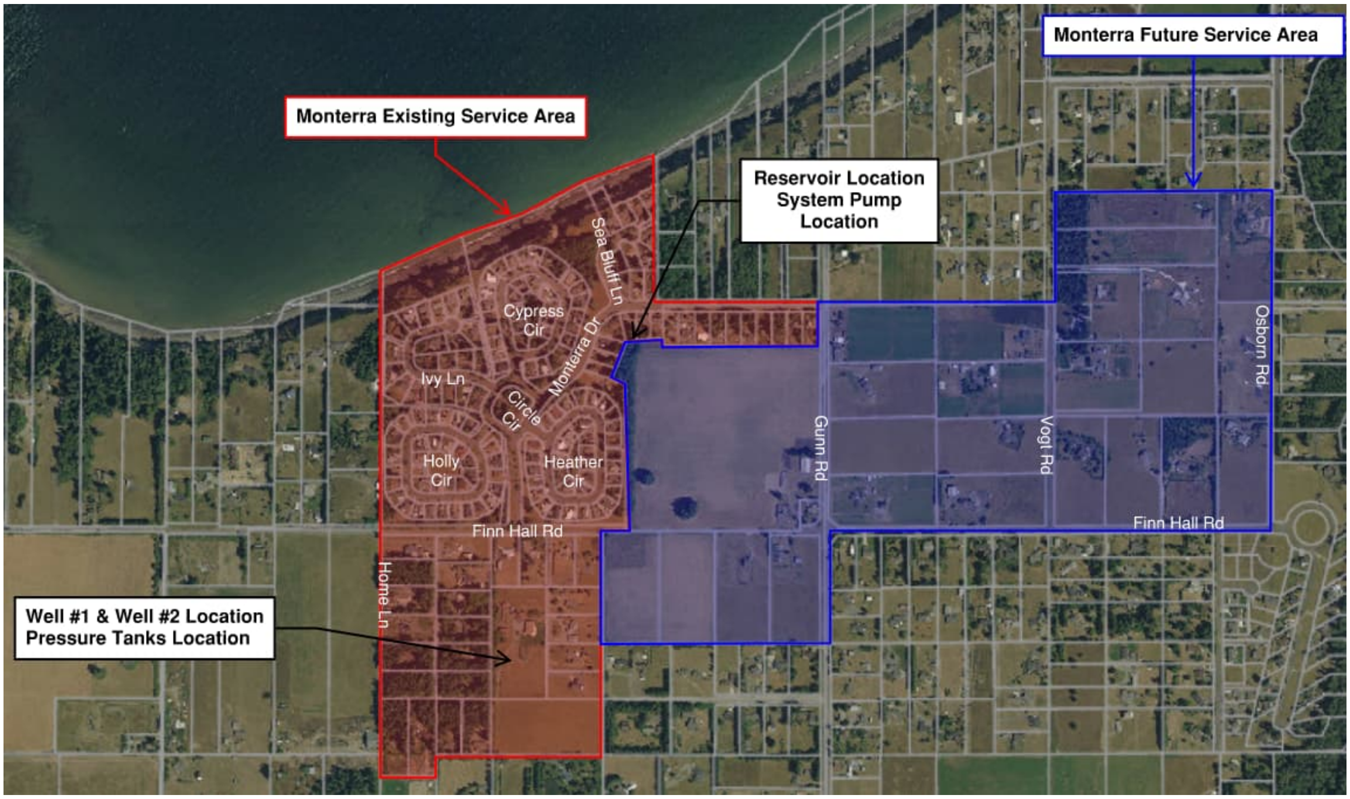

Figure 1-1 Monterra Service Area Boundaries

Monterra originated in 1972 to serve the Monterra Development. The first source was a 6-inch diameter well drilled to a depth of 221 feet. Subsequently, in 1980, a second well was drilled near the first well with an 8-inch casing to a depth of 223 feet to meet demands of the growing system. These two wells still serve the Water System, and their location is shown in Figure 1-1. In 1986 the system was approved to support a maximum of 183 connections.

In 1988 the Water System filed a request to the Washington State Department of Health (DOH) to install improvements to the system to support additional connections. The improvements included increased storage capacity, increased pump capacity, and improvements to the distribution system water mains. In 1989 the 75,000-gallon reinforced concrete reservoir was installed on Clallam County parcel 043007110120 along with a pumphouse containing a booster pump and diesel-powered fire protection pump. The location of these facilities is shown in Figure 1-1. Distribution system piping improvements included an 8-inch water main from the reservoir and pumphouse extended east down Monterra Drive to Gunn Road. Following the installation of these improvements the approved capacity of the system was increased to 203 connections by the DOH. A copy of the Water System's Water Facility Inventory (WFI) form is included in Appendix A.

1.2.1 Geography and Topography

The communities served by Monterra are located in the northeast portion of Clallam County along the coast of the Salish Sea, about 7 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 150-feet feet above sea level. There are various streams, ponds, and other geohazard areas located throughout the current retail service area. These items are shown in Figure 1-2.

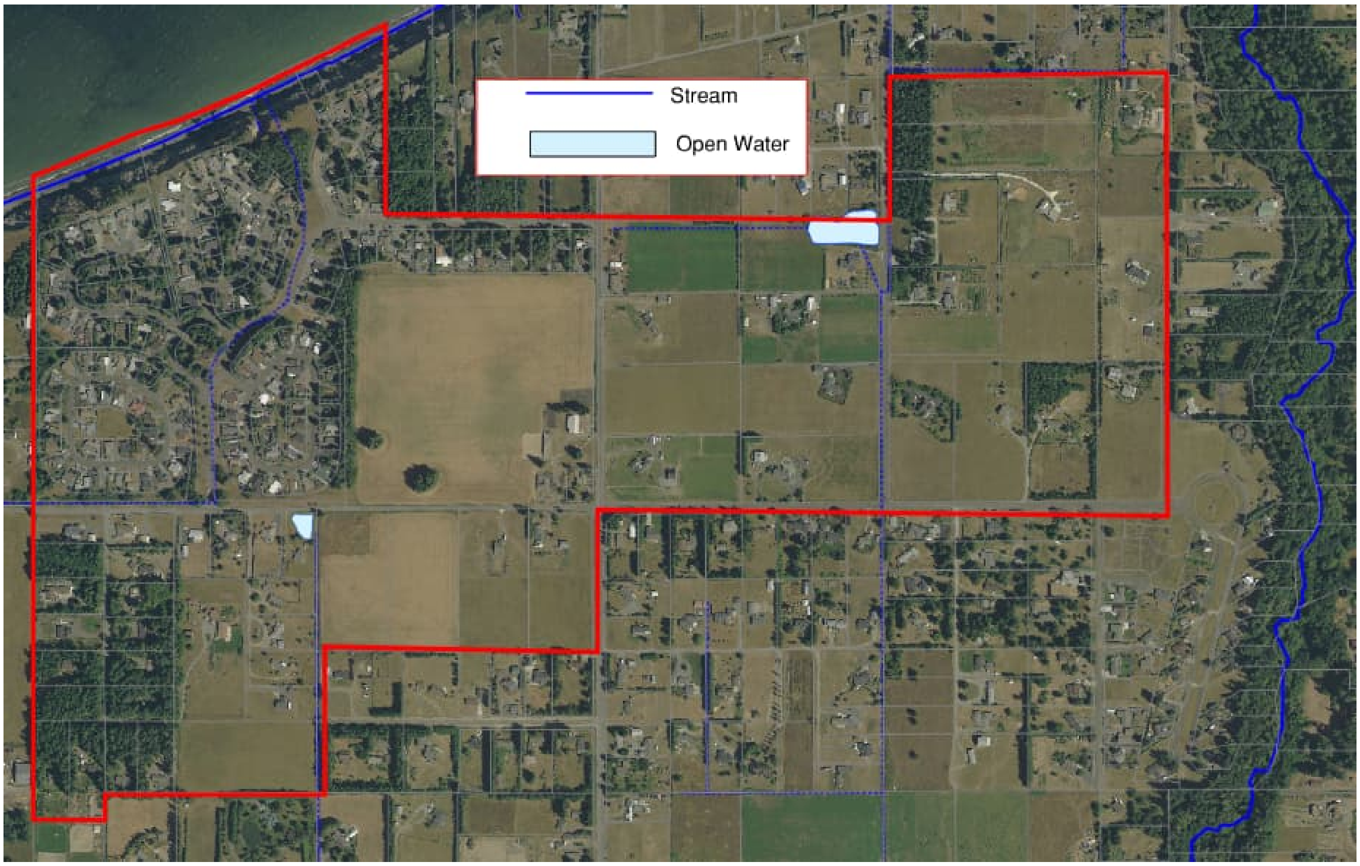

Figure 1-2 Monterra Critical Areas

1.2.2 Climate

The climate within Clallam has quite mild weather 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 around 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. Monterra is surrounded by various Group A community water systems, and one Group B water system. Port Angeles Composite (PWS ID 432960) is located approximately ½ mile away from the existing Monterra service area to the east. Lora Lee Estates (PWS ID 36991F) is directly butting up to the southeastern portion of the future service area, while Olympic Unitarian Universalist (PWS ID 01265) is located approximately ½ mile south of the existing and future service area.

The current and future retain services areas are identified in Figure 1-3 along with the identified neighboring water systems.

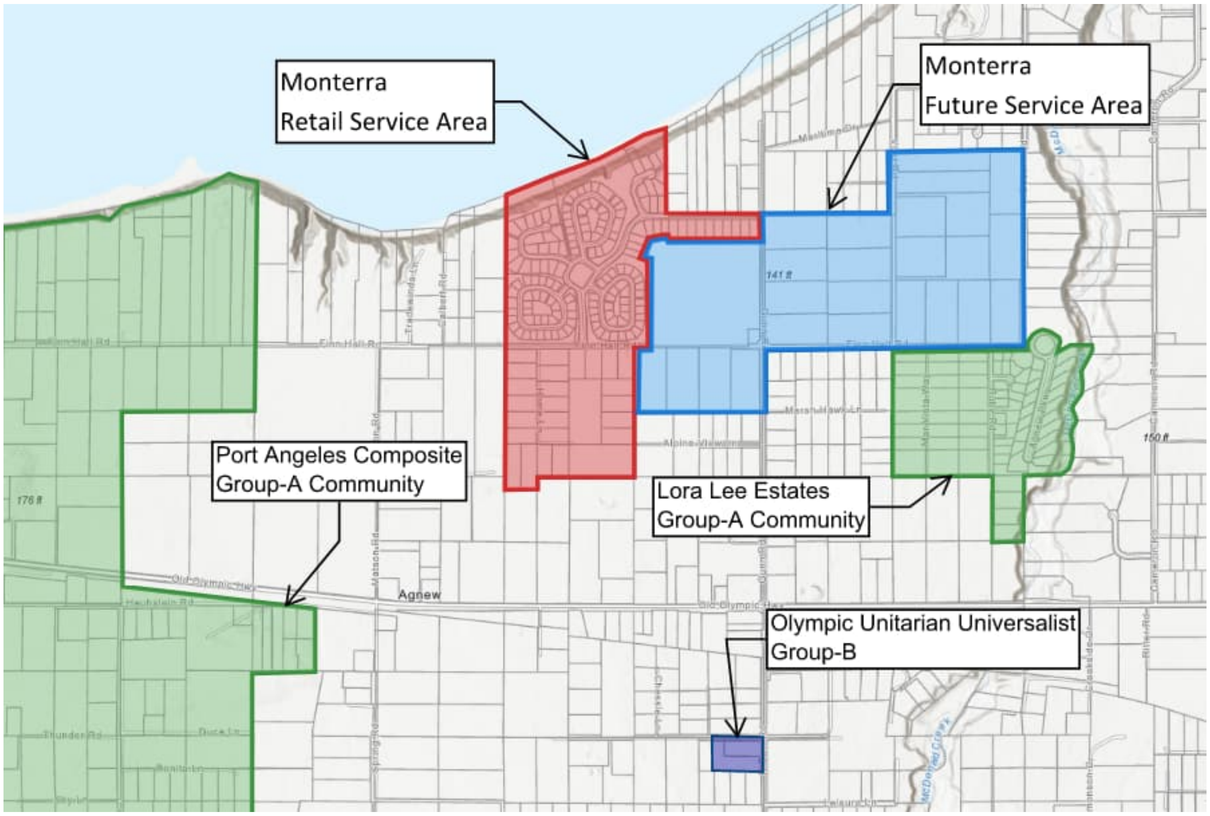

Figure 1-3 Neighboring Water Systems

1.3 Inventory of Existing Facilities

A detailed inventory for the system is provided in Appendix N 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 Monterra is located approximately 7.5 miles west of Port Angeles, Washington and encompasses approximately 113 acres with an additional 130 acres identified as future service area. The northwestern boundary is the Salish Sea just north of the original Monterra Plat. The system encompasses various plats with the connection on the southern boundary being served off Home Lane and the distribution system extending east to Gunn Road. The service area boundary is shown in Figure 1-1 and is included in Appendix B.

1.4.2 Existing Zoning and Land Use

The current retail service area for the Water System is within an area zoned as "Rural Low" (R5) according to Clallam County's terminology. Portions of the future service area are located in areas zoned as "Agricultural Retention" (AR). 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):

- Rural Low (R5): CCC 33.10.020
- Agricultural Retention (AR): CCC 33.23.010

The service area primarily consists of rurally zoned areas. The way these areas can be developed depends greatly on the various 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. Any service area changes will comply with Clallam County and DOH requirements. Any available documentation will be provided in Appendix C.

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 which is essential for properly analyzing the distribution system in Chapter 3. There are currently 188 active connections for Monterra's distribution system with the system currently limited to 203 connections. 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

Monterra's current population, service connections, water usage, and Equivalent Residential Units (ERUs) are discussed in the following sections.

2.1.1 Current Population

The Monterra system currently serves 192 full-time single-family residences. The system is estimated to serve approximately 470 residents for 180 days or more per year. The Water Facility Inventory (WFI), included in Appendix A, has been updated to reflect the current connections and residents served.

2.1.2 Equivalent Residential Units

Many water systems can be 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). Since the Monterra system is primarily made up of full-time single-family residences, each connection is equivalent to one ERU. Currently Monterra has 188 ERUs and is approved to support 203 ERUs.

2.1.3 Water Usage History

Source production for the water system was analyzed from 2019 to 2021 to determine current design demand values for Monterra. The available production data for these periods is provided in Appendix R. The following sections summarize the system production, water loss, service connections, and consumer demands.

2.1.3.1 Water Production

Three years of water production from 2018 to 2022 has been summarized in Table 2-1. The water production has fluctuated slightly over the past 5 years with a peak production year in 2021 consisting of 14,609,800 gallons and a 2.3% increase between 2009 and 2018. An analysis of the monthly source meter data for 2020 to 2022 is provided in Appendix R.

Table 2-1 Water Production and Usage

Year	ERUs	Annual Production (gallons)	Annual ADD (gpd/ERU)	Max Monthly Production (gallons)	MMADD (gpd/ERU)	MDD (gpd/ERU)
2019	188	12,166,600	178	2,046,600	351	580
2020	188	11,155,470	162	2,099,800	399	660
2021	188	14,609,800	220	2,366,800	420	700

Analysis of seasonal demand can assist in identifying trends and difference within the summer and winter months. This data allows the engineer to design the distribution system to support the peak usage for seasonal demands. Knowledge of seasonal variations in water demand over the past 3-years can help planning personnel better serve customers and properly maintain the distribution system.

There is a seasonal demand which occurs during the summer months as irrigation increases and due to a potential increase in population during these months. Variations in consumption rates reflect change in weather conditions, community activities, and habits of the population. The seasonal distribution of the water demand is graphically shown in Figure 2-1.

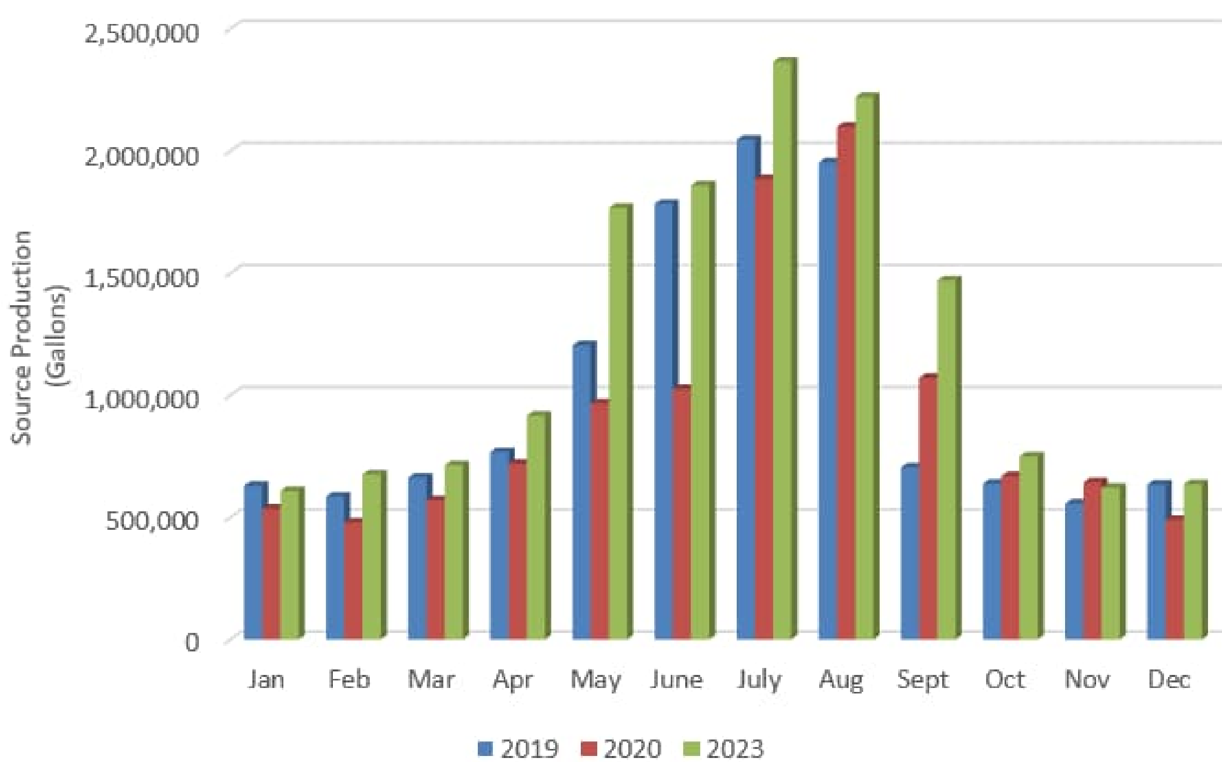

Figure 2-1 Seasonal Source Production

2.1.3.2 Distribution System Leakage

Distribution System Leakage (DSL) is unaccounted water in the distribution system. Typically, DSL is the difference between the quantity of water produced by the system and the quantity of authorized consumption. Authorized consumption consists of consumer meter data and estimates for flushing, fire demand, and other unmetered uses. Accurate DSL data allows for systems to identify and correct unauthorized usage and leaks in the distribution system. At the time this plan was prepared Monterra was estimated to have approximately 50% to 75% of the connections meters. Cascadia is in the process of installing meters on the remaining connections and has submitted meter installation plan to the DOH.

Since water meter consumption data for the system connections was not available, demands in the subsequent sections will include a portion of the DSL. However, in the distribution system the DSL does not increase proportionally with increased demand from additional connections. In the system analysis, provided in Chapter 3, as additional connections are analyzed a proportionally greater portion of DSL is also added to the system. This results in a conservative overall analysis of the system and its components.

2.1.4 Average Day Demand

Average day demand (ADD) is defined as the average usage by an ERU each day in the system. It is calculated by the total volume of water produced in one year divided by the number of days in the year and the number of ERUs in the distribution system. Water usage from 2019 through 2021 was analyzed to determine current design values for the system. The water use data for these periods is provided in Appendix P. The design value used for Monterra's annual ADD is 220 gallons per day per ERU (gpd/ERU).

2.1.5 Maximum Day Demand

The maximum day demand (MDD) is typically determined by source meter readings and is the largest single-day usage of water. The maximum day demand (MDD) could not be determined from actual water meter 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 (MMADD) per Section 3.4.1 of DOH Water System Design Manual, 2019 edition (Design Manual). The source meter data was analyzed for the years 2019 through 2021 as shown in Table 2-1. The design MMADD is 420 gpd/ERU which equates to a system MDD value of 700 gpd/ERU.

2.1.6 Peak Hour Demand

Peak Hour Demand (PHD) was calculated in accordance with Section 5.2.2 of the Design Manual. Equation 2-1 uses the MDD, and the number of potential connections determined in the capacity analysis to determine the PHD flowrate.

Equation 2-1

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

$$PHD = \frac{700}{1440}[(1.8)(305) + 125] + 18 = 346\ gpm$$

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 described in Table 2-2.

Table 2-2 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 700 gpd/ERU, Equation 2-1 and the values provided in Table 2-3 were used to calculate the PHD for 2023, 2029, 2043 and the maximum system physical capacity of 305 ERUs. The calculated PHD values are summarized in Table 2-4.

Table 2-3 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	188	700	2.0	75	237
2029	193	700	2.0	75	242
2043	218	700	2.0	75	266
Approved	203	700	2.0	75	252
Max	305	700	1.8	125	346

As shown in Table 2-3, the PHD associated with the maximum number of 305 ERUs is projected to be 346 gpm. For the purpose of design for the distribution system the projected PHD associated with the maximum number of ERUs will be used. As noted in Table 2-3, the Water System's PHD for the projected number of ERUs will be 346 gpm.

2.2 Projected Land Use, Future Population, and Demand Forecasting

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

2.2.1 Projected Land Use

As discussed in Section 1.4.2, the Water System existing service area provides service to land primarily zoned as low rural (R5) as described in Clallam County Code (CCC) 33.10.020. R5 land is limited in the allowable land use, such as agricultural, bed and breakfast, duplex, and single-family dwellings. Large commercial development is prohibited in R5 zoning. The Water System's future service area will provide service to land zoned as agricultural retention (AR) as described in CCC 33.23.010. AR land is classified to minimize adverse impacts of noise, traffic, and incompatible land uses for rural low mixed and cluster development. A vicinity map showing the location of the Water System is shown in Figure 1-2. Zoning and Land Use maps for each of the water systems' boundaries are provided in Appendix B and D.

Site specific fire flow requirements for individual development projects are determined by Clallam County through its development review processes. The potential for any major business or larger multifamily structures being located within the water system area is minimal due to zoning restrictions. There is a potential for Rural Cluster Developments, and commercial- nonresidential development within the service area.

2.2.2 Projected Connections

From the current system demands, and equipment based on a complete capacity analysis the system can support up to 305 connections. Since 1990 the water system has increased to 188 connections. The projected number of ERUs served at the end of each planning phase are specified in Table 2-3. Phase 3 planning looks beyond the 20-year window to determine what strategic planning may be necessary to safeguard the distribution system into the future.

The estimated number of connections for 2029 and 2043 were determined by using a 1% population growth rate to establish the number of future residents served and 2.5 residents per residential connection as recommended by DOH. From the 2020 WFI, the system averages 2.42 residents per connection with 188 active connections, and a population served of 455 residents. The 1% 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. Equation 2-1 and the values provided in Table 2-2 were used to calculate the PHD for 2023, 2029, 2043, the current number of DOH approved connections, and the maximum system physical capacity as summarized in Table 2-3.

2.2.3 Projected Demand

Projected demands are based on ERU projections and trends in the annual production of ADD. The project demands for annual production is summarized in Table 2-4 based on the number of projected ERUs discussed in Section 2.1.6.

Table 2-4 Projected Annual Demand Based on ADD

Year	N (ERUs)	ADD (gpd/ERU)	Annual Production (gallons)	Annual Production (ac-ft)
2023	188	220	15,096,400	43.33
2029	192	220	15,417,600	47.31
2043	218	220	17,505,400	53.71

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3 SYSTEM ANALYSIS

This chapter summarizes the analysis of the existing system 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

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 provides 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. 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.	9-Year Waiver
Bacteriological	From representative points throughout distribution system.	One sampler per month.
Complete Inorganic Chemical & Physical	From a point representative of the source, 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.	Five samples every 3 years
Nitrate/Nitrite	From a point representative of the source, 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.	Waiver
Radionuclides	From the source.	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.	3-Year Waiver
Synthetic Organic Chemicals (SOCs including EDB and other soil contaminants, Dioxin, Endothall, Diquat, Glyphosate, Insecticides)	From a point representative of the source(s), after treatment, and prior to entry to distribution system.	Complete Waiver
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 the Water System in Appendix L. The testing schedule for the 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 DOH requires that systems serving up to a population of 1,000 people have a minimum of one routine bacteriological analysis per month. The sample is to be taken from a point representative of the distribution system. A copy of the routine sampling locations and repeat sample locations is included as part of the Monterra's Coliform Monitoring Plan, which is included in Appendix M. In the event a coliform detection occurs, the routine sample sites, as well as upstream and downstream repeat samples sites listed in the Coliform Monitoring Plan will also be used to determine that the potable water system is safe for public consumption.

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)	0.010	0.0010	0.0020
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)	0.005	0.0010	LT
Chromium (Cr)	0.1	0.0070	LT
Copper (Cu)	*	0.0200	LT
Cyanide (HCN)	0.2	0.0500	LT
Lead (Pb)	*	0.0010	0.0010
Mercury (Hg)	0.002	0.0002	LT
Nickel (Ni)	0.1	0.0050	LT
Nitrate (as N)	10.0	0.5000	0.1600
Nitrite (as N)	1.0	0.1000	LT
Selenium (Se)	0.05	0.0020	LT
Sodium (Na)	*	5.00	9.4100

Thallium (Tl)	0.002	0.0010	LT
SECONDARY INORGANIC CHEMICALS			
Chloride (Cl)	250.0	20.00	6.14
Fluoride (F)	2.0	0.2000	0.1000
Iron (Fe)	0.3	0.1000	LT
Manganese (Mn)	0.05	0.0100	0.0740
Silver (Ag)	0.1	0.1000	LT
Sulfate (SO_4)	250.0	50.00	LT
Zinc (Zn)	5.0	0.2000	LT

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	266 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 formed 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.

The system does not currently utilize chlorination and therefore does not test for DBPs.

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 2.0000
2,4,5-TP	50.0000	0.2000	LT 1.0000
Benzo[a]pyrene	0.2000	0.0200	LT 0.0400
Dalapon	200.000	1.000	LT 5.000
Di(2-ethylhexyl)adipate	400.0000	0.6000	LT 1.3000
Di(2-ethylhexyl)phthalate	6.0000	0.6000	LT 1.3000
Dinoseb	7.0000	0.2000	LT 1.000
Diquat*	20.0000	-	-
Endothall*	0.1	-	-

Endrin	2.000	0.0100	LT 0.0500
Glyphosate*	0.7	-	-
Hexacholorbenzene	1.000	0.1000	LT 0.5000
Hexachlorocyclo pentadiene	50.0	0.1000	LT 0.5000
Oxamyl (Vydate)**	200.00	2.0000	LT 4.0000
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 DOH 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. 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. Monterra's groundwater wells are located approximately ½ mile away from nearest shoreline. Chloride was measured from the well field at a concentration of 6.14 mg/L. Monterra is considered low risk for seawater intrusion. It is recommended that Monterra continue testing its well field for chloride to check for any long-term trends in the aquifer.

3.2.10 Source Water Quality

The wellhead protection plan was developed to help identify items and situations that could possibly pose a threat to the water quality of the systems. 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.

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 of absent. Coliform was last found present in the distribution system in 2015. Where water quality improvements have been identified a capital improvement project has been identified and scheduled for the immediate term. See Section 8.2.2 for additional information. The latest water quality results are provided in Appendix L.

3.3 System Description and Analysis

Potential system improvements were determined by analysis of system testing, studies, review of water system inventories, consultation with the system operator regarding needed improvements, and longer-term goals for the system. The distribution system 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 in the southern portion of the service area on Clallam County Parcel 043007130000. On this same parcel the system has a pumphouse which houses well controls and two (2) 48-inch diameter (1100-gallon) horizontally oriented hydropneumatic tanks. Cascadia Water has an easement and protective covenants associated with this parcel. The system wells alternate and well functions are controlled by a pressure switch located in the well house set at 40/60-psi. The wells pump directly into the distribution system.

Approximately a half mile north of the system wells the water system has an easement along the northwest section of Clallam County Parcel 043007110120 which contains the storage reservoir and a pumphouse with booster pumps. The reservoir is a 20-foot tall reservoir with a diameter of 25-feet. The reservoir has a total volume of approximately 75,000-gallons. The reservoir is filled from the water in the distribution system. A dedicated fill line for the reservoir tees off from the distribution line in the pumphouse, adjacent to the reservoir, which also contains the reservoir level controls. Reservoir floats control a solenoid valve located in the pumphouse which opens at the bottom of operational storage allowing the reservoir to fill.

Adjacent to the storage reservoir is a small pumphouse that contains a booster pump, a diesel-powered fire pump, and the previously noted reservoir level controls. The booster pumps is a single 5-HP Berkeley Model B1.5 TPL-S pump. The booster pump operates with a 42/62-psi pressure switch. The booster pump works in conjunction with the well pumps to maintain system pressures. Since the pressure settings are very similar, both will often function at the same time depending on where system demands are situated. To ensure that the reservoir is filled by the well pumps, the booster pumps are also set on a timer that shuts it off at 4:00 pm until the next morning. During this time the well pumps pressurize the system and fill the reservoir. Figure 3-1 provides a schematic of the existing system configuration.

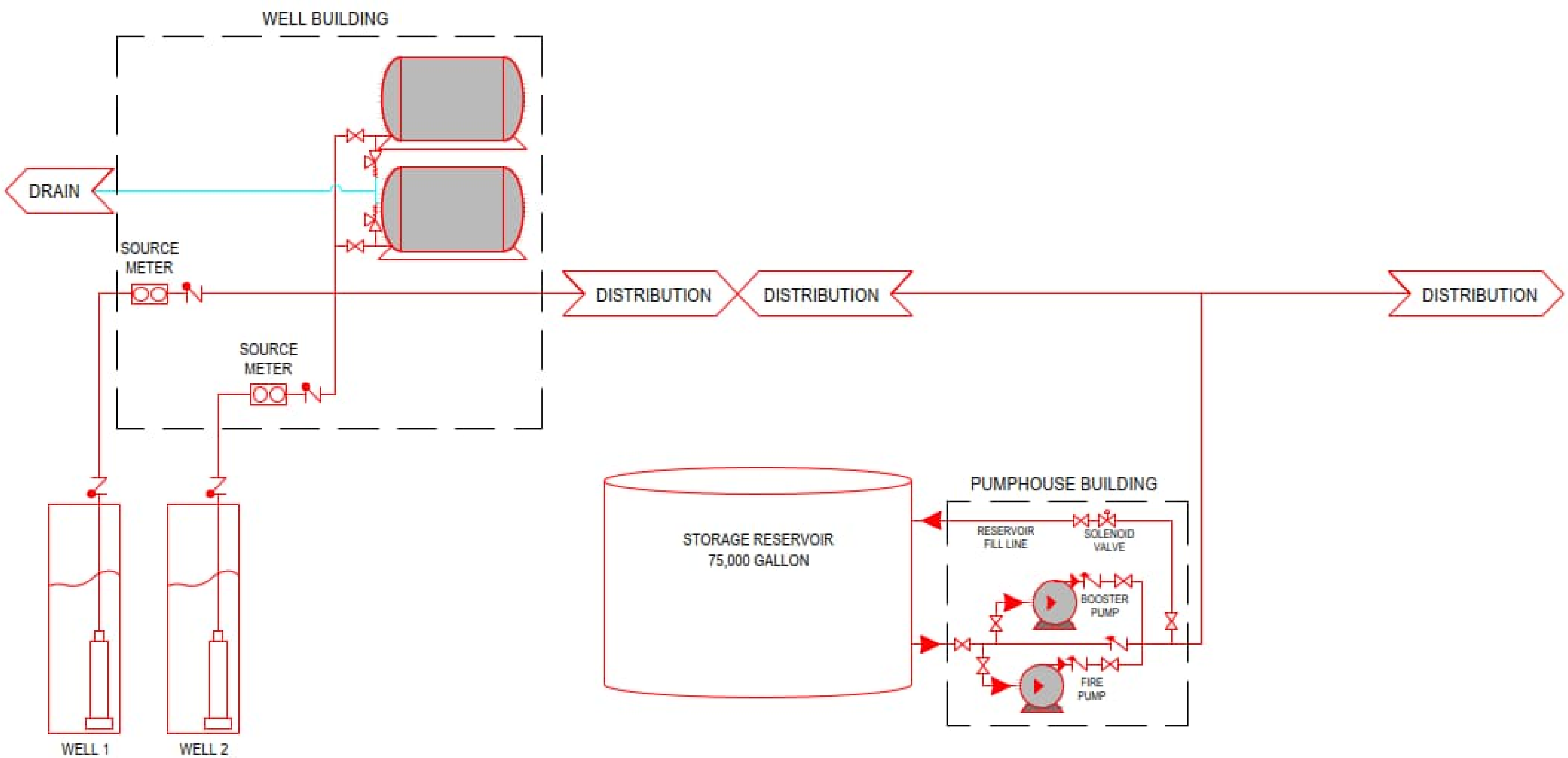

Figure 3-1 Monterra Water System Schematic

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3.3.2 Water Rights

The Washington State Department of Ecology (DOE) issued Ground Water Certificate G2-01131C (Priority Date March 3, 1971) to Monterra. This water right authorizes an instantaneous withdrawal of 370-gpm and a maximum annual withdrawal of 75 acre-feet for the Water System. A copy of the water right is provided in Appendix E. A water right self-assessment for Monterra is provided in Appendix F.

3.3.3 Source

Monterra is served by two groundwater wells that are located on Clallam County parcel 043007130000. The wells are located on a parcel owned by a consumer of the water system located off Finn Rd 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, the 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 has restrictive covenants for the parcel containing both sources which are included in Appendix H. Bacteriological, chemical, and physical water quality requirements are discussed in Section3.2.

Well 1 was drilled in 1971 to a final depth of 221-feet to serve as a primary source. The well log for Well 1 recorded a static water level of 103-feet below the top of well. It also conducted a 24-hour pump test with a maximum rate of withdrawal of 250 gpm with a corresponding drawdown of 70-feet. A copy of the well log and corresponding pump test is included in Appendix G.

Well 2 was drilled in 1976 to a final depth of 221-feet to serve as a supplemental primary source. The well log for Well 2 recorded a static water level of 131-feet below the top of well. It also conducted a 24-hour pump test with a maximum rate of withdrawal of 210 gpm with a corresponding drawdown of 42-feet and 7-inches. A copy of the well log and corresponding pump test is included in Appendix G. Detailed information regarding each source is summarized in Table 3-8.

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

	Well 1	Well 2
Source Type	Well (Non GWI)	Well (Non GWI)
DOE Tag	N/A	N/A
Source Location	Sec 7 T30N R04W	Sec 7 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	1971	1976
App. Capacity (gpm)	250	210
Ex. Capacity (gpm)	210	145
Pump Size (hp – gpm)	10 hp – 200 gpm	7.5 hp – 200 gpm
Casing Size	8”	8”
Ground Elev. (ft)	150	150
Bottom Well Depth (ft)	221	221
Static Water Depth (ft)	103	131
Top of Perforations (ft)	109	89
Bottom of Perforations (ft)	221	215
Drawdown (ft)	70’ at 250 gpm	42’7” at 210 gpm

3.3.3.1 *Condition of Sources*

The sources are routinely monitored by the operator. No problems have been reported that would indicate an adverse condition is present.

3.3.3.2 Current Facility Age and Estimate of Future Life Expectancy

The groundwater wells that serve the system are 51- and 47-years old respectively. 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. Currently, both wells appear to be functioning as intended without a noticeable drop in production.

3.3.3.3 *Condition and Capacity of Transmission Mains*

The sources are conveyed through a pumphouse that contains the source meters, hydropneumatic tanks, and electrical controls via 4-inch galvanized steel transmission mains. Site observations indicate that the piping is in good condition. The transmission mains and well site piping should last through the long-term planning period of this Water System Plan.

3.3.4 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, an emergency reserve in case the supply system should fail, and to provide a large volume water for potential firefighting needs.

Water system storage is provided by a 75,000-gallon reservoir located within an easement on Clallam County parcel 043007110120. The reservoir is accessed through an access easement from Monterra Drive between Clallam County parcels 043006510110 and 043007520100. The reservoir is 25-feet in diameter and is 20-feet tall. The reservoir has a base elevation of 130-feet above sea-level. The reservoir was constructed in 1989 as a circular steel reinforced concrete structure.

The system reservoirs provide the following storage components:

- Operational Storage (OS) – Section 3.4.5.1
- Equalizing Storage (ES) – Section 3.4.5.2
- Standby Storage (SBS) – Section 3.4.5.4
- Fire Suppression Storage (FSS) – Section 3.4.5.5
- Dead Storage (DS) – Section 3.4.5.3

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

Concrete Storage Reservoirs typically have a 70+-year anticipated service life. The concrete reservoir serving the system is 34 years old. The useful lifespan of the existing storage reservoir should surpass the planning periods of this Water System Plan. However, the reservoir should be routinely inspected for leaks, cracking, and other signs of wear or degradation.

3.3.5 Booster Pumps and Pressure Tanks

The distribution system is pressurized by the single booster pump fed from the 75,000-gallon reservoir and the two (2) well pumps. System pressures are maintained, and pump protection is provided by two (2) horizontally orientated hydropneumatic tanks with a volume of 1,100-gallons each.

The booster pump is on a timer from 12:00 am to 4:00 pm during which time it will operate as the lead pump on 42/62-psi pressure switch. The two well pumps alternate as a lag 1/lag 2/ configuration where the lag 1 and lag 2 will alternate between wells with each pump-start. Data regarding each pump is summarized in Table 3-9. Pump curves associated with the proposed equipment are included in Appendix O.

Table 3-9 Pump Capacity

Pump Type	Make	Model	Flowrate (gpm)	THD (feet)
Well 1 Pump	Berkeley 30 HP	6SALL-10	210	420
Well 2 Pump	Berkeley 20 HP	6SALL-7.5	145	400
Booster Pump	Berkeley 5 HP	B1.5 TPL-5	96	120

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

As noted previously, well production rates should continue to be monitored on a yearly basis. The pumping configuration for the system is unusual and not optional for reliable operation of the system. Additional information regarding pump capacity and proposed improvements are detailed in Section 3.4.5 and Section 3.5.4.

3.3.6 Distribution Water Mains

Mains throughout the systems are tapped for the individual service connections. The following sections provide additional details on the distribution system. The transmission mains and well site piping should last through the long-term planning period of this Water System Plan.

3.3.6.1 Length, Diameter, and Type of Pipe

A comprehensive inventory of the system, including distribution system piping, is provided in Appendix N. A comprehensive inventory of the system is provided in A summary of the pipe within the system is provided in Table 3-10.

Table 3-10 Distribution System Piping

Diameter (in)	Material: PVC – C900
2	6,548
4	2,768
6	5,546
8	2,085
Total: 16,947	

As depicted in Table 3-10 records indicate that all the piping in the distribution system is polyvinyl chloride (PVC). According to system records all PVC piping is either Schedule 40, Schedule 80, or C-900 depending on the time of installation. The pipe replacement project began in 1972 as new divisions in the service area were added. The mains were listed as “lake, river and other intakes” on the depreciation schedule with a 50-year lifetime. The age of the piping is 51 years and should be considered for replacement. All system piping should be assessed for leaking, and cracking. A comprehensive inventory of the system, including distribution system piping, is provided in Appendix N. The location and size of water mains are also identified in the system drawings provided in Appendix V.

3.3.7 Hydraulic Analysis of Distribution System

Hydraulic analyses were done for the system 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 in 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 (low pressure settings) and (2) the fire flow with MDD (lowest pressure settings). See Appendix Q for the hydraulic models.

<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, waters 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 with the largest booster pump out of service. For the PHD scenarios, the reservoir levels are set to the bottom of equalizing storage.

Fire Flow & MDD Scenario:

For the fire flow scenario models, the system is required to be capable of providing MDD with fire flow demands at a hydrant while maintaining a required minimum pressure of 20 psi at all service connections with the largest booster pump out of service. Clallam County Code (CCC) 21.02.035 (d) lists the fire flow requirements for a residential system, requiring 500 gpm for forty-five (45) minutes. For the fire flow scenarios, the reservoir levels are set to the bottom of fire suppression storage. The results are summarized in the subsections below. This modeling scenario has been included despite fire flow requirements not being applicable to the Monterra 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.

3.3.7.1 Existing Distribution System – Peak Hour Demand

For the PHD model, the demands are distributed throughout the system and the reservoir level is set at the bottom of equalizing storage. For Monterra, equalizing storage is not required for the current number of ERUs, to meet PHD. For the existing distribution system, a PHD of 290-gpm was used based on water system demands, and the current system capacity of 242 ERUs. The model results for the existing conditions show that the distribution system can provide PHD while maintaining system pressures in accordance with DOH requirements. The lowest and highest pressure in the modeled system are 39.5-psi and 47.8-psi respectively.

3.3.7.2 Existing Distribution System – Fire Flow & MDD

For the Fire Flow model, the MDD demand of 118-gpm for 242 potential ERUs are distributed throughout the system and the reservoir level is set at the bottom of fire suppression storage plus 500-gpm at the most critical fire hydrant. Currently, there are 7 fire hydrants located throughout the distribution system. The distribution mains serving the fire hydrant located of Sea Bluff Lane are 4-inches in diameter and do not meet DOH requirements of distribution main sizing. Additionally, the existing well pumps and system pump do not provide the minimum of 590-gpm to meet fire flow demands. At this time, the Water System cannot provide fire flow to the system. Section 3.5.3 and 3.5.4 further discuss future capital improvements to address these system deficiencies.

3.3.7.3 Future Distribution System – PHD

The hydraulic model for the system was updated with the distribution system improvements, listed in Chapter 8, and budgeted in Appendix W along with maximum allowable ERUs determined in the capacity analysis discussed in Section 3.4. For the future distribution system, a PHD of 346-gpm was used based on water system demands, and the maximum number of connections the system can support of 305 ERUs. The proposed improvements improve the distribution system capacity throughout the system and allow all service connections in the existing and future service area to operate above 30-psi during PHD flows.

3.3.7.4 Future Distribution System – Fire Flow & MDD

The hydraulic model for the system was updated with distribution system improvements listed in Chapter 8. For fire flow demands, the MDD demands of 148-gpm for 305 proposed ERUs are distributed throughout the system and the reservoir level is set to the bottom of fire suppression storage plus 500-gpm at the furthest fire hydrant. The following portions of the system were previously unable to provide the minimum requirements to meet fire flow demands:

- Sea Bluff Road – The capital improvement project increased the water main size along Sea Bluff Road to 6-inches out to the fire hydrant, to meet minimum DOH requirements for distribution sizing.
- Booster Pump Capacity – The capital improvement projects for the pumphouse upgrades involved installing a booster pump station to meet fire flow & MDD demands with the largest pump out of service.

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 Table 2-3 and Table 2-4 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 provided in this section demonstrates that the physical and legal capacities for Monterra is 305 ERUs limited by the annual water right. A copy of the capacity analysis calculation detailed in this section are provided in Appendix P.

3.4.1 Water Right Capacity Based on Annual Volume & Average Day Demand

The water right for the system allows for an annual withdrawal of 75 acre-feet per year (24,437,160-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:

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

$$N = \frac{75\ acre \cdot \frac{\mathrm{ft}}{\mathrm{yr}} \cdot \frac{43{,}560\ \mathrm{ft}^2}{\mathrm{acre}} \cdot 7.48\,\frac{\mathrm{gal}}{\mathrm{ft}^3}}{365\ days/yr \cdot 220\,\frac{gpd}{ERU}} = 305\ ERUs$$

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 220 gpd/ERU (See Section 2.1.4) and the established water right annual withdrawal volume of 75 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 305 ERUs.

3.4.2 Water Right Capacity Based on Instantaneous Flow & Maximum Day Demand

The water right for the system allows for an instantaneous pumping rate of 370 gallons per minute. Equation 4-4a in the WSDOH Design Manual to determine the number of ERUs based upon Maximum Daily Demand (MDD) and water right:

Equation 4-4a:

$$\mathrm{N} = \frac{(V_d)}{(ERU_{MDD})} = \frac{(Q_i * t_d)}{(ERU_{MDD})}$$

$$N = \frac{370\ gpm\ \cdot\ 1{,}440\ minutes/day}{700\ gpd/ERU} = 761\ ERUs$$

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 (Section 2.1.5)

MDD was determined to be 700 gpd/ERU (Section 2.1.5) and the current water right instantaneous pumping rate of 370 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 761 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 ERUs that can be supported based upon source capacity and MDD. The Design Manual provides Equation 4-3 to for the evaluation.

Equation 4-3:

$$\mathrm{N} = \frac{V_t}{ERU_{MDD}} = \frac{(Q_s * t_d)}{ERU_{MDD}}$$

$$\mathrm{N} = \frac{355 * 1200}{700} = 609\ ERUs$$

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 of pumping per day provides a factor of safety and an increased ability to meet unexpected demands. Therefore, the number of ERUs that can be supported by the Water System's sources is 609 ERUs.

3.4.4 System Capacity Based on Booster Pump Capacity

Booster pumps are needed to meet the system 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.

The distribution system is pressurized by the single booster pump fed from the 75,000-gallon reservoir and the two (2) well pumps. In order to provide system PHD while maintaining a service pressure of 30-psi, the pumps need to operate at 40-psi (92.5-feet TDH). For evaluating PHD capacity of the system pumps it is assumed that the largest pump, Well 1 30-HP pump, is not in service. The single booster pump (Berkeley 5 HP) produces 95-gpm while Well 2 (Berkeley 20 HP) produces 195-gpm at 40-psi (270-feet TDH).

Equation 3-1:

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

$$N = \frac{\left[\frac{1440(365 - 18)}{700 - 75}\right]}{2.0} = 242\ ERUs$$

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

MDD is 700-gpd/ERU and the combined capacity of the booster pump the submersible pump from Well 2 is 290-gpm. Currently, the system only has one booster pump installed in the reservoir pump house. The number of ERUs calculated is 242 ERUs for the booster pump capacity.

3.4.4.1 Pressure Tanks

Pump protection is provided by two horizontally orientated galvanized steel hydropneumatic tanks, each with a volume of 1100-gallons. Each tank has a diameter of 48-inches. Section 9.1.3, Equation 9-3 from the Design Manual is used to determine the minimum pressure tank volume needed for the system.

Design Manual Equation 9-3: Horizontally-Oriented Tanks

$$V_t = \frac{P_1 + 14.7}{P_1 - P_2} \times \frac{15\, Q_P(MF)}{N_C}$$

Where,
V_t = Total tank volume required (gallons)
P_1 = Pump off pressure (psi)
P_2 = Pump on pressure (psi)
Q_P = Pump delivery capacity at midpoint between P_1 and P_2
N_C = Pump operating cycles per hour
MF = Multiplication Factor (See Table 9-3)

$$V_t = \frac{60 + 14.7}{60 - 40} \times \frac{15(183)(1.08)}{12} = 920\ gallons$$

With the two (2) well pumps both capable of operating at a similar output it was assumed that there are 12 available pumps starts per hour at the primary pressure settings for the system. The available hydropneumatic tank volume of 2,200-gallons exceeds the total tank volume required of 920 gallons.

3.4.5 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 3.4.5.1
- Equalizing Storage (ES) – Section 3.4.5.2
- Standby Storage (SBS) – Section 3.4.5.4
- Fire Suppression Storage (FSS) – Section 3.4.5.5
- Dead Storage (DS) – Section 3.4.5.3

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

3.4.5.1 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. It is assumed that one foot of elevation difference exists between the well pump on and off signals. As shown in Section 3.3.4.1 the OS for the system is 3,746-gallons.

$$OS = 1\, foot \cdot (3{,}746)\ \frac{gallons}{foot} = 3{,}746\ gallons$$

3.4.5.2 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 combined well pumping capacity for the sources exceeds the PHD for the system, ES is not required. This is demonstrated using Equation 7-1 of the Design Manuel:

$$ES\ (gallons) = (PHD - Qs) \cdot 150\ minutes$$

Where:

PHD = peak hour demand (Section 2.1.6 above);
Qs = well pump capacity,

$$ES = (346 - 355)\ gpm \cdot 150\ minutes = 0\ gallons$$

3.4.5.3 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 1-foot 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.

$$DS = 1.5\ foot \cdot (3{,}749)\ \frac{gallons}{foot} = 5{,}619\ gallons$$

3.4.5.4 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 failure; or source contamination (See 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 for most systems. However, for water systems with multiple sources, such as Monterra, 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). Therefore, the minimum SB volume for Monterra is calculated as shown.

$$SB_{min} = (\mathrm{SB}_i)(N)\,(t_d) = (200)(242)(1) = 48{,}454\ gallons$$

Where:
SB_{min} = minimum recommended standby storage (gallons);
SB_i = Selected volume of standby storage per consumer expectations (gpd/ERU);
N = Number of system ERUs;
t_d = Number of days selected to meet consumer expectations (days),

The minimum standby storage volume for the system to be able to legal and physical capacity of 242 ERUs at the would be 48,545-gallons. The existing storage reservoir exceeds this recommendation with 65,547-gallons available. Equation 4-7 of the Design Manual is provided to calculate ERUs based on SB.

Design Manual Equation 4-7:

$$N = \frac{SB}{(SB_i)(t_d)} = \frac{65{,}547\ gal}{(200\ gpd/ERU)(1\ day)} = 327\ ERUs$$

Where:
N = Number of system ERUs based on ERU_{MDD} value;
SB = Total volume of available standby storage (gallons);
SB_i = Selected volume of standby storage per consumer expectations (gpd/ERU);
t_d = Number of days selected to meet consumer expectations (days),

The minimum recommended volumes are appropriate for Monterra since it has redundant sources that have a backup power supply. Both available sources meet the DOH definition for continuously available sources per Section 7.1.3 of the Design Manual. The available SB of 65,547 for the system can support 327 ERUs.

3.4.5.5 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 is 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.

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

3.4.5.6 Storage Summary

The provided storage volumes, assuming the legal capacity of 242 ERUs, are summarized in Table 3-11.

Table 3-11 Storage Components

Component	Volume (gallons)	Height (feet)
Top Dead Storage	3,746	1.0
Operational Storage	3,746	1.0
Equalizing Storage	0	0.0
Standby Storage	65,547	17.5
Fire Suppression (nested with SB)	(22,500)	(6.0)
Bottom Dead Storage	1,873	0.5
Total	174,481	33.0

3.4.5.7 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 the water in the reservoir is calculated based upon annual average day demand of 200 gpd/ERU and the current number of connections. The storage volume used is the total volume of the reservoir minus the top dead storage and the operational storage.

$$Water\ Age\ = \frac{Storage\ Volume}{ADD_{min} \cdot ERU} = \frac{75{,}000\ gallons}{220\ \text{gpm/ERU} \cdot 203\ \text{ERU}} = 1.68\ days$$

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.

3.4.5.8 Storage Capacity

As noted in the previous subsection, storage capacity of 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 each reservoir would be the available ES and SB for each reservoir. It is calculated as follows:

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

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

The available ES and SB for the reservoir is 65,547 gallons (See Table 3-11). The number ERUs that can be supported by the reservoir is 315.

3.4.6 Summary of System Capacities

An analysis of the system components, water rights and well capacities was performed to determine which item 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	305
Instantaneous Water Right (Q_i)	Q_i & MDD	761
Instantaneous Source Production	Q_s & MDD	609
Booster Pump	Q_B & MDD	242
System Storage	SB & ES Volume	315
Distribution System	PHD	761

The system was determined to have a maximum capacity of 242 ERUs limited by the booster pump capacity of the distribution system. The water system was analyzed to estimate the maximum number of connections that can be served by each component, and to determine which components limit the system's capacity to serve more ERUs as summarized in Table 3-13. In the future, if additional connections are required, they can install the recommended booster pump improvements to expand the physical capacity of the system.

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 and the Cascadia's financial situation.

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 70-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 (See Chapter 6). 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 an appropriate production rate for each respective well at the required total dynamic head to pass to the top of the reservoir.

3.5.2 Treatment Needs

Currently the system does not have treatment installed. Both Well 1 and Well 2 have elevated levels for manganese above the Secondary Maximum Contamination Level (SMCL) of 0.05 mg/L. Cascadia conducted pilot testing in 2021 to evaluate the effectiveness of a filtration system for removal of iron and manganese. During this pilot testing, manganese levels were approximately 0.12 mg/L. (Iron 0.3 mg/L). With the EPA in the process of determining whether to regulate manganese due to updated health effects information, Cascadia plans to proactively treat manganese levels in excel of the SMCL for their group A water system.

Monterra plans on installing an oxidation/filtration system with catalytic media to reduce the level of manganese in the source water to below half of the SMCL. The pilot test conducted at Monterra demonstrated that a filter system where iron is oxidized to its insoluble state and filtered while the manganese is adsorbed on the surface of the media where it is secured and oxidized in place would be an effective form of treatment. Chlorine is injected immediately upstream of the filters. Chlorine would be used to oxidize the iron and to maintain the filter bed in an oxidized state.

It is likely that installation of a treatment facility will require the pressure tanks to be relocated from the building located adjacent to Well 1 and Well 2. This could be accomplished in conjunction with the booster pump improvements noted in Section 3.5.4 or a new building would need to be installed.

3.5.3 Storage Needs

The capacity analysis for the system as referenced in Table 3-12, indicates that the storage capabilities in the system has capacity to meet 305 ERUs based on equalizing and standby storage. It is recommended that standby storage provides 200-gallons per ERU. SD for the water system is 63,754-gallons. The capacity limit of the standby storage is 318 ERUs. Therefore, there are no storage needs for the system.

3.5.4 Booster Pump & Pressure Tank Needs

As shown in the capacity analysis for the system (Section 3.4), the current configuration of the booster pumps system is the current limitation for the number of ERUs can be supported by the system. The current configuration of the pressurization system where the single booster pump and multiple well pumps are used the pressurize the system is not optimal. The booster pump system should be replaced with a new pump configuration that can provide for system demands and fire flow capacity in accordance with the Design Manual. The new configuration will eliminate the need to utilize the submersible well pumps to pressurize the distribution system and meet system demands.

Due to the limitations in space and the need to maintain system operations during proposed system improvements, a new pumphouse will need to be installed within the easement with the existing reservoir and pumphouse. The building should be sized to effectively house the pumps, new pressure tanks, and system controls for the anticipated system growth.

3.5.5 Distribution Needs

The distribution system has fire flow capacity to the few fire hydrants located throughout the distribution system. The capability to convey the fire flow demands of 500-gpm plus MDD for residential neighborhoods in the system is limited to portions of the distribution system with 6- or 8-inch water mains. The appropriately sized water mains are located on the primary trunk of the distribution system along Monterra Drive. The three (3) main residential circles located on Holly Circle, Heather Circle, and Cypress Circle are only served by a 2-inch water main. Improvements to the distribution system should prioritize the replacement of these water mains with 6- or 8-inch water mains with fire hydrants located in accordance with county standards.

3.5.6 Control and Telemetry Needs

The Water System would benefit from having an integrated supervisory control and data acquisition (SCADA) system that could be monitored from a central location. A SCADA system is planned for installation to allow the operators to monitor the Water System more efficiently. At a minimum, the SCADA system should provide the functionality to monitor and adjust well pump run status, booster pump run status, system pressures, 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 their existing meters and will be implemented for Monterra. The remote reading meters would reduce labor costs associated with meter reading and would have the capability to alert customers of potential leaks on their property. The meter replacement project will be prioritized based on age of existing meters, distribution system leakage, ease of installation and potential labor savings. Source meters will also be placed on a routine replacement scheduled to ensure accuracy of well production data.

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Table 3-14 Prioritized Potential Group A System Improvements Needs

#	Prioritization	Component	Component Description	Cost
1	Immediate (2025)	Controls & Telemetry	Increased system monitoring with a SCADA system for well pump operation, reservoir levels, system pressures etc. These improvements will include additional security/alarms to monitor system facilities including pumphouses and storage reservoirs.	$30,000
2	Immediate (2025)	Distribution	Generators for Booster Pumps – A properly designed generator will be sized and installed to allow for functioning of the booster pumps and possible a well pump during power outages in the area.	$50,000
3	Immediate/ Near Term	Distribution	Water meters throughout the system will be replaced with remote read meters.	$200,000 $700/meter
4	Medium Term (2027-2030)	Distribution	Pumphouse & Booster Pump Station – Installation of a new booster pump station to pressurize the system without the needs of the installed well pumps. A redundant booster pump for the system will need to be installed to meet PHD and 30 psi throughout the distribution system with the largest pump out of service. Due to constraints in the existing facilities and to maintain service during improvement projects, this will require the installation of a new pumphouse. Additional improvements will include new pressure tanks, new integrated system controls for pumps and wells, and a new electrical service.	$750,000
5	Medium Term (2027-2030)	Treatment	Manganese Filtration Treatment System – Installation and design of a filtration system for the water system to oxidize and filter out Mn from source water. Perform testing and verification necessary to ensure performance of the new system. It is likely that this will need to be installed in the existing building located adjacent to the system wells. This will require the relocation of the existing pressure tanks or an expansion of the existing facility.	$225,000

6	Long Range (2030-2040)	Distribution	Waterline Replacement (Holly Circle) – Replace existing 2-inch water mains along Holly Circle (Approx. 1,700 feet) with corresponding valves, hydrants, services, and appurtenances.	$300,000
7	Long Range (2030-2040)	Distribution	Waterline Replacement (Heather Circle) – Replace existing 2-inch water mains along Heather Circle (Approx. 1,650 feet) with corresponding valves, hydrants, services, and appurtenances.	$300,000
8	Long Range (2030-2040)	Distribution	Waterline Replacement (Cypress Circle) – Replace existing 2-inch water mains along Cypress Circle (Approx. 1,600 feet) with corresponding valves, hydrants, services, and appurtenances.	$280,000
9	Long Range (2030-2040)	Distribution	Waterline Replacement (Ivy Lane)– Replace existing 2-inch water mains along Ivy Lane (Approx. 925 feet) with corresponding valves, hydrants, services, and appurtenances.	$190,000

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 Water System is located in Clallam County with an average of 60-inches of rain per year, that is considered a large amount of precipitation.

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.
- Increase metering of the Water System to 100 percent to determine distribution system water loss.
- Reduce distribution system water loss to 10 percent or less, if determined to be over 10 percent.

The most recent available WUE reports from the Water System does not provide the past year's distribution system loss. As of 2022, the Water System is metering 50-75 percent of the total connections. The Water System has provided a plan to DOH to obtain 100 percent metered connections.

4.1.1 Water Loss Control Action Plan

With only 50-75 percent of the total current connections being metered, distribution loss is not calculated in the annual WUE report, therefore water loss data is not available for the system. Once 100 percent of the system is metered, water loss can be analyzed. If the Water System experiences 10% or greater of distribution loss, a water loss control action plan (WLCAP) shall be implemented. Since actual DSL has been unknown, Cascadia Water has developed a WLCAP for Monterra as a preventative measure. As part of their plan 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

Monterra has established a goal as part of their conservation program to reduce the growth adjusted maximum day demand by a minimum of 1.5% within six years. Reductions in the MDD can be accomplished though the proper tracking of DSL, updated rate structure, and the Capital Improvements Program that proposes the replacement of aging infrastructure in the Water System based on analyzed and observed deficiencies.

4.2 Source of Supply Analysis

The Department of Ecology requires the water system 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.

The Water System has an adequate water right currently and are not projected to require additional rights within the 20-year planning period.

4.2.1 Enhanced Conservation Measures

As discussed in Section 4.1, Cascadia has or will implement use efficiency measures with the goal of reducing MDD and DSL system wide for Monterra.

4.2.2 Water Rights Changes

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

4.2.3 Interties

Currently there are no additional water systems intertied with Monterra. One nearby water system exists and would butt up to Monterra if the system were to expand into the future service area. The system is smaller than Monterra and could be considered as a candidate for an intertie and/or incorporation. The current service area limits the practicality of intertie without potential development. If the intertie would allow the Water System to purchase water from another system, it could provide a cost-effective way of providing system redundancy in the event of line breaks or source production issues. An intertie with another water system 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 higher than the Water System's 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.

A more thorough analysis of potential interties is beyond the scope of this planning document. If discussions with neighboring systems are fruitful and mutually acceptable, then a study and project report will be generated for future intertie projects.

4.3 Water Right Evaluation

The following sections summarize the Water System's water right evaluation.

4.3.1 Existing Water Rights

Currently, Monterra has a water right with certificate number G2-01131 C. The water right allows the system a maximum instantaneous withdrawal (Q_i) of 370 gpm and a maximum volume (Q_a) of 75 acre-feet per year (ac-ft/yr). Well #1 point of withdrawal is 620 feet south and 710 feet east of the north quarter corner of Section 7, while Well #2 point of withdrawal is 570 feet north and 720 feet east of the center of Section 7.

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 Water System and is included in Appendix F.

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5 SOURCE WATER PROTECTION

5.1 Introduction

Protection of the source of the water supply is of utmost concern for public water systems. The Water System's production wells have been free of man-made contaminants such as PFAS contaminants. 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 are 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 Restrictive Covenants

December 6th, 1989 Monterra established a Restrictive Covenant for the well site containing both groundwater sources located in Clallam County on parcel 043007130000. The Restrictive Covenant document is provided in Appendix C.

5.3 Wellhead Protection Program

The Water System will implement a wellhead protection program. This program will incorporate the following:

- Periodic monitoring of the existing wells for nitrates and conductivity to check 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.
- Sending letters to property owners within the capture zones regarding the presence of the system source wells.

The Water System's source water is from two groundwater wells. The wells physical parameters are discussed in Section 3.3.3. The Water System's Wellhead Protection Program is attached in Appendix I.

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6 OPERATION AND MAINTENANCE PROGRAM

This chapter serves as a general Operations and Maintenance Program (O&M) for the Monterra water system. It contains various tasks, procedures, and strategies to maintain the system in proper working order and it should be used in conjunction with other available plans such as any available an 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 Monterra. Staff should continually maintain certifications through continuing education as required by each individual 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 involve a minimum of the following as outlines 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
▪ 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
System Controls
▪ 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
▪ 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
▪ Consumer meter readings
▪ 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
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

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 Monterra's supply sources be made often enough to assure compliance. Water quality requirements are listed in detail in Section 3.2. The organization practice of maintaining 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, Monterra 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 required 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-hour 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. Nitrates and Nitrates are subject to a separate process by the WSDOH as noted in Section 6.6.3. Currently the Water System has varied waivers for testing parameters are detailed in Table 3-1. The following steps should be taken in the event of an MCL exceedance for either IOC or VOC.

1. The WSDOH must be notified, and the testing frequency is increased to quarterly.
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 public ration 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.

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

Table 6-4 Water Main Break 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 Monterra 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 Monterra 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 Monterra 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

Monterra 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.

Monterra'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. Monterra's plan is outlined below. The rules and regulations provided in the tariff for Cascadia (See Cascadia Water – Water System Plan – Part A) outline requirements for cross-connection control. Monterra 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 Monterra's 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 Monterra 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 Monterra's distribution system. These potential uses can include, but are 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, Monterra 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.

Monterra's 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.

Monterra shall require at a minimum, 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 Monterra shall not connect, directly or indirectly, the water service line, or any part of the plumbing of such structure receiving water service from Monterra.

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. Monterra 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.

Monterra will promptly notify property owners with known potential cross-connections. Monterra 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

Monterra 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.

Monterra shall require 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, Monterra's water system administrator shall notify the Board of Commissioners and the local Department of Health 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 of Monterra.
- Occurred within the premises of a customer served by Monterra.

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. Currently there are no specific improvements planned that need to be addressed at this time.

7 DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS

7.1 Introduction

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 Water 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 of the Water System's distribution system, and treatment. Population and water demand forecast and existing system analysis, discussed in previous chapters, were used to formulate the following Capital Improvement Plan. The Water System's design criteria were included in the formation of the plan.

The existing piping system was also reviewed to determine the necessity of replacing older water mains. Considerations included material condition, size, and capacity. The following sections summarize Monterra's Improvement Program which is organized in two basic elements: 1) Prioritizing Improvement Projects, and 2) Improvement Schedule.

Planning Phase 1 (6 years; 2023 - 2029)

It is anticipated the system will serve approximately 193 ERUs by the end of 2029. Currently, in 2023 the number of DOH approved connections is 203. Based on the capacity analysis detailed in Section 3.4, the Water System's current infrastructure appears adequate to meet the anticipate growth as the limiting factor of the system pump capacity and PHD at 242 ERUs. The existing system deficiencies have been identified to support the anticipated growth and future development of the system. The next limiting factor of the system is the water right allowable annual withdrawal and ADD for a maximum of at 305 ERUs. Currently, the system configuration and booster pump station are limiting the system from future development. All projects associated with the booster pump station are described in this chapter.

Additionally, the water system has manganese concentrations over the MCL and it is recommended to install a filtration system to treat the system. A pilot test was originally completed in 2021 for sizing of an ATEC filtration system. Treatment projects are described in this chapter.

The Water System has projects identified to improve distribution system efficiency, treatment, and redundancy needs. 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 2 (20-year horizon; 2029 - 2043)

It is anticipated that the Water System will serve approximately 222 connections by the end of 2043. The anticipated number of connections is greater than the current number of DOH approved connections. From the capacity analysis, the Water System has the ability to serve the anticipated number of connections.

In Phase 2 of the planning cycle (2029-2043), the Water System will continue to investigate the development, or complete the development, of additional water source(s) as the existing sources will have been in service in excess of 50-years during this planning phase. In addition, replacing/upgrading the distribution system is anticipated 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. The CIP will be re-evaluated during future WSP updates, and the CIP can be adjusted at that time. Development of the future service area may take place during Phase 2, with entails extending the existing 8" distribution main to the future service area region.

Planning Phase 3 (20+ years, 2043 and beyond)
As indicated above, build-out, and future expansion for the Water System 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 Monterra 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 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 S01 and S02 operate under a well field S03. Both S01 and S02 combined have the capacity to serve existing and future development of the system. The sources were installed in 1973 and 1976 and are anticipated to be at the end of their life cycle during Phase 3 as discussed above and should be considered part of the . The aging sources will need to be evaluated during Phase 2-3 which includes evaluating locations for alternative well sites and analyzing existing wells to determine potential for rehabilitation. Future Source treatment may also impact the need for additional well development. Installation of treatment may allow an existing well to return to service or optimizing treatment may decrease overall water usage.

The system currently has two groundwater sources that were installed in 1973 and 1976 respectively. The Chapter 3 capacity analysis shows that the system has sufficient sources and source production to meet the measured and projected demands of their consumers through the 20-year planning period. However, at the end of the 20-year period both groundwater sources will be approximately 70-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 (See Chapter 6). 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. When any work is performed on the wells it is recommended that appropriate sounding tubes be added to both sources and a pressure transducer be added to the wells. The pressure transducer should be calibrated to properly monitor source water levels. This data should be incorporated into the exiting SCADA system, including well run times. This data will be valuable in compliance with water rights, assessment of well health, and potential sizing of future well infrastructure.

The other following improvements are currently in process or should be in the immediate-term for the water system:

1. Source Meter Replacement: Source meters on each well will be evaluated for performance. Source meters will be replaced with a new meter as needed.
2. Emergency Generator: Emergency generators can provide power to pressure tanks and booster pumps during power outages. The Water System has adequate storage, but extended power outages raise concern regarding the ability to replenish the source water in the reservoir. A generator should be installed on the water system to allow at least one of the system's wells to be active in case of an extended power outage. The generator switch should meet all applicable electrical codes. The generator fuel supply should meet all applicable codes, especially spill control measures in the vicinity of the well field. Typically, a propane fired generator is preferred due to spill concerns within the well radii.

8.2.2 Treatment

Treatment facilities improve the quality of water distributed to customers and can reduce flushing and reservoir cleaning needs. Currently, there is no treatment system installed on the Water System. The Water System's treatment capacity should be sized to meet current and potential future demand and build-out. It is recommended the Water System install a treatment system to address manganese. In 2021, a pilot test was completed for Monterra and is provided in Appendix C. The treatment system will either require a pumphouse/treatment building and/or a reconfiguration of the system to eliminate the need for the well pumps to pressurize the system.

The treatment system shall be designed to meet current and future demands of the Water System. Treatment methods will be selected based on the water quality of raw source water, from the completed pilot test report to remove manganese but it is anticipated that oxidation filtration process as demonstrated in the pilot test will be an effective and cost efficient method of treatment. The capacity of the filtration system should be specified and designed to ensure the system has capacity to meet future demands of the system.

8.2.3 Storage

The existing storage capacity for the water system has sufficient equalizing, and standby storage to support the current and future development of the system. The concrete reservoir is appropriately sized for current and anticipated future system demands. It is not anticipated that any significant modification to the system storage will occur within the planning period of this Water System Plan.

The operator and owner should continue to follow the Operation & Maintenance recommendations provided in Chapter 6. These recommendations include routine evaluation of the reservoir for leaking and cracking. If leaking and cracking or failure in the reservoir is found, replacement or rehabilitation of the reservoir should occur.

8.2.4 Distribution

The system plans on completing water main extensions and replacements during the planning period of this Water System Plan. Water main replacements will prioritize replacement of portions of the distribution system that are undersized and portions that have a history of repairs indicating aging and failing water lines. Additional projects include improvement to the pressurization of the system through a booster pumps project. The following projects address the potential distribution needs and long-term plans of the system.

Water Main Replacements

1. The various loops within the Monterra distribution system have undersized water mains for future demands and fire suppression potential. Each of these loops has an equal priority.
    a. Holly Circle: This project would replace the existing 2-inch water main along Holly Circle, totaling approximately 1,700 feet of water main. The new water main should be increased in size to allow for proper pressurization of the system while providing the fire flows in accordance with DOH and Clallam County standard. In conjunction with the replacement of the water main, the corresponding valves, hydrants, services, and other appurtenances should also be replaced.
    b. Heather Circle: This project would replace the existing 2-inch water main along Heather Circle, totaling approximately 1,650 feet of water main. The new water main should be increased in size to allow for proper pressurization of the system while providing the fire flows in accordance with DOH and Clallam County standard. In conjunction with the replacement of the water main, the corresponding valves, hydrants, services, and other appurtenances should also be replaced.
    c. Cypress Circle: This project would replace the existing 2-inch water main along Cypress Circle, totaling approximately 1,600 feet of water main. The new water main should be increased in size to allow for proper pressurization of the system while providing the fire flows in accordance with DOH and Clallam County standard. In conjunction with the replacement of the water main, the corresponding valves, hydrants, services, and other appurtenances should also be replaced.
    d. Ivy Lane: This project would replace the existing 2-inch water main along Ivy Lane, totaling approximately 950 feet of water main. The new water main should be increased in size to allow for proper pressurization of the system while providing the fire flows in accordance with DOH and Clallam County standard. In conjunction with the replacement of the water main, the corresponding valves, hydrants, services, and other appurtenances should also be replaced.

Booster Pumps – System Pressurization

1. The system would like to reduce the reliance upon the well pumps to properly pressurize the water system to extend the life of the well pumps. A redundant booster pump for the system will need to be installed to meet PHD and 30-psi throughout the distribution system with the largest pump out of service. Due to constraints in the existing facilities and to maintain service during improvement projects, this will require the installation of a new pumphouse (See Section 8.2.5). Additional improvements will include new pressure tanks, new integrated system controls for pumps and wells, and a new electrical service. The use of new pressure tanks will allow the system to remove the two large pressure tanks located in the building adjacent to the well. This location could likely be used to house the treatment filters noted in Section 8.2.2. During design the size and number of pumps should be verified based on the future number of potential services associated with the system. Pumps will be sized to meet Clallam County and DOH fire suppression standards.

8.2.5 System Facilities

As noted in Section 8.2.4, the integration of a new booster pump control system would require the installation of a new pumphouse. The new pumphouse should be appropriately sized for the new system facilities. This will allow the existing building and associated pumps to serve the system while improvements are installed, limiting interruption to consumer's water service. The location and size of the facility should be determined during construction. The design should consider future needs in the system including the treatment filter to ensure proper space is provided for current and future system needs.

8.2.6 Controls

Upon purchasing of the Monterra system by Cascadia Water, there have been general telemetry upgrades made to the system. These improvements include the installation of SCADA network to monitor well operations, reservoir levels, system pressures, and general security measures. In addition, there have been improvements made to system reliability with additional generators to provide continued service in emergency events.

The system should continue to implement needed upgrades to system telemetry as needed to control reservoir via pressure transducer, monitory source water levels, chlorine monitoring, and other system upgrades necessary to support available system operators.

8.2.7 Capital Improvements from Previous SWSP

Projects identified in previous 1994 Small Water System Program (SWSP) are shown below:

1. Customer meter installation.
2. Expand to future service area.

Items 1 have 2 have not been completed to date and are listed as items to be carried as part of this Water System Plan.

8.2.8 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 developments 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 Water System is interested in a potential expansion of the water system and would entertain and support developer extensions when feasible.

8.2.9 Non-Facility Improvements

Potential non-facility improvements include continued promotion of conservation policies, establishing DOE well tags, and updates to the Water System's procedures and policies to ensure that the integrity of the water distribution system are maintained. The following items have been identified for the WSP planning periods:

<u>Establishing DOE Well Tags – Current Planning Period</u>

Monterra's wells S01, and S02 currently do not have established DOE well tags and are labeled as "Well #1/#2 NO TAG WW (MONTERRA)". The Water System will need to work with DOE to get established well tags for each well, followed by updates to the WFI and other applicable documents. Once well tags are established, DOE tags should be installed on each well casing that is visible.

Service & Source Meter Replacement – Current Planning Period

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 the 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 Table 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.

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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 the Cascadia updated Water System Plan. In addition to Clallam County, the following adjacent Utilities were also notified:

- Port Angeles Composite (432960)
- Lora Lee Estates (36991F)

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 Monterra serves less than 1,000 connections. Therefore, the documentation has not been included with the Plan.

10.3 Agreements

A copy of Monterra's Service Area Agreement is attached in Appendix C. Clallam County is in the process of establishing the Franchise Agreement for the Water System.

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APPENDIX A
Water Facility Inventory Form (WFI)

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

WATER FACILITIES INVENTORY (WFI) FORM

ONE FORM PER SYSTEM

Quarter: 2
Updated: 10/13/2017
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
55990 Y	MONTERRA	CLALLAM	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS

ERIC T. THOMAS [OWNER/MGR]
PENINSULA WATER, INC.
PO BOX 3246
SEQUIM, WA 98382-5016

STREET ADDRESS IF DIFFERENT FROM ABOVE
ATTN
ADDRESS
CITY STATE ZIP

7. OWNER NAME & MAILING ADDRESS

MONTERRA INC.
ERIC T. THOMAS
PO BOX 574
SEQUIM, WA 98382-5016

8. OWNER NUMBER: 034813

2014 PRESIDENT

STREET ADDRESS IF DIFFERENT FROM ABOVE
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)

- [x] Not applicable (Skip to #12)
- [ ] Owned and Managed
- [ ] Managed Only
- [ ] Owned Only

SMA NAME: ______________________ SMA Number:

12. WATER SYSTEM CHARACTERISTICS (mark all that apply)

- [ ] Agricultural
- [ ] 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
- [x] Residential
- [ ] School
- [ ] Temporary Farm Worker
- [ ] Other (church, fire station, etc.): ______________

13. WATER SYSTEM OWNERSHIP (mark only one)

- [ ] Association
- [ ] City / Town
- [ ] County
- [ ] Federal
- [x] Investor
- [ ] Private
- [ ] Special District
- [ ] State

14. STORAGE CAPACITY (gallons)

75,000

15 Source Number	16 SOURCE NAME: 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	17 INTERTIE: INTERTIE SYSTEM ID NUMBER	18 SOURCE CATEGORY: WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	19 USE: PERMANENT	SEASONAL	EMERGENCY	20 SOURCE METERED	21 TREATMENT: NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	22 DEPTH: DEPTH TO FIRST OPEN TERVAL IN FEET	23 CAPACITY (GALLONS PER MINUTE)	24 SOURCE LOCATION: 1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	WELL #1 NO TAG WW (MONTERRA)				X								X			Y	X						109	180	SW NE	07	30N	04W
S02	WELL #2 NO TAG WW (MONTERRA)				X								X			Y	X						89	180	SW NE	07	30N	04W
S03	WF (S01 & S02)			X									X			N	X						89	380	SW NE	07	30N	04W

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
55990 Y	MONTERRA	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?)		192	242
A. Full Time Single Family Residences (Occupied 180 days or more per year)	192		
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)	0	0	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	0	0	0
28. TOTAL SERVICE CONNECTIONS		192	242

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per year? 470

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

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

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

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

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

35. Reason for Submitting WFI:

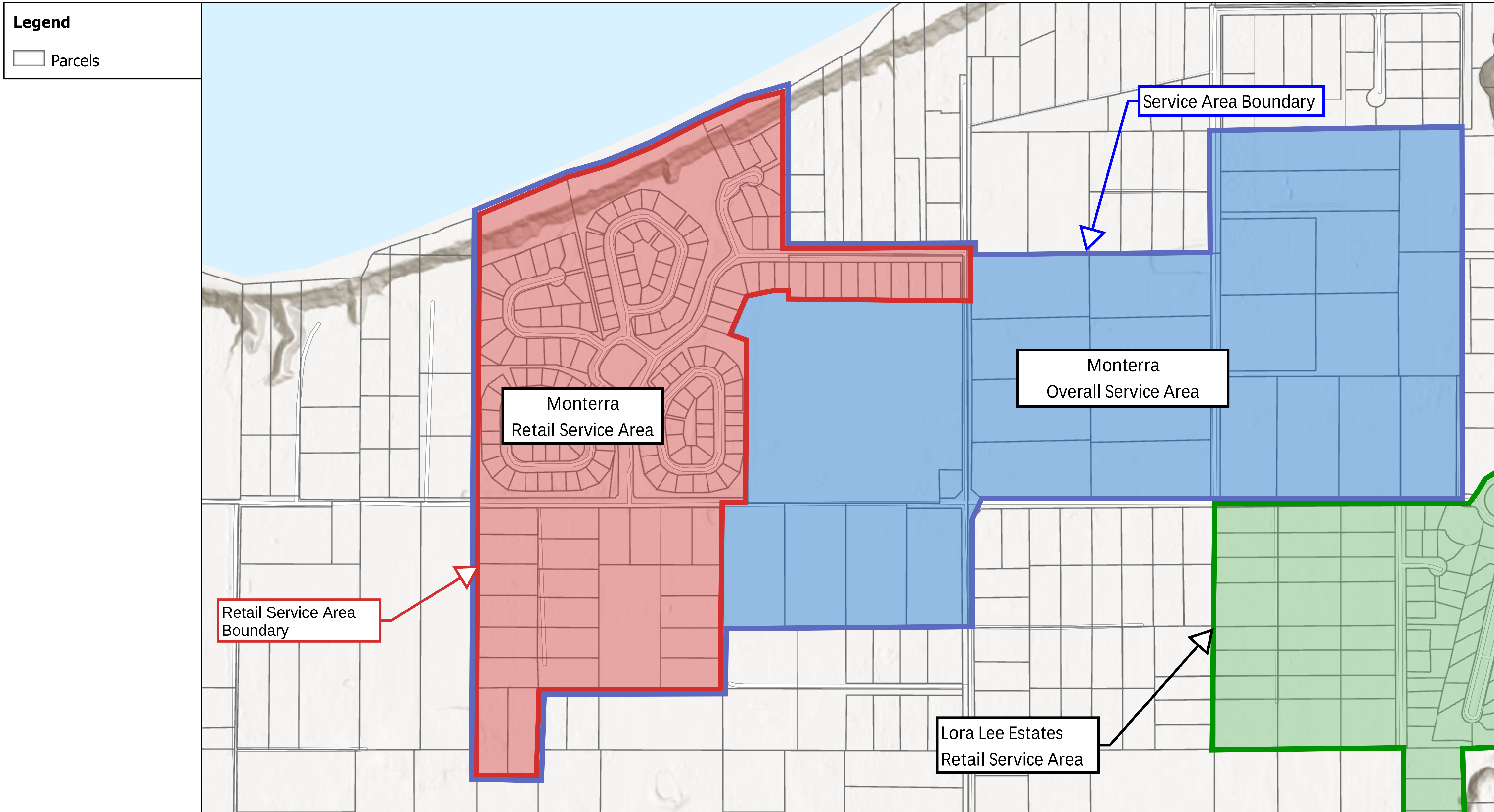
☐ **Update - Change** ☐ **Update - No Change** ☐ **Inactivate** ☐ **Re-Activate** ☐ **Name Change** ☐ **New System** ☐ **Other** ____________

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

SIGNATURE: ____________________ **DATE:** ____________________

PRINT NAME: ____________________ **TITLE:** ____________________

APPENDIX B
Service Area Map



Monterra - Retail Service Area

5/5/2024 11:21 AM

0 0.06 0.11 mi

1:9,028

We are happy to share our maps and hope that you find them helpful. Please be advised, however, that these maps are intended to serve as a guide to the 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">December 27, 2016

Eric Thomas
Post Office Box 574
Sequim, Washington 98381-5016</td><td colspan="2">Monterra
ID #55990Y</td></tr>
<tr><td>County:</td><td>Clallam</td></tr>
<tr><td>System Type:</td><td>Group A Community</td></tr>
<tr><td>Operating Permit Color:</td><td>Green</td></tr>
<tr><td>Surveyor:</td><td>Jester Purtteman</td></tr>
<tr><td>Inspection Date:</td><td>November 15, 2016</td></tr>
</table>

Thank you 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 jester.purtteman@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 FEBRUARY 10, 2017

1. Plug a hole in the Well 1 well conduit.
2. Seal openings in water level gauge.
3. Replace the air compressor in the well control building with an oil-free air compressor.

SIGNIFICANT FINDINGS - NONE

OBSERVATIONS - NO DEADLINES

4. Complete installation of meters by January 17 and begin reporting Water Use Efficiency (WUE) annually. The system should hold a customer informational meeting with a goal setting forum as soon as feasible to establish the system's goals and introduce measures to meet your goals.

RECOMMENDATIONS - NO DEADLINES

5. The operator should establish a program for testing the hydropneumatic tanks on a regular basis. Without a sight tube to visually confirm operation of the air-compressor and associated float controls.
6. The purveyor should confirm the existence of a recorded restrictive covenant for the system's wells. If one does not exist, the purveyor should negotiate one now while a friendly party owns the property on which the wells are located.

SYSTEM INFORMATION

Monterra is a community Group A water system comprised of entirely single family residences. The system has 182 active service connections with approval for up to 203. Two ground water wells with a combined capacity of 380 gallons per minute (gpm) deliver water to distribution under pressure. A 75,000-gallon bladder tank fills by control valve in the reservoir, and water is pumped from the reservoir into distribution by a booster pump. A fire pump also connected to the system provides fire suppression storage. The tank operates on a large operational storage range to introduce new water into the water and prevent stagnation.

The system was installed in two primary phases, and is predominantly of reasonably modern design, only dating back to 1979. The wells are generally well constructed and protected, although there were small openings and no vent on one well apparently due to a recent service. The wells are located inside small doghouses near a driveway. Although the residence is currently owned by a person friendly with the water system, the system should ensure that it has the legal capacity to enforce a restrictive covenant around the wells if it has not done so.

SECTION 1: SOURCE

This system has two sources which are designated a wellfield. As a result, the two sources are sampled on a combined header. Each source has a raw water sample tap.

Source ID #	Name:	Description:	Ecology Tag #	Listed on WFI Yes	No
S02	North	20-Horsepower (HP)	None	☒	☐
S01	South	30-HP	None	☒	☐

WELLHEAD	Source ID #01		Source ID #02	
	Yes	No	Yes	No
System has well log	☒	☐	☒	☐
*Wellcap 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	Weekly			
Frequency of source meter reading	Weekly			

WELL PUMP EQUIPMENT	Source ID #		Source ID #	
	Yes	No	Yes	No
*Functional and reliable pump and pump controls	☒	☐	☒	☐
*Pump control valve or vacuum relief valve with a protected air gap at discharge	☒	☐	☒	☐
Generator available	☐	☒	☐	☒
Generator has automatic startup	☐	☒	☐	☒
Generator fuel source				

The wells are in generally good condition, but it appears that the vent for the South well was recently removed, possibly during service. In addition, the electrical conduit had holes common to the small junction boxes, and should be sealed or caulked.

SECTION 2: DISINFECTION - NONE

SECTION 3: OTHER TREATMENTS - NONE

SECTION 4: DISTRIBUTION SYSTEM

FEATURES	Yes	No
Service area and facility map	☒	☐
Minimum pressure requirements met	☒	☐
Service meters (reading frequency **Bi-Monthly**)	☒	☒
Leak detection program	☒	☐
Water system leakage (%)	Unknown	
Adequate valving for flushing and pipe repair	☒	☐
Blow-offs on dead ends	☒	☐
Routine flushing (frequency **Semi Annual**)	☒	☐
Routine valve exercise (frequency **Monthly**)	☒	☐

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	☒	☐

The system is installing the last of the service meters this month and has not yet completed a WUE report. The system will begin completing WUE reports starting next year now that all services are metered.

SECTION 5: FINISHED WATER STORAGE

RESERVOIR	RESERVOIR NAME	DESCRIPTION	YEAR BUILT	TOTAL VOLUME (GAL)
1	Tank 1	Concrete Reservoir	1985	75,000

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

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

MAINTENANCE	Res #1	
	Yes	No
Frequency of structural and coating inspection	5 Years	
Frequency of cleaning	3 Months	
Frequency of appurtenance inspection	3 Months	
Frequency of routine site visit	Weekly	
**Structure in good condition	☒	☐
Clear of excessive vegetation	☒	☐

The level gauge is of a style that may leave an opening into the tank. The operator will locate the opening and confirm that it is closed, or seal it with either screen or steel wool.

SECTION 6: PRESSURE TANKS

The system has two 750-gallon horizontal hydro-pneumatic tanks.

Site	Location	# and size of Hydropneumatic Tanks	# and size of Bladder Tanks
1	Well Control House	Two 750-Gallon Tanks	

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	☐	☒

The air compressor must be replaced with an oil-free model. Oiled pistons can drive oil lubricant into the water supply when operating. The hydropneumatic tanks do not have a sight glass to check air and water ratio in the tank under normal operation, but fittings to install a sight tube are not available and would require a significant retrofit to introduce. The operator should confirm operation of the hydropneumatic tanks periodically to ensure that control switches are not out of specification. The building recently flooded due to a line break, and was undergoing repair during the visit, but seemed to show some signs of minor damage from long-term exposure to water. Improved drainage, venting, and heat may help increase the useful life of the structure. Finally, when the hydropneumatic tanks reach their end of life, the owner may wish to consider using variable frequency drives (VFDs) for the system's control, which would permit a much smaller hydropneumatic or bladder tank configuration that could greatly reduce the footprint of the well control building.

SECTION 7: BOOSTER PUMPS AND FACILITIES

The reservoir is primarily used for fire protection. To prevent water stagnation, the reservoir operates on a float system that gives a relatively large (several feet) operational storage range to permit cycling of the water in the tank. When pressure falls below regular service pressure, indicating a fire or flushing event, a 500-gallon gasoline fueled fire pump engages delivering high flow.

Facility	Name	Description	Total Capacity (gpm)
1	Pump Station	Pressure Pump	140
2	Pump Station	Fire Pump	500

BOOSTER PUMPS	Facility 1		Facility 2	
	Yes	No	Yes	No
Number of pumps	1		1	
Frequency of routine site visit	Weekly		Weekly	
Isolation valves	☒	☐	☒	☐
Pressure gauge(s)	☒	☐	☒	☐

BOOSTER PUMPS	Facility 1		Facility 2	
	Yes	No	Yes	No
Pressure relief valve	☐	☒	☐	☒
Pump failure alarm	☒	☐	☒	☐
*Functional pump and pump controls	☒	☐	☒	☐
Protected from flooding	☒	☐	☒	☐
Redundant pumps	☐	☒	☐	☒
Equipment in good condition	☒	☐	☒	☐
Generator available	☐	☒	☒	☐
Generator has automatic startup	☐	☒	☒	☐
Generator fuel source			Gasoline	

BUILDINGS/ENCLOSURE	Facility 1		Facility 2	
	Yes	No	Yes	No
**Facility secure	☒	☐	☒	☐
Structure in good condition	☒	☐	☒	☐

The system does not appear to have a pressure relief valve (PRV); however, the pressure pumps are relatively low head pumps and do not appear to be capable of generating dangerous pressures in regular operation.

SECTION 8: WATER QUALITY MONITORING AND REPORTING

The system has generally adequate water quality, although the system did have a total coliform detection last fall, and has manganese above the secondary Maximum Contaminant Level (MCL) at 0.1 milligrams per liter (mg/L). This is well below the health advisory level of 1 mg/L.

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	Well Field Header

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	1 Total Coliform

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

Manganese is approximately 10 times the MCL, and arsenic has been detected at levels well below the MCL.

SECTION 9: SYSTEM MANAGEMENT AND OPERATIONS

The system is operated by the owner, Eric Thomas, with contractual assistance from Dale Metzger.

PROJECT/PLANNING	Yes No
System approved	☒ ☐
Current WSP/SWSMP	☒ ☐
Year WSP/SWSMP approved	N/A
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)	☒ ☐	☐
Cross connection control annual report (> 1000 conn)	☐ ☐	☒

OPERATOR CERTIFICATION

This system is required to have a Water Distribution Manager (WDM 1) certified operator. The operator is responsible for all water quality sample testing, maintenance, repair, and emergency response. The operator owns this system and is also responsible for all budgeting for capital improvements and replacements.

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	WTPO1, WDM3, 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 next survey is due **in 5 years.**

Regulations establishing a schedule of fees, including fees for sanitary surveys, were adopted April 30, 2012 (WAC 246-290-990). The amount due is $408. An itemized worksheet is enclosed with the invoice.

If you have any questions, please contact me at (360) 236-3036 or by e-mail at jester.purtteman@doh.wa.gov.

Sincerely,

Jester Purtteman, P.E.
Office of Drinking Water, Regional Engineer

Enclosures

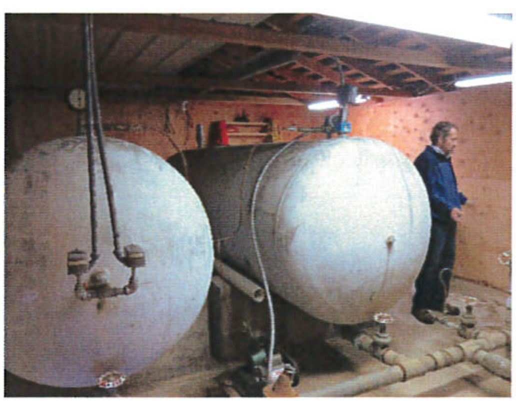
cc: Clallam County Environmental Health
Denise Miles, ODW

S01

S02

S01 Vent

Well Control Building

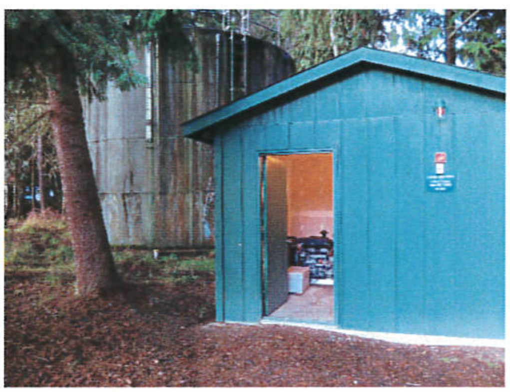


Hydropneumatic tanks inside well control building.

Temporary plumbing from a break the previous weekend.

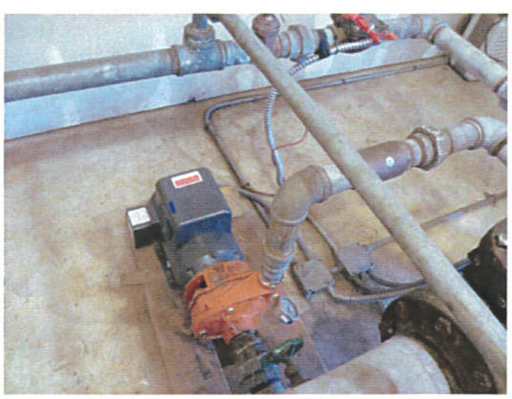
Oil Lubricated Air Compressor

Air compressor input and float switch controls for hydropneumatic tanks.



Reservoir and Booster Pump Station

Reservoir Hatch



Pressure Pump

Fire Pump

Pilot Test Data

DATE: August 24, 2021

TO: Jeff Tasoff, P. E.
Principal-Civil Engineering
Davido Consulting Group, Inc.
T 360-331-4131
Whidbey Island | Mount Vernon | Seattle | Federal Way

FROM: Cullen J. Wilder, P.E.[1]

SUBJECT: Summary of Pilot Testing, Monterra Water System, North and South Wells

On August 10, 2021, we pilot tested the North and South Wells belonging to the Monterra Water System. The purpose of the pilot test was to determine the efficacy of the ATEC system in removing manganese from the water produced by either of these wells and to identify the optimal ATEC filtration equipment for treatment that will reliably remove this contaminant to less than its Secondary Maximum Contamination Level (SMCL) set by the USEPA of 0.05 mg/L.

The treatment system is to have a capacity of either of the two wells, 180 gpm.

The pilot filter system is designed to simulate actual operation of an ATEC filter system on a small scale in terms of retention, media depth, flow per cubic foot of media, flow per square foot of media (loading rate) and so forth. During the pilot testing the pilot trailer's field lab was used to determine chlorine, iron, manganese, hydrogen sulfide (H_2S) and ammonia concentrations in the raw and finished water.

Excellent pilot test results were attained for these wells. Based on these results, an ATEC filter system comprised of (5) 30-inch filters with 60-inch sidewalls filled with 42-inches of AS-741M (pyrolusite) media is recommended. The system would be delivered on one skid, with piping, manifolds, valves. underdrain and underdrain support factory installed. Preliminary plans for the recommended system are given in this report.

The remainder of the report discusses the pilot testing and the recommended system. This report is meant to summarize and document the results of the pilot testing and the basis for the recommended systems. This pilot test report should be helpful in preparing a technical report given in WAC 246-290-110 but is not meant to satisfy the requirements in this section.

General Description of the ATEC Iron, Manganese and Arsenic Removal Process

ATEC Systems uses pyrolusite based media for its high-rate arsenic, iron, and manganese removal systems. The iron is oxidized to its insoluble state and filtered while the manganese is adsorbed on the surface of the media where it is secured and oxidized in place. Chlorine is injected immediately upstream of the filters. The chlorine is used to oxidize the iron and to maintain the filter bed in an oxidized state, not to oxidize and precipitate the manganese as is the case with most other treatment systems.

[1] Registered in WA and CA

In this pilot test, chlorine was introduced to the influent ahead of four 6-inch diameter filter columns with 60-inch filter sidewalls. The filters are manifolded together at the inlet and outlet and filled with AS-741M Filter Media. The pilot test characteristics are given in the Appendix.

Pilot testing results for the wells are tabulated in Tables 1 and 2 and shown graphically in Figures 1, 2, and 3 of this report.

Pilot Test Results

A total of 16 samples were taken on a half-hourly basis until the end of the test. Nine samples were taken of South Well and seven of the North Well. The water quality of each well was essentially the same.

The average loading rate was 9.77 gpm/sf.

Raw water manganese concentrations were fairly consistent and averaged 0.120 mg/L, 239 percent of the SMCL of 0.050 mg/L.

In five tests, ammonia ranged from 0.010 mg/L to 0.080 mg/L, averaging 0.038 mg/L. In one of four tests of hydrogen sulfide, this constituent was 0.010 mg/L. The USEPA has no standard for these constituents, but their presence can often be the cause of taste and odor complaints.

Chlorine dosage varied little, averaging 2.23 mg/L. Treated water chlorine concentration averaged 1.47 mg/L. The average chlorine demand was 0.76 mg/L.

Manganese removal was excellent. Finish water manganese concentrations were at non-detect for 13 of the 16 samples taken.

Ammonia and hydrogen sulfide concentrations in the finish water were below the detection limit.

Recommended System

At the treatment objective of 180 gpm capacity, the recommended system of (5) 30-inch diameter filters would have a loading rate of 7.34 gpm/sf during production and 9.18 gpm/sf during the 25 minutes of backwash when one filter was out of service.

Summary

Based on ATEC's experience with previous systems with similar water, we recommend that backwash should be set initially at 24 hours. The system should be observed for 6 to 8 weeks to determine whether this interval should be adjusted.

Preliminary drawings for this system are included in this report.

Summary of the Recommended Filter System

Parameter	Value
Production Rate	180 gpm
Loading Rate	7.34 gpm/sf
Backwash Rate	28 gpm/sf
Backwash Flow	137 gpm
Backwash Duration	5-minutes per filter
Backwash Frequency	24 hours of production
Backwash Amount	3,425 gallons
Production Between Backwash Cycles	259,200 gallons
Backwash as a Percentage of Production	1.3 %

Please contact me if you have any questions or need further information.

Yours truly,

Cullen Wilder

Cullen J. Wilder, P.E. (CA, WA)
Vice President
ATEC Systems Associates, Inc.
916-742-5542 (direct)

Table 1
Summary of Pilot Study Test Conditions
Monterra Water Company, North and South Wells
August 10, 2021

	Date	Sample Number	Time	Meter Reading (Gallons)	Average Flow (gpm)	Loading Rate (gpm/ft^2)	Loading Rate (gpm/ft^3)	Media Contact Time (Minutes)	Cl_2 Dose (mg/L)	Temp ^oC
South Well										
	8/10	Start	7:00	-	7.80	9.93	2.84	2.64	2.43	9.9
		1	7:30	198.4	7.60	9.68	2.76	2.71	2.22	9.9
		2	8:00	412.7	7.14	9.10	2.60	2.88	2.36	9.9
		3	8:30	659.7	8.23	10.48	3.00	2.50	2.05	9.9
		4	9:00	865.5	6.86	8.73	2.50	3.00	2.46	9.9
		5	9:30	1,093.4	7.60	9.67	2.76	2.71	2.22	9.9
		6	10:00	1,328.4	7.83	9.97	2.85	2.62	2.15	9.9
		7	10:30	1,565.1	7.89	10.05	2.87	2.61	2.14	9.9
		8	11:00	1,796.5	7.71	9.82	2.81	2.67	2.19	9.9
North Well		9	11:30	2,017.9	7.38	9.40	2.68	2.79	2.29	9.9
		10	12:00	2,246.0	7.60	9.68	2.77	2.70	2.22	9.9
		11	12:30	2,497.0	8.37	10.65	3.04	2.46	2.02	9.9
		12	13:00	2,705.0	6.93	8.83	2.52	2.97	2.43	9.9
		13	13:30	2,945.0	8.00	10.19	2.91	2.57	2.11	9.9
		14	14:00	3,203.0	8.60	10.95	3.13	2.39	1.96	9.9
		15	14:30	3,418.0	7.17	9.12	2.61	2.87	2.35	9.9
		Total or Average		**3,418.00**	7.67	9.77	2.79	2.69	2.23	9.9

NA, indicates Not Applicable for this test
Not Dosed, (ND) indicating the period of the test
Not Tested, (NT) indicating no value entered because there was no sample to test
Media contact time = Empty bed contact time

180 gpm each (North and South Wells, 65 psi
Used 42" AS-741 media
Sodium Hypochlorite titrated @ 7592.4
BW start of the test
Used Rochelle Salts
Switched to Nort Well @ 11:10
Backwashed end of test

Table 2
Summary of Pilot Test Results
Monterra Water Company, North and South Wells
August 10, 2021

	Source Water							Product Water								
Sample Number	**pH (Units)**	**Fe (mg/L)**	**Mn (mg/L)**	**H_2S (mg//L)**	**Ammonia (mg//L)**	**Silica (mg/L)**	**PSI**	**pH (Units)**	**Cl_2 (F) (mg/L)**	**Cl_2 (T) (mg/L)**	**Fe (mg/L)**	**Mn (mg/L)**	**H_2S (mg//L)**	**Ammonia (mg//L)**	**Silica (mg/L)**	**PSI**
Start	**NT**	0.04	0.122			4.00	35	**NT**	**1.27**	**1.38**	-	0.008			4.00	32
1	**NT**	0.03	0.125			2.10	39	**NT**	**1.08**	**1.55**	-	0.004			2.10	34
2	**NT**	-	0.120	0.010			39	**NT**	**1.13**	**1.50**	-	-	-			34
3	**NT**	0.04	0.128		0.040	16.00	39	**NT**	**1.17**	**1.56**	-	-		-	15.00	34
4	**NT**	0.03	0.127	-	0.080	16.00	39	**NT**	**1.23**	**1.64**	-	-	-	-	16.00	34
5	**NT**	0.01	0.122		0.040		36	**NT**	**1.18**	**1.49**	-	-		-		34
6	**NT**	0.03	0.125		0.010		36	**NT**	**1.09**	**1.37**	-	-		-		32
7	**NT**	0.01	0.124				36	**NT**	**1.12**	**1.34**	-	-				33
8	**NT**	0.03	0.127				36	**NT**	**1.19**	**1.42**	-	-				32
9	**NT**	-	0.117		0.020		38	**NT**	**1.25**	**1.51**	-	0.003		-		34
10	**NT**	0.02	0.117	-		6.00	37	**NT**	**1.25**	**1.42**	-	-	-		6.00	34
11	**NT**	-	0.112	-			38	**NT**	**1.18**	**1.49**	-	-	-			34
12	**NT**	0.02	0.108				38	**NT**	**1.26**	**1.49**	-	-				33
13	**NT**	0.02	0.107				38	**NT**	**1.29**	**1.48**	-	-				34
14	**NT**	-	0.102				37	**NT**	**1.21**	**1.42**	-	-				33
15	**NT**	-	0.129				37	**NT**	**1.33**	**1.40**	-	-				33
Total or Average	**NT**	**0.02**	**0.120**	**0.003**	**0.038**	**8.82**	**37**	**NT**	**1.20**	**1.47**	**-**	**0.001**	**-**	**-**	**8.62**	33
Average as Percent of MCL		***5.8%***	***239.0%***								***0.00%***	***1.88%***				
Average Removal Rate											***100.0%***	***99.22%***				

Non Detect, indicating the absence of a metal or chemical at or above the method detection limit is shown as "-" and calculated in the total or average as zero.

Figure 1
Pilot Test Results
Chlorine Dosage and Free Residual Concentrations
Monterra Water Company, North and South Wells
August 10, 2020

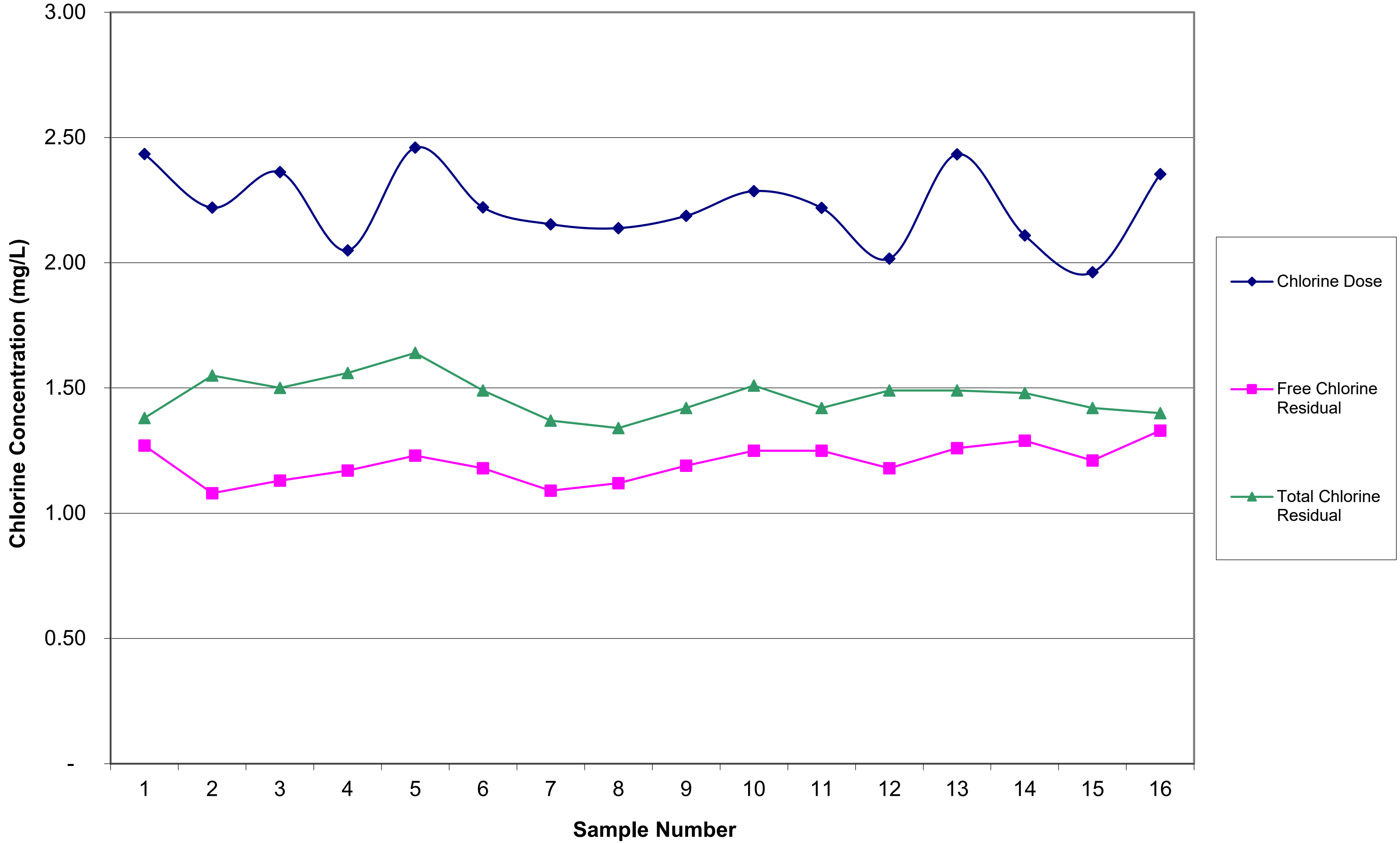


Figure 2
Pilot Test Results
Manganese Removal Using AS-741M Filter Media
Monterra Water Company, North and South Wells
August 10, 2020

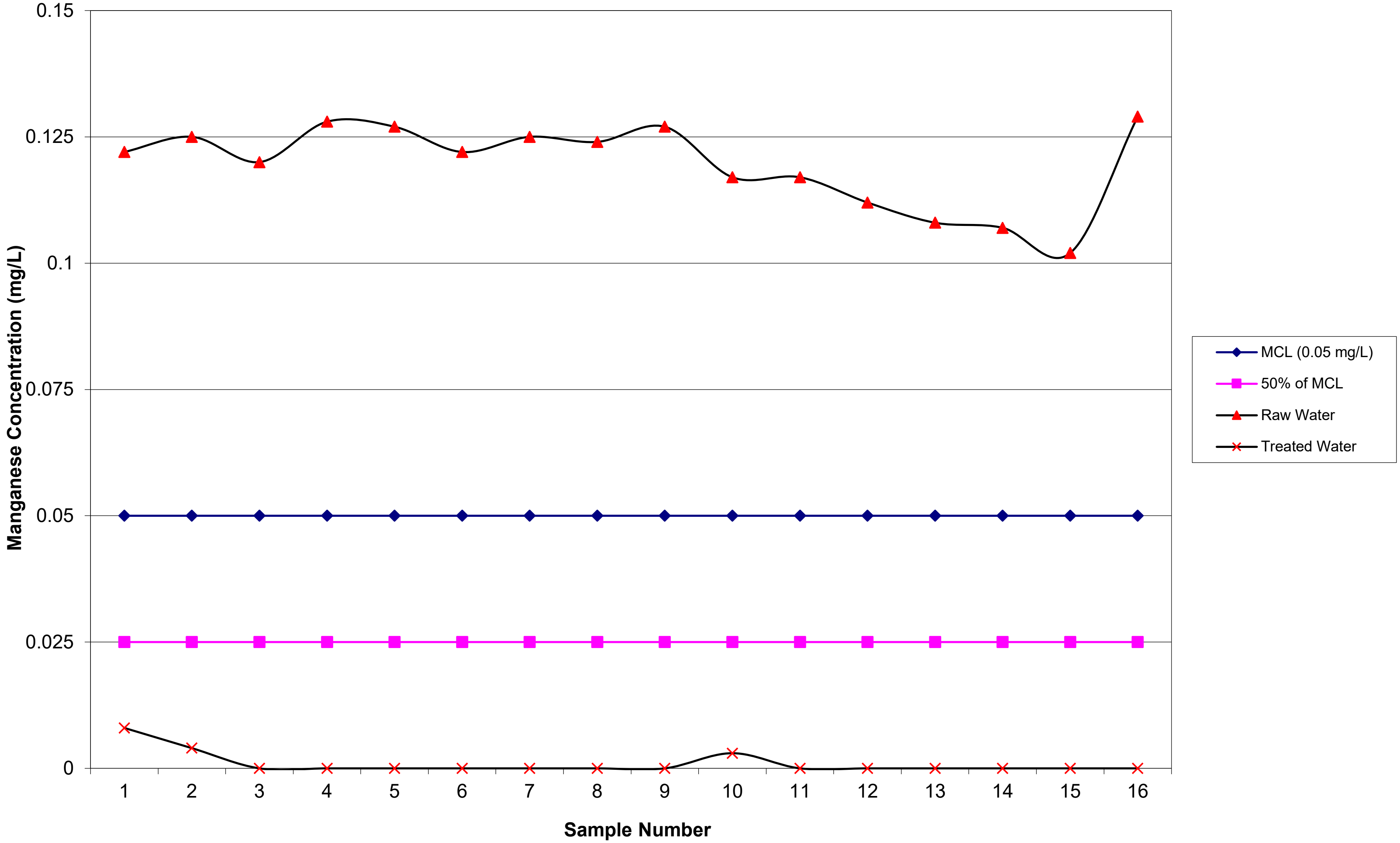
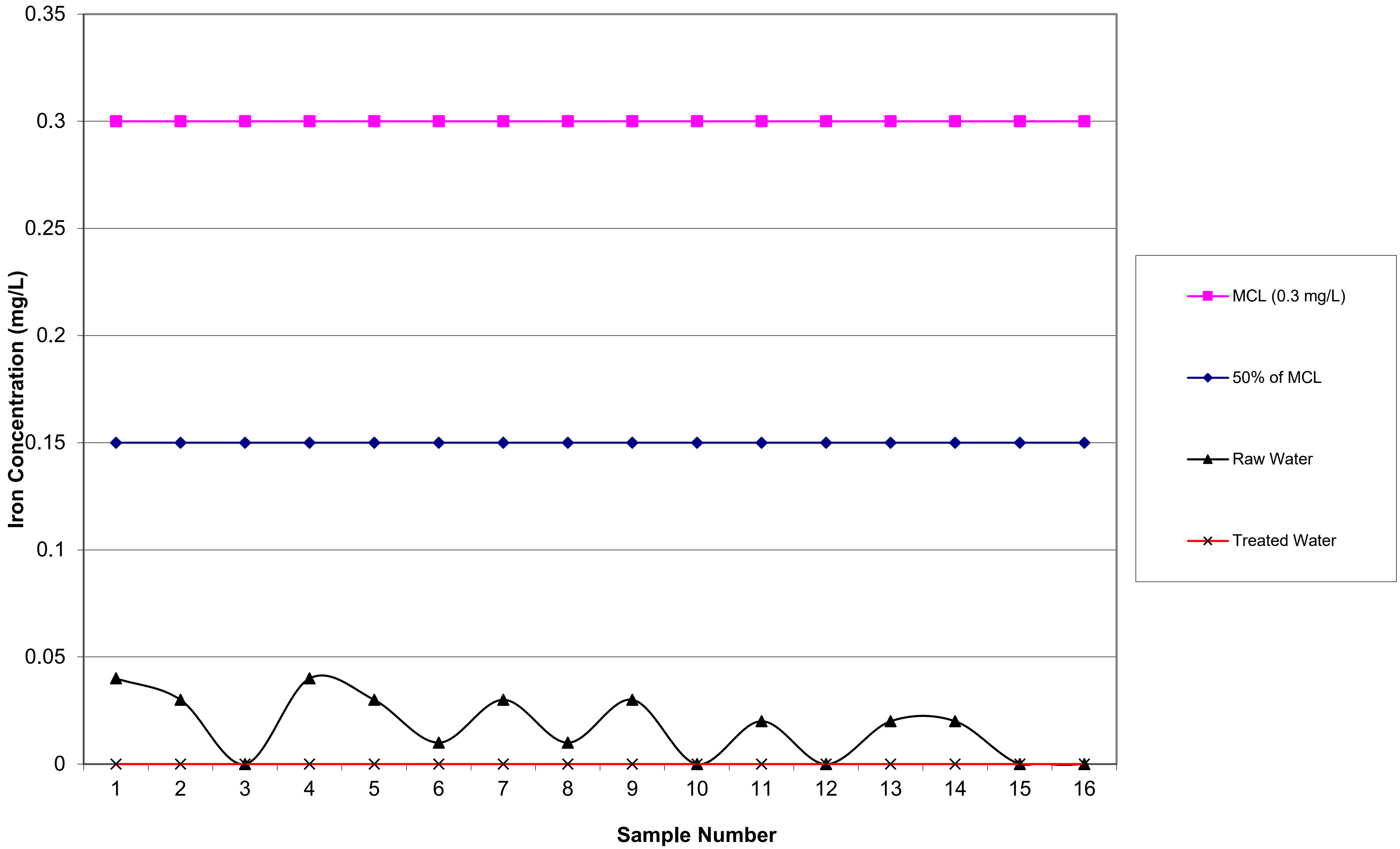
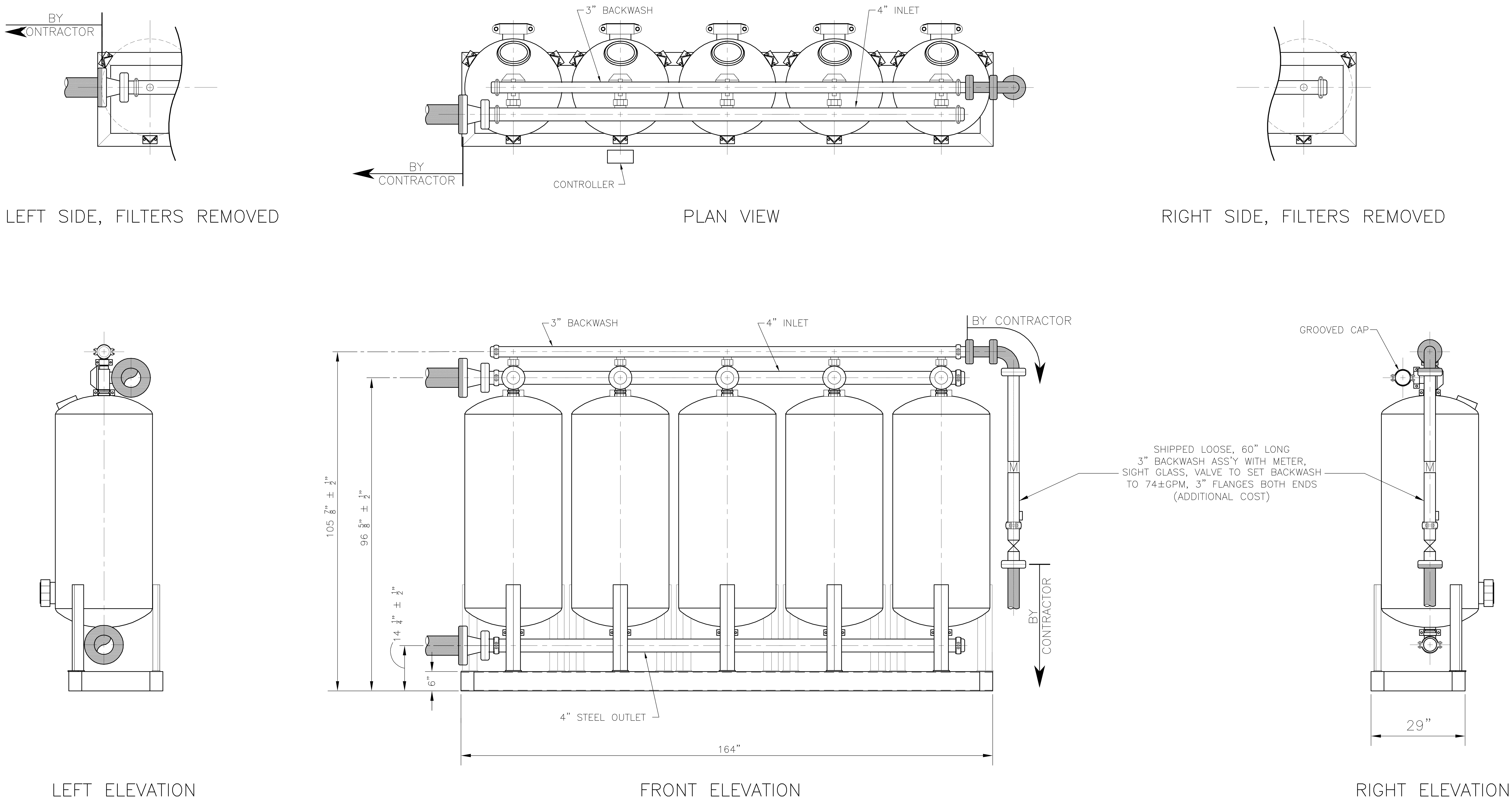


Figure 3
Pilot Test Results
Iron Removal Using ATEC AS-741M Filter Media
Monterra Water Company, North and South Wells
August 10, 2020





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).

ATEC SYSTEMS ASSOCIATES
P.O. BOX 10329
BAINBRIDGE ISLAND, WASHINGTON 98110-0329
PHONE: (360) 414-9223

DESIGN BY: .
DRAWN BY: .
CHECKED BY: .
APR'D BY: .

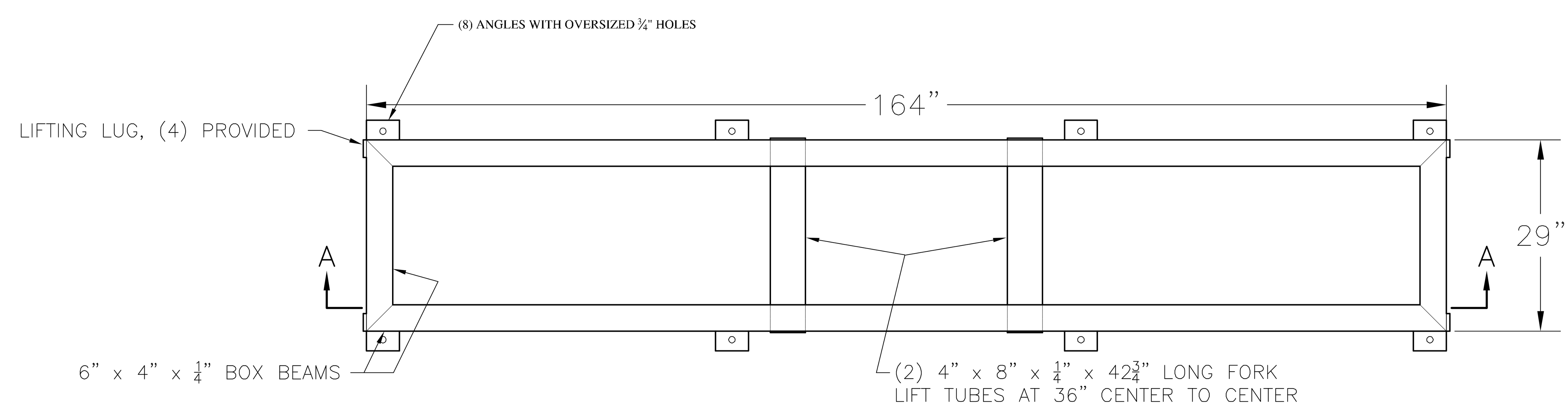
NO.	DATE		BY	APVD

SCALE IN FEET (0, 1', 2')
NOTE: CHECK SCALE
SCALEABLE IN 22x34 - 1" = 1'-0"
SCALEABLE IN 11x17 - 1/2" = 1'-0"

IRON AND MANGANESE TREATMENT
MONTERRA WATER SYSTEM
NORTH AND SOUTH WELLS

FILTER DETAILS

SHEET NO. 1 of 1
DWG. NO.
DATE: 8/20/2021
FILE: Monterra Water System N & S

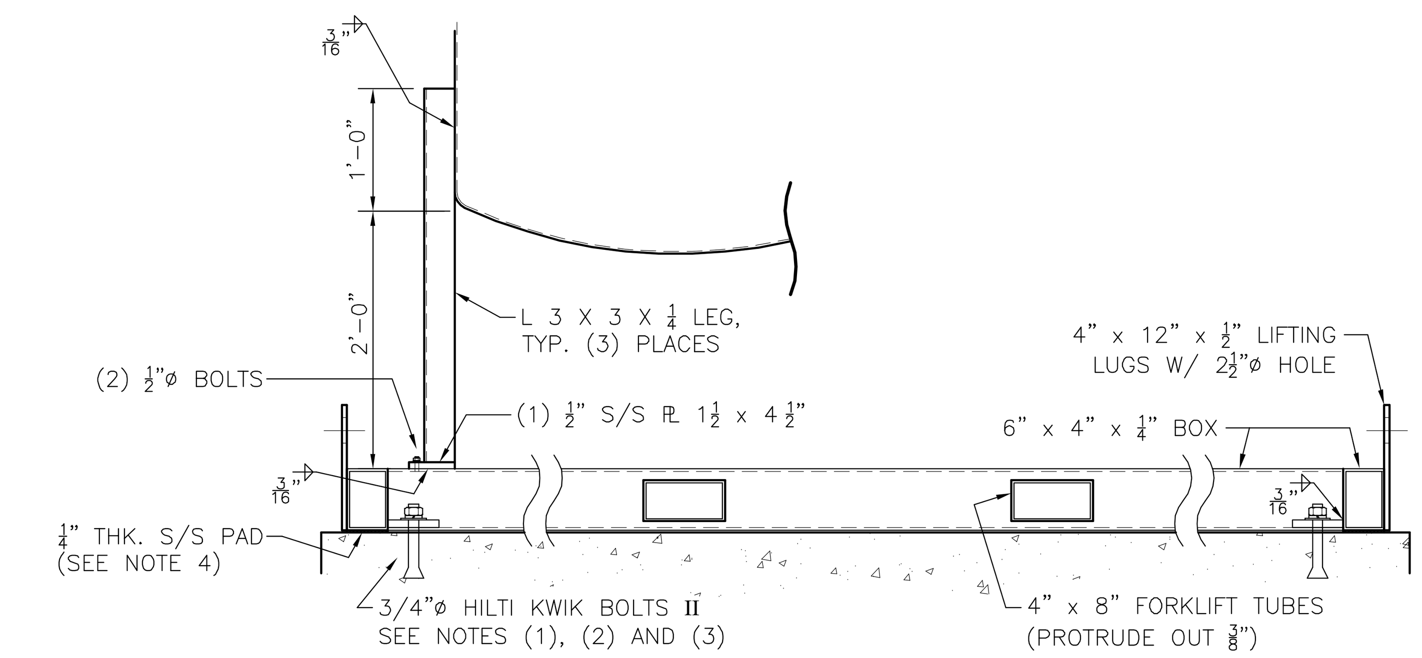


SKID PLAN
(5 FILTER)

SCALE IN FEET
NOTE: CHECK SCALE
SCALEABLE IN 22x34 – 1" = 1'-0"
SCALEABLE IN 11x17 – 1/2" = 1'-0"

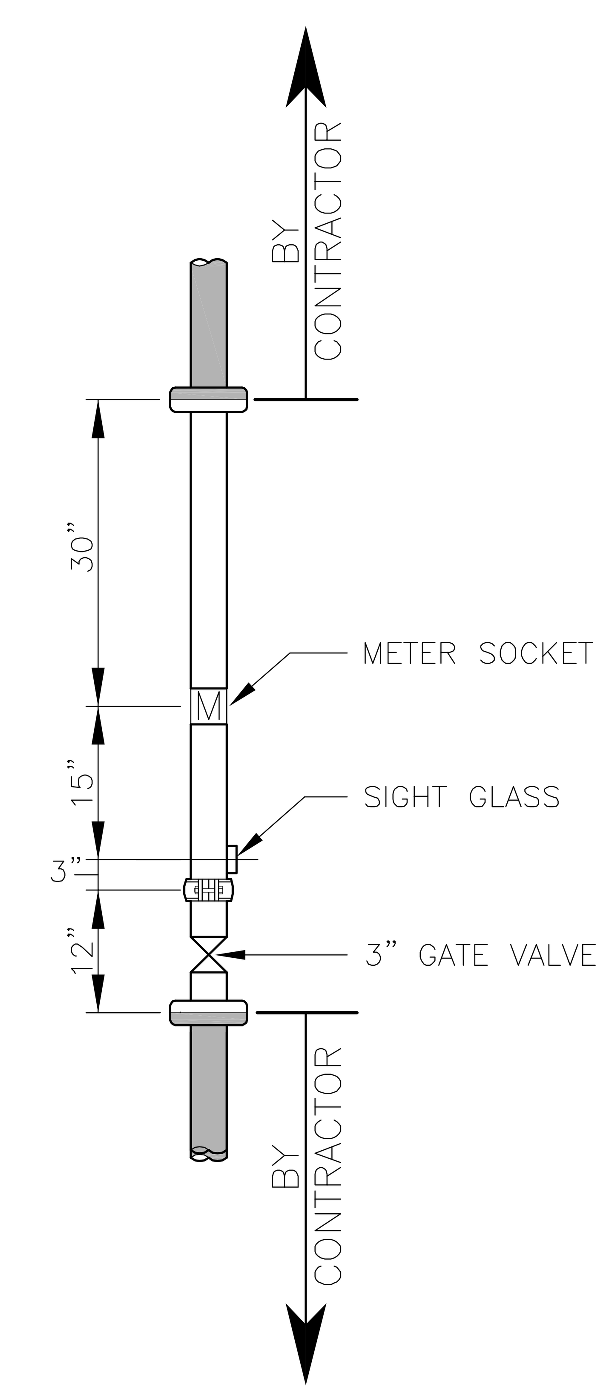
BILL OF MATERIAL			
ITEM	QTY	PART NO.	DESCRIPTION
1	1	PFS–CPL03	3" GROOVED COUPLING, CAST IRON W/ BOLTS & GASKET
2	3	PFS–CPL04	4" GROOVED COUPLING, CAST IRON W/ BOLTS & GASKET
3	1	PFS–CAP08	8" GROOVED END CAP
4	1	PFS–CPL08	8" GROOVED COUPLING, CAST IRON W/ BOLTS & NUTS
5	1	PFS=HHP11	11"x15" HAND HOLE 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

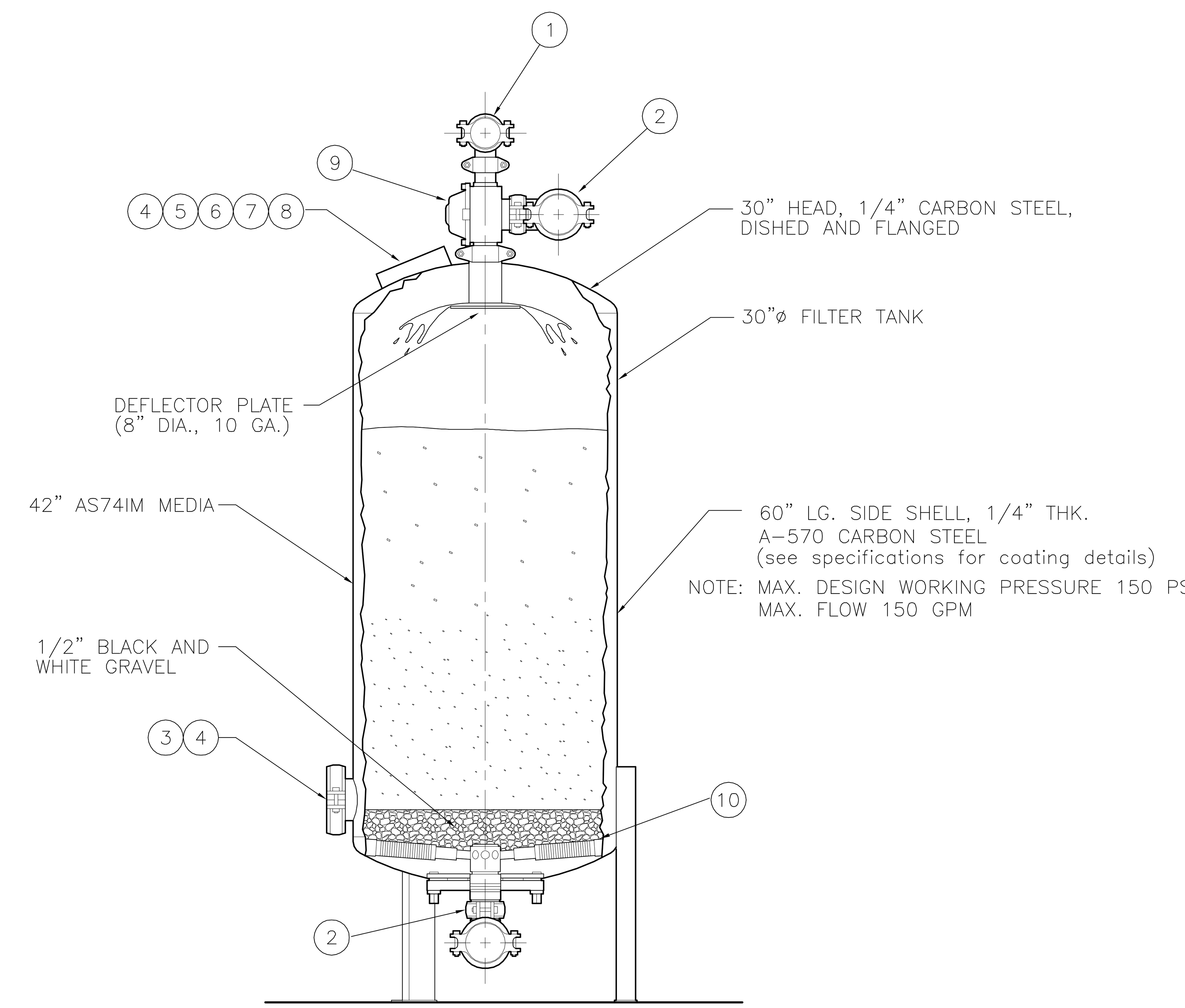


SECTION A–A
SCALE 1" = 1'-0"

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

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.

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).

ATEC
SYSTEMS ASSOCIATES
P.O. BOX 10329
BAINBRIDGE ISLAND, WASHINGTON 98110-0329
PHONE: (360) 414-9223

DESIGN BY: .
DRAWN BY: .
CHECKED BY: .
APR'D BY: .

NO. DATE BY APVD

SCALE IN FEET
NOTE: CHECK SCALE
SCALEABLE IN 22x34 – 1" = 1'-0"
SCALEABLE IN 11x17 – 1/2" = 1'-0"

IRON AND MANGANESE TREATMENT
MONTERRA WATER SYSTEM
NORTH AND SOUTH WELLS

FILTER DETAILS

SHEET NO. 2 of 1
DWG. NO.
DATE: 8/20/2021
FILE: Monterra Water System N & S

APPENDIX

Table 1

Physical Characteristics of Pilot Filter Set and Media
ATEC Iron and Manganese Removal System

Pilot Filters[1]	
Sidewall Height (inches)	48 to 60
Overall Height (inches)	62 to 74
Diameter (inches)	6
Filter Surface Area (each) (ft.^{2})	0.1964
Total Filter Surface Area (ft^2)	0.7854
Underdrain	Stainless Steel Wedgewire, 0.01" slots
Media Support	¾" minus crushed granite, 4"
Source Water Connections	¾" Standard Hose
Recommended Minimum/Maximum Working Pressure	20/90 psi
Filter Media[2]	
Depth in Filters (inches)	36 to 48
Volume in Filters (ft^3)	2.36 to 3.15
Approximate Weight in Filters (lbs.)	285
Weight (lbs./ft^3)	120.5
Physical Size (mm)	0.32 –to-0.85
Maximum Removal Capacity	
Iron Removal (mg/L)	10
Manganese Removal (mg/L)	10
Hydrogen Sulfide Removal (mg/L)	5
Non-Adsorptive Removal (microns)	>20

Chemical Dosing Equipment[3]

Stenner Peristaltic Solution Metering Pumps (up to 17.0 gpd @ 100 psi)
LMI Solution Metering Pumps (various capacities)

Other Equipment

Chlorine Analyzer, Hach CL 17 or ProMinent D2C
Flow Meters, Sea Metrics, Inc., FT-420
Data Logger, Endress + Hauser, Mini-Logger
Automatic Samplers, ISCO, Inc.

1/ The pilot filter plant consists of four, 6" filter columns connected by common manifolds for influent, effluent and backwash water. Each filter is controlled by a three-way ball valve. The system is set up to closely mimic a full-scale filter system in terms of media depth, application rates in terms of both area (gpm/ft^2 of filter area) and volume (gpm/ft^3 of media), and backwash characteristics to the extent possible. Source water is metered using a totalizing flow meter. Pressure is measured on the influent and effluent manifold to determine headloss. Chemical injection points are located as close to the filter as possible to simulate actual operation. In cases where extended contact time is desired before the source water enters the filters, a pipe section of pre-determined volume is placed between the chemical injection points and the filters to provide accurate contact time measurement. Sidewall height is variable to a maximum of 60" without modification, allowing a maximum media bed depth of 48".

2/ AS-721M and AS-741M Filter Media, 0.85 to 2.36mm and 0.42mm to 0.85mm, respectively, are both granular manganese dioxide media, derived from naturally occurring pyrolusite, and are certified to ANSI/NSF Standard 61.

3/ Solution metering pumps are available for the injection of up to three chemicals, if needed. Normally, the only chemical injected is chlorine. And in the case of arsenic, ferric chloride. There are, however, provisions for special circumstances, such as pH adjustment for corrosion control or the treatment of water at fish hatcheries that do not permit chlorine.

Table 2 Analytical Equipment

The following analytical equipment is normally carried on our pilot trailers.

Spectrophotometer, Model DR/2800, Hach Co., Loveland, CO
Digital Titrator, Hach Co., Loveland, CO
pH Meter, Model 266, Orion Co., Boston, MA
Stir Plate, Hach Co., Loveland, CO
0.45-Micron Filter, Nalgene

Glassware—beakers, flasks, columns, sample cells, 10 and 25 ml

Although not normally carried in each trailer, a turbidity meter is available.

Reagents for the following field tests:

Spectrophotometer

Free Chlorine, DPD, Method 8021 and 10059 (300 tests)
Total Chlorine, DPD, Method 8167 or 10060 (300 tests)

Iron, FerroZine Method, Method 8147 (500 tests)
Iron, Total, FerroVer Method, Method 8008 (300 tests)

Manganese, Low Range, PAN Method, Method 8149 (500 tests)

Nitrogen, Ammonia, Salicylate Method, Method 8155 (100 tests)

Sulfide, Methylene Blue Method, Method 8131 (100 tests)

Silica, Molybdate Method, Method 8282 (100 tests)

Digital Titrator

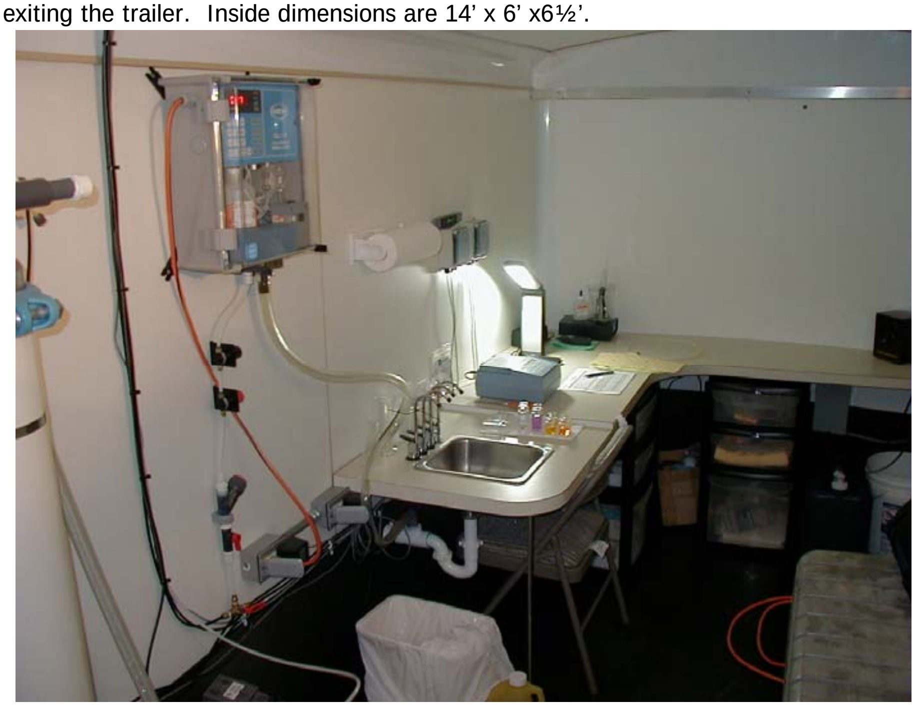
Alkalinity, Phenolphthalein and Total Method, Method 8203 (100 tests)
Hardness, Phenolphthalein and Total Method, Method 8203 (100 tests)
Total Chlorine, Iodometric Method, Method 8209 (100 tests)

Field tests not listed above may be available. Please note that we send all tests for arsenic and other contaminants that require digestion or distillation to a commercial laboratory.

Figure 1

ATEC Iron and Manganese Removal Pilot Plant

The exterior of ATEC Systems' pilot trailer is shown above. The source and product water connections are shown entering and exiting the trailer. Inside dimensions are 14' x 6' x6½'.



The front one-half of the trailer is shown above. The instrument foreground on the wall is an in-line chlorine analyzer. The smaller boxes on the wall above the light are electronic flow meters used to monitor cumulative as well as instantaneous flow for each treatment train in the pilot plant.

Picture above shows the interior of the pilot plant trailer from the rear. The sample outlets and the analytical equipment are on the desk in the front of the trailer.

The picture on the left shows one set of filters. Source water enters through the hose inlet in the wall, passes through a flow meter, past a chlorine injection point, through an in-line static mixer, into the inlet manifold, down through the filter media. Product water is discharged through the wall. The pail holding the sodium hypochlorite solution can be seen to the right of the filter vessels and the in-line chlorine analyzer is on the wall above the NaOCl container. The sample ports and analytical equipment is forward of the chlorine analyzer. A second container of Ferric Chloride solution and feed pump is provided for pilot testing for arsenic removal.

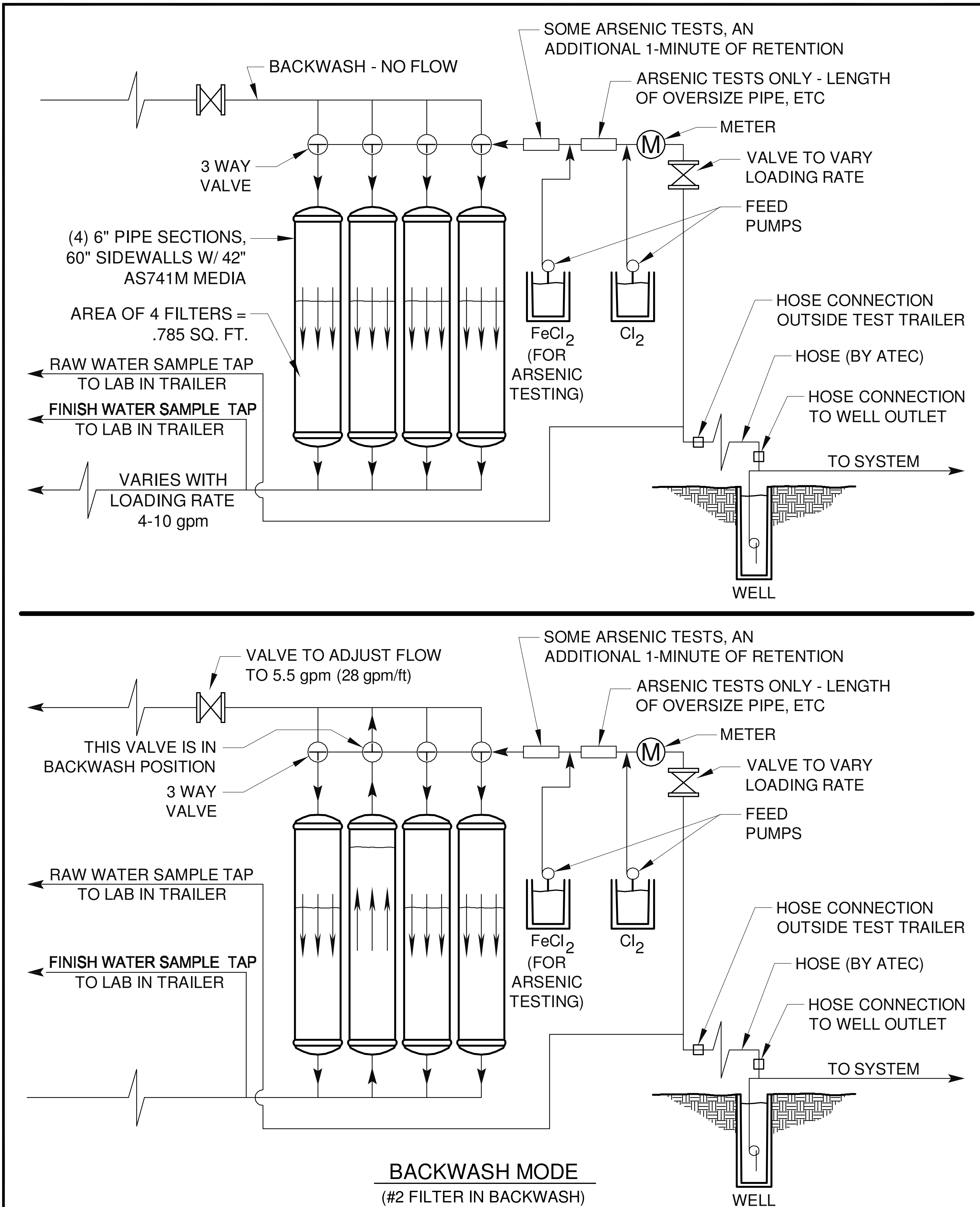
Table 3
SUMMARY OF SITE AND INITIAL DATA REQUIREMENTS

1. Power, 115 VAC for injection equipment and lighting
2. Source water, minimum 10 gpm @ 30 psig (ATEC will supply pump if necessary).
3. Disposal of water and backwash effluent[1]

Data Needed from Utility

1. Comprehensive Water System Plan (relevant sections)
2. Inorganic test results (most recent)

[1] Any necessary permits are the responsibility of the client

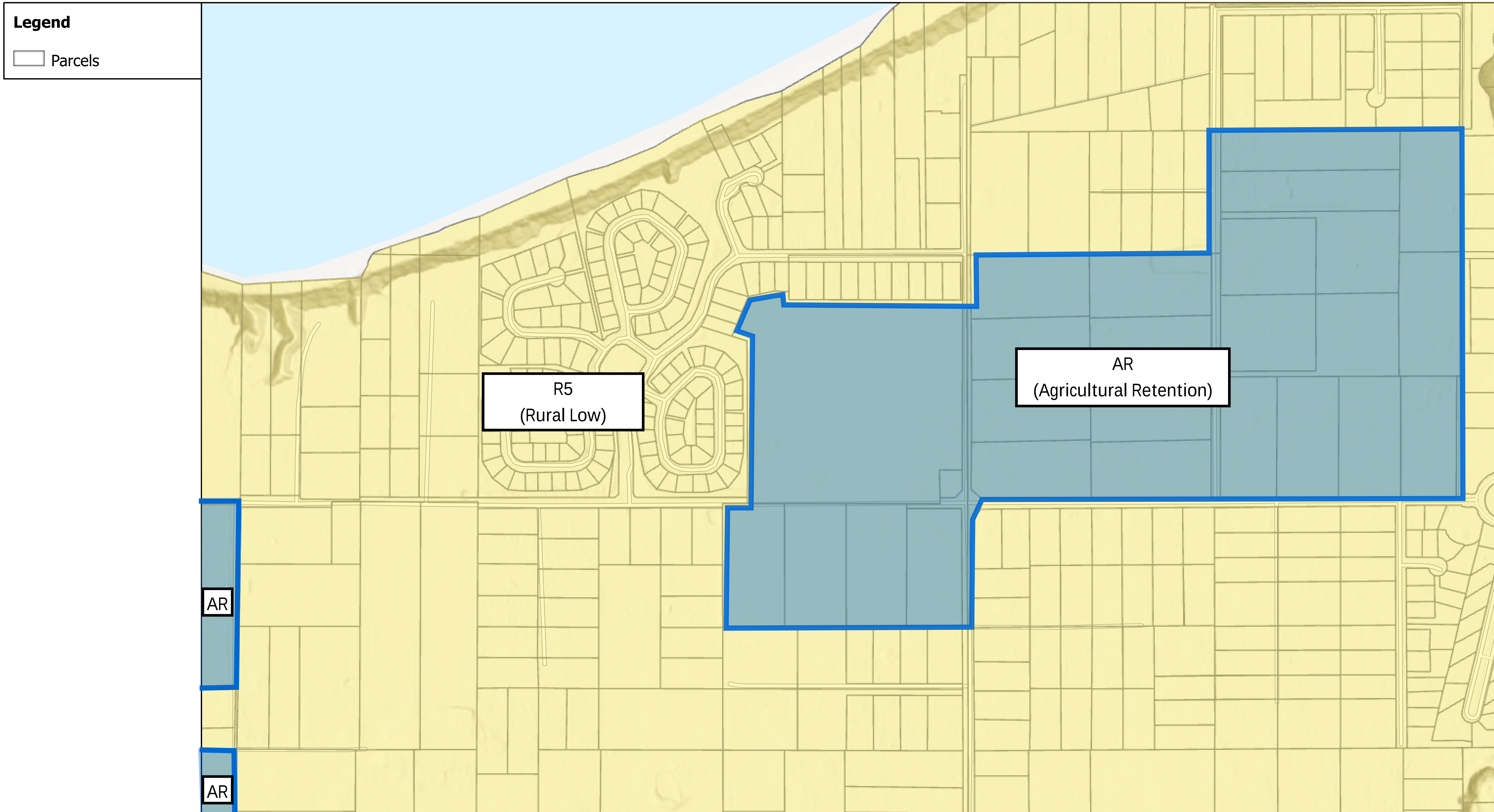


ATEC
SYSTEMS ASSOCIATES
P.O. BOX 10239
BAINBRIDGE ISLAND, WASHINGTON 98110-0329
PHONE: (360) 414-9223 FAX: (360) 397-0375

EXHIBIT 1 PILOT TESTING EQUIPMENT SCHEMATIC

SHEET NO. 1 of 1
DWG. NO.
DATE: 8-1-12
FILE: Pilot Test Equip Schematic

APPENDIX D
County Zoning and Land Use Maps



Monterra - Zoning Map

5/5/2024 11:21 AM

0 0.06 0.11 mi

1:9,028

N S E W

APPENDIX E
Water Right Certificates

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
SUPERCEDING
CERTIFICATE OF WATER RIGHT

☐ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

☒ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
March 3, 1971	11645	10415	G2-01131 C

NAME
Monterra Incorporated

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
Post Office Box 1120	Sequim	Washington	98382

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown, but is limited to an amount actually beneficially used.

PUBLIC WATERS 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
	370	75

QUANTITY, TYPE OF USE, PERIOD OF USE
75 acre-feet per year — Community domestic supply — Continuously

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION--WITHDRAWAL
#1: 620 feet south and 710 feet east of the north quarter corner of Section 7.
#2: 570 feet north and 720 feet east of the center of Section 7. Both being within.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
W½NE¼	7	30	4W	~~19~~ 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

The W½NE¼ plus the west 170 feet and the north 237 feet of the NE¼NE¼ of Section 7, T. 30 N., R. 4 W.W.M., Clallam County, Washington. Also Government Lots 3 and 4, Section 6, T. 30 N., R. 4 W.W.M., Clallam County, Washington, excepting therefrom the east 990 feet of said Government Lot 4 and less road.

PROVISIONS

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.020.

This certificate of water right is specifically subject to relinquishment for nonuse of water as provided in RCW 90.14.180.

Given under my hand and the seal of this office at Olympia, Washington,

this 4th *day of* November, *19* 91.

Christine O. Gregoire, Director

Department of Ecology

ENGINEERING DATA
OK GB

by Gale Blomstrom

FOR COUNTY USE ONLY

APPENDIX F
Water Right Self-Assessment

Water Right Self-Assessment Form for Monterra

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 G2-01132 C	Groundwater	370 gpm	---	75.0 ac-ft	---	370 gpm	0 gpm	54.8 ac-ft	20.2 ac-ft	370 gpm	0 gpm	60.5 ac-ft	0.0 ac-ft	370 gpm	0 gpm	66.8 ac-ft	8.2 ac-ft
2																	
3																	
4																	
5																	
6																	
	TOTALS =	370 gpm		75 ac-ft		370 gpm	0 gpm	54.8 ac-ft	20.2 ac-ft	370 gpm	0 gpm	60.5 ac-ft	14.5 ac-ft	370 gpm	0 gpm	66.8 ac-ft	8.2 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:

Monterra

APPENDIX G
Well Logs

Monterra - Well 1

GWA-11645
GWP-10415

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

WELL LOG

Record by: Driller

Source: Driller's Record

Location: State of WASHINGTON

County: Clallam

Area:

Map:

SW1/4 NE1/4 sec. 7 T. 30 N., R. 4 E.

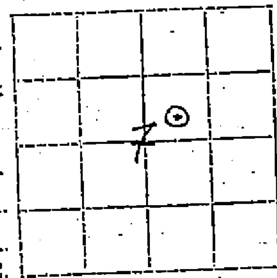


Diagram of Section

Drilling Co.: Van Ausdle Well Drilling Inc.

Address: Rt. #2 Box 1654, Port Angeles, WA

Method of Drilling: Cable Date: 5/26-6/23, 19 71

Owner: Monterra, Inc.

Address: Rt. 2 Box 11866, Port Angeles, WA

Land surface, datum ft. above / below

SWL: 103' Date: June, 19 71 Dims.: 8" X 221

CORRELATION	MATERIAL	From (feet)	To (feet)
	(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)		
	Clay, Brown	0	5
	Clay, Sandy	5	37
	Gravel, Hardpan, Brown	37	67
	Gravel, Brown, Water Bearing	67	73
	Sand, Brown	73	75
	Sand & Clay, Brown	75	77
	Clay, Brown	77	84
	Sand, Brown	84	108
	Clay, Brown	108	125
	Clay, Gray	125	138
	Clay, Streaks of Sand, Brown	138	147
	Clay, Sand & Gravel, Brown	147	158
	Clay & Gravel, Brown	158	160
	Clay, Gravel, Hardpan, Brown	160	162
	Continued		

Turn up

Sheet ..... of ..... sheets

WELL LOG.—Continued

No....../......-......

CORRELATION	MATERIAL	From (feet)	To (feet)
	Depth forward		
	Sand & Gravel, Brown	162	164
	Sand, Gravel, Water Bearing Brown	164	181
	Gravel, Water Bearing, Brown	181	188
	Sand, Coarse, Water Bearing, Brown	188	195
	Clay & Gravel, Water Bearing Brown	195	202
	Gravel, Sand, Coarse, Brown Water Bearing	202	209
	Gravel, Large & Sand, Coarse Brown, Water Bearing	209	221
	Casing: 8" from 0 to 109' 7" from 109' to 221'		
	Perforations: 1/2" X 2" from 109' to 221'		
Pump Test	Well Test: 250 gpm, 70' DD, 24 Hr.		

S. F. No. 7449—OS—12-65.

Monterra - Well 2

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WELL NO 2

WATER WELL REPORT
STATE OF WASHINGTON

Application No. 11645
Permit No. 10415

(1) OWNER: Name Montera Rt 6 Address Box 190 Sequim Wash

(2) LOCATION OF WELL: County Clallam — W ½ NE ¼ Sec. 7 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 8" inches.
Drilled 220 ft. Depth of completed well 221 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8" Diam. from 0 ft. to 221 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐
Type of perforator used Millys Type Knife
SIZE of perforations 3/8 in. by 2½ in.
100 perforations from 89 ft. to 215 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? 20 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
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level APROX 150 ft.
Static level 131 ft. below top of well Date 8/30/76
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.
" 104	" 41'10"	" 6 Hr	"
" 105	" 49'9	5 Hr 45 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
237	169	250	163	615	137
240	167	315	156	9/2/76	
245	165	330	151	830 AM	131

Date of test 8/31 & 9/1/76
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
Brown Sandy Clay	0	8
Brown Sandy Loam Soile	8	20
Brown Sandy Clay	20	30
Brown Sand	30	37
Brown Cemented Gravel	37	83
Brown to Gray Sandy Clay	83	92
Brown Muddy Sand	92	109
Brown Clay	109	110
Blue Clay	110	117
Brown Clay	117	123
Gray to Brown Clay	123	130
Blue Gravely Clay	130	134
Brown Muddy Gravel	134	148
Brown Gravely Clay	148	173
Brown Gravel B/B	173	176
Gray Gravely Clay	176	180
Brown Water Bear Sand and Gravel	180	189
Brown Tight Gravel Water Bear	189	197
Brown Cemented Gravel	197	200
" Water Bear Sand and Gravel Loose	200	220
Brown Clay	220	221
	Continued	

RECEIVED
SEP 8 1976
DEPARTMENT OF ECOLOGY
SOUTHWEST REGIONAL OFFICE

Work started 7/21, 1976. Completed 9/1, 1976.

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] Valier Stoican (President) 0473
Joe G Pike
(Well Driller)

License No. 0391 Date 9/3, 1976

Harld Miller 0343

(USE ADDITIONAL SHEETS IF NECESSARY) Carl D. Rushton - 0427

ECY 050-1-20

PUMPING LOG No. I

Montorra Rt.6 Box 190 Se[illegible]a, Wn. 98382 — Job No. ....

Date [illegible]/31/76 — Page No. I

Well No. 2 — Contract No. ....

Static Water Level 131

By STOICAN DRILLING COMPANY
P.O. Box 161, Sequim, Wash. - Phone 683-5580
Rt 3, Box 175, Port Orchord, Wash. - Phone TR6-2057

NORTHERLY WELL — Application 11645 — Static Water Level [illegible]

DATE ~~Well No. 2~~ — Permit No 10415 — SOUTHERLY WELL ~~Well No. I~~

Time	G.P.M.	Pumping Level	DRAWDOWN	Water Temp.	G.P.M. Pump R.P.M.	Drawdown Remarks	Remarks
[illegible] AM	104			49			
[illegible] "	"		18'	"	204	16'10"	Water Level
[illegible] "	"		23'	"		22'5"	in Well
[illegible] "	"		25'			23'9"	No. 132
[illegible] "	"		27'6"			25'10"	
[illegible] "	"		29'			27'5"	
10:15 "	"		30'4"			28'6"	
[illegible] "	"		32'			29'9"	
[illegible] "	"		33'			30'7"	
11:00 "	"		33'6"			31'8"	
11:[illegible] "	"		34'6"			32'6"	
11:[illegible] "	"		35'			33'	
11:45 AM	104		35'4"			33'4"	
12:00 Midnight	"		35'7"			33'7"	
12:[illegible] AM	"		36'		204	33'10"	
[illegible] "	"		36'4"			34'1"	
[illegible] "	"		36'6"			34'6"	
1:00 "	"		37'			34'10"	2/1/7[illegible]
[illegible] "	"		37'2"			35'3"	
[illegible] "	"		37'6"			35'6"	
[illegible] "	"		39'			36'6"	
[illegible] "	"		39'6"			37'	Pump Stop
[illegible] "	"		40'			37'	2 Min.
[illegible] "	"		40'4"			37'6"	
[illegible] "	"		40'8"			38'2"	
[illegible] AM	"		41'4"			38'2"	
[illegible] "	"		41'6"			38'4"	
[illegible] "	"		41'8"			38'5"	
[illegible] "	"		41'10"			38'8"	
7:00 AM	"		41'10"			38'8"	
[illegible] "	"		41'10"			38'8"	
[illegible] "	"		41'10"			38'8"	
[illegible] "	"		41'10"			38'8"	
[illegible] "	104		41'10"		204	38'8"	
[illegible] AM Up Pump Higher Rate					210		ALL No. [illegible]
[illegible] AM	145		47'4"	49	210	40'8"	Pump and [illegible]
[illegible] "	"		48'			41'4"	210
[illegible] "	"		49'6"			41'10"	
[illegible] "	"		49'8"			42'4"	
[illegible] "	"		49'9"			42'6"	
[illegible] "	"		49'9"			42'7"	
[illegible] Noon	"		49'9"			42'7"	
[illegible] "	"		49'9"			42'7"	
1:00 PM	"		49'9"			42'7"	
[illegible] "	"		49'9"	49		42'7"	
[illegible] "	145		49'9"			42'7"	
[illegible] PM	145		49'9"	49	210	42'7"	
[illegible]	Stopped Pumps and took Recovery Data						Well No. [illegible]

Continued -- Next page

Job No.......

Date 9/1/76 For Monterra Rt. 6 Box 190 Sequim, Wn. 98382

By **STOICAN DRILLING COMPANY**

Contract No.......

Static Water Level 131 ft.

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

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

Page No. 2

Static Water Level 131

DATE Well No. 2 Well No. 1

TIME	G.P.M.	Pumping Level	DRAWDOWN	Water Temp.	Pump R.P.M.	Remarks	
	Stopped Pumps and took Recovery Data						
WELL No. 2						WELL NO. 1	
2:37 p.m.	-------------	169'			2:43 p.m.	---------	161'3"
2:40 p.m.	-------------	167'			2:50 p.m.	---------	153'
2:45 p.m.	-------------	165'			3:00 p.m.	---------	153'
2:50 p.m.	-------------	163'6"			3:15 p.m.	---------	152'
3:15 p.m.	-------------	156'			3:30 p.m.	---------	150'
3:30 p.m.	-------------	151'6"			6:15 p.m.	---------	133'
[illegible]:15 p.m.	-------------	137'			8:35 p.m.	---------	131'6"
[illegible]:30 a.m.	9/2/76	131					

The above statements are true and correct to the best of my knowledge.

Signed: Valier Stoican
Valier Stoican, President
Lic. No. 0473

Stoican Drilling Co. Inc.
P.O. Box 161
Sequim, Washington 98382

APPENDIX H
Well Site Approval

Mail to:
LTE-S

CL- 23832 10

626311

DECLARATION OF RESTRICTIONS
REGARDING WATER EASEMENT

This declaration is made this 6th day of December 1989 by Declarents DONALD F. MUNGER AND BETTY J. MUNGER, Trustees under Trust dated June 7, 1989, who are the owners of that certain parcel of Real Property described in exhibit A hereto.

WHEREAS, Pursuant to that certain survey recorded on the 31st day of March 1978, recorded in volume 3 page 46, records of Clallam County, Washington there exist across the Northeast corner of the property described in exhibit A hereto an easement for waterline and a community well, and

WHEREAS, the subject community Well services the property described in exhibit A hereto as well as those other properties described in exhibit B hereto, and

WHEREAS, It is the desire of declarent to make these restrictions in order to protect the utility and well rights created by the easement described above and preclude activities which would interfere with, or diminish water quality associated with the use of those well rights.;

DECLARENTS THEREFORE DECLARE THE FOLLOWING RESTRICTIONS with respect to those portions of the Property described in Exhibit A which are the subject of the above described Water and utility easement:

1. That no sheep, cattle, horses or other domestic farm animal shall be grazed or kept on said portions of the property.

2. That no manure, insecticides, fertilizers, noxious chemicals or similar industrial or agricultural products shall be stored or used on said portions of the property.

3. That no petrochemical or similar products shall be sprayed on said portions of the property for soil or dust abatement.

4. That no Septic system, associated drainfield, or other human sanitation facility may infringe on or be contained on said area of the property.

5. That no other activity shall be carried out on said portions of the property which poses an unreasonable risk of well contamination or contamination of the aquifer.

6. That no activity shall be carried out on said portions of the property which violates any State, Local or Federal statute, ordinance or regulation, intended to environmentally protect water quality or the underlying aquifer.

This Declaration shall be perpetual and shall run with the property described in exhibit A. It is intended that this declaration shall benefit those parcels which are described in Exhibit B hereto.

Notwithstanding the above, it is not the intention of this Declaration that Declarents shall become Insurers or Guarantors of any level of water quality, or undertake the duties and responsibilities of a public or private water utility. Declarents assume no liability for damages to persons or property resulting from defects in water quality.

DATED this 6TH day of DECEMBER, 1989. x Donald F. Munger
DONALD F. MUNGER

x Betty J. Munger
BETTY J. MUNGER

State of ~~Washington~~ California)
County of ~~Clallam~~ San Diego)

On this day personally appeared before me:

DONALD F. MUNGER

to me ~~known~~ proven to be the individual described in and who executed the within and foregoing instrument, and acknowledged that he (she) signed the same as his (her) free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN under my hand and official seal this 6th day of December, 1989

OFFICIAL SEAL
AUDREY C. BAUMAN
NOTARY PUBLIC - CALIFORNIA
PRINCIPAL OFFICE IN
SAN DIEGO COUNTY
My Commission Exp September 18 1990

Audrey C Bauman
Notary Public in and for the State of ~~Washington~~ California
Residing at SAN DIEGO.

State of ~~Washington~~ California)
County of ~~Clallam~~ San Diego)

On this day personally appeared before me:

BETTY J. MUNGER

VOL 863 PAGE 236

to me ~~known~~ proven to be the individual described in and who executed the within and foregoing instrument, and acknowledged that he (she) signed the same as his (her) free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN under my hand and official seal this 6th day of December, 1984

Notary Public in and for the State of ~~Washington~~ California
Residing at San Diego.

OFFICIAL SEAL
AUDREY C. BAUMAN
NOTARY PUBLIC CALIFORNIA
PRINCIPAL OFFICE IN
SAN DIEGO COUNTY
My Commission Exp. September 18, 1992

EXHIBIT "A"

Lot 1 of Munger Short Plat recorded on January 10, 1979, in Volume 6 of Short Plats, page 38, under Auditor's File No. 491208, being a portion of the Southwest quarter of the Northeast quarter of Section 7, Township 30 North, Range 4 West, W.M., Clallam County, Washington.

23830 10

Land Title Company

89 DEC 18 PM 3 11

863 239

EXHIBIT "B"

Our No.: CL-23830

Parcel 17 of Survey recorded in Volume 3 of Surveys, page 46.

Lots 1, 2, 3 and 4 of Weller Short Plat recorded in Volume 15 of Short Plats, page 17.

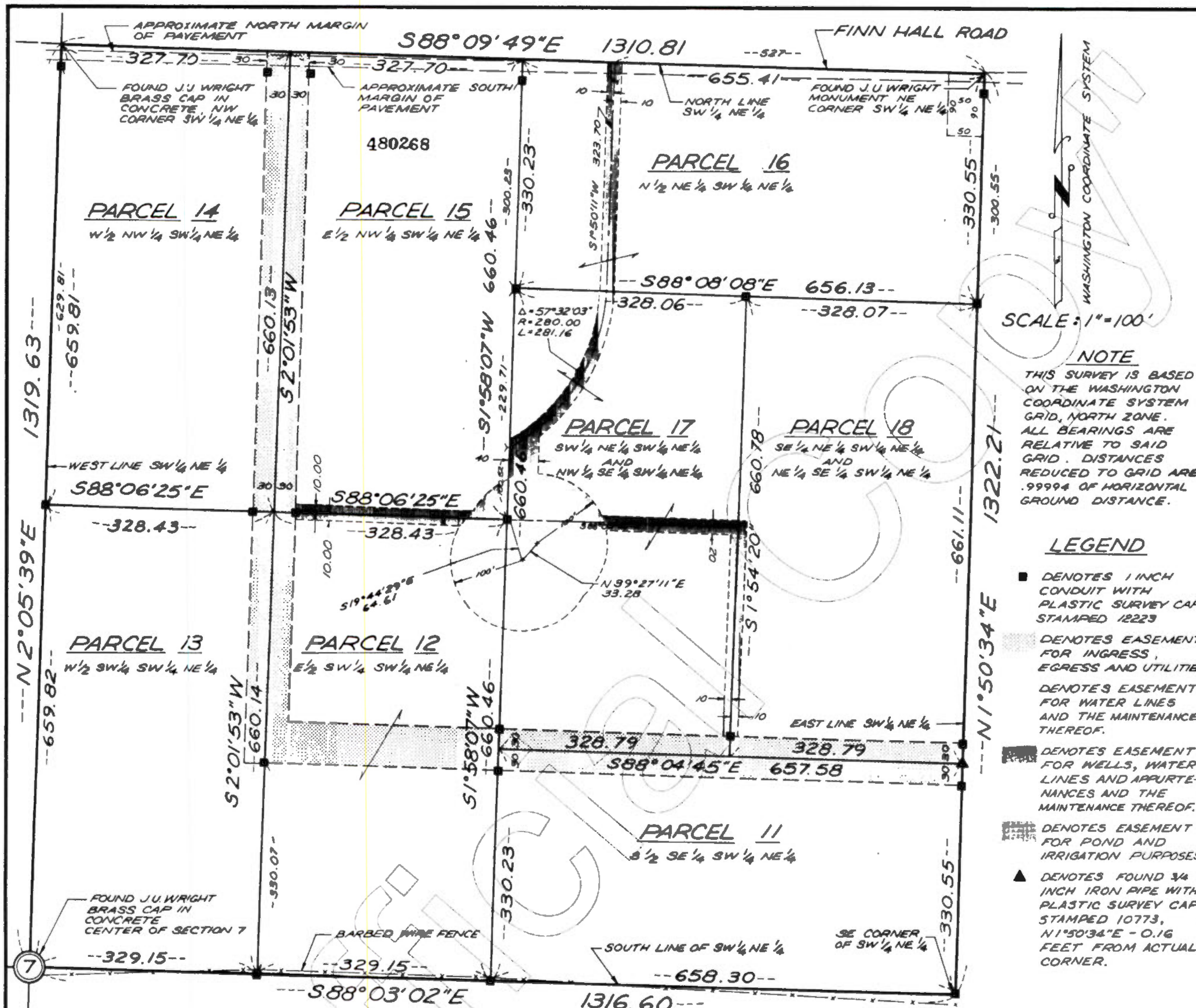
Monterra Divisions 1, 2, 3, 4 and 5, as recorded in the following Volumes and pages of Plats, respectively:

Volume 7, Page 12; Volume 9, Page 60; Volume 10, Page 39; Volume 10, Page 61 and Volume 10, Page 83.

626311

4

BRUNING 40-5253 35206



SURVEY OF THE SOUTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 7, TOWNSHIP 30 NORTH, RANGE 4 WEST, W.M., CLALLAM COUNTY, WASHINGTON.

FOR: MONTERRA INC.

DATE: MARCH 30, 1978

SURVEYOR'S CERTIFICATE

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE SURVEY RECORDING ACT AT THE REQUEST OF MONTERRA INC.

DATE: MARCH 28, 1978

Kenneth A Clark
KENNETH A. CLARK
LICENSE NUMBER 12223

RECORDING CERTIFICATE

FILED FOR RECORD AT THE REQUEST OF Clark & Assoc THIS 31 DAY OF March 1978 A.D. AT 40 MINUTES PAST 3 O'CLOCK P. M. AND RECORDED IN VOLUME 3 OF SURVEYS, PAGE 46 RECORDS OF CLALLAM COUNTY, WASHINGTON.

DEPUTY COUNTY AUDITOR

PLAT CHECK
FINAL CHECK

CLARK & ASSOCIATES
Land Surveyors • Engineers • Planners
404 SOUTH LINCOLN STREET • PORT ANGELES, WASHINGTON 98362
PHONE: 452-9242

VOLUME 3 PAGE 46

WATER SUPPLY EASEMENT

The Grantors, Kenneth L. Peterson and Virginia Peterson, his wife, in consideration of acceptance and approval of the plat Monterra One, in which Grantors have an ownership interest, hereby grant to future residents and owners of lots in Monterra One and future division of Monterra, the [illegible] place, locate, construct, reconstruct, operate, repair, maintain, replace, and keep free from obstructions and pollution hazards, water supply facilities upon and under the below described land for the purpose of supplying domestic water to residents in said Monterra One and any future plats of land in the W½ NE¼ Section 7, T 30 N, R 4 W, W.M. Such facilities include, but are not limited to, pipe-lines, wells, pumps, and housings therefore, including such facilities that have been or shall be installed by the grantors or by the owners and developers of Monterra.

The land to which said right shall apply is that part of SW¼ NE¼ Section 7, T 30 N, R 4 W, W.M., Clallam County, Washington, described as follows:

> Beginning at the point on the north line of said SW¼ NE¼ that is N 88°09'49" W 507 feet from the northeast corner thereof; thence S 1°50'11" W 323.70 feet; thence on a 300-foot-radius curve to the right through an angle of 51°09'49", a length of 267.89 feet; thence S 37° E 225 feet; thence S 53° W 200 feet; thence N 37° W 265 feet; thence N 53° W 200 feet; thence on a 260-foot-radius curve to the left through an angle of 51°09'49", a length of 232.17 feet; thence N 1°50'11" E 323.70 feet to the north line of SW¼ NE¼; thence S 88°09'49" E 40 feet to the point of beginning.

The rights granted hereunder may be exercised whenever reasonably necessary to insure an adequate supply of domestic water to the above stated plat or plats. Whenever an approved plat shall be recorded that includes part or all of the land of this easement, all rights under this easement with respect to such platted land shall automatically terminate. Also all rights hereunder shall terminate IF the principal source of water for the above-stated residents ceases to be from the above described land, the right to use this land merely for an auxilliary or emergency supply of water not being granted hereby.

Dated ____________________ 1971

Kenneth L. Peterson
Kenneth L. Peterson

Virginia Peterson
Virginia Peterson

STATE OF WASHINGTON)
) ss
COUNTY OF CLALLAM)

This is to certify that on this ____ day of ____________, before me, the undersigned, a Notary Public, personally appeared Kenneth L. Peterson and Virginia Peterson, his wife, to me known

2017-1348245
Page 1 of 2 Warranty Deed
Olympic Peninsula Title Company
Clallam County Washington 04/14/2017 11:57:57 AM

When recorded return to:

Victor Kruger
9385 Black Hills Way
San Diego, CA 92129

NO 111106
CLALLAM COUNTY 7214.00
TRANSACTION EXCISE TAX

DATE PAID APR 14 2017

AMOUNT $405,000.00

COUNTY TREASURER

BY Teresa Marchi, Dep.

STATUTORY WARRANTY DEED

Escrow No.: 4747
Title Order No.: 109456-SH

THE GRANTOR(S)

Lonnie D. Jacobson and Roberta J. Jacobson, Trustees of the Jacobson Family Trust

for and in consideration of Ten dollars and other good and valuable consideration in hand paid, conveys, and warrants to

Victor Kruger, ~~a married man as his separate estate~~ and Jeri Ginsburg, husband and wife

the following described real estate, situated in the County of Clallam, State of Washington:

The Southwest Quarter of the Northeast Quarter of the Southwest Quarter of the Northeast Quarter and the Northwest Quarter of the Southeast Quarter of the Southwest Quarter of the Northeast Quarter of Section 7, Township 30 North, Range 4 West, W.M., the same also being Parcel 17 as delineated on Survey recorded on March 31, 1978, in Volume 3 of Surveys, page 46, under Auditor's File No. 480268, records of Clallam County, Washington

Subject to: Future assessments and/or charges imposed by Monterra Water Association
Covenants, conditions, restrictions, reservations, easements, or other servitudes, disclosed by Monterra, Inc. Survey recorded under Auditor's File No. 480268
Easement recorded under Auditor's File Nos. 525971
Reservations contained in document recorded under Auditor's File No. 257102
Covenants, conditions, and restrictions imposed by document recorded under Auditor's File No. 480609
Declaration of Restrictions regarding water easement recorded under Auditor's File No. 626311
Agreements and the terms and conditions thereof recorded under Auditor's File Nos. 525971, 525973, and 1997 1001518

Tax Parcel Number(s): 043007 130000 / PID 35030

Dated: 4-13-17

Jacobson Family Trust

Lonnie D. Jacobson

Lonnie D. Jacobson, Trustee

Roberta J. Jacobson

Roberta J. Jacobson, Trustee

STATUTORY WARRANTY DEED
(Continued)

STATE OF WASHINGTON)
)ss
COUNTY OF CLALLAM)

I certify that I know or have satisfactory evidence that Lonnie D. Jacobson and Roberta J. Jacobson are the persons who appeared before me, and said persons acknowledged that they signed this instrument and on oath stated that they are authorized to execute the instrument and acknowledged it as the Trustees of the Jacobson Family Trust to be the free and voluntary act of such party for the uses and purposes mentioned in this instrument

Dated: 4/13/17

Danielle N

Notary in and for the state of Washington
Residing at Pt Angeles
My appointment expires: 11/15/20

DANIELLE N MINGORI
Notary Public
State of Washington
My Commission Expires
November 15, 2020

APPENDIX I
Well Head Protect Plan

1. OVERVIEW

The Monterra water system (system) is located in Port Angeles, Washington within Clallam County on Sections 5,6,7, and 8 of Township 30 North, Range 4 West, WM. The most commonly available water resource within the area is groundwater. The system is served by two (2) existing groundwater wells, Well #1 and Well #2. Neither well has an assigned Department of Ecology (DOE) Well Tag Number and are listed on the Water Facilities Inventory (WFI) as "WELL #1/#2 NO TAG WW (MONTERRA)". Both wells are within the water system service area boundary, situated on Clallam County parcel 043007-130000. The well information is summarized in Table 1.

Table 1 – Well Information

Monterra	Well 1	Well 2
Source Type	Well (Non GWI)	Well (Non GWI)
DOE Tag	N/A	N/A
Source Location	Sec 7 T30N R04W	Sec 7 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	1971	1976
Capacity (gpm)	210	145
Casing Size	8" 0' to 109' 7" 109' to 221'	8"
Ground Elev. (ft)	150	150
Bottom Well Depth (bgs, ft)	221	221
Static Water Depth (ft)	103	131
Top of Perforations (ft)	109	89
Bottom of Perforations (ft)	221	215
Drawdown (ft)	70	49.75

1.1 Well Information

Monterra originated in 1971, when the first well (Well #1) was drilled with a ground elevation of 150 feet (NAVD88), to a total depth of 221 feet with an 8-inch/7-inch casing. Currently, Well #1 has a production rate of 210 gpm. Well #1's 8 inch casing extends from the land surface to 109 feet below ground surface, continuing with the 7 inch well casing from 109 feet to 221 below ground surface with perforations sized ½" by 2". There are no well screens installed in Well #1. The only pump test information available is from the original well log in 1971 which was performed at 250 gpm with 70 feet of drawdown. A copy of the well log is provided in Appendix A. Well #1 is equipped with a 30-HP Berkeley submersible pump model 6S2AL-10. The specification and operation curve for this pump are provided in Appendix A.

Well #2 was drilled in 1976 and put online in approximately 1980 to serve as a supplemental primary source. Well #2 has a ground elevation of 150 feet (NAVD88), drilled to a total depth of 221 feet with an 8-inch casing. Currently, Well #2 has a production rate of 145 gpm. The Well #2 casing extends from 18" above the land surface to 221' below ground surface with perforations sized 3/8" by 2-1/2" from depths 89 to 215 feet below ground surface. There are no well screens installed in Well #2. A pump test was performed at the time of construction in 1976 at 145 gpm with approx. 50 feet of drawdown. A copy of this well log can also be found in Appendix A. Well #2 is equipped with a 20-HP Berkeley submersible pump model 6S2AL-7.5. The specification and operation curve for this pump are provided in Appendix A.

The wells alternate in operation and are triggered by the float switches in the storage reservoir. Both wells pump into the distribution system piping which is hydraulically connected to the storage reservoir. See Figure 1 for the location of the wells and reservoir within the service area.

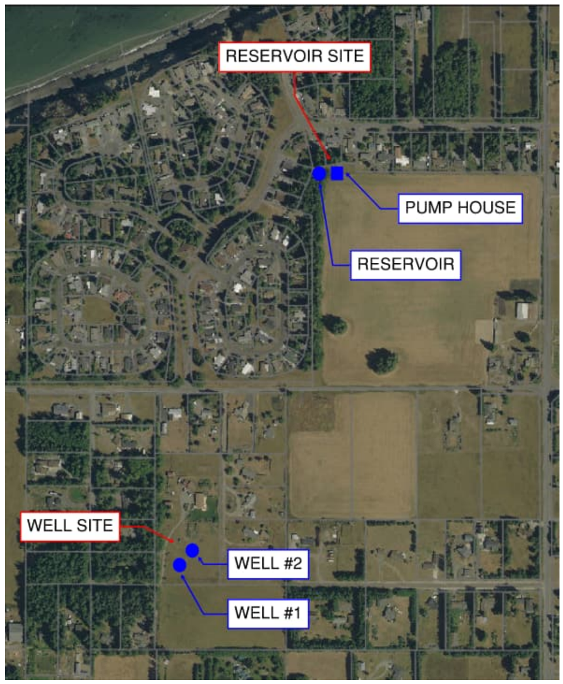


Figure 1 - Well Locations and Water System Service Area

1.1.1 *Water Rights*

The Washington State Department of Ecology (DOE) issued Ground Water Certificate G2-01131C (Priority Date March 3rd, 1971) to Monterra Incorporated. This document allows the system a maximum instantaneous withdrawal (Q_i) of 370 gpm and a maximum volume (Q_a) of 75 acre-feet per year (ac-ft/yr). Well #1 point of withdrawal is 620 feet south and 710 feet east of the north quarter corner of Section 7. Well #2 point of withdrawal is 570 feet north and 720 feet east of the center of Section 7. A copy of the water right is 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 Monterra wells are located 0.45 miles from the shoreline, (just under the ½ mile threshold), and pump water from a depth below sea level, so they are considered “at risk for intrusion” per the DOH Design Manual criteria. Chloride for Well #1 and Well #2’s well field (S03) was measured at 6.3 mg/L in 2019 which is below the threshold, therefore there appears to be little concern of seawater intrusion in the existing wells. It is recommended that Monterra continue testing its wells for chloride to check for any long-term trends in the aquifer.

1.2 Sanitary Control Area

The two wells were drilled in 1971 and 1976 and there is no documentation Clallam County (the County) has inspected and approved Well #1, and Well #2 well site locations, although this is assumed to have occurred prior to the wells being drilled, as they are both approved wells. The wells are located to minimize the possibility of contamination and to prevent surface water from entering the well. The 100-foot pollution control radius for both Well #1 and Well #2 are not contained within a system owned parcel, and overlaps with four (4) adjacent residential parcels.

The well casing for both wells are located within a pumphouse building and the well casing extends approximately 12 inches above the concrete floor surface. There is no known history of surface water affecting the existing wells. 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 residences is also low because of the confining layer protecting the aquifer. If domestic contamination did occur, it could include sources such as residential septic systems, gas, pesticides, fertilizers, etc. See Contaminant Source Inventory in Appendix F for more information regarding potential contaminants. The 100’ sanitary control radii for each well is shown in Figure 2.

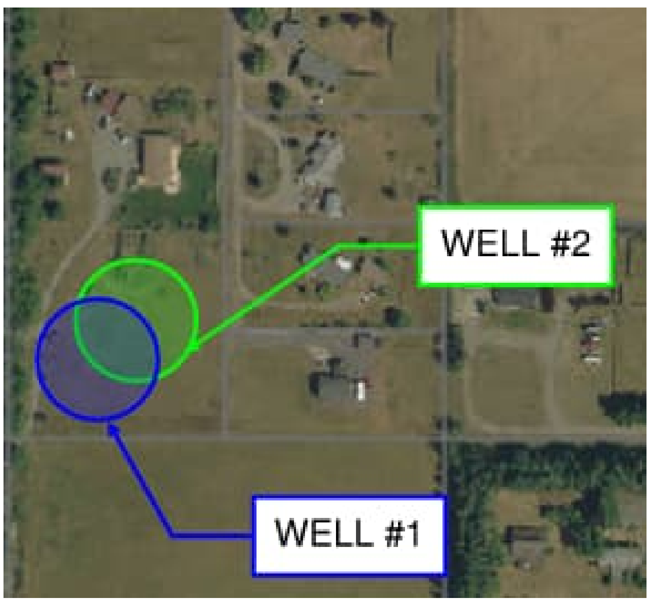


FIGURE 2 - SANITARY CONTROL AREA

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 field (Q) was calculated from the combined well production rate of Well 1 and Well 2 of 355 gpm. This was determined using the following equation:

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

$$355\ gpm * 60\frac{min}{hour} * 24\frac{hour}{day} * 365\ days = 186{,}588{,}000\ gal = 24{,}945{,}000\ cf$$

Table 2 shows the results of the well field (S03) calculated fixed radius based on the different travel times. Fixed Radii calculations can be found in Appendix C. 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 (ft) Based on Travel Times			
Condition	Source	Water Usage (cf/yr)	n	H (ft)	6 mo	1-yr	5-yr	10-yr
Anticipated Withdrawal	S03	24,945,000	.22	10	1,343	1,900	4,248	6,008

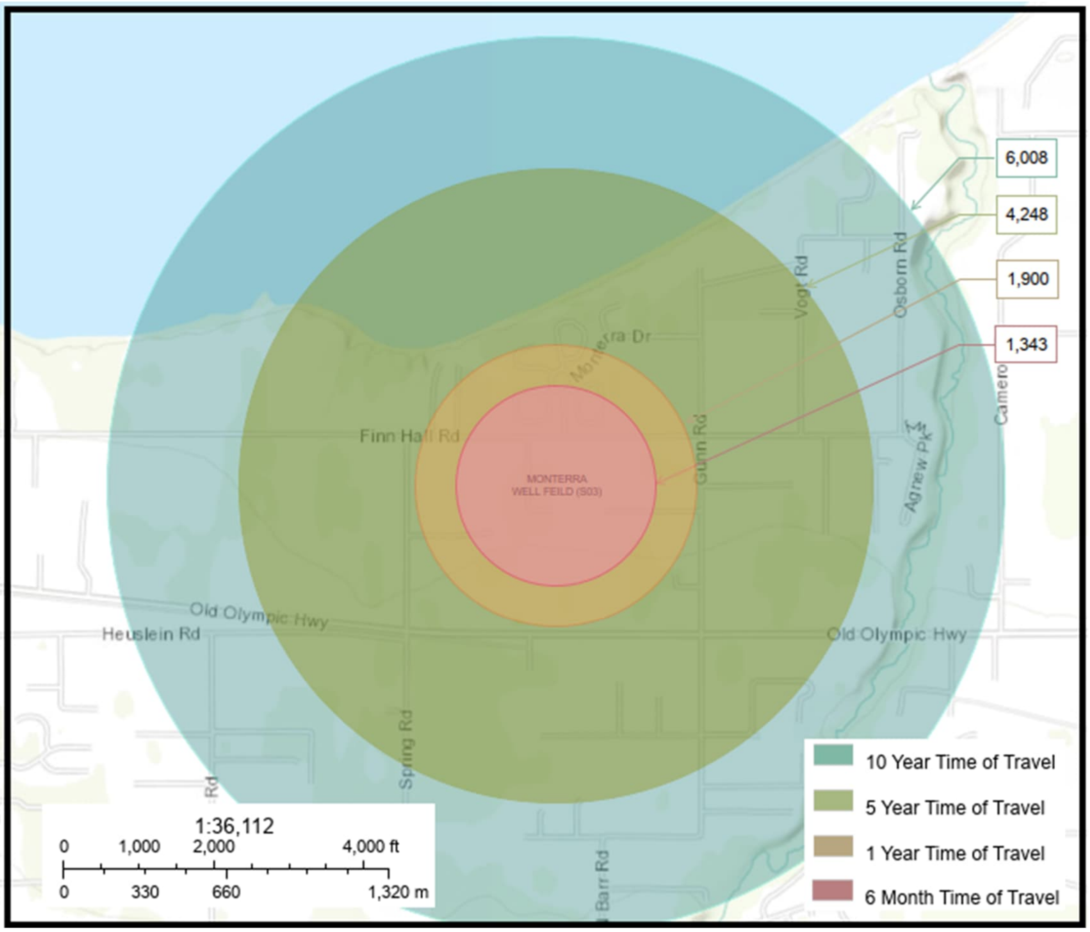


Figure 4 – Wellhead Protection Areas

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 R5, AR, and NC. 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 3 - Land Use Within Wellhead Protection Areas

	Zone 1 (1 year travel time)	Zone 3 (10 year travel time)
Source	R5	R5, AR, NC
S03	204 acres	4,084 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 well field S03. 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
- Clallam 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 well field. 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 the well field. This form is required of all groundwater-based Group A systems and is useful in determining the minimum delineation for the WHPA. The existing wells are classified as low susceptibility. These forms are 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 4 along with the relevant regulators. In summary, Cascadia Water LLC, as the water system's owner should notify the residents of the Monterra water system of their responsibility to protect their drinking water supply (groundwater wells) by properly managing potential contaminates.

Table 4 – 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 Monterra water system	Cascadia Water, LLC

Appendix A – Source Information

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

Appendix B - Water Rights

See Appendix G of Monterra - Water System Plan for Water Rights

Appendix C – Contaminant Source Inventory

Groundwater Contaminant Source Inventory
Project:Monterra Water System Plan
Water System Name: Monterra
Water System ID No. 55990 Y
Source: S01 (Well #1 NO TAG WW (MONTERRA)
Source: S02 (Well #2 NO TAG WW (MONTERRA)

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						Source 2						
		Zone 1 (440 feet)			Zone 3 (1966 feet)			Zone 1 (691 feet)			Zone 3 (3091 feet)			
Potential Groundwater Contaminant	Category	Existence	Threat	Rank	Existence	Threat	Rank	Existence	Threat	Rank	Existence	Threat	Rank	Description
Subsurface Percolation (Septic Tanks and Cesspools)	Category 1	X	1	Low	X	1	Low	X	2	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				X	4	Medium	
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	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	X	4	Low	X	3	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	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	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	X	1	Low	X	1	Low	
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	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	X	1	Medium	X	1	Medium	Large surrounding area of open land with high potential of pesticide applications
Fertilizer Applications		X	1	Medium	X	1	Medium	X	1	Medium	X	1	Medium	Large surrounding area of open land with high potential of fertilizer applications
Animal Feeding Operations														
De-icing Salts Application					X	4	Low				X	4	Low	Multiple residential homes in the surronding areas with potenital to de-ice during winter months
Urban Runoff														
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				X	2	Low	Wells within 0.5 miles of shoreline, giving potential for seawater intrustion
Total Number of Potential Groundwater Contaminants			8			12			9			12		

Potential Groundwater Contaminants Categories (From DOH *Wellhead Protection Program Guidance Document, June 2017*):

Groundwater Contaminant Source Inventory
Project:Monterra Water System Plan
Water System Name: Monterra
Water System ID No. 55990 Y
Source: S01 (Well #1 NO TAG WW (MONTERRA)
Source: S02 (Well #2 NO TAG WW (MONTERRA)

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
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 D – Susceptibility Assessment

Source Water Protection

Ground Water Contamination Susceptibility Assessment Survey

331-274 • Revised 7/21/2022

Instructions

Complete one form for each ground water source (well, well of a wellfield, spring, spring of a springfield) used in your water system (make copies as necessary). Contact your regional office if you need a copy of the instruction packet.

Part 1: System Information			
Well Owner/Manager	CASCADIA WATER, LLC		
Water System Name	MONTERRA	PWSID	55990 Y
County	CLALLAM	Source Number	S01
Well Depth (Feet)	221		
Source Name	WELL #1 NO TAG WW (MONTERRA)		
WA Well Tag ID Number			
Well Not Tagged	☒		
Number of Connections	203	Population Served	455
Township	30N	Range	04W
Section	07	¼ ¼ Section	SW NE
Latitude/Longitude	48.110075	/	-123.240239

How was latitude/longitude determined?

☐	GPS	☐	Survey	☐	Topographical Map
Other	GOOGLE MAPS				

Note: Please see instruction packet for details and explanations of all questions in Parts 2 through 5.

Part 2: Well Construction and Source Information	
1. Original well construction date	5/26/1971
Latest well reconstruction date	9/3/1976
☐	Information Unavailable
2. Well Driller	STOICAN DRILLING COMPANY INC.
☐	Well Driller Unknown

3. Type of Well

☐	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	210	Gallons/Minute

Information Source	PUMP TEST

If not documented, how was pumping rate determined?

☐	Pumping Rate Unknown

6. Is this source treated?

If so, what type of treatment?

☐	Disinfection	☐	Filtrations	☐	Carbon Filter	☐	Air Stripper	☐	Other

Purpose of treatment (describe materials removed or controlled by treatment).

NO

7. If source is chlorinated, is a chlorine residual maintained?	☐	Yes	☒	No

Residual level (at point closest to source).	

Part 3: Hydrogeologic Information

1. Depth to top of open interval (check one)

☐	Less than 20 feet	☐	20-49 feet	☒	50-99 feet
☐	100-200 feet	☐	Greater than 200 feet	☒	Information Unavailable

2. Depth to Groundwater (static water level)

☐	Less than 20 feet	☐	20-49 feet	☒	Greater than 100 feet
☐	Flowing well/spring (artesian)				

How was water level determined?

☒	Well Log	☐	Other
☐	Depth to Groundwater Unknown		

3. If source is flowing well or spring, what is the confining pressure?

	PSI (pounds per square inch) ~OR~
	Feet above wellhead

4. If source is flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source?

☐	Yes	☐	No

5. Wellhead elevation in feet (height above mean sea level.)

150

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 Instruction Packet for example.)*	
X	Evidence of confining layer(s) in well log.
	No evidence of confining layer(s) 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							
☐	Less than 100 feet*	☒	100-120 feet	☐	120-200 feet	☐	Greater than 200 feet

*If less than 100 feet, describe the site conditions.

Click or tap here to enter text.

8. Wellhead Construction	
☒	Wellhead enclosed in wellhouse
☐	Controlled access (describe in box below.)

Click or tap here to enter text.

Other uses for wellhouse (describe in box below.)

Click or tap here to enter text.

☐	No wellhead control.

9. Surface Seal					
☐	18 feet	☐	Greater than 18 feet	☒	Less than 18 feet (No ECY approval)
☐	Less than 18 feet (ECY approval copy attached)	☐	Depth of seal unknown	☐	No surface seal

10. Annual Rainfall (inches per year)					
☐	Less than 10 in/yr	☐	10-25 in/yr	☒	Greater than 15 in/yr

Part 4: Mapping Your Groundwater Resource

1. Annual volume of water pumped in gallons	186,588,000

How was this determined?

☐	Meter	☐	Estimated	☐	Pumping rate	
				☒	Pump capacity	355 GPM (COMBINED WELLS)
				☐	Pump rate and capacity	

Other (describe in box below)

Click or tap here to enter text.

2. Determined time of travel using:

☒ Calculated Fixed Radius estimate of groundwater movement (see instruction packet)

☐ Alternate Numerical Model

Six-month groundwater travel time (in feet)	1,343
One-year groundwater travel time (in feet)	1,900
Five-year groundwater travel time (in feet)	4,248
Ten-year groundwater travel time (in feet)	6,008

Information available on length of screened/open interval?

☒ Yes ☐ No

Length of screened/open interval (in feet)	Well 1 (S01) 109-221

3. Is there a river, lake, pond, stream, or other obvious surface water body within the six-month time of travel boundary? (Mark and identify on map.)

☒ Yes ☐ No

4. Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the six-month time of travel boundary?

☐ Yes ☒ No

Comments

Surface water pond approx.. 600’ south of wellfield

Part 5: Assessment of Water Quality

1. Regional sources of risk to groundwater

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.

	Six-Month	One-Year	Five-Year	Unknown
Likely pesticide application	☒	☐	☐	☐
Stormwater injection well	☐	☐	☐	☒
Other injection wells	☐	☐	☐	☒
Abandoned groundwater well	☐	☐	☐	☐
Landfills, dumps, disposal areas	☐	☐	☐	☐
Known hazardous materials clean-up site	☐	☐	☒	☐
Known water quality problems	☐	☐	☐	☐
Population density less than one house/acre	☐	☐	☒	☐
Residences commonly have septic tanks	☒	☐	☐	☐
Wastewater treatment lagoons	☐	☐	☐	☒
Sites used for land application of waste	☐	☐	☒	☐

Please include a map of the wellhead and time of travel areas with this form. Mark and identify on the map any of the risks listed above.

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 in the box below.

HAZWASTE REPORTED WITHIN 5-YEAR ZONE

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 sample results from the past 12 years. Maximum Contaminant Levels (MCLs) and State Advisory Levels (SALs) are noted next to the specific test and are listed in the instruction packet.

A. Nitrate (Nitrate MCL = 10 mg/liter)	
☐	Results greater than MCL
☒	Less than 2 mg/liter nitrate
☐	2-5 mg/liter nitrate
☐	Greater than 5 mg/liter nitrate
B. VOCs (VOC detection level is 0.5 ug/liter or 0.0005 mg/liter)	
☐	Results greater than MCL or SAL
☐	VOCs detected at least once
☒	VOCs never detected
☐	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 not required
D. Other SOCs (pesticides, herbicides, or SOCs other than EDB/DBCP	
☐	Other SOCs detected (pesticides, herbicides or other synthetic organic chemicals)
☐	Other SOC tests performed but none detected (list test methods in comments)
☒	Other SOC tests not performed
If any SOCs in addition to EDB/DBCP were detected, please identify and date. If other SOC tests were performed, but no SOCs detected, list test methods in box below.	
Click or tap here to enter text.	

E. Bacterial Contamination			
Any bacterial detection(s) in the past three years in samples taken from the source (not distribution sampling records)?			
☐	Yes	☐	No
Any bacterial detection(s) in the past three years in the distribution system attributed to the source?			
☐	Yes	☐	No
Source sampling records for bacteria unavailable.			
☐	Yes	☐	No

Part 6: Geographic or Hydrologic Factors Contributing to a Non-Circular Zone of Contribution

The following questions will help identify those ground water sources that the calculated fixed radius (CFR) method described in Part 4 may not accurately represent. For these sources, use the CFR areas 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, consider a more detailed delineation method.

1. Is there evidence of obvious hydrologic boundaries within the ten-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 in the box below, with references to map produced in Part 4.			
Click or tap here to enter text.			

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 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 groundwater extraction wells removing more than approximately 500 gal/min within...

	Yes	No	Unknown
Less than six-month travel time	☒	☐	☐
Six-month to one-year travel time	☒	☐	☐
One to five-year travel time	☒	☐	☐
Five to ten-year travel time	☒	☐	☐

B. Presence of groundwater recharge wells (dry wells) or heavy irrigation within...

	Yes	No	Unknown
Less than one-year travel time	☐	☒	☐
One to five-year travel time	☐	☒	☐
Five to ten-year travel time	☐	☒	☐

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 4.

Click or tap here to enter text.

Form Completed By	
Name of Authorized Person	Robert Bennion
Signature	
Title	
Date	

For more information

Questions? Contact Nikki Guillot, Source Water Protection Program Manager, 360-236-3114.

Contact our nearest regional office from 8 AM to 5 PM, Monday through Friday.
Eastern Region, Spokane Valley, 509-329-2100.
Northwest Region, Kent, 253-395-6750.
Southwest Region, Tumwater, 360-236-3030.

Washington State Department of Health

To request this document in another format, call 1-800-525-0127. Deaf or hard of hearing customers, please call 711 (Washington Relay) or email civil.rights@doh.wa.gov.

Source Water Protection

Ground Water Contamination Susceptibility Assessment Survey

331-274 • Revised 7/21/2022

Instructions

Complete one form for each ground water source (well, well of a wellfield, spring, spring of a springfield) used in your water system (make copies as necessary). Contact your regional office if you need a copy of the instruction packet.

Part 1: System Information			
Well Owner/Manager	CASCADIA WATER, LLC		
Water System Name	MONTERRA	PWSID	55990 Y
County	CLALLAM	Source Number	S02
Well Depth (Feet)	221		
Source Name	WELL #2 NO TAG WW (MONTERRA)		
WA Well Tag ID Number			
Well Not Tagged	☒		
Number of Connections	203	Population Served	455
Township	30N	Range	04W
Section	07	¼ ¼ Section	SW NE
Latitude/Longitude	48.110075	/	-123.240239

How was latitude/longitude determined?

☐	GPS	☐	Survey	☐	Topographical Map
Other	GOOGLE MAPS				

Note: Please see instruction packet for details and explanations of all questions in Parts 2 through 5.

Part 2: Well Construction and Source Information	
1. Original well construction date	5/26/1971
Latest well reconstruction date	9/3/1976
☐	Information Unavailable
2. Well Driller	STOICAN DRILLING COMPANY INC.
☐	Well Driller Unknown

3. Type of Well

☐	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	145	Gallons/Minute
Information Source	PUMP TEST	

If not documented, how was pumping rate determined?

☐ Pumping Rate Unknown

6. Is this source treated?

If so, what type of treatment?

☐	Disinfection	☐	Filtrations	☐	Carbon Filter	☐	Air Stripper	☐	Other

Purpose of treatment (describe materials removed or controlled by treatment).

NO

7. If source is chlorinated, is a chlorine residual maintained?	☐	Yes	☒	No

Residual level (at point closest to source).

Part 3: Hydrogeologic Information

1. Depth to top of open interval (check one)

☐	Less than 20 feet	☐	20-49 feet	☒	50-99 feet
☐	100-200 feet	☐	Greater than 200 feet	☒	Information Unavailable

2. Depth to Groundwater (static water level)

☐	Less than 20 feet	☐	20-49 feet	☒	Greater than 100 feet
☐	Flowing well/spring (artesian)				

How was water level determined?

☒	Well Log	☐	Other
☐	Depth to Groundwater Unknown		

3. If source is flowing well or spring, what is the confining pressure?

	PSI (pounds per square inch) ~OR~
	Feet above wellhead

4. If source is flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source?

☐ Yes ☐ No

5. Wellhead elevation in feet (height above mean sea level.)

150

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 Instruction Packet for example.)*							
X	Evidence of confining layer(s) in well log.						
	No evidence of confining layer(s) 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							
☐	Less than 100 feet*	☒	100-120 feet	☐	120-200 feet	☐	Greater than 200 feet
*If less than 100 feet, describe the site conditions.							
Click or tap here to enter text.							
8. Wellhead Construction							
☒	Wellhead enclosed in wellhouse						
☐	Controlled access (describe in box below.)						
Click or tap here to enter text.							
Other uses for wellhouse (describe in box below.)							
Click or tap here to enter text.							
☐	No wellhead control.						
9. Surface Seal							
☐	18 feet	☐	Greater than 18 feet	☒	Less than 18 feet (No ECY approval)		
☐	Less than 18 feet (ECY approval copy attached)	☐	Depth of seal unknown	☐	No surface seal		
10. Annual Rainfall (inches per year)							
☐	Less than 10 in/yr	☐	10-25 in/yr	☒	Greater than 15 in/yr		

Part 4: Mapping Your Groundwater Resource					
1. Annual volume of water pumped in gallons			186,588,000		
How was this determined?					
☐	Meter	☐	Estimated	☐ Pumping rate	
				☒ Pump capacity	355 GPM (COMBINED WELLS)
				☐ Pump rate and capacity	
Other (describe in box below)					
Click or tap here to enter text.					

2. Determined time of travel using:	
☒	Calculated Fixed Radius estimate of groundwater movement (see instruction packet)
☐	Alternate Numerical Model
Six-month groundwater travel time (in feet)	1,343
One-year groundwater travel time (in feet)	1,900
Five-year groundwater travel time (in feet)	4,248
Ten-year groundwater travel time (in feet)	6,008
Information available on length of screened/open interval?	
☒ Yes	☐ No
Length of screened/open interval (in feet)	Well 2 (S02) 89-215

3. Is there a river, lake, pond, stream, or other obvious surface water body within the six-month time of travel boundary? (Mark and identify on map.)	
☒ Yes	☐ No

4. Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the six-month time of travel boundary?	
☐ Yes	☒ No
Comments	
Surface water pond approx.. 600’ south of wellfield	

Part 5: Assessment of Water Quality

1. Regional sources of risk to groundwater

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.

	Six-Month	One-Year	Five-Year	Unknown
Likely pesticide application	☒	☐	☐	☐
Stormwater injection well	☐	☐	☐	☒
Other injection wells	☐	☐	☐	☒
Abandoned groundwater well	☐	☐	☐	☐
Landfills, dumps, disposal areas	☐	☐	☐	☐
Known hazardous materials clean-up site	☐	☐	☒	☐
Known water quality problems	☐	☐	☐	☐
Population density less than one house/acre	☐	☐	☒	☐
Residences commonly have septic tanks	☒	☐	☐	☐
Wastewater treatment lagoons	☐	☐	☐	☒
Sites used for land application of waste	☐	☐	☒	☐

Please include a map of the wellhead and time of travel areas with this form. Mark and identify on the map any of the risks listed above.

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 in the box below.

HAZWASTE REPORTED WITHIN 5-YEAR ZONE

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 sample results from the past 12 years. Maximum Contaminant Levels (MCLs) and State Advisory Levels (SALs) are noted next to the specific test and are listed in the instruction packet.

	A. Nitrate (Nitrate MCL = 10 mg/liter)
☐	Results greater than MCL
☒	Less than 2 mg/liter nitrate
☐	2-5 mg/liter nitrate
☐	Greater than 5 mg/liter nitrate

	B. VOCs (VOC detection level is 0.5 ug/liter or 0.0005 mg/liter)
☐	Results greater than MCL or SAL
☐	VOCs detected at least once
☒	VOCs never detected
☐	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 not required
D. Other SOCs (pesticides, herbicides, or SOCs other than EDB/DBCP	
☐	Other SOCs detected (pesticides, herbicides or other synthetic organic chemicals)
☐	Other SOC tests performed but none detected (list test methods in comments)
☒	Other SOC tests not performed
If any SOCs in addition to EDB/DBCP were detected, please identify and date. If other SOC tests were performed, but no SOCs detected, list test methods in box below.	
Click or tap here to enter text.	
E. Bacterial Contamination	
Any bacterial detection(s) in the past three years in samples taken from the source (not distribution sampling records)?	
☐ Yes	☐ No
Any bacterial detection(s) in the past three years in the distribution system attributed to the source?	
☐ Yes	☐ No
Source sampling records for bacteria unavailable.	
☐ Yes	☐ No

Part 6: Geographic or Hydrologic Factors Contributing to a Non-Circular Zone of Contribution

The following questions will help identify those ground water sources that the calculated fixed radius (CFR) method described in Part 4 may not accurately represent. For these sources, use the CFR areas 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, consider a more detailed delineation method.

1. Is there evidence of obvious hydrologic boundaries within the ten-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 in the box below, with references to map produced in Part 4.	
Click or tap here to enter text.	

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 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 groundwater extraction wells removing more than approximately 500 gal/min within...

	Yes	No	Unknown
Less than six-month travel time	☒	☐	☐
Six-month to one-year travel time	☒	☐	☐
One to five-year travel time	☒	☐	☐
Five to ten-year travel time	☒	☐	☐

B. Presence of groundwater recharge wells (dry wells) or heavy irrigation within...

	Yes	No	Unknown
Less than one-year travel time	☐	☒	☐
One to five-year travel time	☐	☒	☐
Five to ten-year travel time	☐	☒	☐

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 4.

Click or tap here to enter text.

Form Completed By	
Name of Authorized Person	Robert Bennion
Signature	
Title	
Date	

For more information

Questions? Contact Nikki Guillot, Source Water Protection Program Manager, 360-236-3114.

Contact our nearest regional office from 8 AM to 5 PM, Monday through Friday.
Eastern Region, Spokane Valley, 509-329-2100.
Northwest Region, Kent, 253-395-6750.
Southwest Region, Tumwater, 360-236-3030.

Appendix E – Notifications

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

Date: 5/1/2025

Re: Monterra – Wellhead Protection Program

Dear Emergency Responders,

Monterra is updating their wellhead protection program as required by DOH. The Monterra source wells are located approximately 500-feet east of Home Lane and approximately 800-feet south of Finn Hall Road 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 Monterra system has 192 service connections and serves about 470 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: Monterra – Wellhead Protection Program

Dear Property Owner,

To protect the drinking water supply for the customers of Monterra, 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

Re: Monterra – Wellhead Protection Program

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General Manager

Date: 7/22/2025

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Sincerely,

Culley Lehman
General Manager

First Name	Last Name	Address	City	State	Zip
CLALLAM	COUNTY	223 E 4TH ST	PORT ANGELES	WA	98362
A JEANIE	McNAMARA	71 HOLLEY CIR	PORT ANGELES	WA	98362
M LYNN	ABEL	1688 FINN HALL RD	PORT ANGELES	WA	98362-9536
LEO	ADSIT TTE	71 IVY LANE	PORT ANGELES	WA	98362
	AGNEW MOUNTAIN VIEW LLC	1011 LOUELLA HEIGHTS DR	SEQUIM	WA	98382
SUSAN E	ALLEN	PO BOX 3096	SEQUIM	WA	98382
ROBERT CAROLYN	AMARAL GUSKE	3327 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
ROBERTA ANTHONY	ANDERSON	3343 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
WILLIAM C AND PHYLLIS M	ANDERSON	62 MAHARAJ LN	PORT ANGELES	WA	98362-7033
SHERRY AND ANGUS	ANDERSON TTES	367 MONTERRA DR	PORT ANGELES	WA	98362
BRICK AND SHERRY	AYOLA AND BECKER CO-TTES	1702 FINN HALL RD	PORT ANGELES	WA	98362
JASON KINDLE	BAERG	2253 HOME LN	PORT ANGELES	WA	98362
LUCIUS J	BALLARD	462 MONTERRA DR	PORT ANGELES	WA	98362-9165
EDWARD	BARNES	200 HOME LANE	PORT ANGELES	WA	98362
KIMBERLY	BARNETT	262 HEATHER CIRCLE	PORT ANGELES	WA	98362
RICHARD AND MARIE A	BARTHOLOMEW	56 W SORREL LN	PORT ANGELES	WA	98362
HEATHER	BATES	211 HEATHER CIRCLE	PORT ANGELES	WA	98362
JASON	BAZE	10 MARSH HAWK LN	PORT ANGELES	WA	98362
JAMES PAMELA	BECKER TINDALL-BECKER	2634 W SEQUIM BAY RD #22	SEQUIM	WA	98382
TIMOTHY GABRIELA	BERISTAIN HAVEL	1682 FINN HALL RD	PORT ANGELES	WA	98362
ALAN PATRICIA	BERNSTEIN	363 GUNN ROAD	PORT ANGELES	WA	98362
BRENT LAMAR AND VIRGINIA B	BERRY AND AUSTIN	1435 FINN HALL RD	PORT ANGELES	WA	98362
BILLY AND BETTY	BIRDSALL	1952 FINN HALL RD	PORT ANGELES	WA	98362-9538
DALE C	BIRGE	252 HOLLEY CIR	PORT ANGELES	WA	98362-9571
IDA M AND LILLIAN A G	BIRNEY AND TWERDY TTES	51 HOLLEY CIRCLE	PORT ANGELES	WA	98362
PATRICK TENNILLE	BIXBY	22 MAHARAJ LANE	PORT ANGELES	WA	98362
DENNIS	BLAKELY	260 CYPRESS CIR	PORT ANGELES	WA	98362
KENT AND FRED AND KATHLEEN	BOSTER AND SWENSON JTWRS	181 CYPRESS CIR	PORT ANGELES	WA	98362
DON J	BRADLEY	345 MONTERRA DR	PORT ANGELES	WA	98382
JASON	BRAGLIN	203 HOME LANE	PORT ANGELES	WA	98362
DONALD	BRALEY	94 MAHARAJ LN	PORT ANGELES	WA	98362
WANDA L	BROUILLETTE	172 HEATHER CIRCLE	PORT ANGELES	WA	98362
ELIZABETH A	BURKE	91 IVY LN	PORT ANGELES	WA	98362
ROBERT	BURNETTE JR	82 ALPINE VIEW LN	PORT ANGELES	WA	98362
ROSE SHAWN	BUTEAU SHEPHERD	182 HOLLEY CIRCLE	PORT ANGELES	WA	98362
	C AND V WILSON LLC	121 LINDERMAN RD	PORT ANGELES	WA	98362
MICHAEL	CARPENTER	81 IVY LN	PORT ANGELES	WA	98362
STEVEN LORRAINE	CASSABOOM	212 MONTERRA DR	PORT ANGELES	WA	98362
LINDA H	CASWELL	3303 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
DORIS AND JOHN	CAUGHEY	112 CYPRESS CIR	PORT ANGELES	WA	98362-9550
WILLIAM PENNY	CHATTERTON	81 CYPRESS CIRCLE	PORT ANGELES	WA	98362
SCOT B AND SHERYL	CLARK	61 LAKEFARM RD	PORT ANGELES	WA	98362
PATRICK E	COE	232 GUNN RD	PORT ANGELES	WA	98362
BREANNA K	COLLLINS	272 GUNN RD	PORT ANGELES	WA	98362
TYLER J AND LINDA L	CONKLE	82 HEATHER CIRCLE	PORT ANGELES	WA	98362
DIANA J	COOMBS	130 HOLLEY CIR	PORT ANGELES	WA	98362
JENNIE L	CORNELL	P O BOX 1870	PORT ANGELES	WA	98362
CHARLES AND DEBBIE	CRANE	72 ALPINE VIEW LANE	PORT ANGELES	WA	98362
PATRICIA	CREIGHTON ESTATE	262 HEATHER CIR	PORT ANGELES	WA	98362-8109
ROLLA LINDA	DECKER	PO BOX 145	CARLSBORG	WA	98324
LARRY AND WANDA	DUGLOSCH	3222 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
FREDERICK M	DULIEN	2906 SE LOOP 820 STE G	FORT WORTH	TX	76140
BRIAN AND SHELBY	DUMAS	20 TRADEWINDS LN	PORT ANGELES	WA	98362-6551
EMILY J	ECCLES	191 HOLLEY CIR	PORT ANGELES	WA	98362
VINCENT	EDSON	13180 PLEASANT VISTA LN	AUBURN	CA	95603
MICHAEL STEPHANIE	EDWARDS	112 HEATHER CIRCLE	PORT ANGELES	WA	98362
PAMELA K	ERB	PO BOX 3083	PORT ANGELES	WA	98382-0339
RACHEL	ERICSEN	1813 BRUSH STREET	OAKLAND	CA	94612
VICTOR LORA	FERRY	262 HOLLEY CIR	PORT ANGELES	WA	98362
ADELE S	FILIPPIN PETTERSEN TTE	340 OLD MILL RD SPACE 163	SANTA BARBARA	CA	93110

PATRICIA	FISHER TTE	2507 OAK HILL DR	COPPERAS COVE	TX	76522
JOHN AND JENNIFER	FISKER-ANDERSEN	2914 209TH PL SW	LYNNWOOD	WA	98036
PRAIRIE	FIVE	109A E BELL ST	SEQUIM	WA	98382
RONITA C	FLACK	PO BOX 194	CARLSBORG	WA	98324
SCOT JENNI	FORBES GREY	382 MATSON RD	PORT ANGELES	WA	98362
DAVID	FORREST	192 CYPRESS CIRCLE	PORT ANGELES	WA	98362-9550
KENNETH E	FOX	51 GUNN RD	PORT ANGELES	WA	98362
CHRISTOPHER G	FRANKFURTH	PO BOX 2638	PORT ANGELES	WA	98362
NANCY L	FROH	72 HOLLEY CIRCLE	PORT ANGELES	WA	98362
ANTOINETTE	FULKERSON TTE	152 HOLLEY CIR	PORT ANGELES	WA	98362
BILLY G	GARDNER	100 MATSON RD	PORT ANGELES	WA	98362-9119
ROGER A	GATES	1413 FINN HALL RD	PORT ANGELES	WA	98362-8116
OLIVER	GEHRKE	51 E DIANE DR	SEQUIM	WA	98382
DIANE R A	GEMMER	61 HEATHER CIR	PORT ANGELES	WA	98362
JOHN C AND PAULINE M	GEPNER	10 HOME LANE	PORT ANGELES	WA	98362
JEFFREY AARON	GERHARD	3220 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
TIMOTHY M AND SUSAN LYNN	GILLETT AND BROTHERS	242 FINN HALL RD	PORT ANGELES	WA	98362
BONNIE L	GILLIS	444 MONTERRA DRIVE	PORT ANGELES	WA	98362
JENNIFER RACHEL	GILMORE BOWEN	1662 FINN HALL RD	PORT ANGELES	WA	98362
JANICE	GIORDANO	200 HOLLEY CIRCLE	PORT ANGELES	WA	98362
JASON	GLEATON	103 HOME LANE	PORT ANGELES	WA	98362
DIANE HARVEY	GOLD	554 VOICE OF AMERICA RD	SEQUIM	WA	98382
SANDRA L	GOODWICK	142 HEATHER CIRCLE	PORT ANGELES	WA	98362
KATHI L	GUNN	292 MONTERRA DR	PORT ANGELES	WA	98362
SUSANNA	HAFNER	302 CYPRESS CIRCLE	PORT ANGELES	WA	98362
SUSAN	HALLORAN	2805 VISTA BUTTE DR	LAS VEGAS	NV	89134
MELVIN L	HANSON	152 CYPRESS CIR	PORT ANGELES	WA	98362-9550
MARY	HARRIS	201 HOLLEY CIRCLE	PORT ANGELES	WA	98362
LINDA R	HARTZELL	154 GUNN RD	PORT ANGELES	WA	98362-9555
JANET ROBERT	HAYES	92 HOLLEY CIRCLE	PORT ANGELES	WA	98362
PARIS	HEART	51 HEATHER CIRCLE	PORT ANGELES	WA	98362
WILMA	HENDRICKSON	1622 FINN HALL RD	PORT ANGELES	WA	98362-9536
BRADLEY	HERMANSON	91 CYPRESS CIR	PORT ANGELES	WA	98362
AARON	HITT	33 HOME LN	PORT ANGELES	WA	98362
KORY E AND JOLENE	HITT	84 HOME LANE	PORT ANGELES	WA	98362
KENNETH AND CHIQUITA	HIYOSHIDA	60 TRADEWINDS LN	PORT ANGELES	WA	98362-6551
NATHAN CAROLE	HOFFMAN	3093 OLD OLYMPIC HWY	PORT ANGELES	WA	98363
GARY AND PAM	HOOPER	188 HOME LN	PORT ANGELES	WA	98362-9179
KAROLYN J	HOOVER	190 HEATHER CIRCLE	PORT ANGELES	WA	98362
ELDEN	HOUSINGER	1712 FINN HALL RD	PORT ANGELES	WA	98362
ROBERT	HOUTZ	151 IVY LN	PORT ANGELES	WA	98362
ROBERT AND ROSE	HUBBARD	83 HOME LANE	PORT ANGELES	WA	98362
WENDY M	INMAN	2835 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
IRENE	IRVINE	221 HOLLEY CIRCLE	PORT ANGELES	WA	98362
KRISTEN EMILY	JENKS	P O BOX 734	PORT ANGELES	WA	98362
JAMES J AND ANGELA	JEZIORSKI	172 THORNTON DR	SEQUIM	WA	98382
DONOVAN W	JORDAN SR	271 HOLLEY CIRCLE	PORT ANGELES	WA	98362
KATHRYN	JORGE	8635 W SAHARA AVE NO 492	LAS VEGAS	NV	89117
CARL AND SUSAN	KAISER	261 CYPRESS CIRCLE	PORT ANGELES	WA	98362
STUART	KIEHL	161 IVY LN	PORT ANGELES	WA	98362
M APRIL	KILGORE	181 HEATHER CIR	PORT ANGELES	WA	98362-8108
CARTER K AND SUSAN C	KIRK	131 HOLLEY CIRCLE	PORT ANGELES	WA	98362
CAROLE	KOENIG	4340 BORGEN BLVD STE 2612	GIG HARBOR	WA	98332
MELODY L	KOESTER	3090 OLD OLYMPIC HWY	PORT ANGELES	WA	98362-9137
DANIEL K AND CATHY L	KOESTER	3272 OLD OLYMPIC HWY	PORT ANGELES	WA	98362-8400
KURT V AND ERICA N	KOLAR	3065 SOUTHINGTON WY	ROSEVILLE	CA	95747
MICHAEL D AND BARBARA J	KRAMER	270 CYPRESS CIR	PORT ANGELES	WA	98362
RODNEY P	KYNASTON	101 HOLLEY CIRCLE	PORT ANGELES	WA	98362
WILLIAM H	LANG	152 HEATHER CIR	PORT ANGELES	WA	98362-8108
DEBORAH M	LAPLANTE	182 IVY LN	PORT ANGELES	WA	98362
LORI FELIX	LARRECHEA	24655 HIGHWAY 112	CLALLAM BAY	WA	98326

FELIX LORI	LARRECHEA	33 MARCH HAWK LANE	PORT ANGELES	WA	98362
QUAHLEE	LASSILA	61 IVY LN	PORT ANGELES	WA	98362
WADE AND APRIL	LAURITSEN	202 HOME LANE	PORT ANGELES	WA	98362
PATRICIA	LEOVY	31 CATHMAR PARK LN	WASHOUGAL	WA	98671
FRANK LAURNA	LETO	202 CYPRESS CIR	PORT ANGELES	WA	98362
LORI	LETTS	222 HEATHER CIRCLE	PORT ANGELES	WA	98362-8109
TERRY AND LISA	LIND	11 HOME LANE	PORT ANGELES	WA	98362
BRYAN L AND LILY M	LINDGREN AND TODD	111 CYPRESS CIRCLE	PORT ANGELES	WA	98362
REGINALD AND MELINDA M	LITTLER AND BARON	223 GUNN ROAD	PORT ANGELES	WA	98362
DANIEL	LIVRAMENTO	102 HOLLEY CIRCLE	PORT ANGELES	WA	98362
DANIEL	LOE CASTLEBERRY	122 HEATHER CIR	PORT ANGELES	WA	98362-8108
ROSEMARIE	LUEKE	162 IVY LN	PORT ANGELES	WA	98362
JAMES AND BARBARA	LYDON TRUST	C/O JOSEPH WOLFLEY	PORT ANGELES	WA	98362
JERRY D AND JOAN E	MACHENHEIMER	282 GUNN RD	PORT ANGELES	WA	98362-9556
MICHAEL F	MADIGAN	83 LINDERMAN RD	PORT ANGELES	WA	98362-9559
JAMES AND BRIANNE	MAGDYCH AND KEELER	3177 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
SATENDRA P AND SUSANNE M	MAHARAJ	69 MAHARAJ LN	PORT ANGELES	WA	98362-7033
NICOLE	MALONE RYAN	171 IVY LN	PORT ANGELES	WA	98362
JOHN AND CHRISTINE	MARBLE	2042 FINN HALL RD	PORT ANGELES	WA	98362
ANTHONY AND TERESA	MARCHI	3393 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
DOUGLAS PATRICE	MARKHAM	42 SEA BLUFF LN	PORT ANGELES	WA	98362
JOHN H CROFT AND CATHERINE I	MARSH TTES REV LIV TRST	13831 N CORAL GABLES DR	PHOENIX	AZ	85023-6274
DEBORAH	MARSHALL	145 SOUTH HOME LANE	PORT ANGELES	WA	98362-9179
MYRNA CHRISTIAN	MARTIN FRANCIS	52 CYPRESS CIRCLE	PORT ANGELES	WA	98362
MARY	MCCABE	302 HOLLEY CIRCLE	PORT ANGELES	WA	98362
CATHERINE	MCCAFFERY	220 HOLLEY CIRCLE	PORT ANGELES	WA	98362
KATHLEEN	MCCLURKEN	124 GUNN ROAD	PORT ANGELES	WA	98362
VERNON L	MCCORD	141 HOLLEY CIRCLE	PORT ANGELES	WA	98362
DONNA E AND RICKEY LYNN	MCKENZIE	2837 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
JULIA	MCLEAN	250 HEATHER CIRCLE	PORT ANGELES	WA	98362
MICHELLE	MENEY	432 MATSON ROAD	PORT ANELES	WA	98362
ALLAN	MILLER TTE	124 HOME LN	PORT ANGELES	WA	98362
JOSIE	MOLINA	23416 128TH PLACE SOUTHEAST	KENT	WA	98031
	MONTERRA HOMEOWNERS ASSOC INC	22 CIRCLE DR	PORT ANGELES	WA	98362
ANNA P	MORGAN	PO BOX 148	CARLSBORG	WA	98324
DONALD AND JOANNE	MORRISON	PO BOX 279	CARLSBORG	WA	98324-0279
STEVEN AND DIXIE	MORTENSEN	232 HOLLEY CIRCLE	PORT ANGELES	WA	98362
ROBIN AND CAROL LEE	MOSES	P O BOX 847	CARLSBORG	WA	98324
JOSEPH ALLEN AND ANITA M	MULLINS	42 IVY LANE	PORT ANGELES	WA	98362
JOHN AND SANDRA	MULLOY	62 CYPRESS CIRCLE	PORT ANGELES	WA	98362
TEDDY ANN	NELSON	232 HEATHER CIR	PORT ANGELES	WA	98362-8109
JEAN	NIMKE	156 MATSON RD	PORT ANGELES	WA	98362
HAROLD J AND PRISCILLA A	NOLF	290 HOLLEY CIRCLE	PORT ANGELES	WA	98362
JOHN SHEREE	NORTHRUP	121 IVY LANE	PORT ANGELES	WA	98363
JUDITH A	NORTON	162 HOLLEY CIRCLE	PORT ANGELES	WA	98362
JAMES LINDA	NUTTALL	242 ALPINE VIEW LN	PORT ANGELES	WA	98362
DANIEL J	OLSON ESTATE	131 HEATHER CIRCLE	PORT ANGELES	WA	98362
GARY S TTE	ONEILL	103 ALPINE VIEW LANE	PORT ANGELES	WA	98362
JOHN CHARLAINE	OWEN CALEY	332 GUNN ROAD	PORT ANGELES	WA	98362
DAN AND JANICE	PALMITER	92 HEATHER CR	PORT ANGELES	WA	98362
SCOTT S AND LINDA J	PAULSON	3253 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
RICHARD D AND JUDITH H	PEACE	141 CYPRESS CIR	PORT ANGELES	WA	98362
PAUL AND SCOOTER K	PERLWITZ JTWROS	3173 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
DAVID LISA	PERRY POWERS ZANE	42 HOLLEY CIRCLE	PORT ANGELES	WA	98362
ANGELA	PERRYMAN	282 CYPRESS CIRCLE	PORT ANGELES	WA	98362
JOHN B AND SHEILA I	PFISTER	281 CYPRESS CIR	PORT ANGELES	WA	98362
KRIS	PIERSON	180 CYPRESS CR	PORT ANGELES	WA	98362
MARILYN	POLLOCK	62 HOLLEY CIR	PORT ANGELES	WA	98362
VIRGILIO AND LARAINE	PONTES AND GAU TR	462 GUNN RD	PORT ANGELES	WA	98362-9558
LOUISE CATHERINE	POTTER MACGREGOR	43 ALPINE VIEW LN	PORT ANGELES	WA	98362
	PUBLIC UTILITY DISTRICT NO. 1	PO BOX 1000	CARLSBORG	WA	98324

MIKE AND ZENAIDA	PUNTENNEY	3065 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
FRESCA AND ELIZABETH	RAINS AND BAATZ	3122 OLD OLYMPIC HWY	PORT ANGELES	WA	98362-8199
DANIEL LEAH	RATHWELL	102 ALPINE VIEW LN	PORT ANGELES	WA	98362
PETER	RENNER	172 HOLLEY CIR	PORT ANGELES	WA	98362
ROBERT AND PAMELA	RITTMUELLER	171 CYPRESS CIRCLE	PORT ANGELES	WA	98362
GENE L	ROBINSON	11 IVY LN	PORT ANGELES	WA	98362-8167
SALLY ROBERT	RODGERS WILSON	3179 OLD OLYMPIC HWY	PORT ANGELES	WA	98362
CHRISTINE AND ALLEN	ROEHL	412 GUNN RD	PORT ANGELES	WA	98362
BARBARA	ROSA	31 HOLLEY CIRCLE	PORT ANGELES	WA	98362
TODD	ROSBACH	PO BOX 133	CARLSBORG	WA	98324
GARY AND DORRRIT	RUEN AND JENSEN	22 SEA BLUFF LN	PORT ANGELES	WA	98362
STEVEN CYNTHIA	RUNNION	82 CYPRESS CIR	PORT ANGELES	WA	98362
JAMES TREASA	RUSSELL	32 HEATHER CIRCLE	PORT ANGELES	WA	98362
SHANNON	RUTLEDGE	234 MONTERRA DRIVE	PORT ANGELES	WA	98362
MICHAEL AND EMILY	SALYER	1686 FINN HALL RD	PORT ANGELES	WA	98362
ELBERT AND WANDA	SANDERS	73 ALPINE VIEW LN	PORT ANGELES	WA	98362-8139
SHARON C	SCAIRPON	332 MONTERRA DR	PORT ANGELES	WA	98362
ALFRED AND CATHY	SCALI	3257 OLD OLYMPIC HWY	PORT ANGELES	WA	98362-8400
MICHAEL KIMBERLY	SCHAEFFER	52 IVY LANE	PORT ANGELES	WA	98362
THOMAS A AND TERESA M	SCHMID	595 AMARILLO RD	PORT ANGELES	WA	98362
RONALD AND SHERRIE	SCHRODER TRUST	2163 LIMA LOOP	LAREDO	TX	78045-9452
RAYMON AND GEORGIANNA	SEKO	1259 FINN HALL RD	PORT ANGELES	WA	98362
PAMELA	SELNES	291 HEATHER CIRCLE	PORT ANGELES	WA	98362
MAUREEN	SEWELL	211 CYPRESS CIRCLE	PORT ANGELES	WA	98362
WARREN	SEWELL	231 HOLLEY CIRCLE	PORT ANGELES	WA	98362
DERRELL AND RACHEL	SHARP	2965 OLD OLYMPIC HWY	PORT ANGELES	WA	98362-9121
JULIE	SHELP TTE	282 HEATHER CIR	PORT ANGELES	WA	98362
CARRIE	SHOLLENBERGER	60 HEATHER CIRCLE	PORT ANGELES	WA	98362
DIMITRIOS K	SIATERLIS ET UX	PO BOX 266	MOUNTLAKE TERRACE	WA	98043-0266
ANNETTE JOHN	SKELLEY	312 MONTERRA DR	PORT ANGELES	WA	98362
LINDA R	SLATER	311 MONTERRA DR	PORT ANGELES	WA	98362
KENNETH W AND PEGGY A	SMELCER	123 ALPINE VIEW LN	PORT ANGELES	WA	98362-8139
CONNIE	SMITH	132 CYPRESS CIRCLE	PORT ANGELES	WA	98362
RENEE	SMITH	292 HEATHER CIRCLE	PORT ANGELES	WA	98362
NANCY L	SMITH	32 CYPRESS CIRCLE	PORT ANGELES	WA	98362
PATRICIA	SMITH ET AL	C/O WESTON-WEBB	PORT ANGELES	WA	98362
STEPHEN AND CHERYL	SMITH FAMILY TRUST	53 SOARING HAWK LANE	PORT ANGELES	WA	98362
JEREMY	SODERSTROM ET AL	53 STAMPEDE DR	SEQUIM	WA	98382
DAVID KARL AND CYNTHIA DEE	STALLKNECHT	74 CUTTY LN	SEQUIM	WA	98382
LEE AND LOUISE	STEPHENS	272 MONTERRA DR	PORT ANGELES	WA	98362
MELVIN W AND DEIRDRE M	STEVENS	155 GUNN RD	PORT ANGELES	WA	98362
SHERRY LEE	STOUT	41 IVY LN	PORT ANGELES	WA	98362-8167
GEORGE AND MARTHA	STUBER	101 HEATHER CIRCLE	PORT ANGELES	WA	98362
BRYAN AND ANNA M	SWANBERG	182 HOME LANE	PORT ANGELES	WA	98362
DAVID A	SWANK	1429 FINN HALL RD	PORT ANGELES	WA	98362
RICHARD SUSAN	SWAZEY JR GALE JTWROS	PO BOX 621	SEQUIM	WA	98382
WINFORD AND DENISE	TAYLOR	112 HOLLEY CIRCLE	PORT ANGELES	WA	98362
BETH WILLIAM	TERRELL ZIMMERMAN	1951 FINN HALL RD	PORT ANGELES	WA	98362
DARYL G AND DEE A	THOMAS	546 GUNN RD	PORT ANGELES	WA	98362
DANIEL M	THOMPSON	232 CYPRESS CIRCLE	PORT ANGELES	WA	98362
JEFFREY AND SANDRA	THORPE	404 MONTERRA DR	PORT ANGELES	WA	98362
KATHLEEN E	TRAINOR	122 CYPRESS CIRCLE	PORT ANGELES	WA	98362
STEVEN B AND KATHY	TUCKER	22 IVY LN	PORT ANGELES	WA	98362-8167
ROBERT W	TURNER	272 HOLLEY CIR	PORT ANGELES	WA	98362
GREGORY M AND BARBARA A	TUTTLE AND POWELL	1251 FINN HALL RD	PORT ANGELES	WA	98362-9502
RUSSELL AND EARLENE	UNDERWOOD	272 HEATHER CIRCLE	PORT ANGELES	WA	98362
BARBARA G	VANCE TTE ESTATE	614 OAKRIDGE DR	PORT ANGELES	WA	98362
DAVID AND PATRICIA	VANDERGRIEND	222 CYPRESS CIRCLE	PORT ANGELES	WA	98362
JOHN P AND PAMELA L	VASS	1142 SPATH RD	SEQUIM	WA	98382
THOMAS AND KIMBERLEY	VILLONI AND BAUER	331 MONTERRA DR	PORT ANGELES	WA	98362-9574
HEDI	VOLOSHEN	101 IVY LANE	PORT ANGELES	WA	98362

	WAGNON PROPERTY	1267 CARLSBORG RD	SEQUIM	WA	98382
STEVEN E AND LISA J	WALLS	41 TRADEWINDS LN	PORT ANGELES	WA	98362
ROBERT W AND TERRI J	WATSON	PO BOX 596	CARLSBORG	WA	98324
SHALAKO	WHITE	82 CALBERT RD	PORT ANGELES	WA	98362
WILLIAM KAREN	WILDISH	PO BOX 567	CRESWELL	OR	97426
JOHN R AND SUSAN L	WILLETTE	92 CYPRESS CIR	PORT ANGELES	WA	98362
VERN R AND CHAD	WILSON ET UX	121 LINDERMAN RD	PORT ANGELES	WA	98362
ROBYN CRAIG	WISEMAN HOLZGRAFE	141 IVY LN	PORT ANGELES	WA	98362
DAWN C	WOLFF	152 IVY LN	PORT ANGELES	WA	98362
KEVIN	WOMACK	374 MONTERRA DR	PORT ANGELES	WA	98362
JOHN AND LINDA JO	WOTHERSPOON	132 ALPINE VIEW LN	PORT ANGELES	WA	98362-8139
CYNTHIA	YAGER	193 GUNN RD	PORT ANGELES	WA	98362
ESTATE OF WANDA	YANDELL	1439 FINN HALL RD	PORT ANGELES	WA	98362-8116
JANE E AND MOSES	ZAKARIAN	112 IVY LN	PORT ANGELES	WA	98362-8168
STEVEN AND SUSAN	ZARIT	242 CYPRESS CIR	PORT ANGELES	WA	98362

APPENDIX J
Water Loss Control Action Plan

1. WATER LOSS CONTROL ACTION PLAN (WLCAP)

The Distribution System Leakage (DSL) of the Monterra water system has been unknown until recently since a portion of the consumer base was unmetered. This has recently been resolved by Cascadia Water and DSL will no be more closely monitored. The system does not have a recent history of water main repairs, no treatment backwash, and no recent fire department use so it is anticipated that the measured DSL will be at or below 10%. However, this Water Loss Control Action Plan (WLCAP) has been created 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 adopted a Water Use Efficiency (WUE) goal in 2019 for customers to save 5 gallons perday. 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. However no consumption data has been provided up to the 2022 WUE report due to the lack of consumer meters throughout the system. This system deficienty has been addressed and this WLCAP has been developed by 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

Monterra water system has established a new WUE goal their conservation program to reduce of the growth adjusted maximum day demand.

More specifically, the system will try to reduce the growth adjusted maximum day demand by a minimum of 1.5% within six years. Cascadia plans on accomplishing this goal by reducing DSL as real losses are measured and as they further educate customers regarding the resource and methods for conservation

APPENDIX K
Water Quality Monitoring Schedule

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

Water Quality Monitoring Schedule

System: MONTERRA | **PWS ID: 55990 Y** | **Region: SOUTHWEST**
Contact: Dale L Metzger | **Group: A - Comm** | **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 monitoring requirement, and when we generate the new monitoring requirement.

Coliform Monitoring Requirements

	Jun 2022	Jul 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022	Jan 2023	Feb 2023	Mar 2023	Apr 2023	May 2023
Coliform Monitoring Population	455	455	455	455	455	455	455	455	455	455	455	455
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	5	Jan 2021 - Dec 2023	standard - 3 year	07/22/2020	Jul 2023	
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.

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 - Moderate

Test Panel/Analyte	*# Samples Required*	*Compliance Period*	*Frequency*	*Last Sample Date*	*Next Sample Due*
Nitrate	1	Jan 2022 - Dec 2022	standard - 1 year	06/08/2021	***Jun 2022***
Complete Inorganic (IOC)	1	Jan 2020 - Dec 2028	waiver - 9 year	12/28/2016	Oct 2025
Manganese	1	Jan 2020 - Dec 2022	standard - 3 year	06/10/2019	***Jun 2022***
Volatile Organics (VOC)	1	Jan 2020 - Dec 2025	waiver - 6 year	09/28/2021	
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	12/31/2018	
Pesticides	0	Jan 2020 - Dec 2022	waiver - 3 year	11/17/2009	
Soil Fumigants	0	Jan 2020 - Dec 2022	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):	07/01/2022
Submit CCR certification form to ODW (Community systems only):	10/01/2022
Submit Water Use Efficiency report online to ODW and to customers (Community and other municipal water systems only):	07/01/2022
Send notices of lead and copper sample results to the customers sampled:	30 days after you receive the laboratory results
Submit Certification of customer notification of lead and copper results to ODW:	90 days after you notify customers

Special Notes

None

Southwest Regional Water Quality Monitoring Contacts

For questions regarding chemical monitoring:	Sophia Petro: (360) 236-3046 or sophia.petro@doh.wa.gov
For questions regarding DBPs:	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 55990Y - MONTERRA	
Collect Date	6/8/2021
Lab Number	010
Lab Name	Spectra Laboratories - Kitsap, LLC
Sample Number	16302
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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DOH Home | **Community and Environment**| **Drinking Water Home** | **Drinking Water Contacts**
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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

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 55990Y - MONTERRA

Collect Date	12/28/2016
Lab Number	010
Lab Name	Spectra Laboratories - Kitsap, LLC
Sample Number	97102
Source	03
Analyte Group	IOC-INORGANIC CONTAMINANTS
Test Panel	IOC-COMPLETE INORGANIC ANALYSIS
Sample Location	ph s/t
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
0010	MANGANESE	EQ	0.0740	0.0500	0.0100	mg/L
0004	ARSENIC	EQ	0.0020	0.0104	0.0010	mg/L
0009	LEAD	EQ	0.0010		0.0010	mg/L
0014	SODIUM	EQ	9.4100		5.0000	mg/L
0015	HARDNESS	EQ	129.0000		10.0000	mg/L
0016	CONDUCTIVITY	EQ	266.0000	700.0000	70.0000	Umhos/cm
0017	TURBIDITY	EQ	0.3500		0.1000	NTU
0019	FLUORIDE	EQ	0.1000	4.0000	0.2000	mg/L
0020	NITRATE-N	EQ	0.1600	10.0000	0.5000	mg/L
0021	CHLORIDE	EQ	6.1400	250.0000	20.0000	mg/L
0161	TOTAL NITRATE/NITRITE	EQ	0.1600		0.5000	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
0022	SULFATE	LT	50.0000	250.0000	50.0000	mg/L
0023	COPPER	LT	0.0200		0.0200	mg/L
0024	ZINC	LT	0.2000	5.0000	0.2000	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

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View Sample Detail - WSID 55990Y - MONTERRA

Collect Date	5/19/2020
Lab Number	094
Lab Name	Eurofins Eaton LLC - Pomona
Sample Number	30023
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

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

Mail:
PO BOX 47822
Olympia, WA 98504-7822

View Sample Detail - WSID 55990Y - MONTERRA

Collect Date	12/31/2018
Lab Number	046
Lab Name	Edge Analytical - Burlington
Sample Number	01341
Source	03
Analyte Group	SOC-SYNTHETIC ORGANIC CONTAMINANTS
Test Panel	HERB1-CHLOROPHENOXY HERBICIDES
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
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
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
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 - 11 of 11

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

Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

View Sample Detail - WSID 55990Y - MONTERRA

Collect Date	11/17/2009
Lab Number	046
Lab Name	Edge Analytical - Burlington
Sample Number	38159
Source	03
Analyte Group	SOC-SYNTHETIC ORGANIC CONTAMINANTS
Test Panel	PEST1-GENERAL PESTICIDE SUITE
Sample Location	s03
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
0033	ENDRIN	LT	0.0500	2.0000	0.0100	ug/L
0034	LINDANE (BHC - GAMMA)	LT	0.0400	0.2000	0.0200	ug/L
0035	METHOXYCHLOR	LT	10.0000	40.0000	0.1000	ug/L
0036	TOXAPHENE	LT	2.0000	3.0000	1.0000	ug/L
0117	Alachlor	LT	0.4000	2.0000	0.2000	ug/L
0118	ALDRIN	LT	0.1000		0.1000	ug/L
0119	ATRAZINE	LT	0.5000	3.0000	0.1000	ug/L
0120	BENZO (A) PYRENE	LT	0.0400	0.2000	0.0200	ug/L
0121	BUTACHLOR	LT	0.4000		0.1000	ug/L
0122	CHLORDANE (TOTAL)	LT	0.4000	2.0000	0.2000	ug/L
0123	DIELDRIN	LT	0.1000		0.1000	ug/L
0124	DI (ETHYLHEXYL) ADIPATE	LT	1.3000	400.0000	0.6000	ug/L
0125	DI (ETHYLHEXYL) PHTHALATE	LT	1.3000	6.0000	0.6000	ug/L
0126	HEPTACHLOR	LT	0.0900	0.4000	0.0400	ug/L
0127	HEPTACHLOR EPOXIDE	LT	0.1000	0.2000	0.0200	ug/L
0128	HEXACHLOROBENZENE	LT	0.5000	1.0000	0.1000	ug/L
0129	HEXACHLOROCYCLO PENTADIENE	LT	0.5000	50.0000	0.1000	ug/L
0130	METOLACHLOR	LT	1.0000		0.1000	ug/L
0131	METRIBUZIN	LT	0.2000		0.1000	ug/L
0132	PROPACHLOR	LT	0.1000		0.1000	ug/L
0133	SIMAZINE	LT	0.1500	4.0000	0.0700	ug/L
0134	PENTACHLOROPHENOL	LT	0.2000	1.0000	0.0400	ug/L
0153	PCB (AS TOTAL AROCHLORS)	LT	0.5000	0.5000	0.5000	ug/L
0173	AROCHLOR 1221	LT	100.0000		20.0000	ug/L
0174	AROCHLOR 1232	LT	2.5000		0.5000	ug/L

Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

Help

View Sample Detail - WSID 55990Y - MONTERRA

Collect Date	9/28/2021
Lab Number	094
Lab Name	Eurofins Eaton LLC - Monrovia
Sample Number	80715
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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APPENDIX M
Coliform Monitoring Plan

Coliform Monitoring Plan for: Monterra, Inc.

A. System Information

Plan Date: 2024

Water System Name: Monterra	**County:** Clallam	**System I.D. Number:** 55990 Y
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 (n/a) – 109 feet – 180 gpm S02 – Well #2 WW (n/a) – 89 feet – 180 gpm S03 – WF (S01 & S02)	
Storage: List and Describe	75,000-gallon – Concrete Reservoir	
Treatment: Source Number & Process	n/a	
Pressure Zones: Number and name	One	
Population by Pressure Zone	455	
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:** micro@edgeanalytical.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 **Routine Sample Sites**	Location/Address for **Repeat Sample Sites**	Groundwater Sources for **Triggered Sample Sites****
X1. 1622 Finn Hall Rd	**1-1. 1622 Finn Hall Road** Front hose bibb	**S01, S02, S03**
	1-2. 124 Home Lane Front hose bibb	
	1-3. Clubhouse (Parcel 043006500000) Front hose bibb	
X2. 72 Sea Bluff Ln	**2-1. 72 Sea Bluff Lane** Front hose bibb	**S01, S02, S03**
	2-2. 22 Sea Bluff Lane Front hose bibb	
	2-3. 112 Sea Bluff Lane Front hose bibb	
X3. 162 Cypress Circle	**3-1. 162 Cypress Circle** Front hose bibb	**S01, S02, S03**
	3-2. 270 Cypress Circle Front hose bibb	
	3-3. 82 Cypress Circle 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.	☒	☐	☐	☐

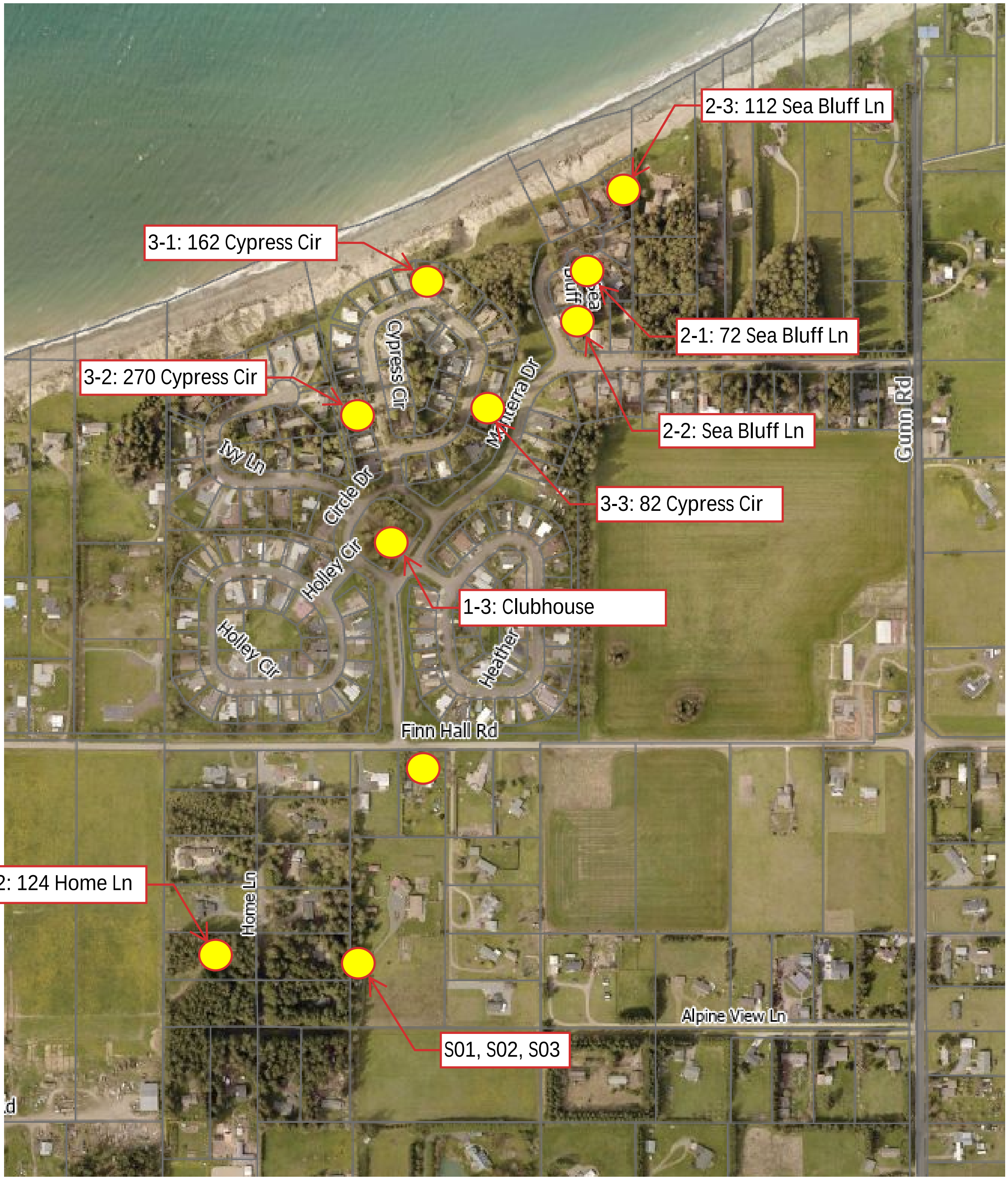
***E. coli*-Present Triggered Source Sample Response Checklist – Sources**				
Alternate Sources	**Yes**	**No**	**N/A**	**To Do List**
We can stop using this source and still provide reliable water service to our customers.	☐	☒	☐	☐
We have an emergency intertie with a neighboring water system that we 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.


2-3: 112 Sea Bluff Ln
3-1: 162 Cypress Cir
2-1: 72 Sea Bluff Ln
3-2: 270 Cypress Cir
Cypress Cir
Monterra Dr
2-2: Sea Bluff Ln
Gunn Rd
Ivy Ln
Circle Dr
3-3: 82 Cypress Cir
Holley Cir
1-3: Clubhouse
Holley Cir
Heather
Finn Hall Rd
1-2: 124 Home Ln
Home Ln
Alpine View Ln
S01, S02, S03

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:	Monterra
System ID:	55990 Y

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	8", 221' Depth	1971	80	1	2	31.0	$ 30,000	1	LS	$ 30,000	2.0%	No	$ 55,428	$ -
Well #1 Pump (Drop Pipe, Spacers, Valves, etc.)	Berkeley Model 6SALL-10, 30 HP	2000	20	5	2	0.0	$ 35,000	1	LS	$ 35,000	2.0%	Yes	$ 35,000	$ 35,000
Well #2	8", 221' Depth	1976	80	1	2	36.0	$ 30,000	1	LS	$ 30,000	2.0%	No	$ 61,197	$ -
Well #2 Pump (Drop Pipe, Spacers, Valves, etc.)	Berkeley Model 6SALL-7.5, 20 HP	2000	20	5	2	0.0	$ 35,000	1	LS	$ 35,000	2.0%	Yes	$ 35,000	$ 35,000
Well Meter		2014	25	2	1	18.1	$ 2,500	2	EA	$ 5,000	2.0%	No	$ 7,148	$ -
Well Controls		2000	15	2	2	0.0	$ 7,500	1	LS	$ 7,500	2.0%	Yes	$ 7,500	$ 7,500
Wellhouse Enclosure		1980	75	2	5	33.3	$ 70,000	1	LS	$ 70,000	2.0%	No	$ 135,224	$ -
Reservoir	25' Diameter x 20' Tall 75,000 Gallons	1989	70	1	1	39.0	$ 375,000	1	EA	$ 375,000	2.0%	No	$ 811,779	$ -
Reservoir Controls		2000	25	1	2	5.0	$ 5,000	1	LS	$ 5,000	2.0%	Yes	$ 5,520	$ 5,000
Pressure Tanks	(2) 1,100 gal Horizontal tanks	1980	30	2	3	0.0	$ 25,000	2	EA	$ 50,000	2.0%	Yes	$ 50,000	$ 50,000
Booster Pumps	(1) 5 HP, Berkeley	2018	20	1	2	18.0	$ 5,000	1	EA	$ 5,000	2.0%	No	$ 7,141	$ -
Booster Pump Controls		2018	25	1	2	23.0	$ 5,000	1	LS	$ 5,000	2.0%	No	$ 7,884	$ -
Distribution System Piping	8" PVC	1972	50	4	4	1.4	$ 175	2,085	LF	$ 364,875	2.0%	Yes	$ 375,132	$ 364,875
Distribution System Piping	6" PVC	1972	50	4	4	1.4	$ 150	5,546	LF	$ 831,900	2.0%	Yes	$ 855,286	$ 831,900
Distribution System Piping	4" PVC	1972	50	4	5	1.4	$ 100	2,768	LF	$ 276,800	2.0%	Yes	$ 284,581	$ -
Distribution System Piping	2" PVC	1972	50	4	5	1.4	$ 75	6,548	LF	$ 491,100	2.0%	Yes	$ 504,906	$ 491,100
Hydrants		1980	50	4	4	7.0	$ 5,000	7	EA	$ 35,000	2.0%	No	$ 40,204	$ -

Gate Valves	8" Valve	1972	75	4	4	18.9	$ 3,000	3	EA	$ 9,000	2.0%	No	$ 13,085	$ -
Gate Valves	6" Valve	1972	75	4	4	18.9	$ 2,500	5	EA	$ 12,500	2.0%	No	$ 18,174	$ -
Gate Valves	4" Valve	1972	75	4	5	18.9	$ 2,500	4	EA	$ 10,000	2.0%	No	$ 14,539	$ -
Gate Valves	2" Valve	1972	75	4	5	18.9	$ 2,000	5	EA	$ 10,000	2.0%	No	$ 14,539	$ -
Gate Valves	3" Valve	1980	75	4	5	24.5	$ 2,500	1	EA	$ 2,500	2.0%	No	$ 4,061	$ -
Meters		2020	20	3	5	16.0	$ 500	188	EA	$ 94,000	2.0%	No	$ 129,042	$ -
Air-release Valves		1980	20	3	4	0.0	$ 5,000	1	EA	$ 5,000	2.0%	Yes	$ 5,000	$ 5,000
Blow-offs		1980	20	3	4	0.0	$ 5,000	3	EA	$ 15,000	2.0%	Yes	$ 15,000	$ 15,000
Propane Tank		2022	30	1	3	32.0	$ 5,000	2	EA	$ 10,000	2.0%	No	$ 18,845	$ -
Generator		2022	50	1	3	52.0	$ 50,000	2	EA	$ 100,000	2.0%	No	$ 280,033	$ -
Check Valves	3" Valve	1980	75	4	5	24.5	$ 2,500	1	EA	$ 2,500	2.0%	No	$ 4,061	$ -
Check Valves	4" Valve	1980	75	4	5	24.5	$ 2,500	1	EA	$ 2,500	2.0%	No	$ 4,061	$ -
Pumphouse		1980	50	2	4	9.5	$ 65,000	1	LS	$ 65,000	2.0%	No	$ 78,454	$ -
Fire Pump		1980	50	4	2	7.0	$ 10,000	1	EA	$ 10,000	2.0%	No	$ 11,487	$ -
Misson Controls	SCADA Data Logger	2020	30	1	3	26	$ 15,000	1	EA	$ 15,000	2.0%	No	$ 25,101	$ -
									Total System Value:	$ 3,015,175			Estimated Near-Term Upgrade Costs:	$ 1,840,375

APPENDIX O
System Equipment Specifications

Fire Pump - Pump Curve

BERKELEY® B3ZRM

HEAVY DUTY PUMPS

- Dimensionally interchangeable with the standard design
- Incorporates ten of the industry's best product features
- Provides the best operating and maintenance benefits available

Features / Benefits

Heavy-duty Bearing Frame
Dimensionally interchangeable with the Standard Bearing Frame. Designed to maximize LT bearing life.

Sealed Bearings
No in-field greasing is required. Keeps dirt and debris out of bearing.

Improved Bearing Retention Method
Allows for extended dependability with minimal maintenance.

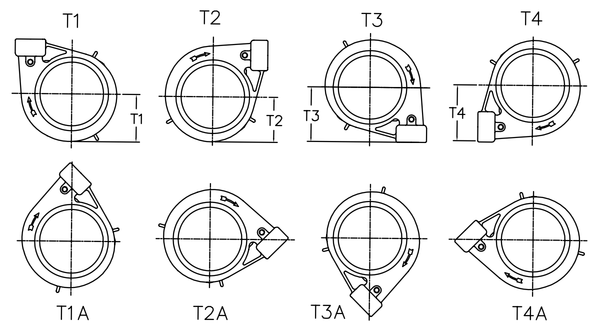
O-Ring Casing Seal (vs. Gasket)
Better sealing method, more convenient for assembly/disassembly; allows easy rotation.

Hefty 1-1/4" Keyed Impeller Shaft
Delivers excellent reliability and durability under all types of operating conditions. Offers easier removal and reduces shaft kit inventory for repairs.

416 S.S. Slip-fit Shaft Sleeve
Offers safer, faster and easier maintenance. Sleeve installation does not require a torch, heat or cooling time, which can cause sticking or galling of the shaft.

Cast Iron Impellers
Fine grained and precision cast to ASTM A48 Class 30.

Casing
Available in CW and CCW models, with either NPT, Flanged or Victaulic connections. Casing can be rotated every 45 degrees for convenient mounting.



Note: Options T1A - T4A are rotated 45° from T1 - T4.

Packed Stuffing Box Design
2-piece packing glands; large opening is easily accessed on either side for improved serviceability.

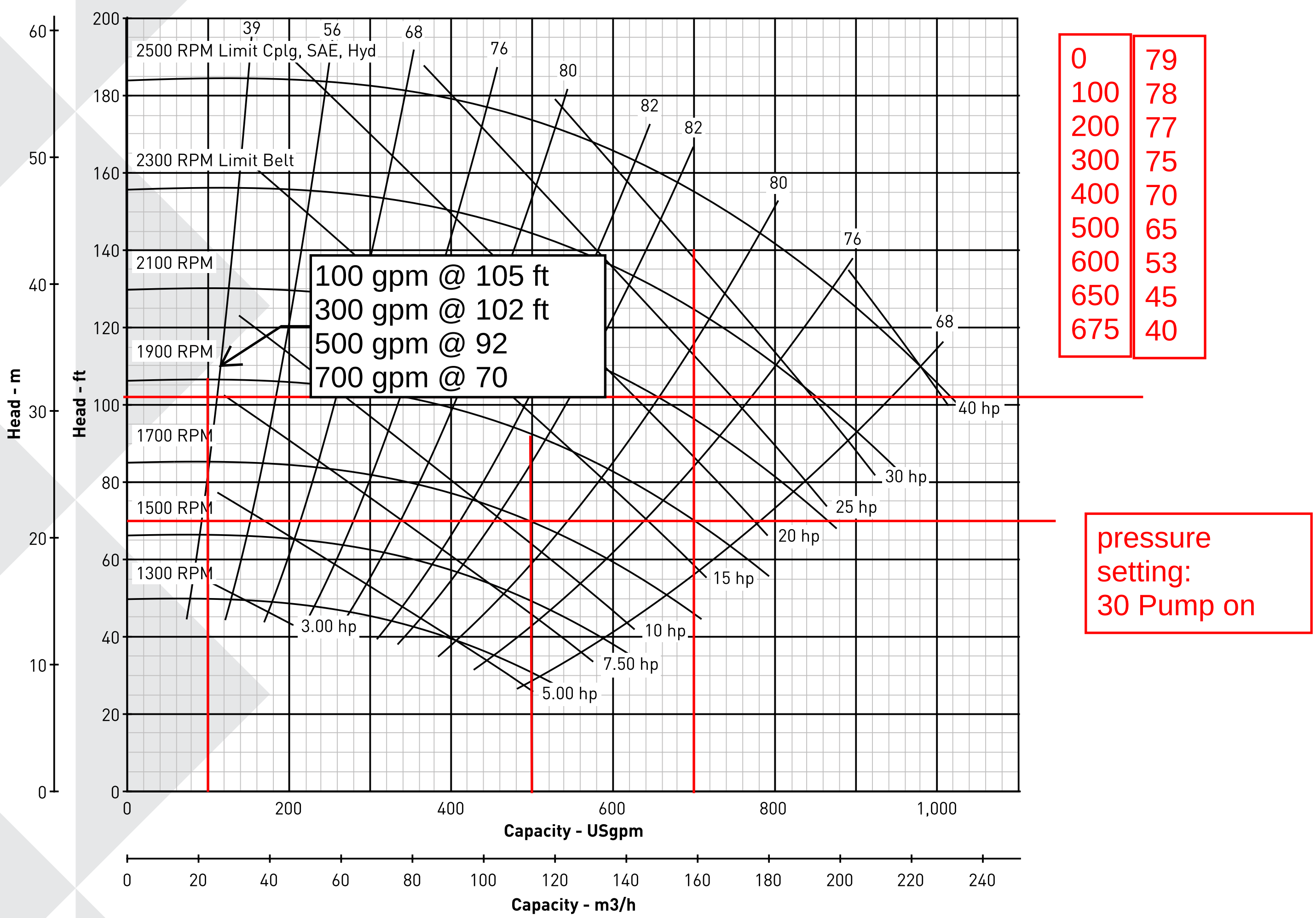
Improved Bolt Clearance
More working room for easier installation.

BERKELEY® B3ZRM

Materials of Construction

Part Name	Material	Spec Number
Volute Case	Cast Iron	ASTM A48 Class 30
Impeller	Cast Iron	ASTM A48 Class 30
Adaptor Bracket	Cast Iron	ASTM A48 Class 30
Shaft Sleeve	416 S.S.	AISI 416SS
Packing	Graphite impregnated PTFE packing	

Pump Size: 3 x 4 x 9 M 9" Diameter Impeller Nominal RPM: VARIOUS
Based on Fresh Water @ 68 deg. F.
Maximum Working Pressure: 266 PSI



PENTAIR

293 WRIGHT STREET, DELAVAN, WI 53115 WWW.BERKELEYPUMPS.COM
PH: 888-237-5353 ORDERS FAX: 800-321-8793

Because we are continuously improving our products and services, Pentair reserves the right to change specifications without prior notice.

Well Pumps - Pump Curves

Well 1 Pump

BERKELEY ®

...P COMPANY

SUBMERSIBLE TURBINE PUMPS

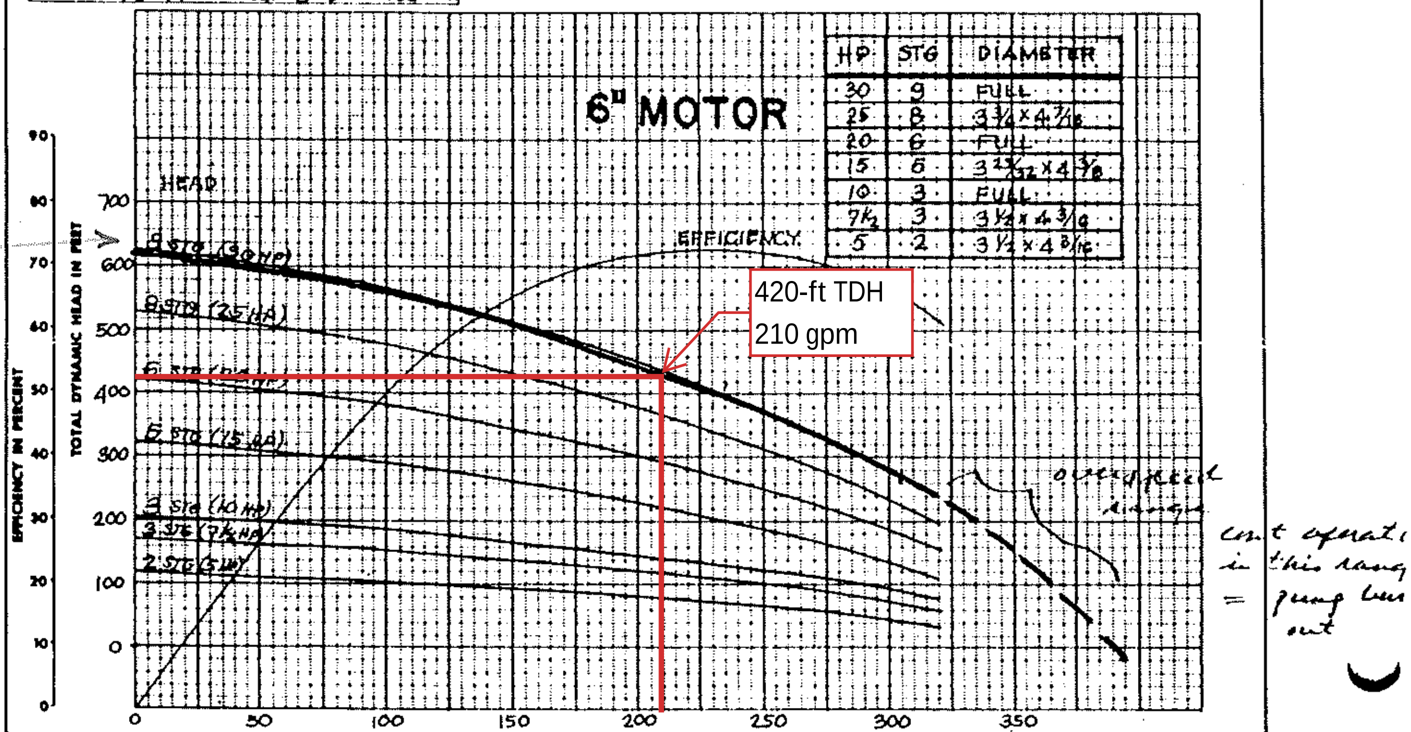
6" AND 7" BOWLS

PERFORMANCE CURVES

CURVE	2500
DATE	6-5-78
PAGE	1.72
SUPERSEDES	
NEW	

	Bowl	Impeller
Material	C.I.	BRZ.
Patt. No.	M-4039	M-4043
Mach. No.	M-4461	M-4043
Diameter	5-3/4" UNITOD	3-7/8 x 4-17/32" FULL

Based on T– 3230 Test of Stage Pump.
Performance for MULTI Stage Pump.



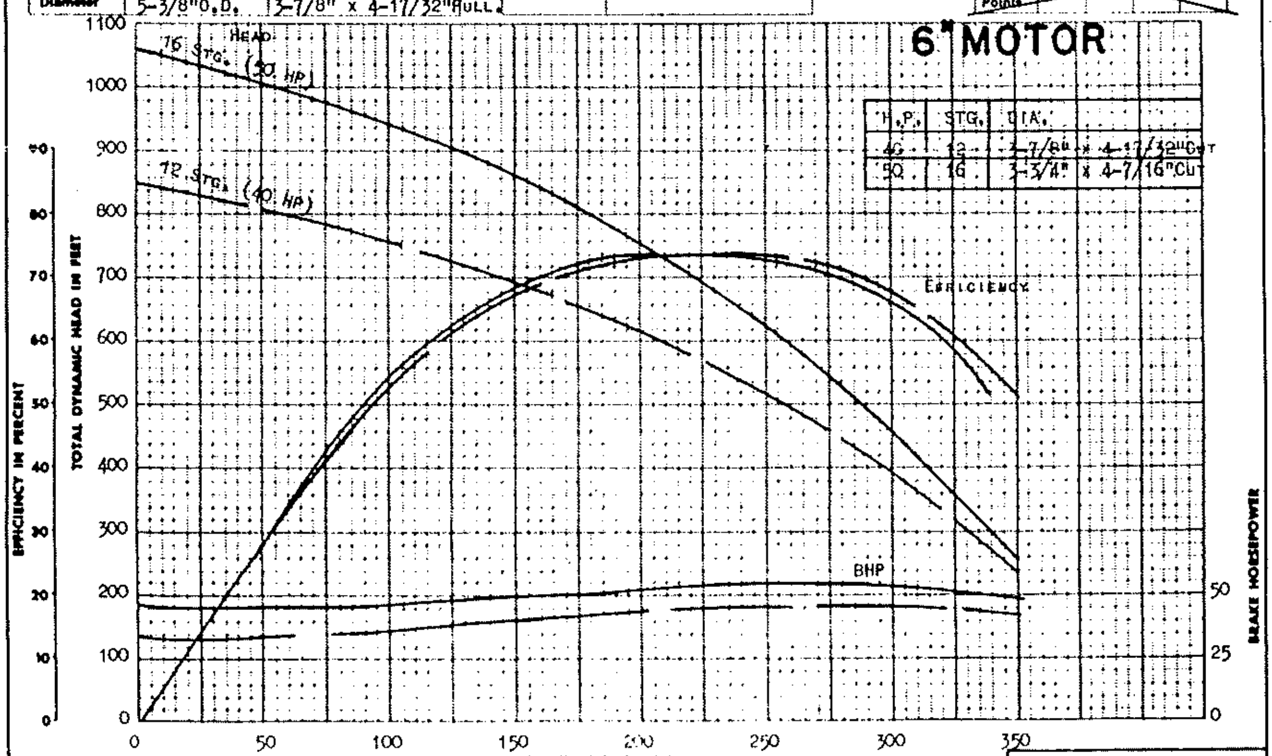
C-5694 Issue Date 5-18-78 (Supersedes C-5694 Dated 2-2-78) NOMINAL 3600 R.P.M.

MODEL **6S2AM**

	Bowl	Impeller	Letter	Impeller Diameter
Material	C.I.	Brz.		
Patt. No.	M-4039	M-4043		
Mach. No.	M-4461	M-4043		
Diameter	5-3/8" O.D.	3-7/8" x 4-17/32" FULL		

Based on T– 3230 Test of 6 Stage Pump.
Performance for 12 & 16 Stage Pump.
Adjust Efficiency for Stages Used:

Stages				
Points				



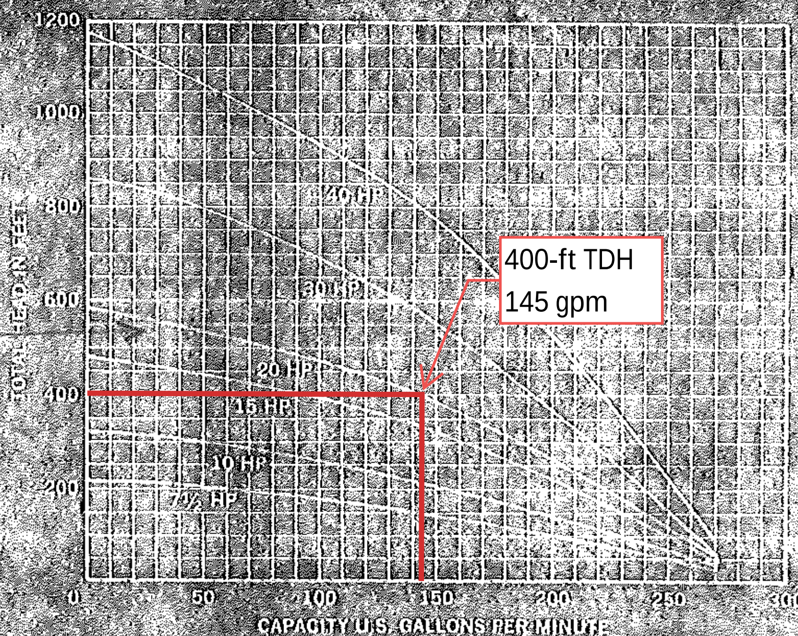
Well #1

C-8140 Issue Date 4-2-76 (Supersedes NEW Dated –) 3600 Nom. R.P.M.

MODEL **6S2AM**

Well 2 Pump

DESIGN SERIES 190
SUBMERSIBLE PUMPS



DISCH PRESS	HP	HEAD IN FEET — PUMPING LEVEL — DISCHARGE PIPE FRICTION LOSSES NOT INCLUDED																	
		20	40	60	80	100	150	200	250	300	350	400	450	500	600	700	800	900	1000
		GALLONS PER MINUTE																	
0	7½	260	245	230	215	200	135	95											
	10	270	260	250	238	228	193	150	108	50									
	15		265	260	253	245	227	205	183	155	128	90	40						
	20		270	265	258	255	240	222	205	135	164	140	114	78					
	30		270	267	262	259	249	240	230	218	206	194	180	165	134	95	45		
	40			270	266	262	256	250	243	235	228	220	212	204	185	165	140	112	75
20	7½	230	213	195	170	142	50												
	10	248	236	225	213	196	159	113	57										
	15	258	250	245	238	230	210	187	160	130	90	45							
	20	263	258	253	247	240	225	208	188	168	145	118	83	40					
	30	265	262	258	254	250	240	230	220	209	195	183	167	152	118	67			
	40	269	265	262	260	257	250	243	237	228	220	214	205	195	177	155	128	95	58
30	7½	205	186	164	135	100													
	10	283	220	208	191	175	135	85											
	15	249	242	235	226	220	198	173	145	113	69								
	20	255	250	245	239	233	215	191	176	155	130	100	60						
	30	260	256	252	248	245	235	225	213	202	187	175	160	144	110	50			
	40	265	262	259	256	253	247	240	232	225	217	208	200	190	170	160	120	86	27
40	7½	186	163	135	95	60													
	10	220	208	192	175	160	115	60											
	15	242	235	226	218	210	188	160	133	97	50								
	20	250	245	239	232	225	208	188	168	145	120	85	45						
	30	257	253	248	245	240	230	220	209	196	183	168	154	137	100	35			
	40	262	259	256	254	250	244	237	230	222	214	205	196	187	166	143	115	80	15
50	7½	160	125	90	55														
	10	205	187	173	158	140	92												
	15	233	225	217	210	200	175	149	115	75	50								
	20	244	238	230	225	217	200	178	158	133	120	65							
	30	252	248	244	240	235	227	215	203	190	183	161	145	130	90	20			
	40	259	256	254	251	248	241	234	225	217	213	201	192	183	162	135	100	66	
60	7½	120	80	40															
	10	185	170	153	137	115	60												
	15	225	215	206	197	188	160	133	97	45									
	20	235	230	222	215	208	188	168	145	115	85	44							
	30	247	243	239	235	230	220	209	196	180	168	154	138	120	78				
	40	255	253	250	247	244	237	230	221	212	205	196	187	177	155	130	98	42	

Tested and rated in accordance with Water Systems Council standards.

SOLD AND SERVICED BY:

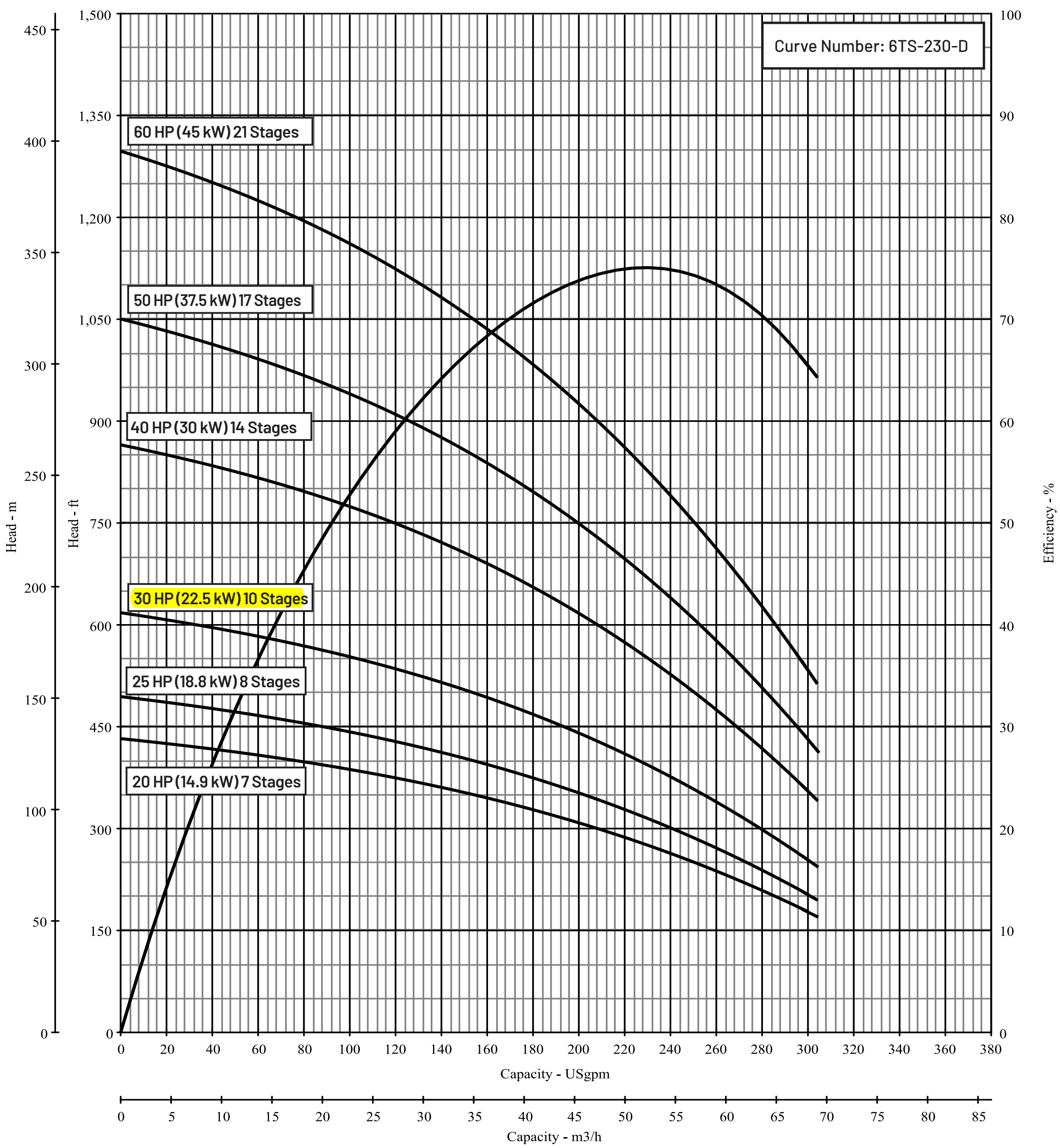
well # 2

STA-RITE INDUSTRIES, INC.
WATER EQUIPMENT DIVISION
• Delavan, Wis. • Los Angeles, Calif.
• Orlando, Fla. • Ft. Worth, Tex.
• Chamblee, Ga. • Mundelein, Ill.
• East Brunswick, N.J.

6TS SERIES 6" STAINLESS STEEL

Series Name: **6TS-230** **Pump Size:** 6TS-230

Department of Energy Requirements		Available Configurations		Curve Conditions	
PEI$_{CL}$	0.91	Submersible Turbine	6TS-230	Nominal RPM	3475
Model	6TS-230			Maximum Working Pressure	625 PSI (43 BAR)
Imp. Dia. (in.)	4.134			Based on Fresh Water @ F	68



This product as sold in U. S. is regulated by 10 CFR Parts 429 and 431.

Booster Pump - Pump Curve

Booster pump B 1½ TPL-5hp
AT Reservoir

BERKELEY PUMPS
Pumptron Division—Transamerica Delaval Inc.

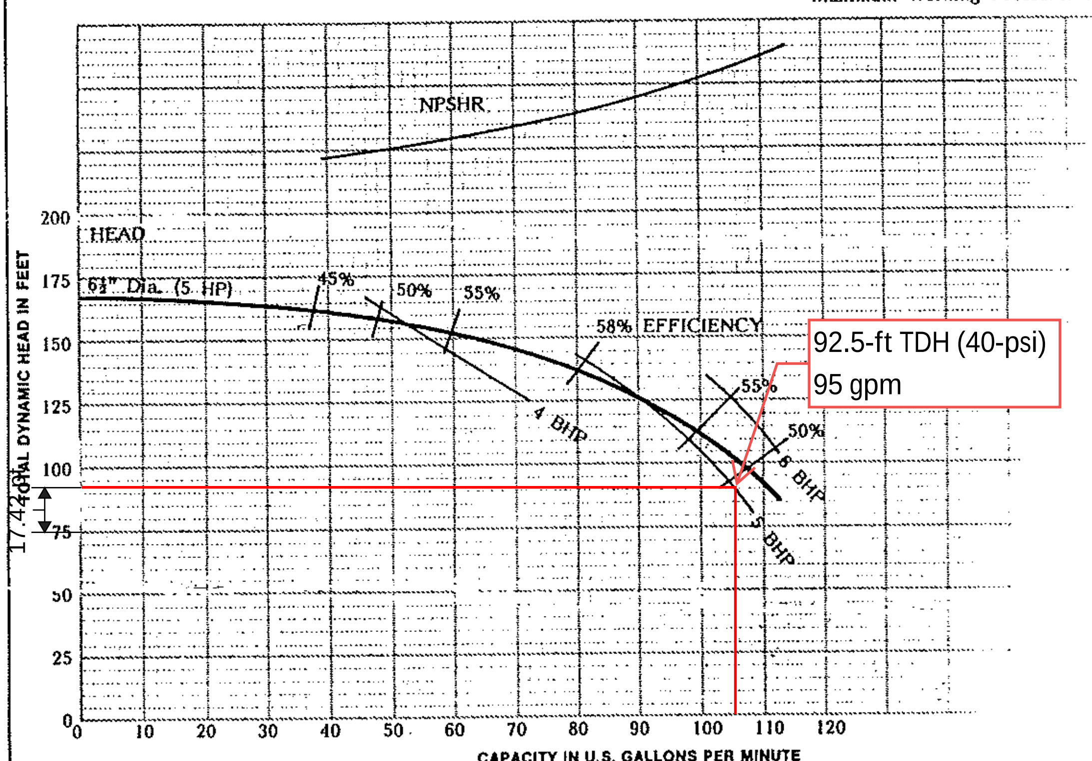
BERKELEY®

TYPE "B" RATING CURVES
MOTOR DRIVE

CURVE	
DATE	
PAGE	
SUPERSEDES	
All previous ...	
4075 C ...	

Case: Material C.I. Patt. No. L01018 Mach. No. L01018
Impeller: Material C.I. Patt. No. S07367 Mach. No. S07367 Dia. 6½ Full

Nominal R.P.M. 3600
Based on Fresh Water @ 80° F.
Maximum Working Pressure: 150 PSI



C-5035 Based on T-3207 Supersedes C-5035 Dated 3-1-72 Date 7-30-85

ELECTRIC BOOSTER

APPENDIX P
System Capacity Calculations

WATER SYSTEM INFORMATION

System:	Monterra
PWS ID:	55990 Y
Location:	Clallam County, Washington
Owner:	Cascadia Water
Operator:	Cascadia Water

Operating Permit	
Issue Date	9/1/2022
Color	Green

Water Facilities Inventory (WFI) Form	
Date Printed	4/23/2019
Active Residential Connections	188
Active Residential Population	455
Active Non-Residential Connections	0
Average Non-Residential Population	0
Approved Connections	203

WATER USAGE DATA

2019

Month	Days	Usage (Cubic Feet)	Usage (Gallons)	GPD/ERU	% Change from Previous Year
January	31	84,152	629,500	108	
February	28	78,203	585,000	111	
March	29	88,617	662,900	122	
April	31	102,614	767,600	132	
May	30	161,072	1,204,900	214	
June	30	238,447	1,783,700	316	
July	31	273,592	2,046,600	351	
August	31	261,146	1,953,500	335	
September	30	94,218	704,800	125	
October	31	85,275	637,900	109	
November	30	74,327	556,000	99	
December	32	84,780	634,200	105	
SYSTEM TOTAL	364	1,626,443	12,166,600	178	
Summer days	122				

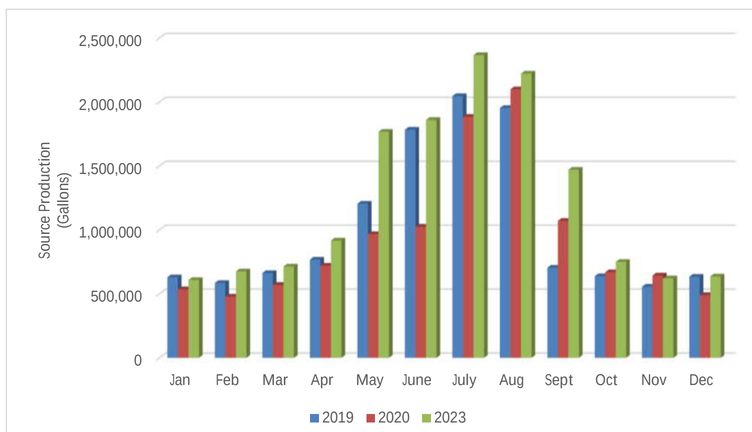
2021

Month	Days	Usage (Cubic Feet)	Usage (Gallons)	GPD/ERU	% Change from Previous Year
January	30	81,345	608,500	108	12.0%
February	30	90,382	676,100	120	
March	28	95,435	713,900	136	20.1%
April	26	122,532	916,600	188	
May	28	236,241	1,767,200	336	45.3%
June	28	248,620	1,859,800	353	
July	30	316,396	2,366,800	420	20.4%
August	32	297,093	2,222,400	369	
September	33	196,645	1,471,000	237	27.2%
October	27	100,261	750,000	148	
November	31	83,043	621,200	107	-3.6%
December	31	85,061	636,300	109	
SYSTEM TOTAL	354	1,953,053	14,609,800	220	23.6%
Summer days	118				

2020

Month	Days	Usage (Cubic Feet)	Usage (Gallons)	GPD/ERU	% Change from Previous Year
January	31	71,613	535,700	92	-17.5%
February	28	64,006	478,800	91	
March	32	76,225	570,200	95	-16.3%
April	30	96,250	720,000	128	
May	30	129,229	966,700	171	-24.6%
June	31	137,023	1,025,000	176	
July	31	251,985	1,884,970	323	-8.6%
August	28	280,703	2,099,800	399	
September	33	143,226	1,071,400	173	34.2%
October	30	89,419	668,900	119	
November	31	86,024	643,500	110	13.6%
December	31	65,571	490,500	84	
SYSTEM TOTAL	366	1,491,274	11,155,470	162	-9.1%
Summer days	120				

Month	2019	2020	2021	
Jan	629,500	535,700	608,500	
Feb	585,000	478,800	676,100	
Mar	662,900	570,200	713,900	
Apr	767,600	720,000	916,600	
May	1,204,900	966,700	1,767,200	
June	1,783,700	1,025,000	1,859,800	
July	2,046,600	1,884,970	2,366,800	
Aug	1,953,500	2,099,800	2,222,400	
Sept	704,800	1,071,400	1,471,000	
Oct	637,900	668,900	750,000	
Nov	556,000	643,500	621,200	
Dec	634,200	490,500	636,300	
Total	12,166,600	11,155,470	14,609,800	
ADD	178	162	220	
Summer usage	6,988,700	5,976,470	8,216,200	
ADD (Summer*)	305	265	370	
max usage	2,046,600	2,099,800	2,366,800	
MADD (Summer*)	351	399	420	
MDD	579	658	692	



CONNECTIONS BASED ON WATER USE DATA

System: Monterra
PWS ID: 55990 Y
Location: Clallam County, Washington

Year	Active Connections	Active Metered	Active Unmetered	Ready to Serve	Committed Connections
2019	188	188	0		
2020	188	188	0		
2021	188	188	0		

Proposed Connections	203

WATER RIGHTS SUMMARY

System: Monterra
PWS ID: 55990 Y
Location: Clallam County, Washington

Certificate #	Name	Priority Date	Source Name	Primary or Supplemental	Q_i (gpm) Additive	Q_a (acre-ft) Additive	
G2-01131 C	Monterra Incorporated	03/03/71	2 Wells	Primary	370	75	
				Total	370.0	75	Total
				max flow per day (gal)	532,800	3,267,000	annual water rights (CF/yr)
				max flow per year (gal)	194,472,000	24,437,160	annual water rights (gal/yr)
						66,951	avg available daily water rights (gal)

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)	60
pump run per day (min)	1440

WRSE					
connections (ERU)	waterusgae	conversion (Va)		acre-ft	
188	15,063,777		2013873.909	46.2	**Current**
305	24,438,574		3267189.054	75.00434	**Limiting Factor**
203	16,265,674		2174555.337	49.92092	**Doh Approved**
201	16,105,421		2153131.147	49.4	**10 year build out**
222	17,788,077		2378085.147	54.6	**20 year build out**

SOURCE INFORMATION

System: Monterra
PWS ID: 55990 Y
Location: Clallam County, Washington

Source				
Status	Active			Emergency
Source ID	Well 1 - S01	Well 2 - S02	Well Field S03	
DOE Well Tag	No tag	No tag		
Category	Well	Well	Well Field	
Use	Permanent	Permanent	Permanent	
Treatment	None	None	None	
Capacity (gpm)	210	145	355	
Depth to First Interval (ft)	109	89		
Casing (in)	8	8		
Screen Diameter (in)				
Location				
1/4, 1/4	SW NE	SW NE	SE NE	
Section	7	7	7	
Township	30N	30N	30N	
Range	04E	04E	04E	

DEMAND BASED ON WATER USE DATA

System: Monterra
PWS ID: 55990 Y
Location: Clallam County, Washington

Year	Active Connections	Annual Withdrawal (gal)	Annual Withdrawal (ac-ft)	Annual Usage (gal)	Summer* Usage (gal)	Maximum Month Usage (gal)	Annual ADD (gpd)	Summer* ADD (gpd)	Maximum Month ADD (gpd)	Annual ADD (gpd/ERU)	Summer* ADD (gpd/ERU)	MMADD (gpd/ERU)	MDD** (gpd/ERU)
2019	188	12,166,600	37.3	12,166,600	6,988,700	2,046,600	33,425	57,284	66,019	178	305	351	579
2020	188	11,155,470	34.2	11,155,470	5,976,470	2,099,800	30,479	49,804	74,993	162	265	399	658
2021	188	14,609,800	44.8	14,609,800	8,216,200	2,366,800	41,271	69,629	78,893	220	370	420	692.4
	Average	12,643,957	38.8	12,643,957	7,060,457	2,171,067	35,058	58,906	73,302	191	313	409	643
	Minimum	11,155,470	34.2	11,155,470	5,976,470	2,046,600	30,479	49,804	66,019	162	265	351	579
	Maximum	14,609,800	44.8	14,609,800	8,216,200	2,366,800	41,271	69,629	78,893	220	370	420	692

* May through August
** MDD = 1.65(MMADD)

	Proposed	
ADD	220	gpd/ERU
MDD	700	gpd/ERU

SOURCE-BASED PHYSICAL CAPACITY

System: Monterra
PWS ID: 55990 Y
Location: Clallam County, Washington

WATER RIGHT CALCULATIONS

Based on Annual Volume & Average Day Demand (Eqn 4-4b):

$N = Q_a/(365*ADD)$

Where: N = Number of Service Connections, ERUs
Q_a = Annual Volume of Water Available from All Sources, as limited by Water Right (gallons/year)
ADD = Average Daily Demand per ERU (gpd/ERU)

	V_a (gal/year)	ADD (gpd/ERU)	N (ERUs)
Potential Connections	24,437,160	220	305

Based on Instantaneous Flow & Maximum Day Demand (Eqn 4-4a):

$N = V_d/MDD = (Q_i*t_d)/MDD$

Where: N = Number of Service Connections, ERUs
V_d = Total Volume of Water Available for Maximum Day's Demand (gpd)
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	370.0	60	1440	700	761

SOURCE CALCULATIONS

Individual Source Capacity (Eqn 4-1):

$V_j = Q_j*t_j$

Where: Vj = Total volume for source "j" over a specified period of time (gal/specified time period)
Qj = Delivery rate of source (gal/unit time)
tj = Time that flow (Qj) was delivered from source "j"

Theoretical Total Source Capacity (Eqn 4-2):

$V_T=sum(Q_i*T_i)$

Where: V_T = Total volume of water available to the system over a specified period of time (gal/specified time period)
Q_i = Delivery rate of source (gal/unit time)
t_i = Time that flow (Q_i) was delivered from source "j"

Source ID	Well 1 - S01	Well 2 - S02	Well Field S03		
Q_j Delivery Rate (gpm)	210	145	355		
Max Pump Time (min/day)	1200	1200	1200		
Max Days Pumped (days/yr)	365	365	365		
V_j Source Capacity (gal/yr)	91,980,000	63,510,000	155,490,000		

Q_s = 355 gpm

V_T = 155,490,000 gal/yr

Based on Source Production & Maximum Day Demand (Eqn 4-3):

$N = V_T/MDD = (Q_s*t_d)/MDD$

Where: N = Number of Service Connections, ERUs
V_T = Total Volume of Water Available for Maximum Day's Demand (gpd)
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	355	50	1200	700	609

BOOSTER PUMP CALCULATIONS

Based on Booster Pump Production & Maximum Day Demand:

N= [(PHD - 18)1440/MDD -F]/C

Where: N = Number of Service Connections, ERUs
PHD = 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	290	2.0	75	700	242

*QB based on the capacity of the system pump, and 1 well pump
The available booster pump capacity is from 2 well pumps, a system pump

SUMMARY

ERUs	Condition	Limiting Factor
305	Water Right	V_a & ADD
761	Water Right	Q_i & MDD
609	Source	Q_s & MDD
242	Booster Pump	Q_B & MDD

40
92.4

0.43956044

System Capacity: 242 ERUs

Limited by: QB & MDD Booster Pump
Proposed connections: 242 ERUs

PEAK HOUR DEMAND (PHD) CALCULATION

System: Monterra
PWS ID: 55990 Y
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)	
700	188	2	75	237	2020 ERUs
700	203	2	75	252	Current DOH Approved
700	305	1.8	125	346	System Capacity
700	193	2	75	242	2029
700	218	2	75	266	2043
700	370	1.8	125	403	max number of connections

year	**residents**	**ERUs 2.42**	**ERUs 2.5**

STORAGE CAPACITY CALCULATIONS

System: Monterra
ID No.: 55990 Y
Location: Clallam County, Washington

Demands	
N (ERUs)	242
ADD (gpd/ERU)	220
MDD (gpd/ERU)	700
PHD (gpm)	346

Sources

Source ID	Delivery Rate (gpm)	
Well 1	210	
Well 2	145	
0	0	
0	0	
Q_s =	355	
Q_s =	370	water right limited
Q_L =	210	largest source

Reservoirs

Reservoir ID	Diameter (ft)	Area (ft^2)	Height (ft)	Base Elevation (ft)	Volume (gal)	VF (gal/ft)
Reservoir 1 (Circular)	25	500.7	20	130	74,911	3,746
					0	0
				Total	74,911	3,746

Top Dead Storage (TDS)

Depth (ft)	Volume (gal)
1.00	3,746

Operational Storage (OS)

Depth (ft)	Volume (gal)
1.0	3,746

Required Equalizing Storage (ES)

PHD (gpm)	Q_s (gpm)	Volume (gal)	Depth (ft)
346	355	0	0.0

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 **	242	700	n/a	n/a	169,590	45.3
Minimum ***	242	200	n/a	n/a	48,454	12.9
Optional Reduction ****	242	700	355.0	210.0	-4,410	-1.2
				Recommended SB	48,454	12.9

* (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)]

Available Standby Storage (SB)

Volume (gallons)	Depth (ft)	N (ERUs)	SB_i (gal/ERU)
65,547	17.5	242	271

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 = FF*t_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	1,873

Available Storage Summary

Component	Volume (gal)	Depth of Storage Component (ft)
TDS	3,746	1.0
OS	3,746	1.0
ES	0	0.0
SB/FSS	65,547	17.5
BDS	1,873	0.5
Total	74,911	20.0

Is the available SB/FSS...

greater than recommended SB?	greater than required FSS?
yes	yes

HYDROPNEUMATIC TANK SIZING CALCULATION

System:	Monterra
PWS ID:	55990 Y
Location:	Clallam County, Washington

From DOH Water System Design Manual (Section 9.1.3)

Equation 9-2: $$V_t = \frac{P_1 - 14.7}{P_1 - P_2} x \frac{15Q_P(MF)}{N_C}$$

Where:

V_T = Total Tank Volume (gallons)
P_1 = Pump off pressure (psi)
P_2 = Pump on pressure (psi)
N_C = Pump operating cycles per hour
Q_P = Pump delivery capacity at midpoint between P_1 and P_2
MF = Multiplication Factor (See Table 9-3)

Table 3-1:

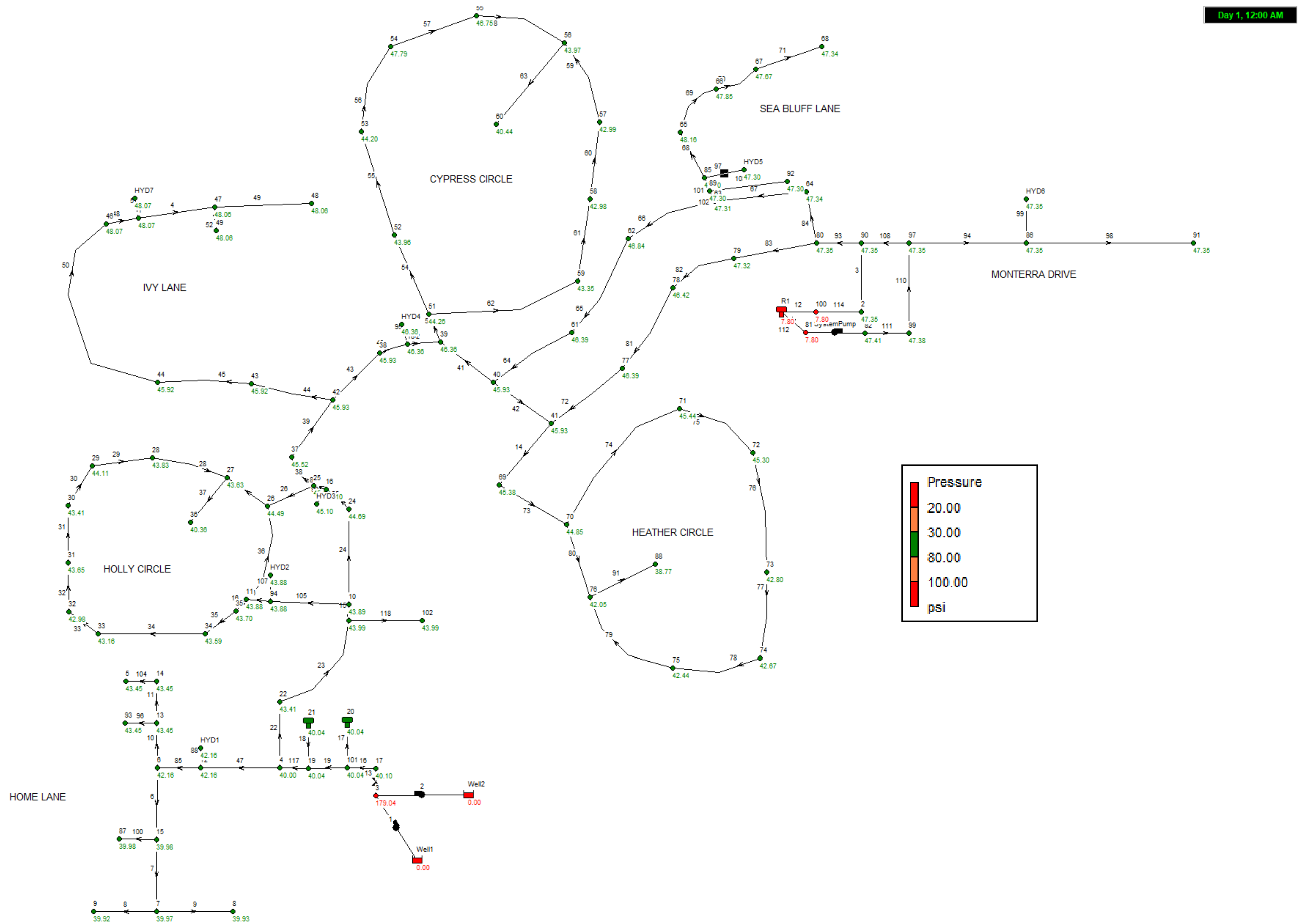
Tank Diameter (inches)	MF
12	2.00
16	1.52
20	1.34
24	1.24
30	1.17
36	1.12
48	1.08
54	1.06
60	1.05
72	1.04
84	1.03
96	1.03
120	1.02

Diameter:	48	inches
P_1:	60	psi
P_2:	40	psi
Q_1:	170	gpm
Q_2:	195	gpm
Q_P:	183	gpm

APPENDIX Q
Hydraulic Models

Monterra - Hydraulic Model
Existing Conditions - Peak Hour Demand

Monterra-PHD Scenario (Existing)



Monterra-PHD Scenario (Existing)

Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 3	150	0	563.19	179.04
Junc 4	150	0	242.33	40.00
Junc 6	145	0	242.30	42.16
Junc 7	150	0	242.25	39.97
Junc 8	150	4.41	242.16	39.93
Junc 9	150	4.41	242.14	39.92
Junc 13	142	0	242.28	43.45
Junc 14	142	0	242.27	43.45
Junc 15	150	0	242.26	39.98
Junc 17	150	0	242.54	40.10
Junc 19	150	0	242.40	40.04
Junc 22	142	0	242.19	43.41
Junc 23	140	0	241.52	43.99
Junc 24	138	0	241.13	44.69
Junc 25	137	0	241.08	45.10
Junc 26	137	0	239.68	44.49
Junc 27	136	0	236.69	43.63
Junc 28	136	0	237.16	43.83
Junc 29	136	0	237.81	44.11
Junc 30	138	0	238.19	43.41
Junc 31	138	0	238.73	43.65
Junc 32	140	0	239.20	42.98
Junc 33	140	0	239.61	43.16
Junc 34	140	0	240.61	43.59
Junc 35	140	0	240.86	43.70
Junc 36	136	45.36	229.15	40.36
Junc 37	136	0	241.05	45.52

Monterra-PHD Scenario (Existing)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 38	135	0	241.00	45.93
Junc 39	134	0	240.99	46.36
Junc 40	135	0	241.00	45.93
Junc 41	135	0	241.00	45.93
Junc 42	135	0	241.01	45.93
Junc 43	135	0	240.99	45.92
Junc 44	135	0	240.97	45.92
Junc 46	130	0	240.94	48.07
Junc 47	130	0	240.92	48.06
Junc 48	130	0	240.92	48.06
Junc 49	130	27.72	240.92	48.06
Junc 51	134	0	236.15	44.26
Junc 52	133	0	234.46	43.96
Junc 53	130	0	232.00	44.20
Junc 54	120	0	230.30	47.79
Junc 55	120	0	227.90	46.75
Junc 56	125	0	226.48	43.97
Junc 57	130	0	229.21	42.99
Junc 58	132	0	231.19	42.98
Junc 59	133	0	233.05	43.35
Junc 60	130	44.1	223.32	40.44
Junc 61	134	0	241.05	46.39
Junc 62	133	0	241.10	46.84
Junc 63	132	0	241.17	47.31
Junc 64	132	0	241.26	47.34
Junc 65	130	0	241.14	48.16
Junc 66	130	0	240.44	47.85
Junc 67	130	0	240.02	47.67

Monterra-PHD Scenario (Existing)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 68	130	13.86	239.25	47.34
Junc 69	136	0	240.73	45.38
Junc 70	137	0	240.51	44.85
Junc 71	135	0	239.86	45.44
Junc 72	135	0	239.55	45.30
Junc 73	140	0	238.79	42.80
Junc 74	140	0	238.48	42.67
Junc 75	140	0	237.95	42.44
Junc 76	140	0	237.04	42.05
Junc 77	134	0	241.06	46.39
Junc 78	134	0	241.13	46.42
Junc 79	132	0	241.21	47.32
Junc 80	132	0	241.27	47.35
Junc 81	132	0	149.99	7.80
Junc 82	132	0	241.41	47.41
Junc 88	140	44.1	229.47	38.77
Junc 90	132	0	241.28	47.35
Junc 91	132	15.75	241.27	47.35
Junc 2	132	0	241.28	47.35
Junc 10	140	0	241.29	43.89
Junc 11	140	0	241.28	43.88
Junc HYD2	140	0	241.28	43.88
Junc 12	145	0	242.30	42.16
Junc HYD1	145	0	242.30	42.16
Junc 16	137	0	241.09	45.10
Junc HYD3	137	0	241.09	45.10
Junc 18	134	0	241.00	46.36
Junc HYD4	134	0	241.00	46.36

Monterra-PHD Scenario (Existing)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 85	132	0	241.17	47.30
Junc HYD5	132	0	241.17	47.30
Junc 86	132	15.75	241.27	47.35
Junc HYD6	132	0	241.27	47.35
Junc 87	150	5.46	242.26	39.98
Junc 89	132	0	241.17	47.30
Junc 92	132	0	241.17	47.30
Junc 1	130	0	240.93	48.07
Junc HYD7	130	0	240.93	48.07
Junc 5	142	5.46	242.27	43.45
Junc 93	142	5.46	242.28	43.45
Junc 94	140	0	241.28	43.88
Junc 97	132	0	241.28	47.35
Junc 99	132	0	241.35	47.38
Junc 100	132	0	150.00	7.80
Junc 101	150	0	242.40	40.04
Junc 102	140	5.04	241.52	43.99
Resvr Well1	33	#N/A	33.00	0.00
Resvr Well2	69	#N/A	69.00	0.00
Tank 20	150	#N/A	242.40	40.04
Tank 21	150	#N/A	242.40	40.04
Tank R1	132	#N/A	150.00	7.80

Monterra-PHD Scenario (Existing)

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 6	208	4	140	14.28	0.36	0.18
Pipe 7	205	4	140	8.82	0.23	0.07
Pipe 8	190	2	140	4.41	0.45	0.59
Pipe 9	150	2	140	4.41	0.45	0.59
Pipe 10	190	4	140	10.92	0.28	0.11
Pipe 11	385	4	140	5.46	0.14	0.03
Pipe 17	10	6	140	-55.08	0.62	0.30
Pipe 18	10	6	140	50.66	0.57	0.26
Pipe 19	10	6	140	-76.93	0.87	0.56
Pipe 22	140	6	140	102.39	1.16	0.95
Pipe 23	705	6	140	102.39	1.16	0.95
Pipe 24	330	6	140	71.22	0.81	0.48
Pipe 25	80	6	140	71.22	0.81	0.49
Pipe 26	155	2	140	19.24	1.96	9.06
Pipe 27	115	2	140	33.96	3.47	25.95
Pipe 28	135	2	140	-11.40	1.16	3.43
Pipe 29	190	2	140	-11.40	1.16	3.43
Pipe 30	110	2	140	-11.40	1.16	3.43
Pipe 31	160	2	140	-11.40	1.16	3.43
Pipe 32	135	2	140	-11.40	1.16	3.43
Pipe 33	120	2	140	-11.40	1.16	3.43
Pipe 34	290	2	140	-11.40	1.16	3.43
Pipe 35	75	2	140	-11.40	1.16	3.43
Pipe 36	290	2	140	14.73	1.50	5.52
Pipe 37	170	2	140	45.36	4.63	44.34
Pipe 38	105	6	140	51.99	0.59	0.27
Pipe 39	165	6	140	51.99	0.59	0.27

Monterra-PHD Scenario (Existing)

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 40	35	6	140	24.27	0.28	0.07
Pipe 41	200	6	140	-19.83	0.23	0.05
Pipe 42	40	6	140	26.15	0.30	0.08
Pipe 43	110	6	140	24.27	0.28	0.07
Pipe 44	225	6	140	27.72	0.31	0.08
Pipe 45	215	6	140	27.72	0.31	0.08
Pipe 48	55	6	140	27.72	0.31	0.08
Pipe 49	120	6	140	0.00	0.00	0.00
Pipe 50	365	6	140	-27.72	0.31	0.08
Pipe 52	40	6	140	27.72	0.31	0.08
Pipe 53	115	2	140	44.10	4.50	42.09
Pipe 54	155	2	140	21.30	2.18	10.93
Pipe 55	225	2	140	21.30	2.18	10.93
Pipe 56	155	2	140	21.30	2.18	10.93
Pipe 57	220	2	140	21.30	2.18	10.93
Pipe 58	130	2	140	21.30	2.18	10.93
Pipe 59	220	2	140	-22.80	2.33	12.41
Pipe 60	160	2	140	-22.80	2.33	12.41
Pipe 61	150	2	140	-22.80	2.33	12.41
Pipe 62	250	2	140	-22.80	2.33	12.41
Pipe 63	75	2	140	44.10	4.50	42.09
Pipe 64	225	6	140	-45.99	0.52	0.22
Pipe 65	240	6	140	-45.99	0.52	0.22
Pipe 66	330	6	140	-45.99	0.52	0.22
Pipe 67	234	6	140	-59.85	0.68	0.35
Pipe 68	190	4	140	13.86	0.35	0.17
Pipe 69	143	2	140	13.86	1.42	4.93
Pipe 70	85	2	140	13.86	1.42	4.93

Monterra-PHD Scenario (Existing)

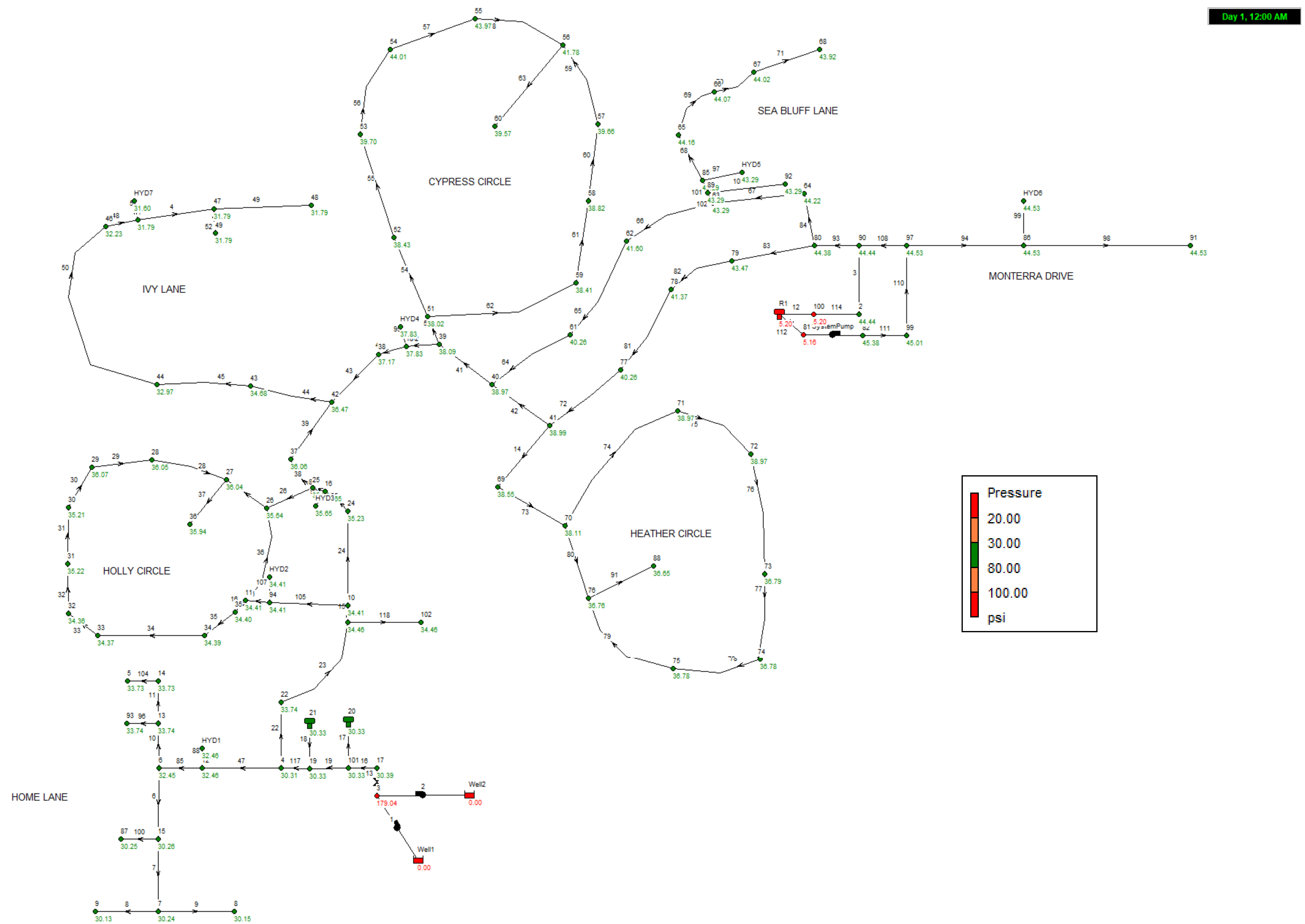
Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 71	155	2	140	13.86	1.42	4.93
Pipe 72	205	4	140	-17.95	0.46	0.27
Pipe 74	300	2	140	8.89	0.91	2.17
Pipe 75	145	2	140	8.89	0.91	2.17
Pipe 76	350	2	140	8.89	0.91	2.17
Pipe 77	140	2	140	8.89	0.91	2.17
Pipe 78	245	2	140	8.89	0.91	2.17
Pipe 79	420	2	140	8.89	0.91	2.17
Pipe 80	125	2	140	-35.21	3.60	27.74
Pipe 81	270	4	140	-17.95	0.46	0.27
Pipe 82	300	4	140	-17.95	0.46	0.27
Pipe 83	220	4	140	-17.95	0.46	0.27
Pipe 84	40	6	140	-59.85	0.68	0.35
Pipe 91	180	2	140	44.10	4.50	42.09
Pipe 93	40	8	140	-77.79	0.50	0.14
Pipe 94	460	8	140	31.50	0.20	0.03
Pipe 3	270	8	140	0.00	0.00	0.00
Pipe 12	205	8	140	0.00	0.00	0.00
Pipe 15	270	6	140	-97.35	1.10	0.86
Pipe 16	120	2	140	11.40	1.16	3.43
Pipe 47	300	6	140	25.20	0.29	0.07
Pipe 85	50	6	140	25.20	0.29	0.07
Pipe 88	25	6	140	0.00	0.00	0.00
Pipe 89	25	6	140	71.22	0.81	0.48
Pipe 90	25	6	140	0.00	0.00	0.00
Pipe 92	42	6	140	24.27	0.28	0.07
Pipe 95	25	6	140	0.00	0.00	0.00
Pipe 97	25	6	140	0.00	0.00	0.00

Monterra-PHD Scenario (Existing)

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 98	480	8	140	15.75	0.10	0.01
Pipe 99	25	8	140	0.00	0.00	0.00
Pipe 100	65	4	140	5.46	0.14	0.03
Pipe 101	35	6	140	-13.86	0.16	0.02
Pipe 102	25	6	140	-13.86	0.16	0.02
Pipe 103	170	2	140	0.00	0.00	0.00
Pipe 4	140	6	140	27.72	0.31	0.08
Pipe 5	25	6	140	0.00	0.00	0.00
Pipe 14	190	4	140	44.10	1.13	1.44
Pipe 73	150	4	140	44.10	1.13	1.44
Pipe 96	65	4	140	5.46	0.14	0.03
Pipe 104	65	4	140	5.46	0.14	0.03
Pipe 105	160	6	140	26.12	0.30	0.08
Pipe 106	20	6	140	26.12	0.30	0.08
Pipe 107	25	6	140	0.00	0.00	0.00
Pipe 108	50	8	140	77.79	0.50	0.14
Pipe 110	270	8	140	-109.29	0.70	0.26
Pipe 111	205	8	140	-109.29	0.70	0.26
Pipe 112	20	8	140	109.29	0.70	0.26
Pipe 114	10	8	140	0.00	0.00	0.00
Pipe 116	90	6	140	132.00	1.50	1.52
Pipe 117	50	6	140	127.59	1.45	1.43
Pipe 118	50	6	140	5.04	0.06	0.00
Pump 1	#N/A	#N/A	#N/A	132.00	0.00	-530.19
Pump 2	#N/A	#N/A	#N/A	0.00	0.00	0.00
Pump SystemPump	#N/A	#N/A	#N/A	109.29	0.00	-91.41
Valve 13	#N/A	6	#N/A	132.00	1.50	320.66

Monterra - Hydraulic Model
Existing Conditions - Fire Flow & Max Day Demand

Monterra-FF Scenario(Existing)



Monterra-FF Scenario(Existing)

Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 3	150	0	563.19	179.04
Junc 4	150	0	219.95	30.31
Junc 6	145	0	219.90	32.45
Junc 7	150	0	219.79	30.24
Junc 8	150	7	219.58	30.15
Junc 9	150	7	219.53	30.13
Junc 13	142	0	219.87	33.74
Junc 14	142	0	219.85	33.73
Junc 15	150	0	219.83	30.26
Junc 17	150	0	220.14	30.39
Junc 19	150	0	220.00	30.33
Junc 22	142	0	219.88	33.74
Junc 23	140	0	219.52	34.46
Junc 24	138	0	219.30	35.23
Junc 25	137	0	219.26	35.64
Junc 26	137	0	219.26	35.64
Junc 27	136	0	219.18	36.04
Junc 28	136	0	219.21	36.05
Junc 29	136	0	219.24	36.07
Junc 30	138	0	219.26	35.21
Junc 31	138	0	219.29	35.22
Junc 32	140	0	219.31	34.36
Junc 33	140	0	219.33	34.37
Junc 34	140	0	219.38	34.39
Junc 35	140	0	219.39	34.40
Junc 36	136	7	218.95	35.94
Junc 37	136	0	219.23	36.06

Monterra-FF Scenario(Existing)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 38	135	0	220.78	37.17
Junc 39	134	0	221.91	38.09
Junc 40	135	0	224.93	38.97
Junc 41	135	0	224.97	38.99
Junc 42	135	0	219.17	36.47
Junc 43	135	0	215.04	34.68
Junc 44	135	0	211.09	32.97
Junc 46	130	0	204.38	32.23
Junc 47	130	0	203.37	31.79
Junc 48	130	0	203.37	31.79
Junc 49	130	7	203.37	31.79
Junc 51	134	0	221.75	38.02
Junc 52	133	0	221.70	38.43
Junc 53	130	0	221.61	39.70
Junc 54	120	0	221.56	44.01
Junc 55	120	0	221.48	43.97
Junc 56	125	0	221.43	41.78
Junc 57	130	0	221.52	39.66
Junc 58	132	0	221.59	38.82
Junc 59	133	0	221.65	38.41
Junc 60	130	7	221.33	39.57
Junc 61	134	0	226.90	40.26
Junc 62	133	0	229.01	41.60
Junc 63	132	0	231.91	43.29
Junc 64	132	0	234.05	44.22
Junc 65	130	0	231.91	44.16
Junc 66	130	0	231.71	44.07
Junc 67	130	0	231.59	44.02

Monterra-FF Scenario(Existing)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 68	130	7	231.37	43.92
Junc 69	136	0	224.97	38.55
Junc 70	137	0	224.96	38.11
Junc 71	135	0	224.94	38.97
Junc 72	135	0	224.93	38.97
Junc 73	140	0	224.90	36.79
Junc 74	140	0	224.89	36.78
Junc 75	140	0	224.87	36.78
Junc 76	140	0	224.84	36.76
Junc 77	134	0	226.92	40.26
Junc 78	134	0	229.48	41.37
Junc 79	132	0	232.33	43.47
Junc 80	132	0	234.42	44.38
Junc 81	132	0	143.92	5.16
Junc 82	132	0	236.74	45.38
Junc 88	140	7	224.59	36.65
Junc 90	132	0	234.57	44.44
Junc 91	132	7	234.77	44.53
Junc 2	132	0	234.57	44.44
Junc 10	140	0	219.41	34.41
Junc 11	140	0	219.41	34.41
Junc HYD2	140	0	219.41	34.41
Junc 12	145	0	219.91	32.46
Junc HYD1	145	0	219.91	32.46
Junc 16	137	0	219.27	35.65
Junc HYD3	137	0	219.27	35.65
Junc 18	134	0	221.30	37.83
Junc HYD4	134	0	221.30	37.83

Monterra-FF Scenario(Existing)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 85	132	0	231.91	43.29
Junc HYD5	132	0	231.91	43.29
Junc 86	132	7	234.77	44.53
Junc HYD6	132	0	234.77	44.53
Junc 87	150	7	219.82	30.25
Junc 89	132	0	231.91	43.29
Junc 92	132	0	231.91	43.29
Junc 1	130	0	203.37	31.79
Junc HYD7	130	500	202.92	31.60
Junc 5	142	7	219.85	33.73
Junc 93	142	7	219.87	33.74
Junc 94	140	0	219.41	34.41
Junc 97	132	0	234.77	44.53
Junc 99	132	0	235.89	45.01
Junc 100	132	0	144.00	5.20
Junc 101	150	0	220.00	30.33
Junc 102	140	7	219.52	34.46
Resvr Well1	33	#N/A	33.00	0.00
Resvr Well2	69	#N/A	69.00	0.00
Tank 20	150	#N/A	220.00	30.33
Tank 21	150	#N/A	220.00	30.33
Tank R1	132	#N/A	144.00	5.20

Monterra-FF Scenario(Existing)

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 6	208	4	140	21.00	0.54	0.36
Pipe 7	205	4	140	14.00	0.36	0.17
Pipe 8	190	2	140	7.00	0.71	1.39
Pipe 9	150	2	140	7.00	0.71	1.39
Pipe 10	190	4	140	14.00	0.36	0.17
Pipe 11	385	4	140	7.00	0.18	0.05
Pipe 17	10	6	140	-60.29	0.68	0.36
Pipe 18	10	6	140	35.71	0.41	0.13
Pipe 19	10	6	140	-71.71	0.81	0.49
Pipe 22	140	6	140	72.43	0.82	0.50
Pipe 23	705	6	140	72.43	0.82	0.50
Pipe 24	330	6	140	59.02	0.67	0.34
Pipe 25	80	6	140	59.02	0.67	0.34
Pipe 26	155	2	140	0.59	0.06	0.01
Pipe 27	115	2	140	4.73	0.48	0.67
Pipe 28	135	2	140	-2.27	0.23	0.17
Pipe 29	190	2	140	-2.27	0.23	0.17
Pipe 30	110	2	140	-2.27	0.23	0.17
Pipe 31	160	2	140	-2.27	0.23	0.17
Pipe 32	135	2	140	-2.27	0.23	0.17
Pipe 33	120	2	140	-2.27	0.23	0.17
Pipe 34	290	2	140	-2.27	0.23	0.17
Pipe 35	75	2	140	-2.27	0.23	0.17
Pipe 36	290	2	140	4.14	0.42	0.52
Pipe 37	170	2	140	7.00	0.71	1.39
Pipe 38	105	6	140	58.42	0.66	0.34
Pipe 39	165	6	140	58.42	0.66	0.34

Monterra-FF Scenario(Existing)

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 40	35	6	140	-448.58	5.09	14.65
Pipe 41	200	6	140	-455.58	5.17	15.08
Pipe 42	40	6	140	-115.14	1.31	1.18
Pipe 43	110	6	140	-448.58	5.09	14.65
Pipe 44	225	6	140	507.00	5.75	18.38
Pipe 45	215	6	140	507.00	5.75	18.38
Pipe 48	55	6	140	507.00	5.75	18.38
Pipe 49	120	6	140	0.00	0.00	0.00
Pipe 50	365	6	140	-507.00	5.75	18.38
Pipe 52	40	6	140	7.00	0.08	0.01
Pipe 53	115	2	140	7.00	0.71	1.39
Pipe 54	155	2	140	3.38	0.35	0.36
Pipe 55	225	2	140	3.38	0.35	0.36
Pipe 56	155	2	140	3.38	0.35	0.36
Pipe 57	220	2	140	3.38	0.35	0.36
Pipe 58	130	2	140	3.38	0.35	0.36
Pipe 59	220	2	140	-3.62	0.37	0.41
Pipe 60	160	2	140	-3.62	0.37	0.41
Pipe 61	150	2	140	-3.62	0.37	0.41
Pipe 62	250	2	140	-3.62	0.37	0.41
Pipe 63	75	2	140	7.00	0.71	1.39
Pipe 64	225	6	140	-340.44	3.86	8.79
Pipe 65	240	6	140	-340.44	3.86	8.79
Pipe 66	330	6	140	-340.44	3.86	8.79
Pipe 67	234	6	140	-347.44	3.94	9.13
Pipe 68	190	4	140	7.00	0.18	0.05
Pipe 69	143	2	140	7.00	0.71	1.39
Pipe 70	85	2	140	7.00	0.71	1.39

Monterra-FF Scenario(Existing)

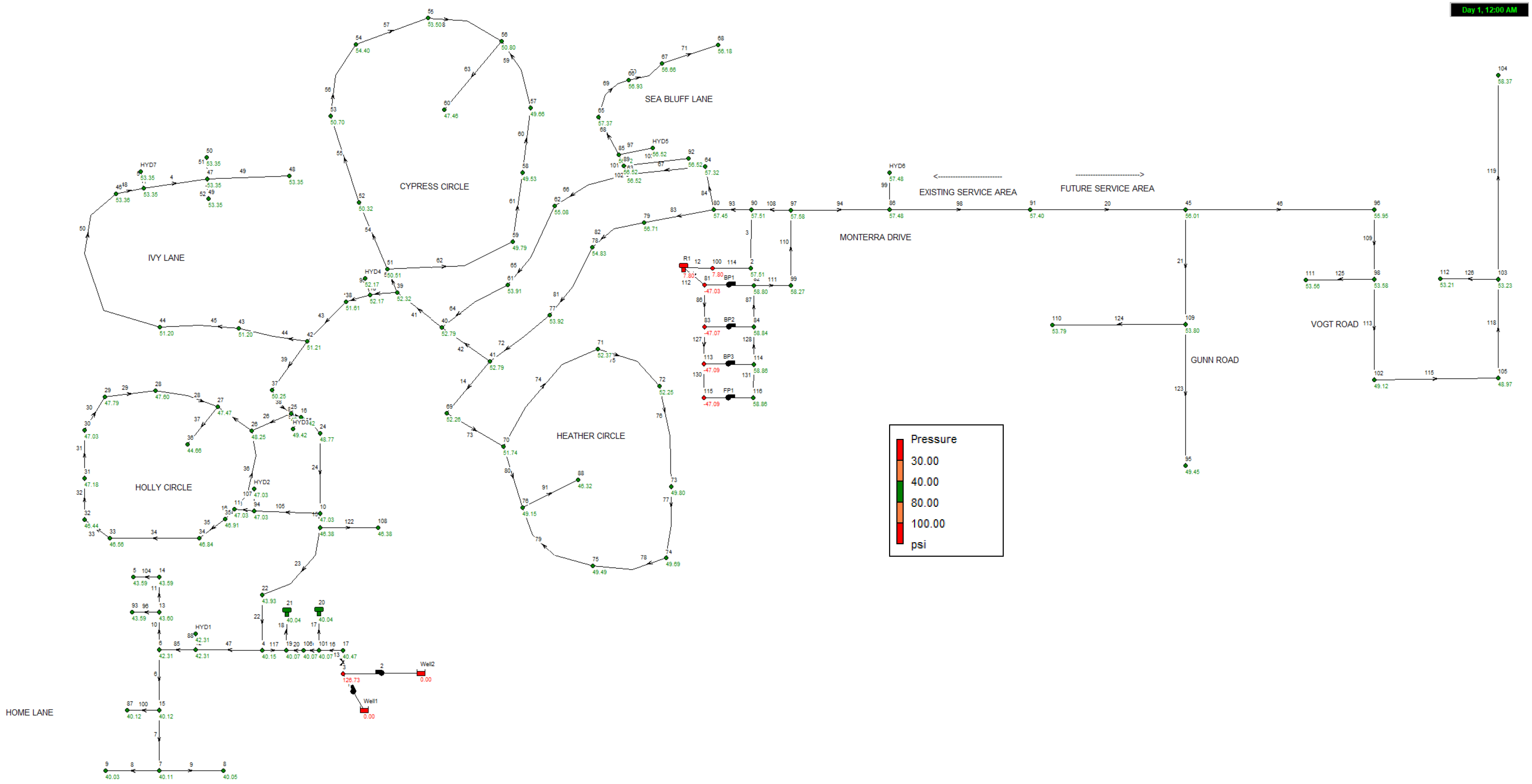
Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 71	155	2	140	7.00	0.71	1.39
Pipe 72	205	4	140	-122.14	3.12	9.49
Pipe 74	300	2	140	1.42	0.14	0.07
Pipe 75	145	2	140	1.42	0.14	0.07
Pipe 76	350	2	140	1.42	0.14	0.07
Pipe 77	140	2	140	1.42	0.14	0.07
Pipe 78	245	2	140	1.42	0.14	0.07
Pipe 79	420	2	140	1.42	0.14	0.07
Pipe 80	125	2	140	-5.58	0.57	0.92
Pipe 81	270	4	140	-122.14	3.12	9.49
Pipe 82	300	4	140	-122.14	3.12	9.49
Pipe 83	220	4	140	-122.14	3.12	9.49
Pipe 84	40	6	140	-347.44	3.94	9.13
Pipe 91	180	2	140	7.00	0.71	1.39
Pipe 93	40	8	140	-469.58	3.00	3.93
Pipe 94	460	8	140	14.00	0.09	0.01
Pipe 3	270	8	140	0.00	0.00	0.00
Pipe 12	205	8	140	0.00	0.00	0.00
Pipe 15	270	6	140	-65.43	0.74	0.41
Pipe 16	120	2	140	2.27	0.23	0.17
Pipe 47	300	6	140	35.00	0.40	0.13
Pipe 85	50	6	140	35.00	0.40	0.13
Pipe 88	25	6	140	0.00	0.00	0.00
Pipe 89	25	6	140	59.02	0.67	0.34
Pipe 90	25	6	140	0.00	0.00	0.00
Pipe 92	42	6	140	-448.58	5.09	14.65
Pipe 95	25	6	140	0.00	0.00	0.00
Pipe 97	25	6	140	0.00	0.00	0.00

Monterra-FF Scenario(Existing)

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 98	480	8	140	7.00	0.04	0.00
Pipe 99	25	6	140	0.00	0.00	0.00
Pipe 100	65	4	140	7.00	0.18	0.05
Pipe 101	35	6	140	-7.00	0.08	0.01
Pipe 102	25	6	140	-7.00	0.08	0.01
Pipe 103	170	2	140	0.00	0.00	0.00
Pipe 4	140	6	140	7.00	0.08	0.01
Pipe 5	25	6	140	500.00	5.67	17.91
Pipe 14	190	4	140	7.00	0.18	0.05
Pipe 73	150	4	140	7.00	0.18	0.05
Pipe 96	65	4	140	7.00	0.18	0.05
Pipe 104	65	4	140	7.00	0.18	0.05
Pipe 105	160	6	140	6.41	0.07	0.01
Pipe 106	20	6	140	6.41	0.07	0.01
Pipe 107	25	6	140	0.00	0.00	0.00
Pipe 108	50	8	140	469.58	3.00	3.93
Pipe 110	270	8	140	-483.58	3.09	4.15
Pipe 111	205	8	140	-483.58	3.09	4.15
Pipe 112	20	8	140	483.58	3.09	4.15
Pipe 114	10	8	140	0.00	0.00	0.00
Pipe 116	90	6	140	132.00	1.50	1.52
Pipe 117	50	6	140	107.43	1.22	1.04
Pipe 118	50	6	140	7.00	0.08	0.01
Pump 1	#N/A	#N/A	#N/A	132.00	0.00	-530.19
Pump 2	#N/A	#N/A	#N/A	0.00	0.00	0.00
Pump SystemPump	#N/A	#N/A	#N/A	483.58	0.00	-92.82
Valve 13	#N/A	6	#N/A	132.00	1.50	343.05

Monterra - Hydraulic Model
Future Conditions - Peak Hour Demand

Monterra-PHD Scenario Future (High Pressure)



Monterra-PHD Scenario Future (High Pressure)

Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 3	150	0	442.47	126.73
Junc 4	150	0	242.67	40.15
Junc 6	145	0	242.64	42.31
Junc 7	150	0	242.56	40.11
Junc 8	150	5.56	242.43	40.05
Junc 9	150	5.56	242.39	40.03
Junc 13	142	0	242.61	43.60
Junc 14	142	0	242.60	43.59
Junc 15	150	0	242.59	40.12
Junc 17	150	0	243.40	40.47
Junc 19	150	0	242.46	40.07
Junc 22	142	0	243.39	43.93
Junc 23	140	0	247.03	46.38
Junc 24	138	0	250.57	48.77
Junc 25	137	0	251.21	49.49
Junc 26	137	0	248.36	48.25
Junc 27	136	0	245.56	47.47
Junc 28	136	0	245.86	47.60
Junc 29	136	0	246.29	47.79
Junc 30	138	0	246.53	47.03
Junc 31	138	0	246.89	47.18
Junc 32	140	0	247.19	46.44
Junc 33	140	0	247.46	46.56
Junc 34	140	0	248.10	46.84
Junc 35	140	0	248.27	46.91
Junc 36	136	41.81	239.08	44.66
Junc 37	136	0	251.98	50.25

Monterra-PHD Scenario Future (High Pressure)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 38	135	0	254.11	51.61
Junc 39	134	0	254.75	52.32
Junc 40	135	0	256.82	52.79
Junc 41	135	0	256.84	52.79
Junc 42	135	0	253.19	51.21
Junc 43	135	0	253.17	51.20
Junc 44	135	0	253.16	51.20
Junc 46	130	0	253.14	53.36
Junc 47	130	0	253.13	53.35
Junc 48	130	0	253.13	53.35
Junc 49	130	22.86	253.13	53.35
Junc 50	130	0	253.13	53.35
Junc 51	134	0	250.58	50.51
Junc 52	133	0	249.12	50.32
Junc 53	130	0	247.00	50.70
Junc 54	120	0	245.54	54.40
Junc 55	120	0	243.47	53.50
Junc 56	125	0	242.25	50.80
Junc 57	130	0	244.60	49.66
Junc 58	132	0	246.31	49.53
Junc 59	133	0	247.91	49.79
Junc 60	130	40.68	239.53	47.46
Junc 61	134	0	258.41	53.91
Junc 62	133	0	260.11	55.08
Junc 63	132	0	262.45	56.52
Junc 64	132	0	264.28	57.32
Junc 65	130	0	262.40	57.37
Junc 66	130	0	261.38	56.93

Monterra-PHD Scenario Future (High Pressure)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 67	130	0	260.77	56.66
Junc 68	130	16.95	259.66	56.18
Junc 69	136	0	256.60	52.26
Junc 70	137	0	256.42	51.74
Junc 71	135	0	255.86	52.37
Junc 72	135	0	255.59	52.25
Junc 73	140	0	254.94	49.80
Junc 74	140	0	254.67	49.69
Junc 75	140	0	254.22	49.49
Junc 76	140	0	253.43	49.15
Junc 77	134	0	258.44	53.92
Junc 78	134	0	260.54	54.83
Junc 79	132	0	262.88	56.71
Junc 80	132	0	264.59	57.45
Junc 81	132	0	23.46	-47.03
Junc 82	132	0	267.70	58.80
Junc 83	132	0	23.37	-47.07
Junc 84	132	0	267.79	58.84
Junc 88	140	40.68	246.91	46.32
Junc 90	132	0	264.73	57.51
Junc 91	132	18.65	264.47	57.40
Junc 2	132	0	264.73	57.51
Junc 10	140	0	248.54	47.03
Junc 11	140	0	248.54	47.03
Junc HYD2	140	0	248.54	47.03
Junc 12	145	0	242.64	42.31
Junc HYD1	145	0	242.64	42.31
Junc 16	137	0	251.06	49.42

Monterra-PHD Scenario Future (High Pressure)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc HYD3	137	0	251.06	49.42
Junc 18	134	0	254.40	52.17
Junc HYD4	134	0	254.40	52.17
Junc 85	132	0	262.45	56.52
Junc HYD5	132	0	262.45	56.52
Junc 86	132	18.65	264.66	57.48
Junc HYD6	132	0	264.66	57.48
Junc 87	150	6.03	242.58	40.12
Junc 89	132	0	262.45	56.52
Junc 92	132	0	262.45	56.52
Junc 1	130	0	253.14	53.35
Junc HYD7	130	0	253.14	53.35
Junc 5	142	6.03	242.60	43.59
Junc 93	142	6.03	242.61	43.59
Junc 94	140	0	248.54	47.03
Junc 97	132	0	264.89	57.58
Junc 99	132	0	266.49	58.27
Junc 100	132	0	150.00	7.80
Junc 101	150	0	242.47	40.07
Junc 45	135	0	264.26	56.01
Junc 95	150	16.95	264.12	49.45
Junc 96	135	0	264.13	55.95
Junc 98	140	0	263.65	53.58
Junc 102	150	16.95	263.37	49.12
Junc 103	140	0	262.84	53.23
Junc 104	128	16.95	262.72	58.37
Junc 105	150	16.95	263.02	48.97
Junc 106	150	0	242.47	40.07

Monterra-PHD Scenario Future (High Pressure)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 108	140	11.3	247.03	46.38
Junc 109	140	0	264.16	53.80
Junc 110	140	11.3	264.15	53.79
Junc 111	140	22.6	263.61	53.56
Junc 112	140	16.95	262.81	53.21
Junc 113	132	0	23.32	-47.09
Junc 114	132	0	267.84	58.86
Junc 115	132	0	23.32	-47.09
Junc 116	132	0	267.84	58.86
Resvr Well1	33	#N/A	33.00	0.00
Resvr Well2	69	#N/A	69.00	0.00
Tank 20	150	#N/A	242.40	40.04
Tank 21	150	#N/A	242.40	40.04
Tank R1	132	#N/A	150.00	7.80

Monterra-PHD Scenario Future (High Pressure)

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 6	208	4	140	17.15	0.44	0.25
Pipe 7	205	4	140	11.12	0.28	0.11
Pipe 8	190	2	140	5.56	0.57	0.91
Pipe 9	150	2	140	5.56	0.57	0.91
Pipe 10	190	4	140	12.06	0.31	0.13
Pipe 11	385	4	140	6.03	0.15	0.04
Pipe 17	10	6	140	-307.11	3.48	7.26
Pipe 18	10	6	140	-289.07	3.28	6.49
Pipe 19	10	6	140	-62.89	0.71	0.38
Pipe 22	140	6	140	-255.39	2.90	5.16
Pipe 23	705	6	140	-255.39	2.90	5.16
Pipe 24	330	6	140	-280.28	3.18	6.13
Pipe 25	80	6	140	-280.28	3.18	6.13
Pipe 26	155	2	140	28.22	2.88	18.41
Pipe 27	115	2	140	32.78	3.35	24.30
Pipe 28	135	2	140	-9.03	0.92	2.23
Pipe 29	190	2	140	-9.03	0.92	2.23
Pipe 30	110	2	140	-9.03	0.92	2.23
Pipe 31	160	2	140	-9.03	0.92	2.23
Pipe 32	135	2	140	-9.03	0.92	2.23
Pipe 33	120	2	140	-9.03	0.92	2.23
Pipe 34	290	2	140	-9.03	0.92	2.23
Pipe 35	75	2	140	-9.03	0.92	2.23
Pipe 36	290	2	140	4.56	0.47	0.63
Pipe 37	170	2	140	41.81	4.27	38.13
Pipe 38	105	6	140	-308.50	3.50	7.32
Pipe 39	165	6	140	-308.50	3.50	7.32

Monterra-PHD Scenario Future (High Pressure)

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 40	35	6	140	-331.36	3.76	8.36
Pipe 41	200	6	140	-372.04	4.22	10.36
Pipe 42	40	6	140	-69.15	0.78	0.46
Pipe 43	110	6	140	-331.36	3.76	8.36
Pipe 44	225	6	140	22.86	0.26	0.06
Pipe 45	215	6	140	22.86	0.26	0.06
Pipe 48	55	6	140	22.86	0.26	0.06
Pipe 49	120	6	140	0.00	0.00	0.00
Pipe 50	365	6	140	-22.86	0.26	0.06
Pipe 51	40	6	140	0.00	0.00	0.00
Pipe 52	40	6	140	22.86	0.26	0.06
Pipe 53	115	2	140	40.68	4.15	36.24
Pipe 54	155	2	140	19.65	2.01	9.42
Pipe 55	225	2	140	19.65	2.01	9.42
Pipe 56	155	2	140	19.65	2.01	9.42
Pipe 57	220	2	140	19.65	2.01	9.42
Pipe 58	130	2	140	19.65	2.01	9.42
Pipe 59	220	2	140	-21.03	2.15	10.68
Pipe 60	160	2	140	-21.03	2.15	10.68
Pipe 61	150	2	140	-21.03	2.15	10.68
Pipe 62	250	2	140	-21.03	2.15	10.68
Pipe 63	75	2	140	40.68	4.15	36.25
Pipe 64	225	6	140	-302.89	3.44	7.08
Pipe 65	240	6	140	-302.89	3.44	7.08
Pipe 66	330	6	140	-302.89	3.44	7.08
Pipe 67	234	6	140	-319.84	3.63	7.83
Pipe 68	190	4	140	16.95	0.43	0.24
Pipe 69	143	2	140	16.95	1.73	7.16

Monterra-PHD Scenario Future (High Pressure)

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 70	85	2	140	16.95	1.73	7.16
Pipe 71	155	2	140	16.95	1.73	7.16
Pipe 72	205	4	140	-109.83	2.80	7.79
Pipe 74	300	2	140	8.20	0.84	1.87
Pipe 75	145	2	140	8.20	0.84	1.87
Pipe 76	350	2	140	8.20	0.84	1.87
Pipe 77	140	2	140	8.20	0.84	1.87
Pipe 78	245	2	140	8.20	0.84	1.87
Pipe 79	420	2	140	8.20	0.84	1.87
Pipe 80	125	2	140	-32.48	3.32	23.89
Pipe 81	270	4	140	-109.83	2.80	7.79
Pipe 82	300	4	140	-109.83	2.80	7.79
Pipe 83	220	4	140	-109.83	2.80	7.79
Pipe 84	40	6	140	-319.84	3.63	7.83
Pipe 86	25	8	140	450.27	2.87	3.63
Pipe 87	25	8	140	450.27	2.87	3.63
Pipe 91	180	2	140	40.68	4.15	36.24
Pipe 93	40	8	140	-429.67	2.74	3.33
Pipe 94	460	8	140	155.95	1.00	0.51
Pipe 3	270	8	140	0.00	0.00	0.00
Pipe 12	205	8	140	0.00	0.00	0.00
Pipe 15	270	6	140	266.69	3.03	5.59
Pipe 16	120	2	140	9.03	0.92	2.23
Pipe 47	300	6	140	29.21	0.33	0.09
Pipe 85	50	6	140	29.21	0.33	0.09
Pipe 88	25	6	140	0.00	0.00	0.00
Pipe 89	25	6	140	-280.28	3.18	6.13
Pipe 90	25	6	140	0.00	0.00	0.00

Monterra-PHD Scenario Future (High Pressure)

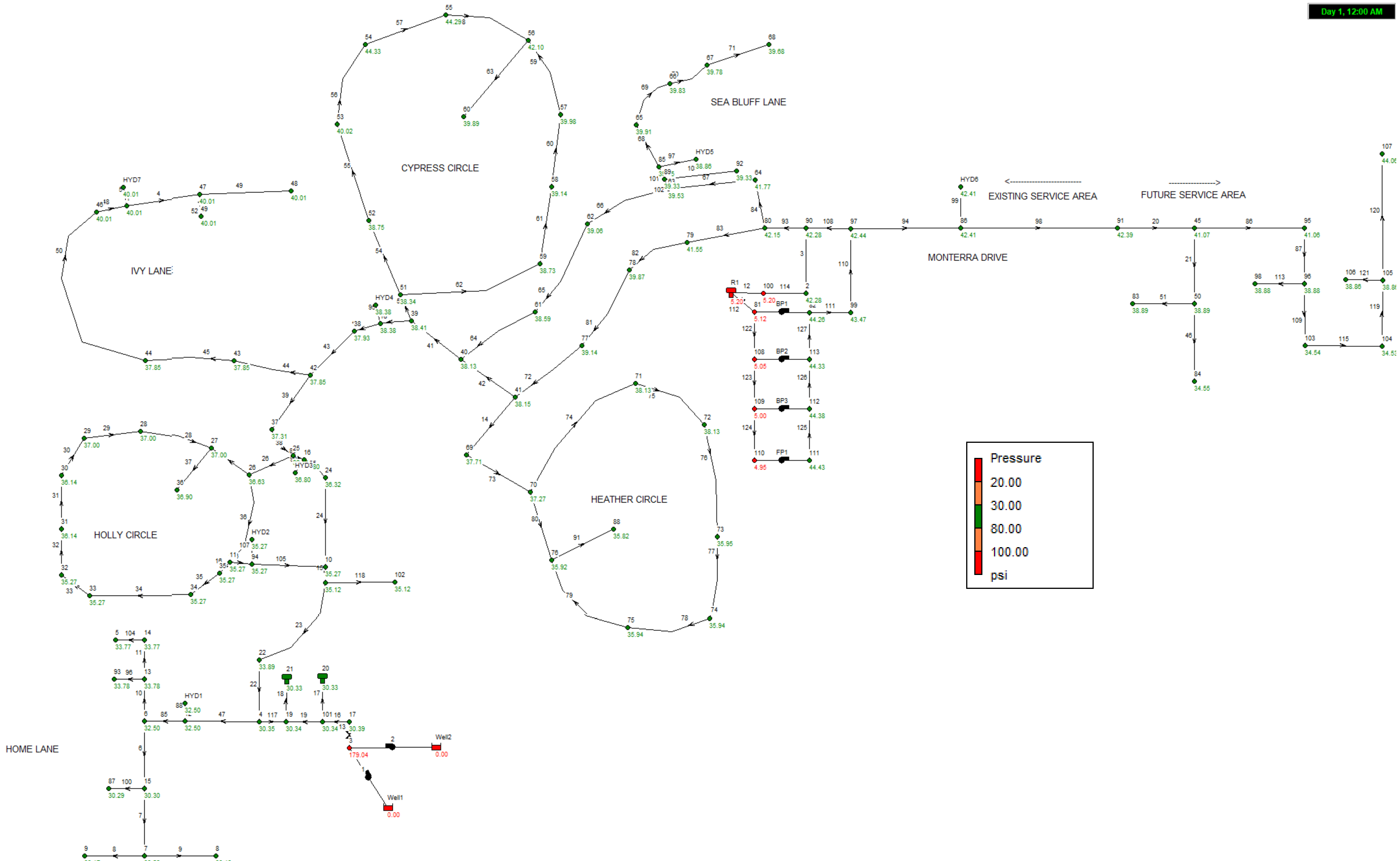
Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 92	42	6	140	-331.36	3.76	8.36
Pipe 95	25	6	140	0.00	0.00	0.00
Pipe 97	25	6	140	0.00	0.00	0.00
Pipe 98	480	8	140	137.30	0.88	0.40
Pipe 99	25	8	140	0.00	0.00	0.00
Pipe 100	65	4	140	6.03	0.15	0.04
Pipe 101	35	6	140	-16.95	0.19	0.03
Pipe 102	25	6	140	-16.95	0.19	0.03
Pipe 103	170	6	140	0.00	0.00	0.00
Pipe 4	140	6	140	22.86	0.26	0.06
Pipe 5	25	6	140	0.00	0.00	0.00
Pipe 14	190	4	140	40.68	1.04	1.24
Pipe 73	150	4	140	40.68	1.04	1.24
Pipe 96	65	4	140	6.03	0.15	0.04
Pipe 104	65	4	140	6.03	0.15	0.04
Pipe 105	160	6	140	13.59	0.15	0.02
Pipe 106	20	6	140	13.59	0.15	0.02
Pipe 107	25	6	140	0.00	0.00	0.00
Pipe 108	50	8	140	429.67	2.74	3.33
Pipe 110	270	8	140	-585.62	3.74	5.91
Pipe 111	205	8	140	-585.62	3.74	5.91
Pipe 112	25	8	140	585.62	59.81	5061.70
Pipe 114	10	8	140	0.00	0.00	0.00
Pipe 116	90	6	140	370.00	4.20	10.25
Pipe 117	50	6	140	-226.18	2.57	4.12
Pipe 20	677	8	140	118.65	0.76	0.31
Pipe 21	1162	6	140	28.25	0.32	0.09
Pipe 46	677	8	140	90.40	0.58	0.19

Monterra-PHD Scenario Future (High Pressure)

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 109	640	8	140	90.40	1.03	0.75
Pipe 113	640	8	140	67.80	0.77	0.44
Pipe 115	1340	8	140	50.85	0.58	0.26
Pipe 118	1477	8	140	-33.90	0.38	0.12
Pipe 119	3447	8	140	16.95	0.19	0.03
Pipe 120	10	6	140	62.89	0.71	0.39
Pipe 122	50	6	140	11.30	0.13	0.02
Pipe 123	1163	6	140	16.95	0.19	0.03
Pipe 124	101	6	140	11.30	0.29	0.12
Pipe 125	101	6	140	22.60	0.58	0.42
Pipe 126	101	6	140	16.95	0.43	0.24
Pipe 127	25	8	140	315.12	2.01	1.88
Pipe 128	25	8	140	-315.12	2.01	1.88
Pipe 130	25	8	140	0.00	0.00	0.00
Pipe 131	25	8	140	0.00	0.00	0.00
Pump 1	#N/A	#N/A	#N/A	219.08	0.00	-409.47
Pump 2	#N/A	#N/A	#N/A	150.92	0.00	-373.47
Pump BP1	#N/A	#N/A	#N/A	135.35	0.00	-244.24
Pump BP2	#N/A	#N/A	#N/A	135.15	0.00	-244.43
Pump BP3	#N/A	#N/A	#N/A	315.12	0.00	-244.52
Pump FP1	#N/A	#N/A	#N/A	0.00	0.00	0.00
Valve 13	#N/A	6	#N/A	370.00	4.20	199.07

Monterra - Hydraulic Model
Future Conditions - Fire Flow & Max Day Demand

Monterra-FF Scenario (Future)



Monterra-FF Scenario (Future)

Network Table - Nodes

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 3	150	0	563.19	179.04
Junc 4	150	0	220.04	30.35
Junc 6	145	0	219.99	32.50
Junc 7	150	0	219.88	30.28
Junc 8	150	7	219.68	30.19
Junc 9	150	7	219.62	30.17
Junc 13	142	0	219.96	33.78
Junc 14	142	0	219.94	33.77
Junc 15	150	0	219.92	30.30
Junc 17	150	0	220.15	30.39
Junc 19	150	0	220.01	30.34
Junc 22	142	0	220.21	33.89
Junc 23	140	0	221.04	35.12
Junc 24	138	0	221.82	36.32
Junc 25	137	0	221.95	36.81
Junc 26	137	0	221.53	36.63
Junc 27	136	0	221.39	37.00
Junc 28	136	0	221.39	37.00
Junc 29	136	0	221.40	37.00
Junc 30	138	0	221.40	36.14
Junc 31	138	0	221.40	36.14
Junc 32	140	0	221.40	35.27
Junc 33	140	0	221.40	35.27
Junc 34	140	0	221.40	35.27
Junc 35	140	0	221.40	35.27
Junc 36	136	7	221.16	36.90
Junc 37	136	0	222.11	37.31

Monterra-FF Scenario (Future)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 38	135	0	222.53	37.93
Junc 39	134	0	222.65	38.41
Junc 40	135	0	223.01	38.13
Junc 41	135	0	223.04	38.15
Junc 42	135	0	222.35	37.85
Junc 43	135	0	222.35	37.85
Junc 44	135	0	222.35	37.85
Junc 46	130	0	222.34	40.01
Junc 47	130	0	222.34	40.01
Junc 48	130	0	222.34	40.01
Junc 49	130	7	222.34	40.01
Junc 51	134	0	222.49	38.34
Junc 52	133	0	222.44	38.75
Junc 53	130	0	222.35	40.02
Junc 54	120	0	222.30	44.33
Junc 55	120	0	222.22	44.29
Junc 56	125	0	222.17	42.10
Junc 57	130	0	222.26	39.98
Junc 58	132	0	222.33	39.14
Junc 59	133	0	222.39	38.73
Junc 60	130	7	222.07	39.89
Junc 61	134	0	223.07	38.59
Junc 62	133	0	223.14	39.06
Junc 63	132	0	223.23	39.53
Junc 64	132	0	228.40	41.77
Junc 65	130	0	222.12	39.91
Junc 66	130	0	221.92	39.83
Junc 67	130	0	221.80	39.78

Monterra-FF Scenario (Future)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 68	130	7	221.58	39.68
Junc 69	136	0	223.03	37.71
Junc 70	137	0	223.02	37.27
Junc 71	135	0	223.00	38.13
Junc 72	135	0	222.99	38.13
Junc 73	140	0	222.96	35.95
Junc 74	140	0	222.95	35.94
Junc 75	140	0	222.94	35.94
Junc 76	140	0	222.91	35.92
Junc 77	134	0	224.32	39.14
Junc 78	134	0	226.02	39.87
Junc 79	132	0	227.90	41.55
Junc 80	132	0	229.28	42.15
Junc 81	132	0	143.82	5.12
Junc 82	132	0	234.14	44.26
Junc 88	140	7	222.66	35.82
Junc 90	132	0	229.57	42.28
Junc 91	132	7	229.84	42.39
Junc 2	132	0	229.57	42.28
Junc 10	140	0	221.40	35.27
Junc 11	140	0	221.40	35.27
Junc HYD2	140	0	221.40	35.27
Junc 12	145	0	220.00	32.50
Junc HYD1	145	0	220.00	32.50
Junc 16	137	0	221.92	36.80
Junc HYD3	137	0	221.92	36.80
Junc 18	134	0	222.58	38.38
Junc HYD4	134	0	222.58	38.38

Monterra-FF Scenario (Future)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 85	132	0	222.13	39.05
Junc HYD5	132	500	221.68	38.86
Junc 86	132	7	229.89	42.41
Junc HYD6	132	0	229.89	42.41
Junc 87	150	7	219.92	30.29
Junc 89	132	0	222.77	39.33
Junc 92	132	0	222.77	39.33
Junc 1	130	0	222.34	40.01
Junc HYD7	130	0	222.34	40.01
Junc 5	142	7	219.94	33.77
Junc 93	142	7	219.96	33.78
Junc 94	140	0	221.40	35.27
Junc 97	132	0	229.94	42.44
Junc 99	132	0	232.33	43.47
Junc 100	132	0	144.00	5.20
Junc 101	150	0	220.01	30.34
Junc 102	140	7	221.04	35.12
Junc 45	135	0	229.79	41.07
Junc 50	140	0	229.75	38.89
Junc 83	140	8	229.75	38.89
Junc 84	150	8	229.74	34.55
Junc 95	135	0	229.76	41.06
Junc 96	140	0	229.74	38.88
Junc 98	140	8	229.74	38.88
Junc 103	150	8	229.72	34.54
Junc 104	150	8	229.70	34.53
Junc 105	140	0	229.69	38.86
Junc 106	140	8	229.69	38.86

Monterra-FF Scenario (Future)

Node ID	Elevation ft	Base Demand GPM	Head ft	Pressure psi
Junc 107	128	8	229.68	44.06
Junc 108	132	0	143.66	5.05
Junc 109	132	0	143.55	5.00
Junc 110	132	0	143.43	4.95
Junc 111	132	0	234.53	44.43
Junc 112	132	0	234.41	44.38
Junc 113	132	0	234.30	44.33
Resvr Well1	33	#N/A	33.00	0.00
Resvr Well2	69	#N/A	69.00	0.00
Tank 20	150	#N/A	220.00	30.33
Tank 21	150	#N/A	220.00	30.33
Tank R1	132	#N/A	144.00	5.20

Monterra-FF Scenario (Future)

Network Table - Links

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 6	208	4	140	21.00	0.54	0.36
Pipe 7	205	4	140	14.00	0.36	0.17
Pipe 8	190	2	140	7.00	0.71	1.39
Pipe 9	150	2	140	7.00	0.71	1.39
Pipe 10	190	4	140	14.00	0.36	0.17
Pipe 11	385	4	140	7.00	0.18	0.05
Pipe 17	10	6	140	-108.10	1.23	1.05
Pipe 18	10	6	140	-104.48	1.19	0.99
Pipe 19	10	6	140	-23.90	0.27	0.06
Pipe 22	140	6	140	-115.59	1.31	1.19
Pipe 23	705	6	140	-115.59	1.31	1.19
Pipe 24	330	6	140	-119.48	1.36	1.26
Pipe 25	80	6	140	-119.48	1.36	1.26
Pipe 26	155	2	140	10.10	1.03	2.75
Pipe 27	115	2	140	6.38	0.65	1.16
Pipe 28	135	2	140	-0.62	0.06	0.01
Pipe 29	190	2	140	-0.62	0.06	0.01
Pipe 30	110	2	140	-0.62	0.06	0.01
Pipe 31	160	2	140	-0.62	0.06	0.01
Pipe 32	135	2	140	-0.62	0.06	0.01
Pipe 33	120	2	140	-0.62	0.06	0.01
Pipe 34	290	2	140	-0.62	0.06	0.01
Pipe 35	75	2	140	-0.62	0.06	0.01
Pipe 36	290	2	140	-3.72	0.38	0.43
Pipe 37	170	2	140	7.00	0.71	1.39
Pipe 38	105	6	140	-129.59	1.47	1.47
Pipe 39	165	6	140	-129.59	1.47	1.47

Monterra-FF Scenario (Future)

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 40	35	6	140	-136.59	1.55	1.62
Pipe 41	200	6	140	-143.59	1.63	1.78
Pipe 42	40	6	140	-90.69	1.03	0.76
Pipe 43	110	6	140	-136.59	1.55	1.62
Pipe 44	225	6	140	7.00	0.08	0.01
Pipe 45	215	6	140	7.00	0.08	0.01
Pipe 48	55	6	140	7.00	0.08	0.01
Pipe 49	120	6	140	0.00	0.00	0.00
Pipe 50	365	6	140	-7.00	0.08	0.01
Pipe 52	40	6	140	7.00	0.08	0.01
Pipe 53	115	2	140	7.00	0.71	1.39
Pipe 54	155	2	140	3.38	0.35	0.36
Pipe 55	225	2	140	3.38	0.35	0.36
Pipe 56	155	2	140	3.38	0.35	0.36
Pipe 57	220	2	140	3.38	0.35	0.36
Pipe 58	130	2	140	3.38	0.35	0.36
Pipe 59	220	2	140	-3.62	0.37	0.41
Pipe 60	160	2	140	-3.62	0.37	0.41
Pipe 61	150	2	140	-3.62	0.37	0.41
Pipe 62	250	2	140	-3.62	0.37	0.41
Pipe 63	75	2	140	7.00	0.71	1.39
Pipe 64	225	6	140	-52.89	0.60	0.28
Pipe 65	240	6	140	-52.89	0.60	0.28
Pipe 66	330	6	140	-52.89	0.60	0.28
Pipe 67	234	6	140	-559.89	6.35	22.09
Pipe 68	190	4	140	7.00	0.18	0.05
Pipe 69	143	2	140	7.00	0.71	1.39
Pipe 70	85	2	140	7.00	0.71	1.39

Monterra-FF Scenario (Future)

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 71	155	2	140	7.00	0.71	1.39
Pipe 72	205	4	140	-97.69	2.49	6.27
Pipe 74	300	2	140	1.42	0.14	0.07
Pipe 75	145	2	140	1.42	0.14	0.07
Pipe 76	350	2	140	1.42	0.14	0.07
Pipe 77	140	2	140	1.42	0.14	0.07
Pipe 78	245	2	140	1.42	0.14	0.07
Pipe 79	420	2	140	1.42	0.14	0.07
Pipe 80	125	2	140	-5.58	0.57	0.92
Pipe 81	270	4	140	-97.69	2.49	6.27
Pipe 82	300	4	140	-97.69	2.49	6.27
Pipe 83	220	4	140	-97.69	2.49	6.27
Pipe 84	40	6	140	-559.89	6.35	22.09
Pipe 91	180	2	140	7.00	0.71	1.39
Pipe 93	40	8	140	-657.59	4.20	7.33
Pipe 94	460	8	140	70.00	0.45	0.12
Pipe 3	270	8	140	0.00	0.00	0.00
Pipe 12	205	8	140	0.00	0.00	0.00
Pipe 15	270	6	140	122.59	1.39	1.33
Pipe 16	120	2	140	0.62	0.06	0.01
Pipe 47	300	6	140	35.00	0.40	0.13
Pipe 85	50	6	140	35.00	0.40	0.13
Pipe 88	25	6	140	0.00	0.00	0.00
Pipe 89	25	6	140	-119.48	1.36	1.26
Pipe 90	25	6	140	0.00	0.00	0.00
Pipe 92	42	6	140	-136.59	1.55	1.62
Pipe 95	25	6	140	0.00	0.00	0.00
Pipe 97	25	6	140	500.00	5.67	17.91

Monterra-FF Scenario (Future)

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 98	480	8	140	63.00	0.40	0.10
Pipe 99	25	6	140	0.00	0.00	0.00
Pipe 100	65	4	140	7.00	0.18	0.05
Pipe 101	35	6	140	-507.00	5.75	18.38
Pipe 102	25	6	140	-507.00	5.75	18.38
Pipe 103	170	2	140	0.00	0.00	0.00
Pipe 4	140	6	140	7.00	0.08	0.01
Pipe 5	25	6	140	0.00	0.00	0.00
Pipe 14	190	4	140	7.00	0.18	0.05
Pipe 73	150	4	140	7.00	0.18	0.05
Pipe 96	65	4	140	7.00	0.18	0.05
Pipe 104	65	4	140	7.00	0.18	0.05
Pipe 105	160	6	140	-3.10	0.04	0.00
Pipe 106	20	6	140	-3.10	0.04	0.00
Pipe 107	25	6	140	0.00	0.00	0.00
Pipe 108	50	8	140	657.59	4.20	7.33
Pipe 110	270	8	140	-727.59	4.64	8.84
Pipe 111	205	8	140	-727.59	4.64	8.84
Pipe 112	20	8	140	727.59	4.64	8.84
Pipe 114	10	8	140	0.00	0.00	0.00
Pipe 116	90	6	140	132.00	1.50	1.52
Pipe 117	50	6	140	-80.59	0.91	0.61
Pipe 118	50	6	140	7.00	0.08	0.01
Pipe 20	677	8	140	56.00	0.36	0.08
Pipe 21	1162	6	140	16.00	0.18	0.03
Pipe 46	1163	6	140	8.00	0.09	0.01
Pipe 51	101	6	140	8.00	0.09	0.01
Pipe 86	677	8	140	40.00	0.26	0.04

Monterra-FF Scenario (Future)

Link ID	Length ft	Diameter in	Roughness	Flow GPM	Velocity fps	Unit Headloss ft/Kft
Pipe 87	640	8	140	40.00	0.26	0.04
Pipe 109	640	8	140	32.00	0.20	0.03
Pipe 113	101	6	140	8.00	0.09	0.01
Pipe 115	1340	8	140	24.00	0.15	0.02
Pipe 119	1477	8	140	16.00	0.10	0.01
Pipe 120	3447	8	140	8.00	0.05	0.00
Pipe 121	101	6	140	8.00	0.09	0.01
Pipe 122	25	8	140	617.80	3.94	6.53
Pipe 123	25	8	140	508.22	3.24	4.55
Pipe 124	25	8	140	508.22	3.24	4.55
Pipe 125	25	8	140	508.22	3.24	4.55
Pipe 126	25	8	140	508.22	3.24	4.55
Pipe 127	25	8	140	617.80	3.94	6.53
Pump 1	#N/A	#N/A	#N/A	132.00	0.00	-530.19
Pump 2	#N/A	#N/A	#N/A	0.00	0.00	0.00
Pump BP1	#N/A	#N/A	#N/A	109.79	0.00	-90.31
Pump FP1	#N/A	#N/A	#N/A	508.22	0.00	-91.10
Pump BP3	#N/A	#N/A	#N/A	0.00	0.00	0.00
Pump BP2	#N/A	#N/A	#N/A	109.57	0.00	-90.64
Valve 13	#N/A	6	#N/A	132.00	1.50	343.05

APPENDIX R
Water Usage Data

Water System: Monterra
System ID: 55990 Y
Year: 2019
ERUs: 188

Month	Source Production (gallons)	Days	ADD (gallons/day)	Gallons/ERU	ERU_{ADD} (gpd/ERU)
January	629,500	31	20,306	3,348	108
February	585,000	28	20,893	3,112	111
March	662,900	29	22,859	3,526	122
April	767,600	31	24,761	4,083	132
May	1,204,900	30	40,163	6,409	214
June	1,783,700	30	59,457	9,488	316
July	2,046,600	31	66,019	10,886	351
August	1,953,500	31	63,016	10,391	335
September	704,800	30	23,493	3,749	125
October	637,900	31	20,577	3,393	109
November	556,000	30	18,533	2,957	99
December	634,200	32	19,819	3,373	105
Total:	12,166,600	364	-	-	-
Average:	1,013,883	-	33,425	5,393	178

Water System: Monterra
System ID: 55990 Y
Year: 2020
ERUs: 188

Month	Source Production (gallons)	Days	ADD (gallons/day)	Gallons/ERU	ERU_{ADD} (gpd/ERU)
January	535,700	31	17,281	2,849	92
February	478,800	28	17,100	2,547	91
March	570,200	32	17,819	3,033	95
April	720,000	30	24,000	3,830	128
May	966,700	30	32,223	5,142	171
June	1,025,000	31	33,065	5,452	176
July	1,884,970	31	60,805	10,026	323
August	2,099,800	28	74,993	11,169	399
September	1,071,400	33	32,467	5,699	173
October	668,900	30	22,297	3,558	119
November	643,500	31	20,758	3,423	110
December	490,500	31	15,823	2,609	84
Total:	11,155,470	366	-	-	-
Average:	929,623	-	30,479	4,945	162

Water System: Monterra
System ID: 55990 Y
Year: 2021
ERUs: 188

Month	Source Production (gallons)	Days	ADD (gallons/day)	Gallons/ERU	ERU_{ADD} (gpd/ERU)
January	608,500	30	20,283	3,237	108
February	676,100	30	22,537	3,596	120
March	713,900	28	25,496	3,797	136
April	916,600	26	35,254	4,876	188
May	1,767,200	28	63,114	9,400	336
June	1,859,800	28	66,421	9,893	353
July	2,366,800	30	78,893	12,589	420
August	2,222,400	32	69,450	11,821	369
September	1,471,000	33	44,576	7,824	237
October	750,000	27	27,778	3,989	148
November	621,200	31	20,039	3,304	107
December	636,300	31	20,526	3,385	109
Total:	14,609,800	354	-	-	-
Average:	1,217,483	-	41,271	6,476	220

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	Monterra
Population:	470 people – 192 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
Source Location:	Wells & Well-House (Easement on the address listed) 253 Home Ln Port Angeles, WA 98362
Reservoir Location:	Pumphouse & Reservoir (Easement on the address listed) 1951 Finn Hall Rd Port Angeles, WA 98362
Directions	Traveling East/West on WA 101, turn North onto Kitchen-Dick Rd. Travel North approximately 1.4 miles, turn left onto Old Olympic Hwy. Travel west on Old Olympic Hwy for 1.5 miles, turn right onto Gunn Rd. Continue North on Gunn Rd for 0.8 miles and turn left onto Monterra Dr. Turn left on the driveway between 342 & 332 Monterra Drive to the back of those parcels. Turn right and continue approximately 200 feet along the easement to the pumphouse and reservoir.
Sources	Well 1 – 210 gpm – 221' depth Well 2 – 150 gpm – 221' depth
Reservoirs	Reservoir 1 – 75,000 gallons (25' diameter x 30' height)
Well Pumps	Well 1 – Berkeley 6SALL-10 (7.5 hp) Well 2 – Berkeley 6SALL-7.5 (20 hp)
Booster Pump	(1) Berkeley B1.5 TPL-5 (5 hp) Pressure Settings: 42-/62-psi
Pressure Tanks	(2) 1,100 gallon hydropneumatic steel tanks
Distribution Piping	▪ 2" – 6,550 ft ▪ 4" – 2,765 ft ▪ 6" – 5,550 ft ▪ 8" – 2,085 ft Total: 16,950 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 Monterra 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 Monterra 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/Monterra 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.

<u>Complaint about water quality or positive bacteriological result from routine monitoring</u>

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 Monterra – 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 reservoir has a storage capacity of approximately 75,000-gallons.

Assuming that only a single source is compromised, the reservoir has capacity to provide approximately 390 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 Monterra 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

- Diamond Point -

1 OVERVIEW

The Diamond Point Water System (Diamond Point) is located in unincorporated Clallam County east of Sequim, Washington. The service area includes portions of Sections 15, 16, 21, and 22 of Township 30 North, Range 2 West of the Willamette Meridian.

Diamond Point 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. Monterra currently has 320+ connections, all of which are classified as single-family residential connections aside from one recreation connection.

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

FACET

June 20, 2024

PORT ANGELES COMPOSITE
ATTN: BOWEN KENDRICK, MANAGER
PO BOX 1000
CARLSBORG, WA 98324

Re: Cascadia Water – Monterra – Water System Plan (WSP) Update

Dear Bowen Kendrick,

Cascadia Water, which owns the Monterra 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: Monterra PWS ID: 55990 Y

Planning/Engineering Document Title: Monterra 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.

Donella Clark

Signature

8-12-24

Date

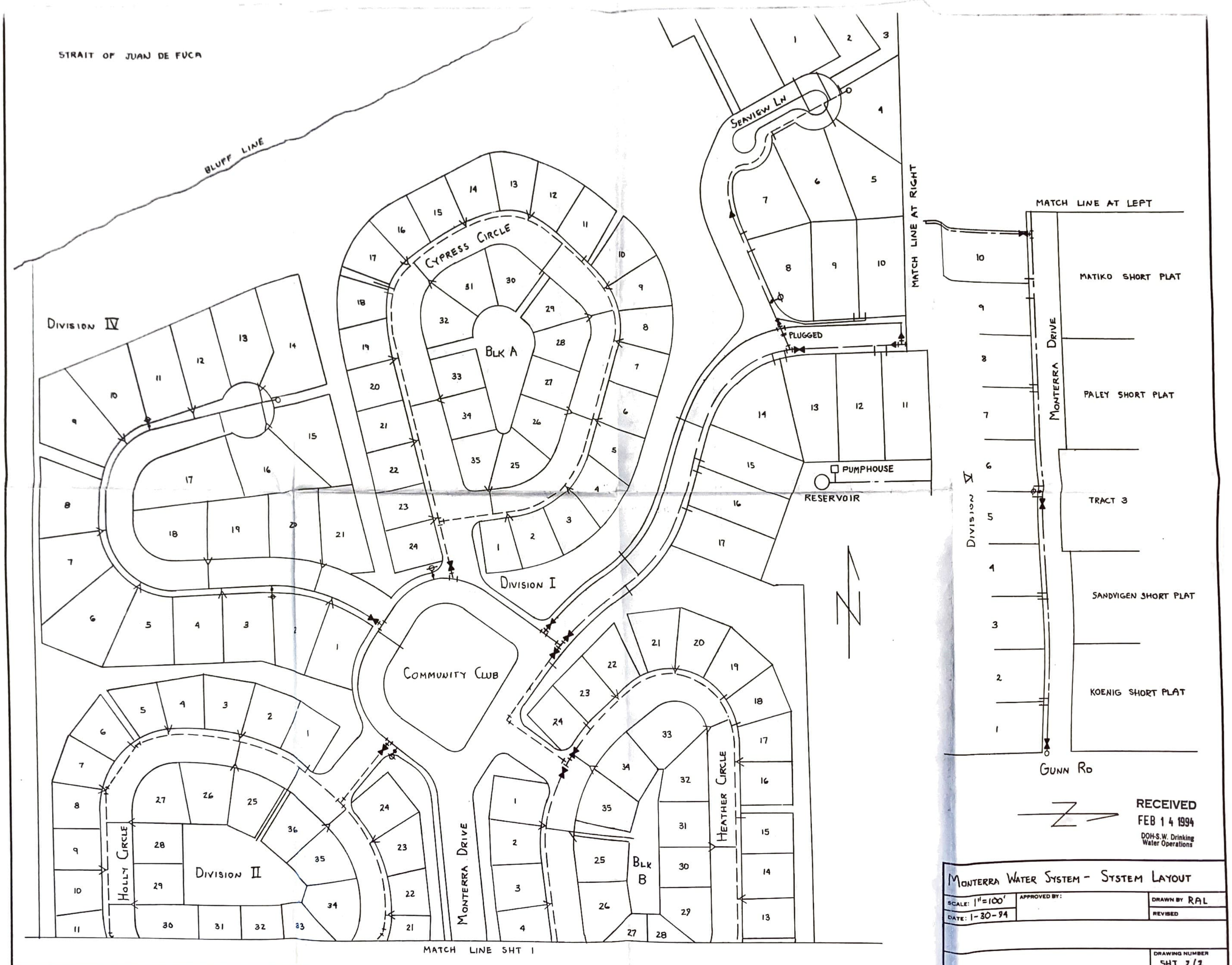
Donella Clark, Principal Planner, Clallam County

Printed Name, Title, & Jurisdiction

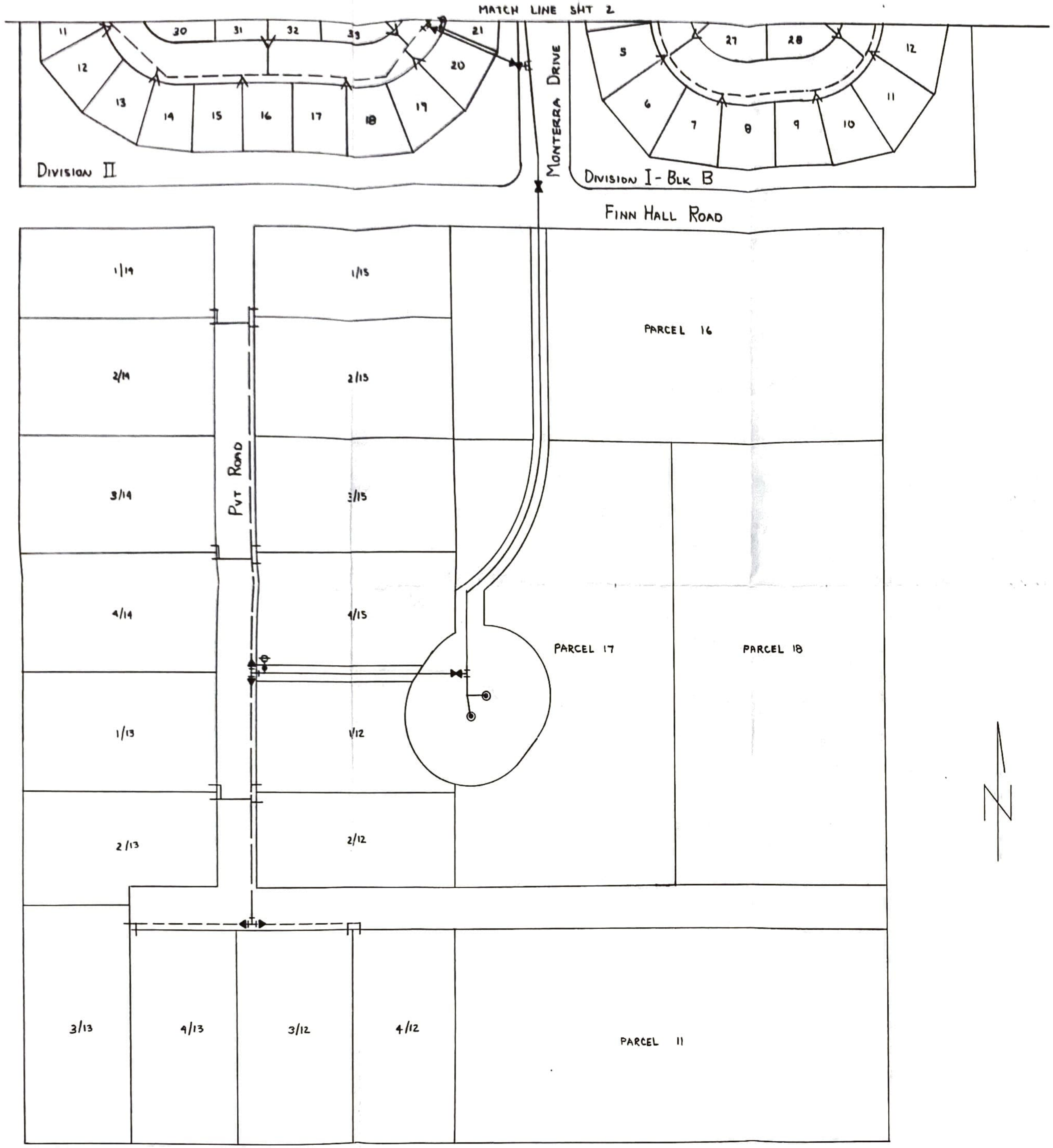
Public Meeting Notes

This page is a placeholder for future minutes from the Consumer Meeting

APPENDIX V
Water System Drawings



18 X 24 PRINTED ON NO. 1000H CLEARPRINT



LEGEND

8" PVC

6" PVC

4" PVC

2" OR 2½" PVC

GATE VALVE

REDUCER

BLOW OFF VALVE

WELL

FIRE HYDRANT

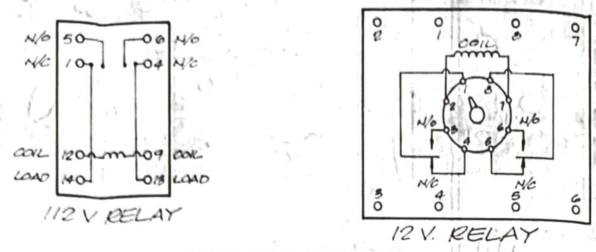
RECEIVED
FEB 1 4 1994
DOH-S.W. Drinking Water Operations

MONTERRA WATER SYSTEM – SYSTEM LAYOUT

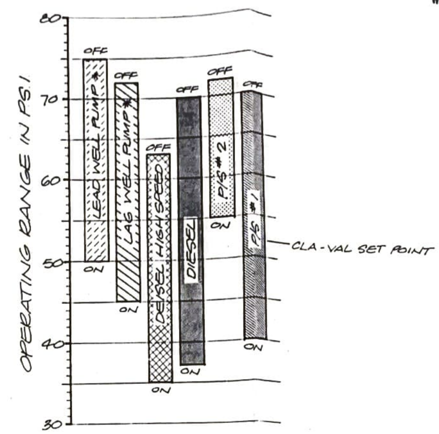
SCALE: 1" = 100'	APPROVED BY:	DRAWN BY RAL
DATE: 1-30-94		REVISED
		DRAWING NUMBER SHT 1/2

18 X 24 PRINTED ON NO. 1000H CLEARPRINT

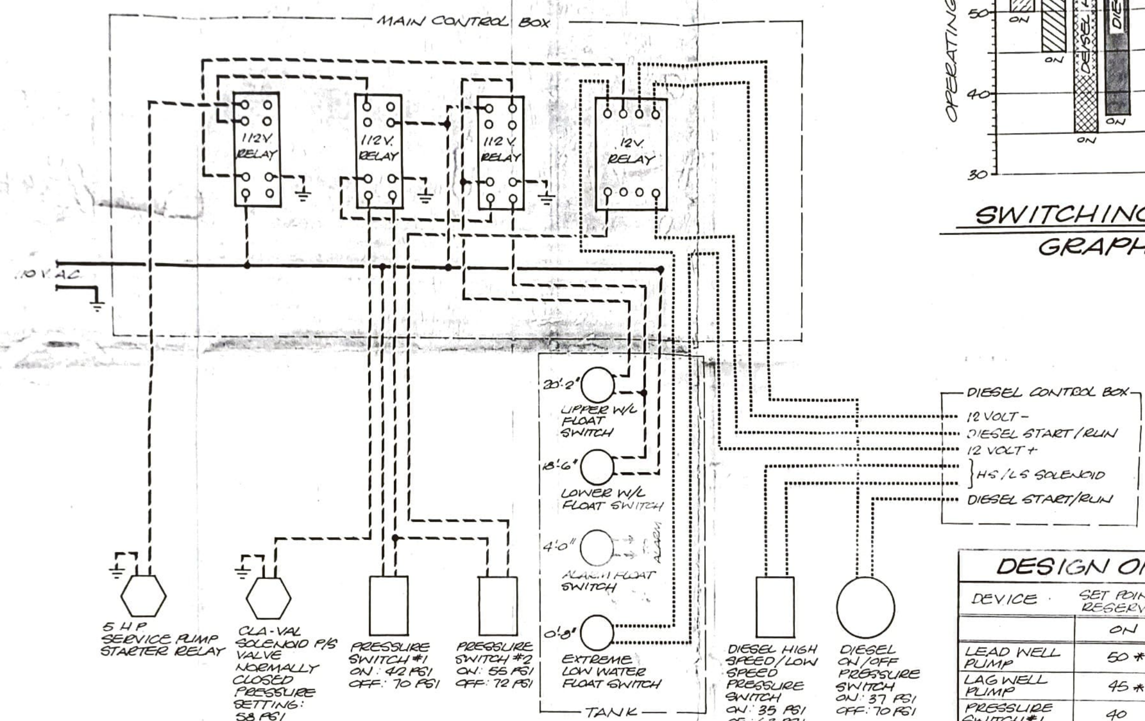
RECEIVED
FEB 1 4 1994
DOH-S.W. Drinking Water Operations



RELAY DETAIL



SWITCHING LOGIC GRAPH



SYSTEM WIRING SCHEMATIC

LEGEND:

- - - - 110 VOLT CIRCUIT
······· 12 VOLT CIRCUIT
—— 110 VOLT POWER BUSS
110 VOLT GROUND

DESIGN OPERATING PRESSURE

DEVICE	SET POINT INDICATED IN RESERVOIR PUMP HOUSE		SET POINT INDICATED IN WELL TANK HOUSE	
	ON	OFF	ON	OFF
LEAD WELL PUMP	50 *	75 *	40	65
LAG WELL PUMP	45 *	72 *	35	62
PRESSURE SWITCH #1	40	70	—	—
PRESSURE SWITCH #2	55	72 ***	—	—
DIESEL ON / OFF	37	70	—	—
DIESEL H/S L/S	36	63 **	—	—
AIR COMPRESSOR	—	—	43	67
CLA-VAL	SUSTAIN 52 PSI		SUSTAIN 42 PSI	

* NOTE: OPERATING PRESSURE AS INDICATED IN RESERVOIR PUMP HOUSE. STATIC PRESSURE IN WELL TANK HOUSE INDICATES 10 PSI LESS.

** NOTE: PUMP CUT-OFF HEAD FOR DIESEL FIRE PUMP IS 66 PSI @ 2200 RPM. VERIFY THIS POINT PERIODICALLY BY MOMENTARILY CLOSING OUTLET VALVE FOR SYSTEM TO INSURE H.S. CUT-OFF IS SET CORRECTLY 3 PSI BELOW THIS POINT.

*** NOTE: PUMP CUT-OFF HEAD FOR 5 H.P. SYSTEM PUMP IS 84 PSI

NORTHWESTERN TERRITORIES, INC.
Engineers • Land Surveyors • Planners • Construction Coordination • Materials Testing

MONTERRA WATER SYSTEM
SYSTEM ELECTRICAL SCHEMATIC

FILE: 7 (30-4)

DESIGNED BY: BJD
DRAWN BY: BJD/DLH
PLAT CHECK BY: —
FINAL CHECK BY: BJD

HERB SAHAR EXTENSION TO THE
MONTERRA WATER SYSTEM

IN SECTION 8, TOWNSHIP 30 NORTH, RANGE 4 WEST, W.M.
CLALLAM COUNTY, WASHINGTON

AS CONSTRUCTED

GENERAL NOTES

WORK IN COUNTY ROAD RIGHT OF WAY REQUIRES A PERMIT FROM THE CLALLAM COUNTY ROAD DEPARTMENT. PRIOR TO ANY WORK COMMENCING, THE CONTRACTOR SHALL ARRANGE FOR A PRECONSTRUCTION MEETING TO BE ATTENDED BY A REPRESENTATIVE OF THE ROAD DEPARTMENT, THE DEVELOPER OR HIS REPRESENTATIVE, THE WATER SYSTEM OWNER, THE CONTRACTOR AND ANY SUBCONTRACTORS.

THE CONTRACTOR SHALL HAVE ALL UTILITIES VERIFIED ON THE GROUND PRIOR TO ANY CONSTRUCTION. CALL 1-800-424-5555 AT LEAST 48 HOURS IN ADVANCE OF BEGINNING WORK.

DURING CONSTRUCTION, ALL PUBLIC AND PRIVATE STREETS ADJACENT TO THIS PROJECT SHALL BE KEPT CLEAN OF ALL MATERIAL DEPOSITS RESULTING FROM CONSTRUCTION.

THE CONTRACTOR ALONE SHALL BE RESPONSIBLE FOR WORKER SAFETY AND NEITHER THE DEVELOPER, THE WATER SYSTEM, THE DESIGN ENGINEER NOR ANY GOVERNMENTAL ENTITY ASSUME ANY RESPONSIBILITY. ALL TRENCH SAFETY SYSTEMS AND CONSTRUCTION METHODS SHALL MEET THE REQUIREMENTS OF THE WASHINGTON INDUSTRIAL SAFETY AND HEALTH ACT AND OTHER APPLICABLE LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TRAFFIC CONTROL IN ACCORDANCE WITH M.U.T.C.D. AND ANY REQUIREMENTS OF THE CLALLAM COUNTY ROAD DEPARTMENT. NEITHER THE ROAD DEPARTMENT, THE DEVELOPER, THE DESIGN ENGINEER, NOR THE WATER SYSTEM ASSUME ANY RESPONSIBILITY FOR TRAFFIC CONTROL OR TRAFFIC SAFETY.

THE CLALLAM COUNTY ROAD DEPARTMENT SHALL BE ADVISED AT LEAST 24 HOURS PRIOR TO BEGINNING ANY WORK WITHIN ROAD DEPARTMENT JURISDICTION. ALL WORK WITHIN ITS JURISDICTION IS SUBJECT TO ROAD DEPARTMENT INSPECTION.

ANY FIELD REVISIONS TO THESE PLANS SHALL BE SUBJECT TO ROAD DEPARTMENT APPROVAL WHENEVER SUCH CHANGES AFFECT WORK WITHIN ROAD DEPARTMENT JURISDICTION.

TRENCH BACKFILL AT ALL COUNTY ROAD CROSSINGS SHALL CONFORM WITH CLALLAM COUNTY'S STANDARD CONTROL DENSITY BACKFILL DETAIL.

CULVERTS PLACED OR REPLACED WITHIN COUNTY ROAD RIGHT OF WAY SHALL BE A MINIMUM DIAMETER OF 18" AND SHALL BE BEVELED WITH A 4:1 BEVEL PER CLALLAM COUNTY'S BEVEL END SECTION DETAIL.

THE WATER MAIN SHALL BE INSTALLED BASED ON THE GREATER DEPTH OF THE FOLLOWING:

3.33 FEET OF COVER BASED ON THE ADJACENT ROAD GRADE WHERE THE WATER MAIN IS PARALLELING OR CROSSING VOGT ROAD.

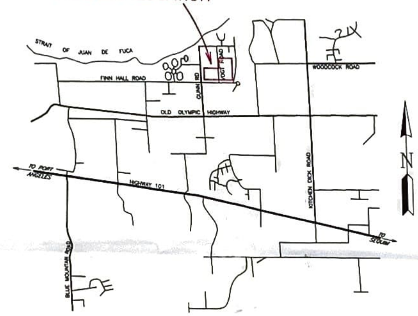
3.33 FEET MINIMUM COVER FROM THE EXISTING GROUND GRADE AT THE TRENCH.

THESE PLANS WERE PREPARED TO SHOW IMPROVEMENTS NECESSARY FOR AN UPGRADE TO AN EXISTING WATER SYSTEM PER THE APPROVED WATER SYSTEM PLAN. EXISTING DISTRIBUTION MAINS, STORAGE FACILITIES, WELL, PUMPHOUSE AND SIMILAR ITEMS SHALL BE LEFT INTACT EXCEPT WHERE SPECIFICALLY NOTED OTHERWISE IN THESE PLANS. DETAILS SHOWN ON THESE PLANS APPLY ONLY TO NEW CONSTRUCTION AND NEW HOOKUPS.

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES SHOWN ON THESE PLANS, INCLUDING THE LOCATIONS OF THE EXISTING WATER LINES, ARE BASED ON INFORMATION PROVIDED BY OTHERS. NO ATTEMPT HAS BEEN MADE TO FIELD VERIFY THIS DATA. UNDERGROUND ELECTRICAL, TELEPHONE AND POSSIBLY OTHER UTILITIES HAVE BEEN INSTALLED IN THE VICINITY OF THE WATER SYSTEM, BUT NO ATTEMPT HAS BEEN MADE TO SHOW THEIR LOCATIONS ON THESE PLANS. PRIOR TO BEGINNING EXCAVATION, THE CONTRACTOR SHALL CONTACT THE UNDERGROUND UTILITY LOCATE SERVICE AT THE NUMBER SHOWN AT THE BOTTOM OF THIS SHEET AND ARRANGE FOR LOCATES OF BURIED UTILITIES.

IN ORDER FOR THE WATER SYSTEM TO BE APPROVED BY THE WASHINGTON STATE DEPARTMENT OF HEALTH, THE CONSTRUCTION SHOWN ON THESE PLAN SHEETS MUST BE VERIFIED BY A PROFESSIONAL CIVIL ENGINEER LICENSED IN THE STATE OF WASHINGTON. TO THIS END, THE CONTRACTOR SHALL MAKE SUCH ARRANGEMENTS WITH THE OWNER AS ARE NECESSARY TO ENSURE THAT THE WORK IS INSPECTED BY OR UNDER THE DIRECTION OF SUCH AN ENGINEER AND THAT THE ENGINEER IS NOTIFIED FOR INSPECTIONS IN A TIMELY MANNER.

PROJECT LOCATION



1/1 AGNEW VICINITY MAP

NO SCALE

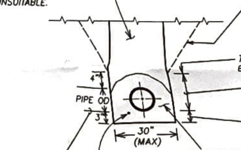
PVC WATER MAINS SHALL BE 8" PVC RATED TO 200 PSI AND APPROVED FOR POTABLE WATER USE. JOINTS SHALL BE RUBBER RING & THICKENED BELL. SOLVENT WELD (GLUED) JOINTS SHALL NOT BE USED. PIPE SHALL BE INSTALLED AND TESTED PER THE REQUIREMENTS OF SECTION 7-11 OF THE WSDOT STANDARD SPECIFICATIONS. PIPE FITTINGS AND VALVES SHALL COMPLY WITH SECTIONS 9-30.2(5) AND 9-30.3 RESPECTIVELY, OF THE WSDOT STANDARD SPECIFICATIONS. VALVES SHALL BE INSTALLED PER SECTION 7-12. "EARS" ON VALVE BOXES SHALL BE ALIGNED WITH THE AXIS OF THE PIPE.

PIPE BEDDING FOR PVC WATER MAINS SHALL BE CLEAN SAND/GRAVEL, FREE FROM ORGANIC MATERIAL AND MEETING THE FOLLOWING GRADATION OR BE OTHERWISE APPROVED BY THE ENGINEER.

SIEVE SIZE	% PASSING (BY WEIGHT)
3/4"	100
3/8"	70 – 100
#4	55 – 100
#10	35 – 95
#20	20 – 80
#40	10 – 55
#100	0 – 10
#200	0 – 3

TRENCH BACKFILL TO BE SELECT NATIVE MATERIAL. CLEAN PIT RUN GRAVEL SHALL BE USED WHERE SPECIFICALLY REQUIRED OR WHERE NATIVE MATERIAL IS UNSUITABLE.

TRENCH WALLS MAY BE SLOPED BACK ABOVE ELEV OF PIPE BEDDING (BOTH SIDES)



TRENCH WALLS SHALL BE VERTICAL BELOW THIS ELEVATION

BEDDING SUFFICIENT TO COVER PIPE TO A DEPTH OF 4" (MIN)

SINGLE 3" (MIN COMPACTED DEPTH) LIFT OF BEDDING

PIPE BEDDING FOR PVC WATER MAINS PER SPECS ABOVE, PLACED AS SHOWN

PLACE 12 GA (MIN) INSULATED COPPER WIRE ALONGSIDE PIPE IN BOTTOM OF TRENCH. BRING WIRE UP INTO VALVE BOXES AND LEAVE SMALL COIL.

PIPE INVERT TO BE 4.0' BELOW THE DESIGN ELEV OF THE CENTERLINE OF THE ADJOINING STREET OR 4.0' BELOW PROPOSED FINAL GROUND ELEV., WHICHEVER IS LOWER.

2/1 PVC WATER MAIN – 8" DIA.

SCHEMATIC ONLY – NO SCALE

INDEX TO SHEETS

RECEIVED
APR 23 1999
DOH S.W. DRINKING WATER OPERATIONS

DAVID M HANNA
STATE OF WASHINGTON
23747
REGISTERED PROFESSIONAL ENGINEER
David Hanna
EXPIRES 8-25-99
2-10-99
4-6-99

SHEET 1

PROJECT IS IN THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 8, TOWNSHIP 30 NORTH, RANGE 4 WEST, W.M., CLALLAM COUNTY, WASHINGTON.

04300B-WATER-020999

REVISIONS

DATE	DESCRIPTION
2-18-99	ADDED TEE TO DETAIL 1/2

DETAIL REFERENCES

DETAIL NUMBER 4/2 PAGE NUMBER

BALLOON REFERENCES TO DETAILS INCLUDE TWO NUMBERS. THE BOTTOM NUMBER IS THE NUMBER OF THE PAGE WHERE THE DETAIL MAY BE FOUND. THE TOP NUMBER IS THE NUMBER OF THAT DETAIL.

CALL 48 HOURS BEFORE YOU DIG
1-800-424-5555
FOR UNDERGROUND UTILITY LOCATE SERVICE

HERB SAHAR EXTENSION TO THE
MONTERRA WATER SYSTEM

CLARK LAND OFFICE
ENGINEERING
LAND SURVEYING
WETLAND DELINEATION
DEVELOPMENT CONSULTING
P.O. Box 2199
535 N 5th Ave
Sequim, WA 98382
(360) 681-2161

HERB SAHAR EXTENSION TO THE
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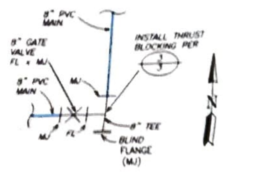
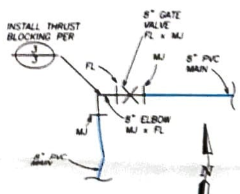
CLALLAM COUNTY, WASHINGTON

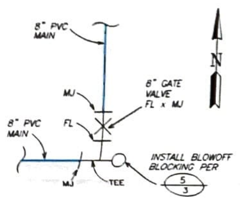
AS CONSTRUCTED



1/2 DETAIL OF FITTINGS
SCHEMATIC ONLY – NO SCALE

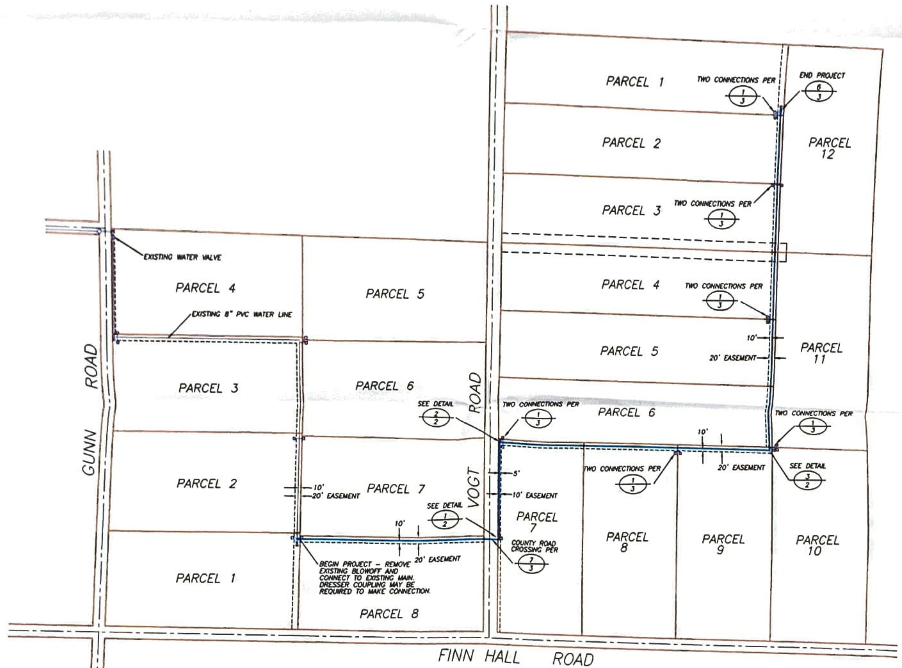


2/2 DETAIL OF FITTINGS
SCHEMATIC ONLY – NO SCALE



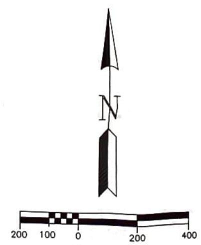
INSTALL BLOWOFF AT HIGH POINT OF WATER LINE MAINTAIN CONTINUOUS NEGATIVE GRADE ON BOTH SIDES OF BLOWOFF

3/2 DETAIL OF FITTINGS
SCHEMATIC ONLY – NO SCALE



LEGEND:

- DENOTES PROPOSED WATER LINE
- DENOTES THRUST BLOCKING
- DENOTES WATER BLOWOFF
- DENOTES DOUBLE WATER SERVICE
- DENOTES EXISTING WATER LINE



2-10-99
4-6-99

EXPIRES 8-25-99

SHEET 2

PROJECT IS IN THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 8, TOWNSHIP 30 NORTH, RANGE 4 WEST, W.M., CLALLAM COUNTY, WASHINGTON.

043008–WATER–020999

REVISIONS

DATE	DESCRIPTION
2-18-99	ADDED TEE TO DETAIL 1/2

DETAIL REFERENCES

DETAIL NUMBER
4/2
PAGE NUMBER

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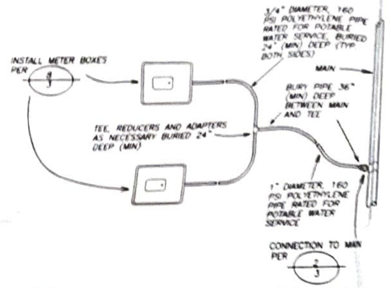
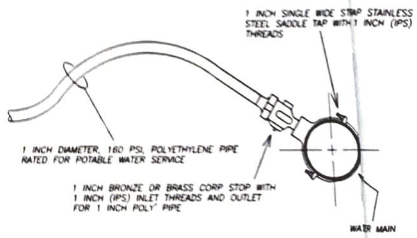
HERB SAHAR EXTENSION TO THE MONTERRA WATER SYSTEM

AS CONSTRUCTED



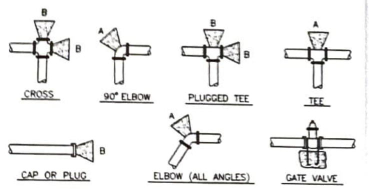
1/3 DOUBLE WATER SERVICE LATERAL

SCHEMATIC ONLY – NO SCALE



SCHEMATIC ONLY – NO SCALE

2/3 WATER SERVICE LATERAL CONNECTION TO MAIN



SCHEMATIC ONLY – NO SCALE

A — 7 SQ FT BEARING AGAINST UNDISTURBED SOIL

B — 4 SQ FT BEARING AGAINST UNDISTURBED SOIL

BEARING AREA OF THRUST BLOCKING MAY BE INCREASED IN THE FIELD BY THE ENGINEER IF SOILS REQUIRE ADDITIONAL BLOCKING AREA.

THRUST BLOCKING SHALL BE CONSTRUCTED OF 3,000 PSI CONCRETE WITH A MINIMUM OF 1/4 SQ FT BEARING AGAINST PIPE OR FITTING TO BE RESTRAINED.

WRAP ALL FITTINGS TO BE RESTRAINED WITH 6 MIL PLASTIC SHEETING.

SUPPORT ALL FITTINGS AND VALVES ON CONCRETE BLOCKS.

SIZE OF THRUST BLOCKING AT CROSSES AND TEES SHALL BE BASED ON THE LARGEST PIPE CONNECTED TO THE FITTING.

REDUCERS SHALL BE THRUST BLOCKED AS IF THEY WERE CAPS OR PLUGS AT THE END OF A PIPE. SIZE OF THRUST BLOCKING AT A REDUCER SHALL BE BASED ON THE LARGER SIZE PIPE.

3/3 THRUST BLOCKING DETAILS 8" DIAMETER PIPE

MIX DESIGN FOR CONTROLLED DENSITY BACKFILL:

CEMENT	50 – 70 lbs
FLY ASH	230 – 300 lbs
AGGREGATE	2850 lbs
WATER	45 GAL (MAX)

SLUMP 2" – 8"

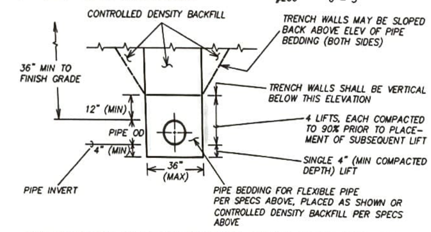
NO COMPACTION NECESSARY

MAXIMUM AGGREGATE SIZE = 1/2" (AGGREGATE IS TYPICALLY A MIX OF 50% SAND AND 50% PEA GRAVEL)

EXISTING PAVEMENT SHALL BE REPAIRED WITH 2" – 3" ASPHALT CONCRETE PAVEMENT

PIPE BEDDING FOR FLEXIBLE PIPE SHALL BE CLEAN SAND/GRAVEL, FREE FROM ORGANIC MATERIAL AND MEETING THE FOLLOWING GRADATION:

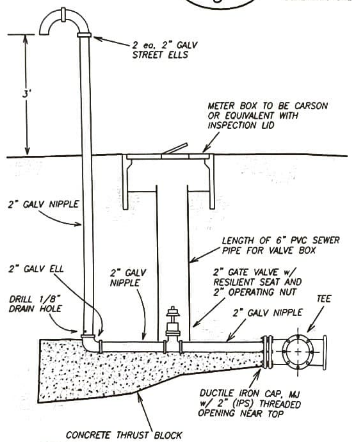
SIEVE SIZE	% PASSING (BY WEIGHT)
3/4"	100
3/8"	70 – 100
#4	55 – 100
#10	35 – 95
#20	20 – 80
#40	10 – 55
#100	0 – 10
#200	0 – 3



PIPE BEDDING SHALL BE COMPACTED TO 90% MIN OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM TEST METHOD D 1557 (MODIFIED PROCTOR). WHERE MORE THAN 30% OF THE MATERIAL IS RETAINED ON A 3/4" SIEVE, SUCH RETAINED MATERIAL SHALL BE DISCARDED AND THE PROCTOR TEST PERFORMED ON THE REMAINING MATERIAL.

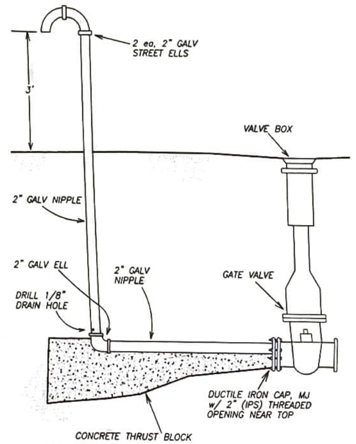
4/3 CONTROLLED DENSITY BACKFILL FOR FLEXIBLE PIPE

SCHEMATIC ONLY – NO SCALE



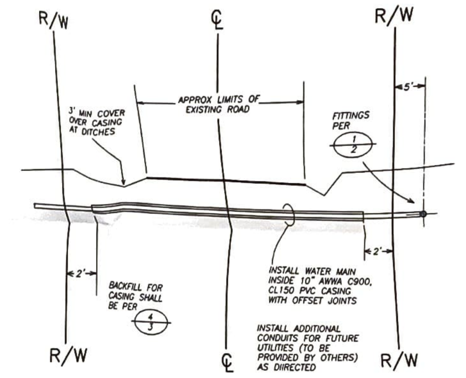
5/3 BLOWOFF DETAIL

SCHEMATIC ONLY – NO SCALE



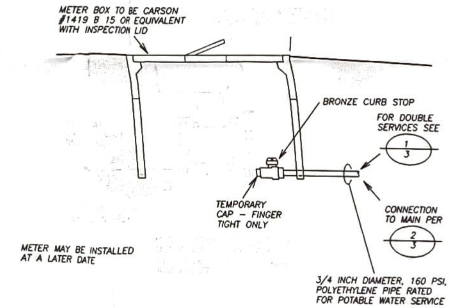
6/3 BLOWOFF DETAIL

SCHEMATIC ONLY – NO SCALE



7/3 COUNTY ROAD CROSSING

NO SCALE – SCHEMATIC ONLY



8/3 WATER METER DETAIL

SCHEMATIC ONLY – NO SCALE

DAVID M. HANNA STATE OF WASHINGTON 23747 REGISTERED PROFESSIONAL ENGINEER

David M. Hanna

2-10-99

4-6-99

EXPIRES 8-25-99

SHEET 3

PROJECT IS IN THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 8, TOWNSHIP 30 NORTH, RANGE 4 WEST, W.M., CLALLAM COUNTY, WASHINGTON.

043008–WATER–020999

REVISIONS

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FOR UNDERGROUND UTILITY LOCATE SERVICE

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LAND SURVEYING
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Sequim, WA 98382
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