

WATER DISTRICT 19

KING COUNTY

WASHINGTON



WATER SYSTEM PLAN

G&O #15626
NOVEMBER 2021
REVISED JULY 2022



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July 7, 2022

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CHAPTER 1

WATER SYSTEM DESCRIPTION

INTRODUCTION

In accordance with Washington Administrative Code (WAC) 246-290-100 and the Washington State Department of Health (DOH), water system plans need to be updated every 6 years or more frequently, if necessary, to reflect the current conditions of the water system. DOH has drafted changes to extend the planning period from 6 years to 10 years. This Plan has been prepared to update the 2008 Water District 19 Water System Plan for the 10-year planning horizon, in accordance with the DOH Water System Design Manual, December 2009, and the DOH Water System Planning Handbook, April 1997. Copies of the Washington State DOH Project Approval Application and Submittal Forms are included in Appendix A.

In accordance with the DOH and King County requirements, this document identifies the characteristics of the service area, describes the existing water system, establishes the minimum design criteria for system evaluation, identifies system deficiencies, and presents a detailed capital facilities plan and implementation program to accomplish the recommendations of the plan. The District's existing computerized hydraulic model was converted to more current water system modeling software, updated, and used to evaluate the existing system and simulate alternatives for recommended system improvements. In accordance with DOH requirements, the document also contains water quality monitoring, cross connection control, watershed and wellhead protection, water use efficiency program information, and other supporting documentation.

SYSTEM OWNERSHIP AND MANAGEMENT

Water District 19 (District) is a public utility authorized under RCW Title 57 – Water and Sewer Districts. Water service is provided to the eastern central portion of Vashon Island and a small area within the northwest section of Maury Island, all in unincorporated King County. The DOH water system identification number for the District is 38900R. A copy of the Water Facilities Inventory Report (WFI) is included in Appendix B. Figure 1-1 is a vicinity map. Figure 1-2 shows the District's retail water service area.

The governing body of the Water District is a three-member Board of Commissioners. Two full-time administrators, one part-time administrator and three field staff are responsible for the day-to day running of the District.

The District's current physical and mailing addresses are:

Physical: 17630 100th Avenue SW, Vashon, Washington 98070
Mailing: P.O. Box T, Vashon, Washington 98070

SYSTEM BACKGROUND

Water District 19 is the largest Group A Public Water System on Vashon Island. The District was established by special election in 1925. At that time the service area consisted of one square mile of land within the unincorporated Town of Vashon. Today the service area encompasses approximately 6.2 square miles.

The original distribution system consisted of about 2 miles of dipped and wrapped wrought iron pipe. Storage consisted of a 20,000-gallon elevated wood tank. This tank was replaced in 1945 with similar material and was utilized until 1965. In 1970, a 625,000-gallon reservoir was constructed at SW 188th Street and 103rd Avenue SW and then in 1988 a 1,000,000-gallon reservoir was also constructed at this site.

The original source of supply consisted of two small dams with 4-inch intakes just north of the mouth of Beall Creek. A pump house at the current location replaced these dams when they were washed out in 1936. The pump house was used in conjunction with Water Treatment Plant 1. Water Treatment Plant 1 was abandoned in 1995.

In 1969, Island Mutual Water Company was annexed into the District. This included the acquisition of the Ellis Creek source including Water Treatment Plant 2 and an additional 100,000-gallon tank, which was constructed in 1958, at 9720 SW 216th Street. Water Treatment Plant 2 was abandoned in 1995.

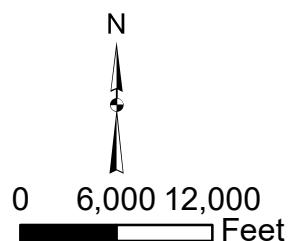
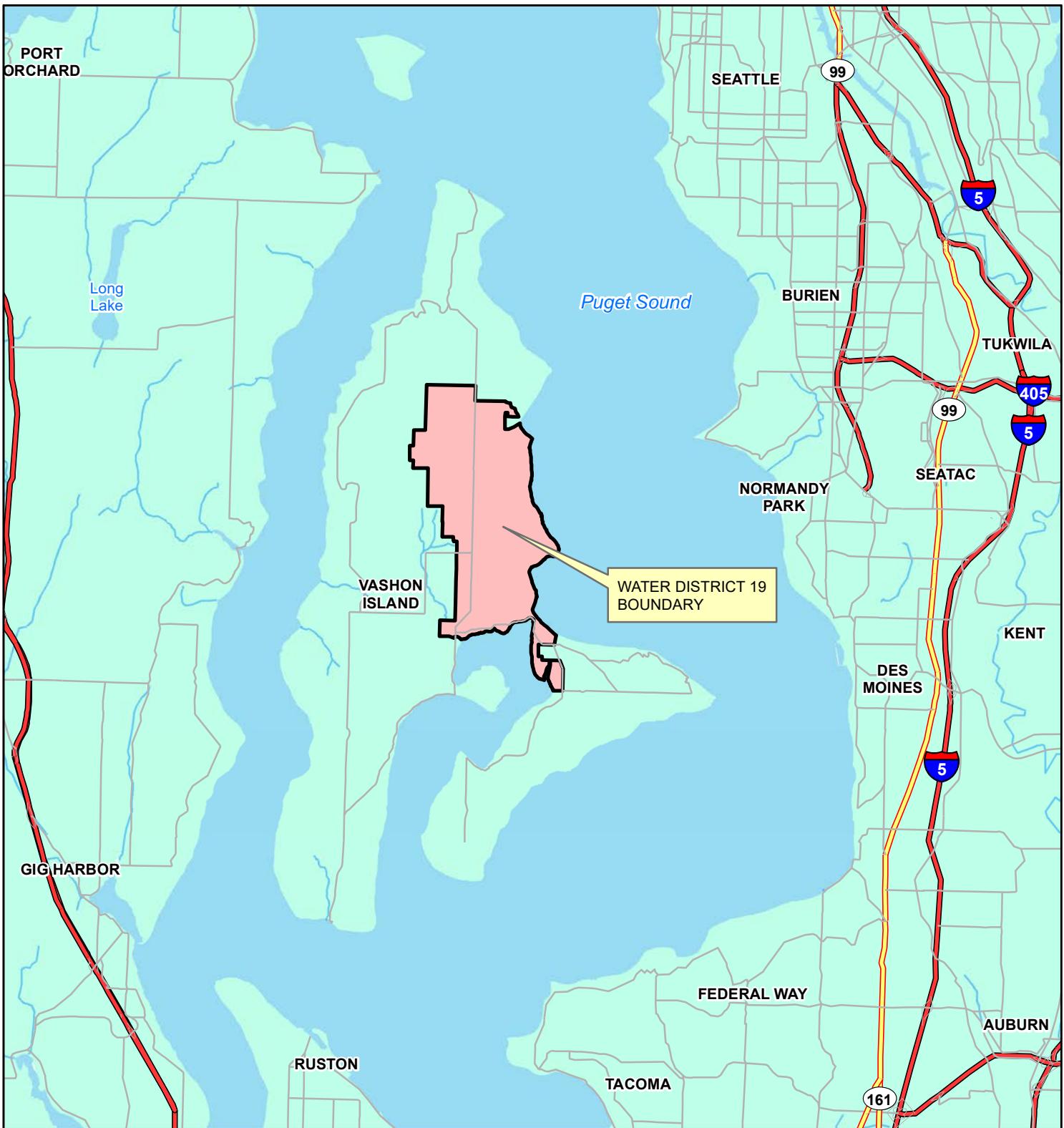
In 1995, a new water treatment plant was constructed to replace Water Treatment Plants 1 and 2. Both existing withdrawal sites were converted into raw water pump stations.

The District maintains several wells. The production at Wells 1, 2 and 4 at the reservoir/wellfield site has decreased over time. Rehabilitation efforts have been partially successful. Well 3, the Vashon Meadows Well and the Beall Well are located elsewhere in the system. A discussion of the wells is below.

The District recognizes ongoing evolution of the optimum management of the wells, including options for rehabilitation and treatment, pumping schedules, and sustainable pumping rates. The apparent sustainable well production capacity has varied over a wide range in recent years. The values in Table 1-2 are long term capacity estimates.

INVENTORY OF EXISTING FACILITIES

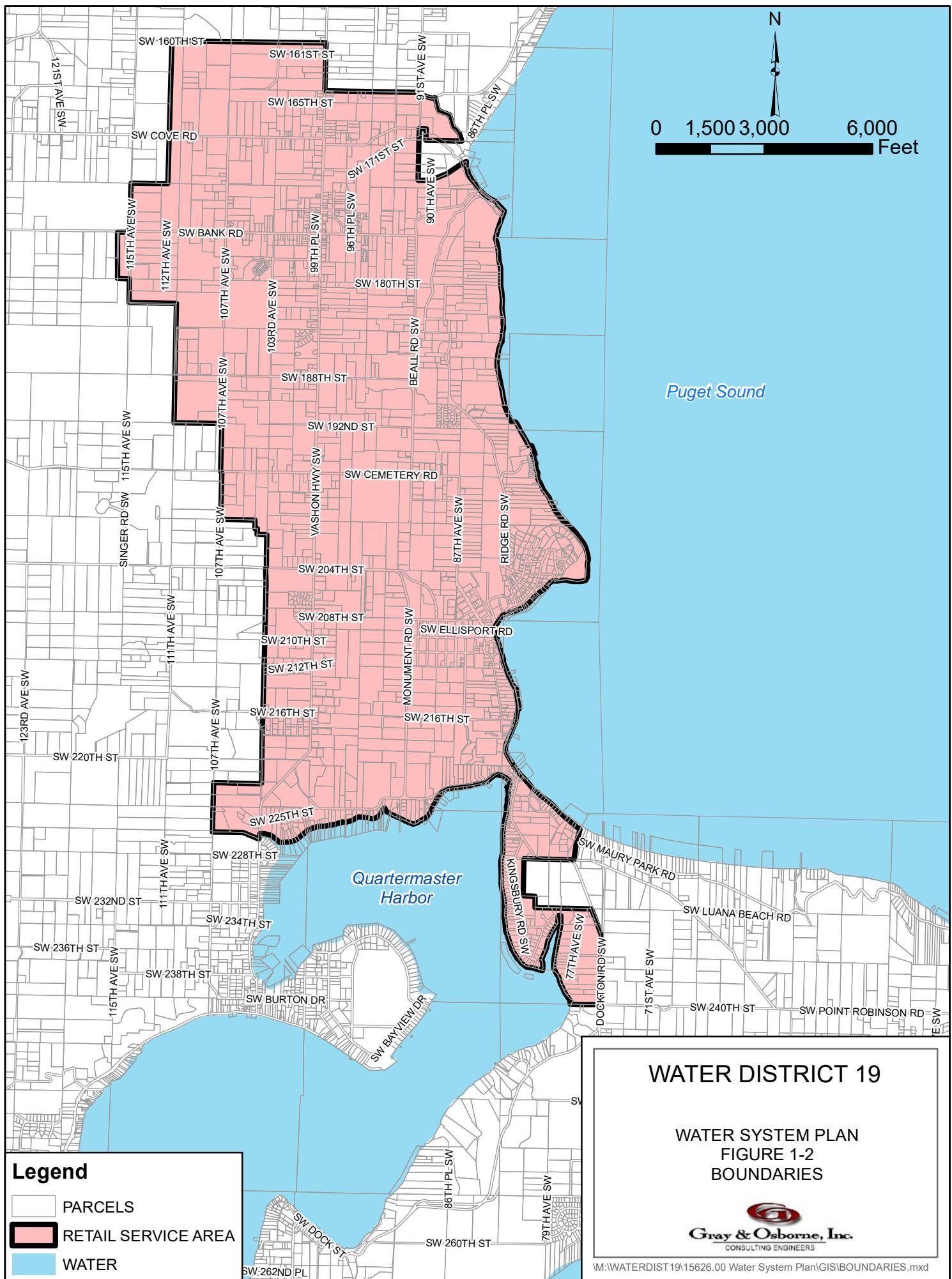
Water District 19's existing water system contains six wells, two surface water sources, a water treatment facility, and three steel reservoirs with a total storage capacity of 1.725 million gallons (MG) and distribution mains ranging in size from 3/4 inch to 16 inch in diameter. The existing system includes five pressure zones. Figure 1-3 shows locations of all major facilities and the water distribution system.

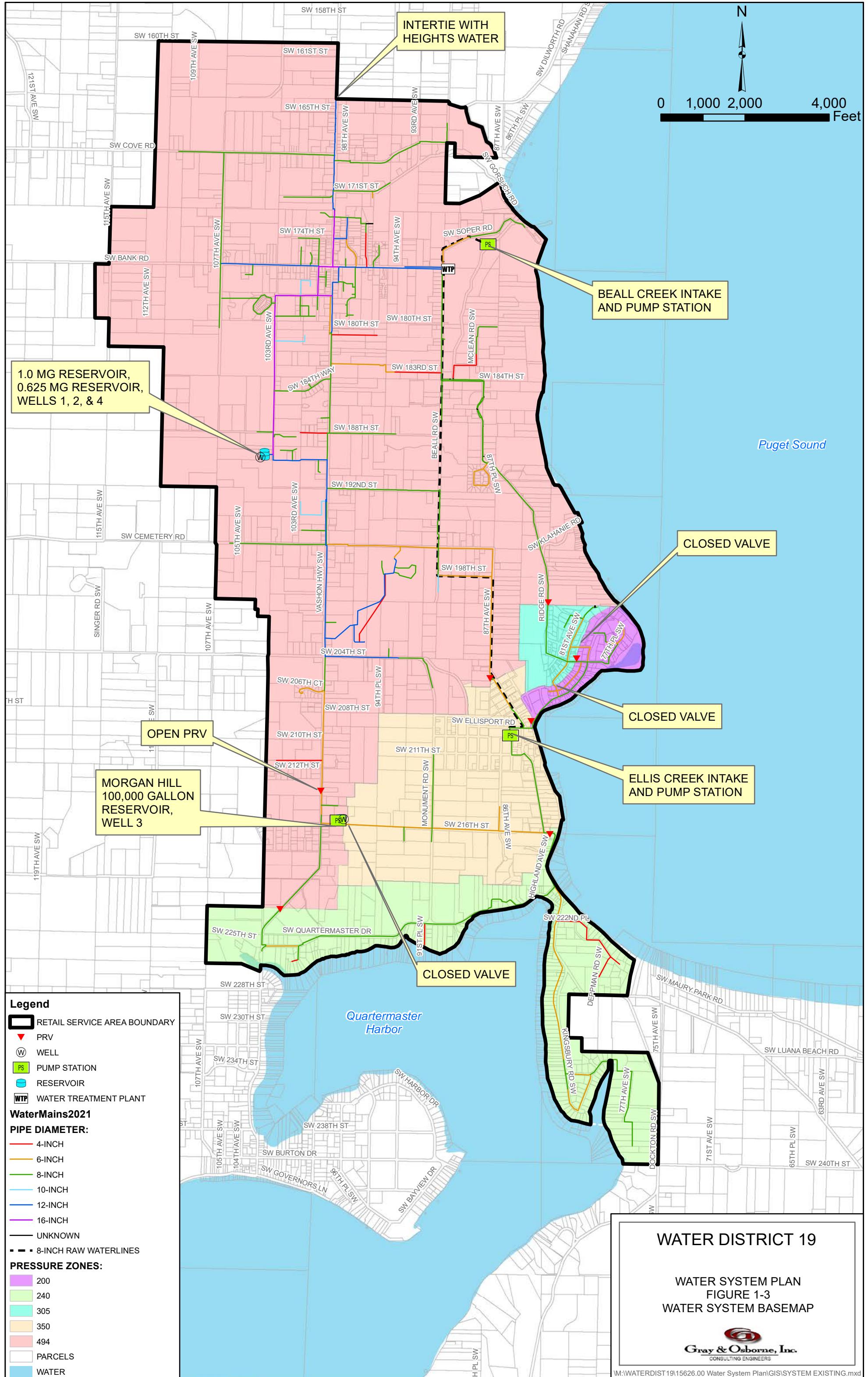


WATER DISTRICT 19

WATER SYSTEM PLAN
FIGURE 1-1
VICINITY MAP


Gray & Osborne, Inc.
CONSULTING ENGINEERS





SOURCE CHARACTERISTICS

Vashon Island water resources are the only water supply source for the District. US EPA Region 10 received a petition from the Seattle-King County Department of Public Health on April 2, 1992, which requested EPA to designate Vashon-Maury Island as a sole source aquifer.

EPA's review of the petition and other data determined that:

- The Vashon-Maury Island Aquifer System supplies approximately 71 percent of the drinking water to persons living on the Island;
- As the area's principal source of drinking water, contamination of the aquifer system would create a significant hazard to public health;
- The sole source aquifer boundary is coincident with the shoreline of the Island, and at depth includes all geologic units that can supply significant quantities of drinking water to wells;
- There are no reasonably available alternative sources of drinking water which could replace the aquifer system, should it become contaminated;
- The Vashon-Maury Island Aquifer System is now considered a sole source aquifer.

The District benefits from groundwater and surface water sources of supply. From a water rights perspective, surface water is the District's main source of supply. In practice, water comes roughly equally from surface (stream) and groundwater (well) sources.

Surface Water Sources

The District's two surface water sources, Beall Creek and Ellis Creek are primarily aquifer-fed, and based on the flow data tend to fluctuate seasonally.

Water District 19 recently conducted a fish survey through Vashon Nature Center LLC in 2016 on the creeks under its stewardship. This survey updated a report by the Wild Fish Conservancy in 2001 and the more recent 2009 King County report titled "Dockton Road SW: Baseline Stream Conditions." The 2009 report identified juvenile Coho Salmon in the lower reaches of Ellis Creek. The 2016 District-commissioned report identified that the District's creeks support cutthroat trout and are "salmon-viable" once two barriers to salmon added after 2001 are removed from the private property towards the mouth of the creek. The State Department of Fish and Wildlife (DFW) is aware of these fish passage

barriers. DFW has recently connected with the private property owner and is focused on removal of the barriers.

A barrier to fish passage has also been identified on District property. In addition to the District's general commitment to supporting island ecosystems, the District is specifically committed to facilitating fish passage and supporting fish habitat in streams under our stewardship.

Beall Creek

Beall Creek is located in the northeastern area of the District. The stream flows to the northeast and into Puget Sound. The District owns approximately 42 acres, approximately 1/2 of the watershed, above the intake structure. The remaining acres are zoned for residential uses. The District-owned portion of the Beall Creek Watershed is off limits to human activity. A 3-foot-high diversion dam diverts water from Beall Creek into a 13,000-gallon clear well. The Beall Creek pump station contains two pumps that transfer water out of the wet well to the WTP located at the intersection of Beall, SW Soper and SW Bank Roads. The pumps have a capacity of 300 gpm each.

During periods of heavy rain, the District closes the intake gate to the pump station and shuts the pump station down. The dam is then opened to release accumulated sediment downstream. Dry weather baseflow is maintained through springs discharging from the Colvos sand aquifer. Data from the Carr Report (1988) shows the aquifer that supplies Beall Creek has a 15-foot to 30-foot saturated thickness near the creek. Stream flows at the Beall Creek pump station are measured seasonally with a flume. Minimum flows are generally about 0.69 cfs (310 gpm).

The District Beall Creek water rights requires that withdrawals from Beall Creek must leave 0.1 cfs (45 gpm) in the creek immediately after the intake structure.

Ellis Creek

Ellis Creek is located in the west central portion of the District. The stream flows south and then to the east to Puget Sound. The District owns approximately 474 acres out of a total of 508 acres of the Ellis Creek surface water drainage basin above the intake. The remaining acres are zoned for residential uses. Stream flows at the Ellis Creek pump station are measured with a flume. Minimum stream flows are generally about 0.36 cfs 160 gpm. Raw water flows from Ellis Creek into a 13,000-gallon clear well. The Ellis Creek pump station contains two pumps that transfer water out of the wet well to the Water Treatment Plant, each with a capacity of 200 gpm.

Diurnal fluctuations in dry weather flow due to evapotranspiration can be seen in the flow data at the pump station. The primary aquifer is composed of mostly sand and some occasional gravel and silt.

Summary

Table 1-1 summarizes the Beall and Ellis Creek source infrastructure.

TABLE 1-1
Surface Water Source Summary

	Beall Creek	Ellis Creek
Location	SW Soper Road	SW Ellispot Road
Clear Well Capacity, gal	13,000	13,000
Pump Capacity, gpm	(2) at 40 hp 300 gpm each	(2) at 30 hp 200 gpm each
Normal output, gpm	300	200
Low Flow stream capacity, gpm	265 ⁽¹⁾	160

(1) 310 gpm minimum flow minus 45 gpm bypass required by water right.

Groundwater Sources

Wellfield – Wells 1, 2, and 4

Wells 1, 2 and 4, are located on the 1.0 and 0.625 MG Reservoirs site on 103rd Avenue SW. Well 1 has been in service since 1979 and consists of a 6-inch diameter by 665-feet deep well. The submersible pump is at the depth of 549 feet. The well house facilities include a flow meter, chlorine injection and a water level recorder. The well capacity has decreased from 250 gpm to 80 gpm. Efforts to rehabilitate this well back to its original capacity have been unsuccessful.

Well 2 was developed to a depth of 685 feet in November 1990 to replace Well 1; however, in the summer of 1991, the capacity began to decrease. Originally, a pump test determined that the aquifer yield was 250 gpm. As the well was utilized, the water level required increased time for recovery after pumping and showed signs of increased drawdown during pumping. Field investigations showed the well screen was plugged with iron bacteria. The well was dosed with chlorine. Some increase in performance was achieved, though the well did not fully recover. The District redeveloped the well in 1992 and purchased a new pump. Excessive drawdowns led to further efforts to rehabilitate Well 2. The well has a capacity of approximately 50 gpm when operating alone.

Well 4 is within 100 feet of Wells 1 and 2. This well was developed to a depth of 691 feet in August 2005 to replace the lost capacity in Well 2. A pump test determined that the well yield was 250 gpm. Initially the District operated Well 4 at 100 gpm and 150 gpm for a period of time without significant drawdown concerns. When the rate was increased to 180 gpm the drawdown increased and forced the District to discontinue use of the well until rehabilitation could be completed in February 2006. Well 4 has not

recovered to its original specific capacity and currently has a limit of 120 gpm with no other wells operating.

The production from any one well is reduced if other wells in the wellfield are running. The maximum capacity from the wellfield is estimated to be 200 gpm. The water rights instantaneous capacity is 250 gpm.

Well 3 – Morgan Hill Well

Well 3, the Morgan Hill Well, is developed to a depth of 360 feet. It is located adjacent to the 100,000-gallon reservoir at Vashon Highway SW and SW 216th Street. In 2010, the District applied to the Department of Ecology to add the Morgan Hill Well to the parent wellfield water right as a point of withdrawal under the existing water right for the wellfield. The application was approved and in 2011 DOH approved the use of the well and associated infrastructure producing an additional 35 gpm, raising the instantaneous 24-hour maximum to 235 gpm for wells 1, 2, 3 and 4.

Water from the Morgan Hill Well (Well 3) is high in manganese. The well discharges directly into the adjacent reservoir. There is no designed treatment system for this water, and the District does not generally receive water quality or color complaints related to this source. However, chlorine is added at the wellhead and manganese is noted to settle out at the adjacent reservoir.

Vashon Meadows Well

The Vashon Meadows Well was constructed in 2004. It is located within the Vashon Meadows subdivision on SW 184th Way, west of 99th Avenue SW. The well is 200 feet deep with a 6-inch casing. The normal output for the well is 10 gpm, although the water right is for 20 gpm. The District is in the process of having the water right transferred to the District from the Vashon Meadows system, and will be utilizing the well as an additional source.

Beall Well

The Beall Well is located adjacent to the treatment plant. The 6-inch well was drilled in 2007 developed to a depth of 565.5 feet below grade and came online in 2012. The well is operated at 80 gpm. This well is only used if needed during summer peak demand due to the added requirements to treat for ammonia. Well discharge is treated using break point chlorination and blended with influent flows coming from Beall and Ellis Creeks.

Table 1-2 summarizes the District's wells.

TABLE 1-2
Groundwater Source Summary

	Well 1	Well 2	Well 4	Well 3/ Morgan Hill Well	Vashon Meadows Well	Beall Well
DOH Source #	3	4	8	6	9	
Location	Reservoir site	Reservoir site	Reservoir site	0.1 MG Reservoir site	V.M. Subdivision	Treatment Plant
Date of Construction	1979	1990	2005	2010	2004	2012
Casing size	6-inch	12-inch	12-inch	6-inch	6-inch	6-inch
Approximate Ground elevation, ft.	412	413	412	280	370	260
Developed Well depth, (ft. BGS)	665	685	691	360	200	565.5
Screen Interval (ft BGS)	608-635 649-665	652-685	616-630 658-690	338-360	-	498-560
Discharge Rate, gpm	80 ⁽²⁾	50 ⁽²⁾	120 ⁽²⁾	35	10	80
Static water level (ft. BGS)	383	403	413	208	145	324

(1) BGS – Below ground surface

(2) Discharge Rate based on each well running individually. Total wellfield capacity is 200 gpm on an instantaneous basis with Wells 1, 2 and 4 pumping simultaneously.

WATER RIGHTS

The District's current water right certificates are listed in Table 1-3. Copies can be found in Appendix C. Additional water rights have been pursued over the years as discussed below. In 2013, a surface water right was transferred to a groundwater right culminating in the receipt of the Beall Greenhouse Water Right, under which the Beall Well operates. The Morgan Hill well was added to the District's primary groundwater right G1-23519, as an additional point of withdrawal. No additional water rights were received. The Vashon Meadows Water System acquisition provided an additional 20 gpm and 1.16 ac-ft of water rights to the system.

TABLE 1-3
Water Rights Summary

Water Right	Priority Date	Source Name	Instantaneous Rate	Annual Quantity
			(cfs/gpm)	(ac-ft/yr)
S1-0149C (SWC887)	9/11/1925	Beall Creek	0.90 cfs	651 ⁽²⁾
S1-0192C (SWC836)	11/14/1926	Ellis Creek	0.50 cfs	361 ⁽²⁾
G1-23519C(A) ⁽³⁾	11/30/1979	Wells 1, 2, 3 ⁽¹⁾ and 4	250 gpm	222
G1-23519P(B) ⁽³⁾	11/30/1979	Wells 1, 2, 3 ⁽¹⁾ and 4	250 gpm	78
S1-15998CAL (SWC8145) ⁽⁴⁾	4/14/1960	Beall Greenhouse	180 gpm	55
G1-28746P	12/21/2012	Vashon Meadows	20 gpm	1.16
Totals			1,078 gpm	1,368.16

- (1) Well 3 maximum Qi = 35 gpm and maximum Qa = 45 ac-ft/yr.
- (2) Qa is the quantity that would result from use of these sources for 24 hours per day over a full year. This has not yet occurred, and the rights are therefore not as of yet fully perfected.
- (3) Total wellfield withdrawals are limited to 250 gpm and 300 ac-ft/yr.
- (4) Not currently perfected.

The District currently has permitted capacities of 1,078 gpm instantaneous withdrawal and 1,368.16 ac-ft/year annual withdrawal.

TREATMENT AND DISINFECTION

The Water Treatment Plant is a Rapid Rate Filter Plant. The treatment plant recycles the water used for backwash back into the inflow to the plant. The plant receives water from Beall and Ellis Creeks and the Beall Well. It is designed for a maximum output of 700 gpm.

The Water Treatment Plant's summer capacity, when the District normally experiences its peak customer usage, is limited by diminished creek flows in Ellis and Beall Creeks. Recent monitoring results show a total available creek flow of 310 gpm during periods of minimum instream flow. However, per the District's water rights, Beall Creek withdrawal must leave 0.1 cfs (45 gpm) in the creek at the intake structure. Thus, the total flow available to the treatment plant during low stream flow conditions is 425 gpm (265 from Beall Creek and 160 gpm from Ellis Creek). Backwashing of filters occurs for approximately 2 hours per day further reducing the capacity to 390 gpm on a 24-hour basis.

Pump stations deliver raw water from both surface water sources through 8-inch transmission mains. Prior to beginning treatment, backwash water is added directly to the incoming raw water.

The treatment process begins with injection of a primary coagulant poly aluminum silicate sulfate (PASS C®) and a Polyacrylamide (Superfloc Polymer 573C). Water then passes through an inline static mixer and in to twin Roberts Filter Co. adsorption clarifier/multi-media filter package treatment units. Exiting from the filters, the water is disinfected with sodium hypochlorite prior to entering into one of the two clear wells. Since there are two filters, the plant can continue treatment processes while one of the filters is backwashed.

The disinfected water enters a pump chamber that is common to both clear wells. Flow from the clear well is pumped into the 494 Zone. Finished water is utilized for the filter backwash system.

The plant must recycle its backwash through the two 146,700-gallon settling basins (backwash lagoons) onsite. The recycle flow to the treatment plant is limited by the current operating permit to 15 percent of the treatment plant output. The plant includes a SCADA system that monitors flow, turbidity, pH and temperature.

Water pumped from the Beall Well is treated with break point chlorination prior to supply entering the raw waterline to the WTP.

Source water from Wells 1, 2, 3, and 4 is treated with chlorine at the wellhead prior to discharge into the storage reservoirs.

The WTP booster pumps supply the distribution system's 494 Zone from the WTP. There are two 700 gpm, 50-hp pumps.

STORAGE

The three reservoirs owned by the District are listed in the following Table 1-4. Two of the reservoirs are collocated with Wells 1, 2, and 4. The third reservoir is located with the Morgan Hill Well (Well 3). All reservoirs operate within the 494 Zone. Storage analysis is included later in Chapter 3.

TABLE 1-4

Reservoir Summary

	Morgan Hill 100,000-Gallon Reservoir	625,000-Gallon Reservoir	1.0 MG Reservoir
Location	SW 216 th Street and 99 th Avenue SW	SW 188 th Street and 103 rd Avenue SW	SW 188 th Street and 103 rd Avenue SW
Date Constructed	1958	1970	1988
Material	Steel	Steel	Steel
Diameter (ft)	30	45	45
Overflow Height (ft)	19.5	50	80
Capacity (gal)	100,000	625,000	1,000,000
Overflow Elevation (ft)	305	465	494
Pressure Zone Served	494 via pumps	To 1 MG tank	494
Source	Morgan Hill Well 3	Wells 1, 2, and 4	625,000 Reservoir and WTP

Wells 1, 2, and 4 discharge directly into the 625,000-gallon reservoir. A booster pump transfers water from the 0.625 MG reservoir to the 1.0 MG reservoir. Water gravity feeds in to the distribution system in the 494 Zone from the 1.0 MG reservoir. The Morgan Hill Reservoir (100,000 gallons) and Well are used during peak water use periods to help meet demand. The Morgan Hill Well discharges to the Reservoir. Water in the Morgan Hill Reservoir is pumped into the 494 Zone.

Reservoir Site

The transfer pump station that feeds into the 1.0 MG reservoir from the 625,000-gallon reservoir was constructed at the same time as the 1.0 MG reservoir. The station originally had two 5-hp pumps with a total pumping capacity of 300 gpm. The pumps were replaced in 2006, and the station now has a pumping capacity of 500 gpm, with 250 gpm at each pump. The wells and booster pumps can be powered by an on-site 100-kW generator in the event of a power outage.

Morgan Hill Site

The Morgan Hill Reservoir is located in the 494 Zone but has an overflow level of only 305 feet. In order to supply the 494 zone, a booster pump transfers water into the distribution system. The booster station includes two pumps, one 150 gpm, 25-hp pump, and one 100 gpm, 15-hp pump.

BOOSTER STATIONS

The District operates two booster pump stations. Table 1-5 for summarizes information on each station.

TABLE 1-5
Booster Stations Summary

Location	No. of Pumps	Pump Capacity, Size	Date	Purpose
SW 188 th Street and 103 rd Avenue SW (Reservoir Site)	2	250 gpm, 5 hp	Original 1988, replaced 2006	Pumps from the 0.625 MG Reservoir to the 1.0 MG Reservoir
SW 216 th Avenue (Morgan Hill)	2	(1) 150 gpm, 25 hp, (1) 100 gpm, 15 hp	Original 1958, replaced later	Pumps into 494 Zone, used only during peak periods

TRANSMISSION AND DISTRIBUTION SYSTEM

Pressure Zones

The District operates five pressure zones and seven pressure reducing stations, which are shown in Figure 1-3 and described below.

494 Zone

The upper or the 494 Zone encompasses 4.7 square miles in the north part of the District, including the downtown commercial area. This zone operates at the hydraulic grade line of 494 feet, the overflow level of the 1 MG tank.

350 Zone

The middle 350 Zone encompasses 0.7 square miles in the central part of the District. This zone operates at the hydraulic grade line of 350 feet, and is controlled by two pressure reducing valve stations.

305 Zone

The 305 Zone encompasses 0.1 square miles in the east central part of the District primarily in the Ellisport area. This zone operates at the hydraulic grade line of 305 feet, and is controlled by one pressure reducing valve station. In an emergency, a normally closed valve on SW 203rd Street east of 81st Avenue SW may be opened.

240 Zone

The 240 Zone encompasses 0.6 square miles in south and east part of the District extending onto Maury Island. This zone operates at the hydraulic grade line of 240 feet, and is controlled by two pressure reducing valves.

200 Zone

The 200 Zone encompasses 0.1 square miles in the lower east central portion of the District in the Ellispot area. This zone operates at the hydraulic grade line of 200 feet controlled by two pressure reducing valve stations. A normally closed valve on SW 203rd Street east of 81st Avenue SW may be opened in an emergency.

Pressure Reducing Valve Stations

The District has seven pressure reducing stations that regulate flow between the 494, 350, 305, 240 and 200 Zones. The locations are shown on Figure 1-3. Table 1-6 provides detail about each valve station.

TABLE 1-6

Pressure Reducing Valve Stations Summary

	PRV Station and Location	Elevation (ft)	Pressure Zones	Size (inch)	Setting (psi)⁽¹⁾
1	20505 87 th Avenue SW	200	494 Zone to 350 Zone	2	78
				6	73
2	Ridge Road	255	494 Zone to 305 Zone	2	25
				6	20
3	22100 Vashon Highway	170	494 Zone to 240 Zone	2	30
				6	25
4	SW 8215 216 th Street	70	350 Zone to 240 Zone	6	50
5	87 th Avenue SW and West Ellispot Road	20	350 Zone to 200 Zone	2	80
				6	75
6	Chautauqua - 8022 SW 204 th Street	95	305 Zone to 200 Zone	6	30
7	21318 Vashon Highway	295	NOT IN USE		

(1) Downstream pressures recorded on April 1, 2019.

Pipe Inventory

The District's distribution system consists of a network of pipes ranging from 3/4 inches to 16 inches in diameter. Pipe materials within the District's system include PVC, ABS plastic, cast iron, ductile iron, asbestos cement, galvanized, and dipped and wrapped wrought iron. Table 1-7 presents a summary of the District's water main based upon the GIS database.

TABLE 1-7**Pipe Inventory**

Pipe Size	Pipe Material										Total
	ABS ⁽¹⁾	AC ⁽²⁾	DI ⁽³⁾	CI ⁽⁴⁾	Copper	GI ⁽⁵⁾	PVC	STI	STL	Unknown	
Under 4 in	1,838				1,816	6,956	1,317		1,879	2,187	15,933
4 in		5,834	658						7,150	115	13,757
6 in		15,246	9,693					2,167	10,354	533	37,993
8 in		10,755	61,049	2,456			3,148		2,386	9,217	89,011
10 in			3,267								3,267
12 in			22,909	993						323	24,225
16 in			2,523							5,156	7,679
Unknown										5,763	5,763
Total	1,838	31,835	100,099	3,449	1,816	6,956	4,465	2,167	21,769	23,294	197,688

(1) Acrylonitrile-Butadiene-Styrene.

(2) Asbestos Concrete.

(3) Ductile Iron.

(4) Cast Iron.

(5) Galvanized Iron.

TELEMETRY AND CONTROLS

The District utilizes Wonderware software as the telemetry and Supervisory Control and Data Acquisition (SCADA) system, with Winn911 for alarm notification. The Human-Machine Interface (HMI) is located at the Water Treatment Plant. The Beall and Ellis Creek pump stations and the Wellfield and reservoir site use physical data lines (wires), while the Beall Well is wired directly to the WTP. The District is in the process of installing cellular communication for SCADA control at the Morgan Hill site.

All of the programmable logic controllers (PLCs) are Siemens brand. The wellfield has a Siemens interface and can be operated as a local SCADA control station if necessary.

SYSTEM INTERTIES

In addition to its regular source of water supply, Water District 19 has an emergency intertie with Heights Water located at 16400 Vashon Highway SW. The agreement governing conditions of use is included in Appendix D. The intertie provides an emergency source of water for both purveyors. For Heights Water to supply Water District 19, a connecting valve is opened allowing flow due to the higher hydraulic grade line at Heights. Pumping from Water District 19 to Heights is achieved through a fire hydrant, a nearby blowoff, and a portable pumping unit. A meter installed in the intertie vault is used to monitor the amount of water transferred.

IMPROVEMENTS SINCE 2008 WATER SYSTEM PLAN

Table 1-8 provides the projects listed in the Capital Improvement Plan (CIP) included in the District's 2008 Water System Plan identifying the status of each project.

TABLE 1-8
2008 Water System Plan CIP Project Status Summary

Project Description/Title	Year Completed	Additional Information
Treatment Plant Chlorination	2008	Chlorine analyzer installed at end of treatment process prior to entering the distribution system.
Beall Well Implementation	2012	Equipping well and connecting it to distribution system and SCADA system.
Tank Farm Booster Station	In Preliminary Design	Installation of a booster station at the reservoir site to increase fire flow to surrounding areas.
On-Going Water Main Replacement		Replacement of deficient, undersized, aging, and/or failing water mains.
Ridge Road	2016	Replaced 5,200 LF of 4-inch and 6-inch pipe with 8-inch pipe.
Evaluation of Source Development Alternatives	In Preliminary Stages	Study/analysis of source alternative options including wells, conservation, surface water impoundments, rainwater collection, desalination, pipeline off island, purchasing water from other systems on island, artificial aquifer recharge, and reclaimed water.

SERVICE AREA CHARACTERISTICS

The service area for Water District 19 encompasses 6.2 square miles in the east-central portion of Vashon Island in King County, Washington and includes the Unincorporated Rural Town of Vashon and a small area on the northern end of Maury Island. The District is generally bounded by SW 160th Street to the north, Puget Sound to the east, 115th Avenue SW and 103rd Avenue SW to the west and Quartermaster Harbor and Maury Island on the south. The service area on Maury Island is bordered on the south by SW 240th Street, on the west by Quartermaster Harbor and to the east by Dockton Road SW. The Interlocal Service Agreement included in Appendix D establishes these boundaries and is an outcome of an inter-jurisdictional planning effort that resulted in the Vashon Coordinated Water System Plan. Figure 1-2 presents the Boundary Map for the current service area.

EXISTING AND RETAIL SERVICE AREA

The District's existing service area is shown on Figure 1-3. The area has been established by interlocal agreement. This boundary establishes the water rights place of use and defines the area for which the District has a duty to serve. The current retail service area is consistent with King County records.

FUTURE SERVICE AREA

The District does not anticipate any changes to the current retail service area boundary.

ZONING AND FUTURE LAND USE

The land use and zoning are under the jurisdiction of King County. The center of the District, in and around the Unincorporated Rural Town of Vashon consists of Industrial, Community Business, Neighborhood Business, Office, and Multi-Family along Vashon Highway SW. This is the most densely populated area of the Island and is in the center of WD 19's service area. However, approximately 85 percent of the District's service area is zoned Rural Area.

The potential for future development and growth within the District is limited by the large lot zoning and rural designation of the Island as a whole. There is, however a considerable amount of undeveloped land within the District. These undeveloped lots are scattered throughout the District but due to the large lot zoning, are restricted from subdivision and eligible for private well installation. Figure 1-4 shows King County Zoning designations within the Water District 19 Service Area and Table 1-9 provides a summary of the breakdown of zoning designations by acre.

TABLE 1-9

Zoning within District

Zoning Designation	Area (acres)	Percent of Total Service Area
R-1 Residential (1 DU/ac)	103	2.6%
R-4 Residential (4 DU/ac)	176	4.5%
R-8 Residential (24 DU/ac)	23	0.6%
R-12 Residential (12 DU/ac)	16	0.4%
RA-2.5 Rural Area (1 DU/5 ac)	728	18.5%
RA-5 Rural Area (1 DU/5 ac)	1,943	49.4%
RA-10 Rural Area (1 DU/10 ac)	697	17.7%
A-10 Agriculture (1DU/ac)	14	0.4%
CB Community Business	83	2.1%
NB Neighborhood Business	12	0.3%
O Office	18	0.5%
I Industrial	118	3.0%
Total	3,931	100%

GEOGRAPHY AND CLIMATE

The District's topography ranges from sea level along the shoreline on the eastern boundary to an estimated maximum elevation of 415 feet on the western portion of the service area. Figure 1-5 shows the topography within the District's boundary. At the upper elevations, the topography levels to gentle rolling plateaus. Exceptions to the rolling terrain of these upland plateaus occur only in a few deeply cut stream ravines. Topography within the District generally slopes toward Judd Creek on the southwestern portion of the District, toward the east shore of the Island on the northeastern portion of the District and southerly toward Quartermaster Harbor on the southern portion of the District. Large portions of Vashon Island have slopes exceeding 15 percent near the waterfront. Steep slope areas are shown on Figure 1-6.

The average annual precipitation on the Island is approximately 40 inches. The climate is classified as Marine West Coast and is characterized by cool dry summers, mild wet winters, and a relatively small range in temperature. The prevailing wind direction in the summer time is from the north, and south-southwest for the rest of the year.

SOILS AND GEOLOGY

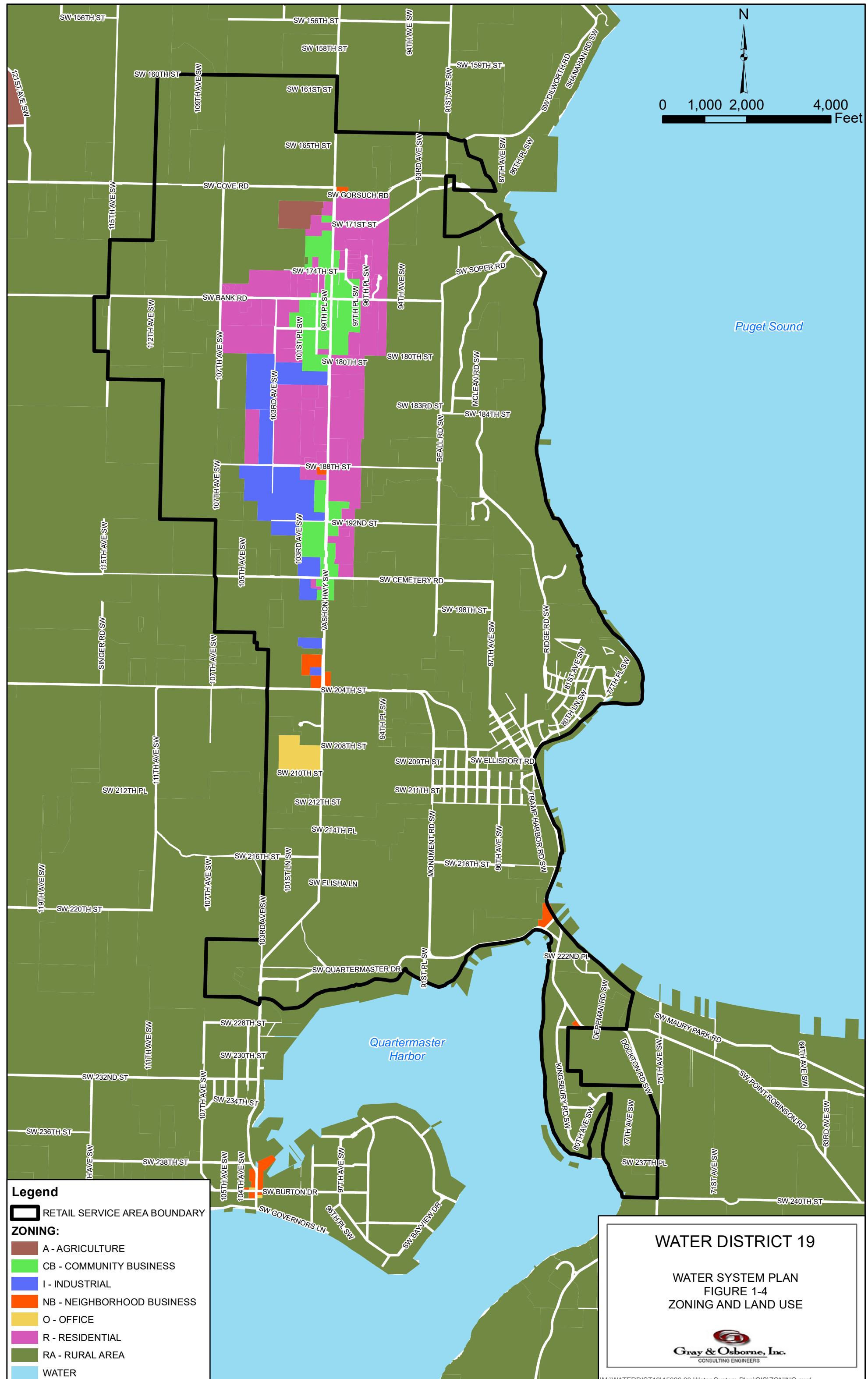
The King County Soil Survey Map shows that the surficial soils in the area are mostly glacial till topped with gravelly sandy silty loam. There are areas of Coastal Beaches (Cb) and Riverwash (Rh) soil types along with slopes varying from 0 to 30 percent. The King County Soil Survey does not include percent slopes for the Coastal Beaches soil type within the District. There are steep slopes, up to 55 percent, along the eastern boundary of the service area down to Puget Sound.

Geologic and hydrogeologic studies have been performed on Vashon-Maury Island over the years. Perhaps the most detailed geologic information specific to the area is based on the work of Derek B. Booth. Booth's detailed analyses can be found in various documents and are summarized in the December 1998 edition of Vashon-Maury Island Groundwater Management Plan, a product of the Vashon-Maury Island Groundwater Advisory Committee. Based on Booth's work, the stratigraphic glacial deposits are named as follows:

Qvr, Recessional Outwash: Mainly stratified sand and gravel that mantle the upper till surface.

Qvi, Ice Contact Deposits: Similar in texture to Qvr, but with collapse features and rare till lenses suggesting deposition on or near stagnant ice.

Qvt, Till: Mainly compact diamactions, typically 40 to 60 feet thick having low permeability.



Legend

RETAIL SERVICE AREA BOUNDARY

ZONING:

- A - AGRICULTURE
 - CB - COMMUNITY BUSINESS
 - I - INDUSTRIAL
 - NB - NEIGHBORHOOD BUSINESS
 - O - OFFICE
 - R - RESIDENTIAL
 - RA - RURAL AREA
 - WATER

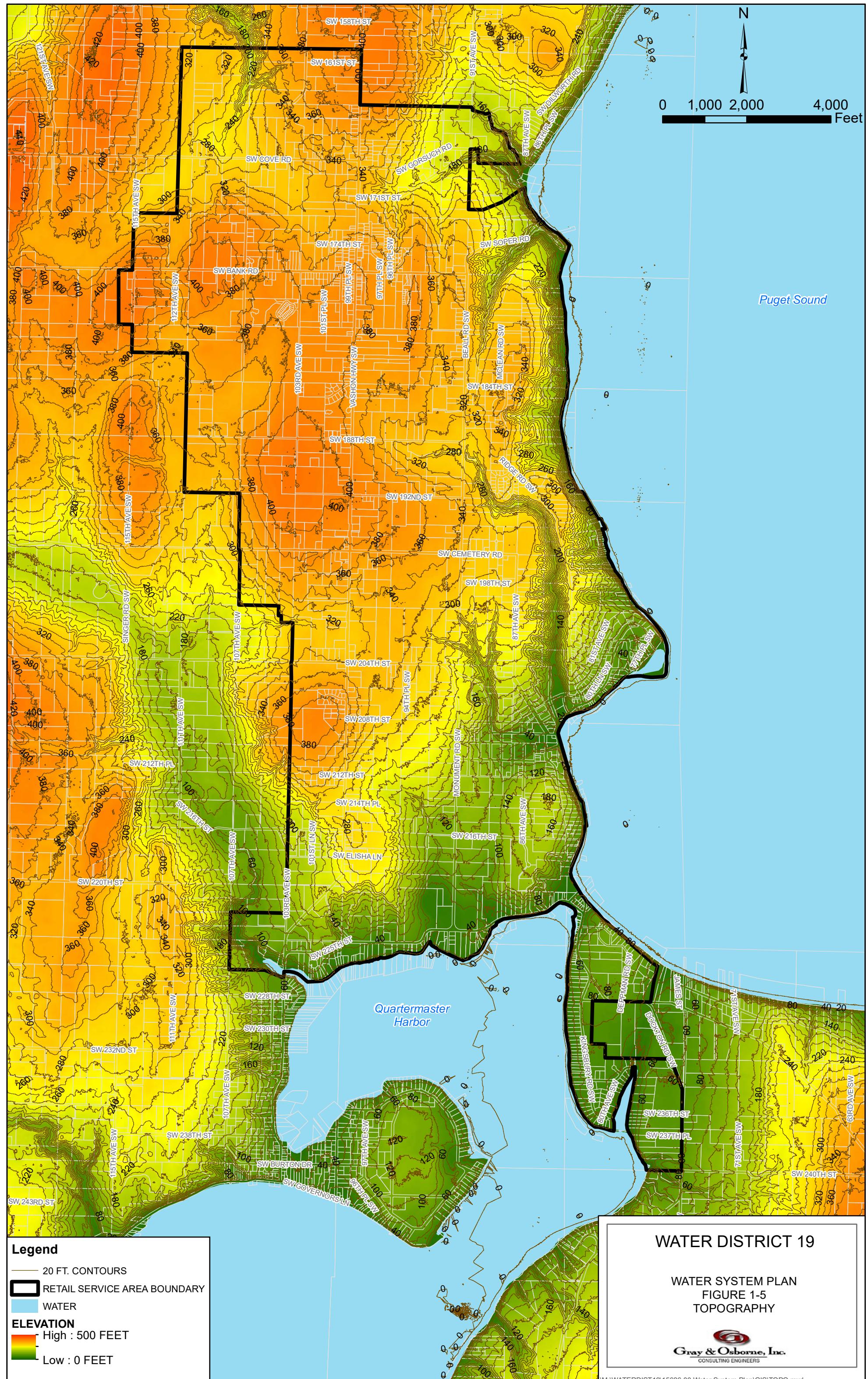
WATER DISTRICT 19

WATER SYSTEM PLAN

FIGURE 1-4

ZONING AND LAND USE





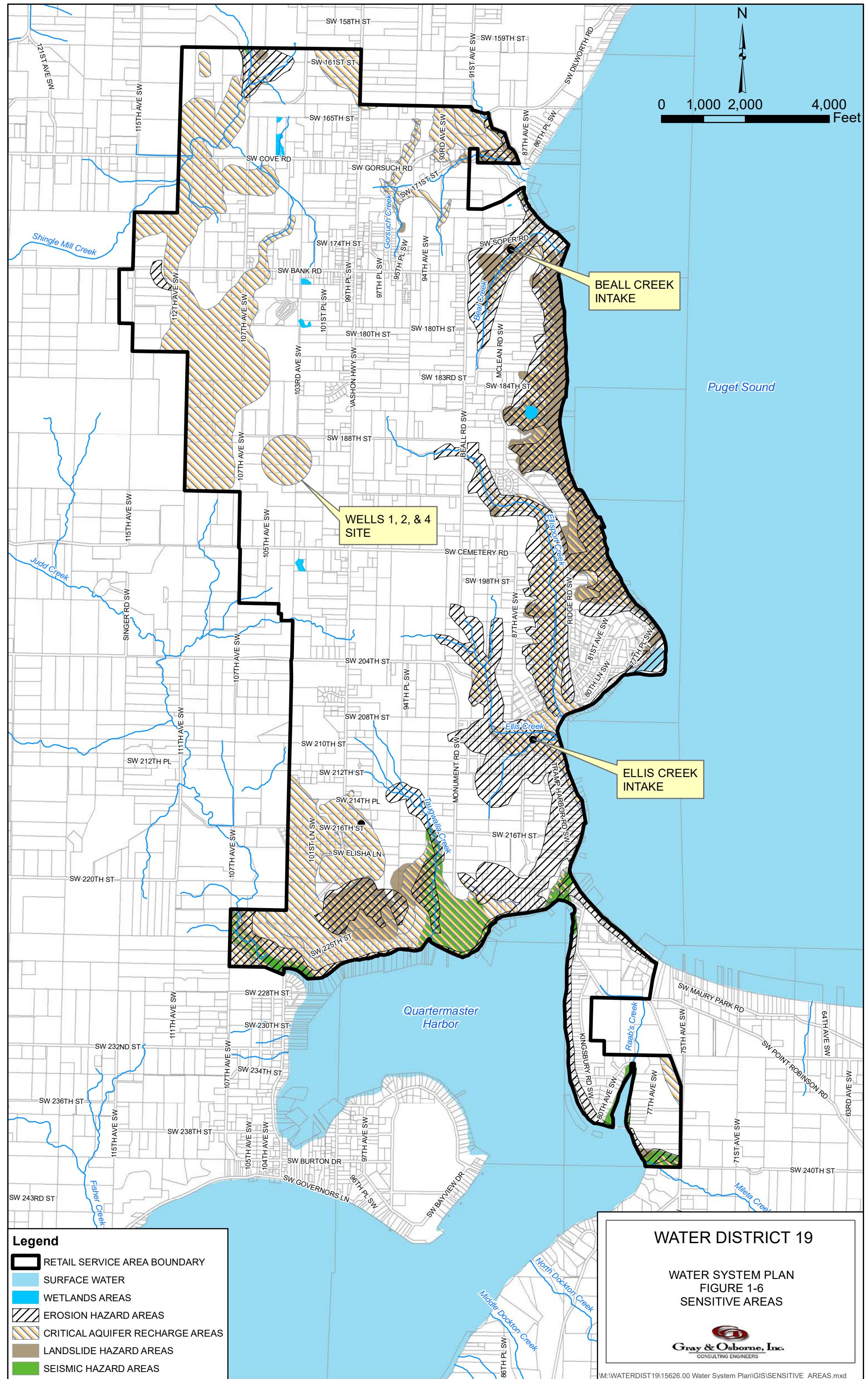
Legend

- The legend includes:
 - A yellow line segment labeled "20 FT. CONTOURS".
 - A black rectangle labeled "RETAIL SERVICE AREA BOUNDARY".
 - A blue rectangle labeled "WATER".
 - A bold title "ELEVATION" followed by a color gradient from red (High) to green (Low), with labels "High : 500 FEET" and "Low : 0 FEET".

WATER DISTRICT 19

WATER SYSTEM PLAN FIGURE 1-5 TOPOGRAPHY





Legend

- RETAIL SERVICE AREA BOUNDARY
 - SURFACE WATER
 - WETLANDS AREAS
 - EROSION HAZARD AREAS
 - CRITICAL AQUIFER RECHARGE AREAS
 - LANDSLIDE HAZARD AREAS
 - SEISMIC HAZARD AREAS

WATER DISTRICT 19

WATER SYSTEM PLAN

FIGURE 1-6

SENSITIVE AREAS



Qva, Advance Outwash: Commonly medium- and fine- grained sand, with some sandy gravel. Thickness of this unit varies from being absent (0 feet) to greater than 200 feet. The shallowest reliable water-bearing zone on the Island is probably composed of permeable Qva material.

A simplified summary of the geology and soils of Vashon/Maury Island are best described in “Vashon/Maury Island Water Resources Study” prepared by J.R. Carr/Associates in 1983. Carr’s simplified descriptions, with Booths classifications in parentheses, are presented below:

Unit I – This is the uppermost or surface layer of nearly all of the uplands of the Island. This layer Consists principally of till (Qvt), but also contains recessional outwash (Qvr) and sand lenses that yield small quantities of water to shallow dug wells. Many of the island’s drainfields are located in Unit I.

Unit II – Unit II is a sand and/or advance outwash sand and gravel (Qva) unit that is typically 50 to 100 feet thick but reaches thicknesses of several hundred feet on the southwestern shore of Maury Island and the west side of Vashon Island. This Unit contains the principal aquifer.

Unit III – Unit III comprises all of the pre-Vashon deposits, including silty layers that are presumably the Olympia Beds (Qob). This is a homogeneous blue to brown silt or clay layer that generally acts as an aquitard (aquitards are low permeability hydrostratigraphic layers) to impede groundwater flow from Unit II. Springs are common where the two layers meet and are exposed along the Island perimeter. Discontinuous sand layers at 100 to 300 feet below sea level yield water to a number of domestic wells. These isolated pockets are referred to as the deep aquifer.

SURFACE WATERS

Within the District’s service area, there are several small creeks. The most prominent in terms of importance to this Plan are Beall and Ellis Creeks because they are sources of water supply to the District. Other surface water features within the District are Ellisport Creek, Gorsuch Creek, Shingle Mill Creek, and Raab’s Creek. Beall Creek is the largest creek in the District and flows northeast to Puget Sound from the north side of SW 184th Street. Ellis Creek originates east of Vashon High School and flows south and east to Tramp Harbor.

SENSITIVE AREAS

Established sensitive areas occurring within the District service area are mapped on Figure 1-6. As indicated, a variety of hazards and environmental sensitivities will impact the level and location of future development within the service area. These sensitive areas may present difficulties when siting new facilities and determining the most cost effective

and efficient routes for new pipelines. In addition, these are areas where the District needs to take special precaution during construction, repairs, and day-to-day operation of the system. The nature of the sensitive area may also prompt the District to initiate public education efforts in association with its Wellhead Protection, Watershed Management, and Water Use Efficiency Programs. For instance, published Best Management Practices may be shared with the owners of property located within certain sensitive areas to promote watershed management and protection.

ADJACENT PURVEYORS

According to the 1990 Coordinated Water System Plan for Vashon Island, there are a total of seven principle purveyors providing water service on Vashon Island. Below is a summary of the adjacent purveyors to Water District 19's service area boundary. Figure 1-7 shows the adjacent purveyors. The District has several small Community systems within their current service area, which are also shown on Figure 1-7.

HEIGHTS WATER ASSOCIATION

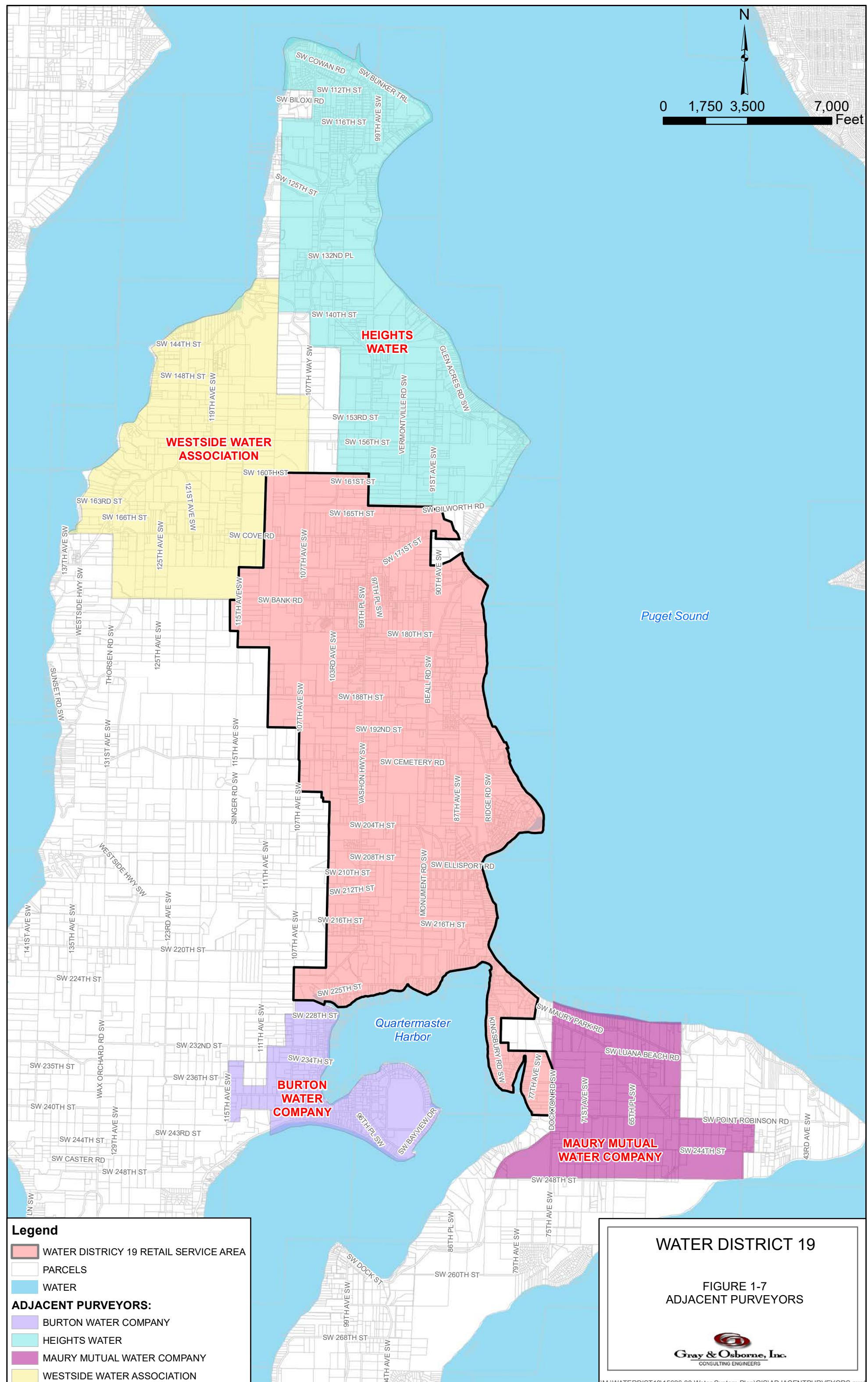
Heights Water Association was organized as a private, non-profit mutual water association, created in 1921. The Association is located on the northern end of Vashon Island and is adjacent to WD 19's northeast boundary. The Heights Water service area is approximately 4 square miles and serves 773 connections. The customers are mostly single-family residents. The non-residential customers include the Washington State Ferry Facilities, Vashon Community Care Center, and the Harbor Elementary School. Sources for the Association are one spring source with a minimum capacity of approximately 125 gpm and four groundwater wells with a total capacity of 217 gpm. Height's Water system has 800,000 gallons of storage capacity. WD 19 has an intertie agreement with Heights Water. See Appendix D for a copy of this agreement.

WESTSIDE WATER ASSOCIATION

Westside Water Association was established in 1928 as a non-profit cooperative to provide water service to the northwest side of Vashon Island. The Association is adjacent to WD 19's northwest boundary. The sources of supply are a series of springs located in Shingle Mill Creek Canyon, with a capacity of 210 gpm and two wellfields with a combined capacity of 110 gpm. Storage capacity is approximately 259,000 gallons.

BURTON WATER COMPANY

Burton Water Company service area is adjacent to WD 19's southwest boundary. The Burton Water Company was established in 1950 as a private water utility. The Water Company's customers are mostly single-family homes and a small neighborhood center and elementary school. Wells are the source of supply at a capacity of approximately 185 gpm. The system includes 320,000 gallons of storage.



WATER DISTRICT 19

FIGURE 1-7
ADJACENT PURVEYORS



MAURY MUTUAL WATER COMPANY

Maury Mutual Water Company was formed in 1952 as a water co-op. The Water Company is adjacent to WD 19's southeast boundary on Maury Island. The Company's sources of supply are wells and springs with a capacity of approximately 85 gpm. The system includes approximately 149,000 gallons of storage.

DOCKTON WATER ASSOCIATION

Although not directly adjacent to WD 19's service area boundary, Dockton serves the south end of Maury Island. Dockton Water Association is a private non-profit organization that serves mostly residential connections with a few commercial accounts. Dockton has two sources of supply with a capacity of 200 gpm, five pressure zones, pumping facilities, and two reservoirs with 317,000 gallons of storage.

SERVICE AREA POLICIES AND CONDITIONS OF SERVICE

Service area policies are important in guiding the development of a water system. DOH has established a list of service area policies to be referenced in water system comprehensive plans.

The following policies have been adopted by Water District 19 and supersede previous policies in the 2008 Water System Plan.

GENERAL POLICIES

G-1: Water District 19 provides water resource management with an emphasis on conservation to deliver a safe and reliable supply of high-quality water to meet present and future needs in an environmentally sensitive and economically responsible way.

G-2: As our local and global environments continue to change, the District needs to be ready to respond quickly. The District will pursue sustainable operations, searching globally for environmentally safer solutions and technologies, working with staff to answer the needs of the community it serves as well as the environment that sustains it, and collaborating with regional stakeholders to ensure a thriving environment, economy and community.

G-3: The District will place sufficient operating revenues in reserve so that predictable infrastructure replacement and repair do not unduly burden present and future customers with exorbitant rates or debt.

G-4: The District encourages public input and provides the opportunity for public participation at each commissioner's meeting.

G-5: The District will update when necessary its Emergency Preparedness Plan and will work with other local groups to coordinate community response in the event of a disaster.

G-6: The District shall provide fire protection within the service area where existing infrastructure provides adequate fire flow. New and replacement infrastructure shall support fire protection per system design criteria.

G-7: The District strives to attract, develop and retain a talented and diverse workforce. Creativity, innovation and a deep understanding of the Vashon community's needs are encouraged for improving the effectiveness of the District. We value a work environment characterized by fair treatment, open communications, personal accountability, trust and mutual respect which is reflected in our relationships with our clients. We encourage a high level of workplace safety and favorable conditions of employment.

G-8: The District recognizes that protecting our precious water resources, such as the aquifer, not only protects the environment but also serves to minimize the cost of service to our lowest income customers. Instituting expensive alternative methods of supply after loss of ground or surface water supplies, such as desalination plants (in use by neighboring islands), are recognized as a failure to manage water resources effectively, resulting in environmental damage and less affordable water for our customers.

G-9: The District will ensure implementation of the actions specified in this document using whatever effective means of management necessary to ensure their timely delivery.

WATER SUPPLY POLICIES

WS-1: Water District 19 is the largest publicly owned water supply system on Vashon Island. There are no other sources on the Island that will likely be able to service the District in the event of prolonged drought situations. Therefore, the District has chosen to plan conservatively and if more capacity becomes available, the release of new water service will be carefully considered, giving the District the opportunity to assess the impacts and needs of the water users and the ecosystem.

WS-2: The District strives for water security as defined by the UN as the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems.

WS-3: The District will focus on diversification of sources of supply and will prioritize conservation savings and other alternative sources and consider options such as water reclamation, rate structure adjustments and rainwater harvesting while continuing to explore traditional supply options.

WS-4: The District will manage its water sources in a manner that ensures long-term sustainability. To that end, the District will continuously monitor withdrawals from wells, well drawdowns, aquifer levels, withdrawal from streams, stream flows, and all system leakage and losses. In the event of a chronic decrease in groundwater or surface water supply levels, the District will take any steps necessary to stabilize those levels, potentially including pursuing regulation of exempt wells within District boundaries.

WS-5: The District will strive to manage its resources so that water restrictions are not necessary in the event of drought conditions and so that the District will be prepared to meet any chronic water shortages or unexpected changes to our traditional sources of supply.

WS-6: The District evaluates metered customer water usage to calculate per day peak use per single-family residential service connection, or equivalent residential unit (ERU). This ERU, which will be re-evaluated periodically, is used along with other DOH recommendations, to determine the number, if any, of new service connections that can be added.

WAITING LIST POLICES

WL-1: Future service connections, should they be possible, will be distributed to customers on the waiting list on a first-in time frame.

WL-2: The District will continue to evaluate the reliability of its sources of supply, the demand placed upon those supplies (by both water production and stream flow), and authorize new service connections only if it is confident that a sufficient supply is available to meet both demands.

WL-3: At such time when the current closed waiting list is fully served, any newly available units shall be distributed to applicants via an annual allocation event. Prior to issuing further new connections, the District shall consider a policy requiring sale and/or “capacity rental” of additional ERU capacity to existing customers whose long-term usage is in excess of their allotted ERUs.

ENVIRONMENTAL POLICIES

E-1: The District will steward the natural watershed areas it currently owns using the best available science and advice to manage the surface water sources and the habitat within these watersheds, and will actively encourage landowners within and near the watersheds’ drainage areas to participate in this stewardship.

E-2: The District will address environmental impacts of projects in accordance with the State Environmental Policy Act and the requirements of all applicable local, state and federal law.

E-3: The District will support island wide efforts to understand the nature and complexity of the Vashon Island water resources and the search for funding to implement such programs.

E-4: Understanding that actions taken within its boundaries may impact surrounding areas, the District will work to minimize any negative effects. Specifically, the District will evaluate the demand of fisheries habitat and water supply on its water supply resources, and strive to maintain healthy stream flows both for resident fish and for their contribution to the near shore marine environment.

E-5: Wishing to minimize negative impacts on the overall environment, the District will seek out ways to take advantage of emerging renewable power sources; will emphasize energy fuel efficiency and low emissions in choosing vehicles and other equipment; and will minimize the dispersal of contaminants throughout its water treatment process.

E-6: The District will actively monitor and reduce fossil fuel-based energy used in our systems by examining the viability of alternative energy supply sources; consider vehicle electrification; conserving water used (and thereby reducing associated energy used) and prioritizing increasing energy efficiencies in our water systems.

WATER CONSERVATION POLICIES

WC-1: The District will pursue water conservation as a primary goal through educational outreach to its customers and through programs designed to directly reduce consumption.

WC-2: The District will continue to vigorously pursue leak detection within its system.

WC-3: The District's goal for the next 6 years is a reduction per ERU of consumption during summer months by an average of 2 percent per year.

WATER QUALITY POLICIES

WQ-1: The District regards providing good water quality as its highest priority and will actively seek continuous improvement in achieving water quality goals that meet and attempt to exceed all local, state and federal standards.

WQ-2: Recognizing the vulnerability of the Vashon sole source aquifer, the District will seek to protect long-term water quality through educational and other efforts to minimize source water quality degradation related to issues such as introduced contaminants and excessive water use.

WQ-3: Our water system design balances the use of water supply sources to prioritize the use of the highest quality water from sources with the lowest negative environmental impact.

WQ-4: The District recognizes that all of our water quality questions involve economic choices. The status quo assumption is that source treatment of groundwater to remove arsenic at the Beall Well and manganese at the Morgan Hill well is too costly. When used, Beall Well will be blended with treatment plant water. Manganese in the Morgan Hill water is noted to settle out in the adjacent reservoir but there is no formal manganese removal facility at this time. The District is committed to regularly reevaluating the need for separate treatment systems.

TIMELY AND REASONABLE

Water District 19 is the only public water service provider within the Vashon Coordinated Water System Plan area. RCW 70A.100.060(3)(b) states “No other purveyor shall establish a public water system within the area covered by the (coordinated water system) plan, unless the local legislative authority determines that existing purveyors are unable to provide the service in a timely and reasonable manner, pursuant to guidelines developed by the secretary. An existing purveyor is unable to provide the service in a timely manner if the water cannot be provided to an applicant for water within one hundred twenty days unless specified otherwise by the local legislative authority.” The District adopts the following definitions for timely and reasonable:

Timely – Water District 19 will issue, or deny, a Certificate of Water Availability to applicants that have submitted, in writing, an accurate and complete application for a Certificate within 120 days of receipt.

Reasonable – Water District 19 considers the extension of service reasonable if service may be extended to the applicant’s property consistent with applicable District resolutions, policies, and procedures.

The developer is responsible for all costs to extend Water District 19’s system to serve the proposed development with reliable service meeting all WDOH and WDOH criteria and including the provision of fire flow as may be required by the Vashon Fire District or by King County.

WATER SERVICE POLICIES

WServ-1: All new connections to the system, and all material changes of use of existing connections, must be authorized by the District Board of Commissioners. Authorization will be accomplished with the issuance of a Certificate of Water Availability (CWA) that specifies the King County parcel number, the number of water service units, and the intended use of the connection.

WServ-2: Every commercial structure that uses water from the District must have at least one water meter and at least one water service unit. Exemptions may be made for multi-family or temporary lodging structures, as stated in the District’s Master Resolution.

WServ-3: When the District grants a Certificate of Water Availability (CWA) to one of its existing water service unit holders, the District is agreeing to provide water for the use specified by the applicant at the time of the application. If, subsequent to the granting of a CWA, the water service unit holder wishes to fundamentally change or add a new use of water to the holder's original request, the holder must reapply for a new CWA from the District to approve the change or new use.

WServ-4: Customers with existing, paid-up water service units, which are assigned to specific parcels, will normally be issued CWAs when applying for King County building and development permits, if these permits do not call for fundamental change or significant expansion of water use on the parcel. However, a CWA will be provided only if all applicable District policies and conditions are met, and no changes to land use or zoning are involved.

SERVICE AREA POLICIES

SA-1: Wholesale Customers: The District currently does not have any wholesale customers and will address this issue on a case-by-case basis.

SA-2: Wheeling of Water: The District does not currently wheel water to another system. The District will evaluate this on a case-by-case basis. Any entity wishing to wheel water through the District's system will need to meet certain conditions pertaining to water quality, system engineering, etc.

SA-3: Annexation: The District will address any request from a person/group that petitions the District for annexation.

SA-4: Direct Connection and Remote Systems: The District requires direct connection to the system if the District has the capacity to do so. If not, refer to the District's Satellite Management Agency Plan.

SA-5: Design and Performance Standards: The District has published Developer Standards for the Construction of Water Systems within the District.

SA-6: Surcharge for Outside Customers: The District does not provide water service outside of its service area boundaries.

SA-7: Latecomer Agreements: The District will address latecomer agreements which will allow persons/groups to recover costs used towards the construction of waterline construction on a case-by-case basis.

SA-8: Oversizing Policy: The District may reimburse developers for oversizing water main extensions if the District requires the developer to install water mains larger than 8 inches.

SA-9: Cross Connection Control Program: The District requires existing or potential cross-connection hazards to have a proper backflow prevention device installed, test and annually inspected.

SA-10: Extension Policy: The District requires water main extension pipe to be no less than 6-inch ductile iron pipe.

SA-11: Requests for new service connections are processed in the order received. If water is available, an Application for Water Service is executed between the District and the property owner.

SA-12: Every 10 years prior to initiating the revision of the Comprehensive Water System Plan, the District will complete a System Capacity and Analysis Study to determine system capacity.

SA-13: Conditions of a non-technical nature that directly impact the District's ability to provide new water service include the limited water resources available for the Island sole source aquifer, the adherence to applicable laws and regulations governing the administration and operation of the water system, the conformance to recommendations of the state Department of Health, Department of Ecology and King County, the nature of the District's service area, the limited water rights of the District and the lack of affordability of implementing improvements and perfecting new sources.

SA-14: Requests for project/installation extensions will be reviewed by the District staff. A recommendation will be forwarded to the Board of Commissioners and a decision rendered at a regular public meeting. Any disputes or appeals must be brought before the Board at the next regular public meeting. A file will be established to document each case.

EXISTING MORATORIUM

Water District 19 is currently under a moratorium on new connections. This is the second such moratorium instituted by the District and is authorized under District Resolution No. 723. The first moratorium was issued in September 1994 when the source capacity from all sources was estimated at 655 gpm. The limiting factor was the treatment capacity from the Beall Creek and Ellis Creek treatment facilities and the difficulty meeting peak day demands as required by the DOH.

In recent years, the District has experienced source production capacity limits well below its water right limits. First, Well 2 repeatedly failed to achieve the predicted and permitted 250 gpm capacity. Finally, in 2005, after repeated and costly attempts at redevelopment, Well 2 failed and the District took out an emergency loan to drill yet another deep well (Well 4) so that it could pump at its water right limit. Well 4 has needed to be redeveloped and currently safely pumps at 120 gpm (Table 1-2)

Currently, Well 2 is operated for short periods of time, plus it provides a source of monitoring aquifer levels. Between Wells 1, 3, and 4, the Wellfield capacity is 200 gpm. This represents approximately 78 percent of the permitted capacity.

Previous District planning documents indicate that the peak day use was calculated on a per meter basis based upon production and indicated that average peak day production at that time was 782 gpd per meter. Based on this calculation and DOH requirements at the time, the peak day value of 800 gpd per connection was adopted and used for evaluating water availability. The District used the term “water service units (WSU)” to describe connections, and each “WSU” was allotted 800 gpd maximum day demand for the purpose of analyzing system capacity. Larger customers were allotted multiple shares, while most single-family residential customers were allotted one share each. The moratorium was in effect until the current treatment plant was put online in the fall of 1995.

Upon completion of the new water treatment plant in 1995, the first moratorium was lifted and based on the increase in production capacity, approximately 200 new WSUs were issued. A second moratorium went into effect in February 1996. Combining the total permitted groundwater capacity from the District wellfield (250 gpm) and permitted surface water capacity from Beall and Ellis Creeks (628 gpm), and dividing by 800 gpd per water unit as the estimated peak usage, the District calculated that it did not possess the capacity to issue any more WSUs to serve additional connections. However, a limited number of new connections were authorized when unused water service units were returned to the District, and when the District reevaluated the water demand of its customers. The District has a waiting list for new connections that currently contains 30 parcels requesting a total of 85 water service units.

The quantity assigned to a WSU was changed to 600 gpd maximum day as part of the 2008 Water System Plan. The 600 gpd figure is now applied only to those with commercial properties, who must show via an engineer’s report that their usage will not exceed that WSU value.

In recent years the District has produced updated, peer reviewed capacity analyses as water trends continue to change to determine capacity status. As a result, 90 units have been issued since the approval of the 2008 Comprehensive Plan. The most recent update to this analysis completed in 2015 serves as the foundation for Chapter 3 of this Plan.

This Plan includes a projection in Chapter 2 that 14 waitlist ERUs will be issued each year until the waitlist is cleared. This is projected to occur in early 2023. After this occurs, the District anticipates returning to a regular issuance of 4 additional ERUs per year. The District’s current policies state that once the moratorium is lifted, an annual lottery will be held to distribute new ERUs.

The importance of water supply and system issues that have led to past and current moratoriums are a key consideration for future land use planning. The District expects to

play a significant role in any future revisions to the Vashon Town Plan. It is expected that this will be accomplished in partnership discussions with King County and the Vashon community.

RELATED PLANNING DOCUMENTS

Vashon-Maury Island Groundwater Advisory Committee, Vashon-Maury Island Groundwater Management Plan, December, 1998.

This document, prepared over a period of 10 years, contains a statement of purpose, recommended groundwater management strategies, and a recommended implementation process. The plan contains an extensive set of recommendations, along with prioritization and funding discussions. The plan states “the Vashon Groundwater Advisory Committee decided at the outset that its goal is: to manage the groundwater resources of King County to optimize current and long-term benefits for present and future residents. To achieve that goal, we ask King County to: adopt a non-degradation policy for Vashon.”

The “high” priority management strategies include, but are not limited to, the following:

- Applying land use controls to prevent overuse or contamination.
- Incorporating an assessment of water quality impacts from specific land uses.
- Implementing a program to prevent seawater intrusion.
- Monitoring trigger levels of certain parameters to help in assessing land use impacts on groundwater.
- Assessing development’s potential impact to recharge areas or infiltration potential on groundwater.
- Requesting King County to enforce and implement adopted resource and land use policies applicable to Vashon-Maury Island.

The plan outlines an implementation strategy, which requires significant resources from several County agencies, the Seattle-King County Health District, utility providers, and other state agencies. As described in the plan, funding would come from a combination of sources, including County agency funds and creation of an Aquifer Protection Area, to be approved by ballot, which would authorize the collection of monthly groundwater and septic system user fees.

As part of the recommended management strategies, water purveyors would participate in a program to monitor water quality, water level, precipitation and stream discharge parameters (high priority), update water right records (low priority), and should investigate artificial recharge (also assigned a low priority).

The plan summarizes the potential for seawater intrusion as follows:

Water quality on Vashon-Maury Island is also threatened by seawater intrusion. When groundwater is pumped from aquifers that are in hydraulic continuity with Puget Sound, seawater may flow toward the well resulting in elevated levels of chloride. Wells with elevated chloride levels were identified in 1983 on the northern end of Vashon Island and the southeastern section of Maury Island. Wells monitored along the coastline in 1989 and 1990 as part of this Plan showed no evidence of seawater intrusion. However, a well with seawater intrusion in the northeast area (near Glen Acres) of Vashon was closed in 1993.

It is the District's understanding that County funding commitments are not forth- coming and that implementation of this plan is not imminent. This document also contains conclusions which differ from previously reported data concerning seawater intrusion.

King County, Vashon Town Plan, July 1996.

This Plan was completed to reflect the current desires of Islanders to protect the area's character and structure, and to guide future development in directions consistent with this character. This Plan looks at circulation within the Town, parks and open space, urban design, historic preservation, residential development, and implementation. An Existing Conditions Report is included in the appendix to document existing physical and regulatory conditions within the Vashon Town Planning Area, to provide design guidelines, development/implementation strategies, and policies. The Existing Conditions Report discusses existing land uses, sensitive areas, circulation/transportation, utilities, regulatory conditions, and the King County Zoning Ordinance. It also provides a susceptibility to change analysis, problems and opportunities, and Vashon Island/King County Demographics.

Carr/Associates, Water Supply Development Alternatives Phase I Report, October 1988.

This document discusses the existing sources at Beall and Ellis Creeks. It provides information about the surficial hydrogeology, the electrical resistivity, and local well information. The study is providing future recommendations for the status of the documented water sources.

Gray & Osborne, Inc., King County Water District No. 19 Water Treatment Plant Operation and Maintenance Manual, April 1996.

This document was developed specifically for the District Treatment Plant. The manual provides instructions for operating and maintaining the components within the water treatment system. It includes physical and functional descriptions of the components within the water treatment system as well as operation and troubleshooting procedures with suggested corrections.

Geraghty & Miller, Inc., Vashon Groundwater Management Plant Updated Area Characterization and Data Analysis, June 7, 1993.

This report was completed to provide an updated characterization of the Vashon-Maury Island Groundwater Management Area for the Vashon-Maury Island Groundwater Management Plan. The report also summarizes the results of groundwater and surface water data collection and analysis activities between 1989 and 1992 conducted as a part of the Vashon Groundwater Management Plan. Results of this study include, but are not limited to, the following:

Annual rainfall for the Island may range from approximately 23 to 62 inches per year. High fecal coliform levels appear throughout the stream system, although the quality of spring water on the Island appears to be good.

The water-bearing zones monitored by the selected wells generally showed a stable or a slight rise in the water level during this study and, therefore, do not appear to have been affected by groundwater withdrawals.

The concentration levels of chloride, nitrate, and TDS do not suggest any impact from land use.

Seawater does not appear to be intruding on the Island's freshwater sources. Based on the 25 wells monitored as part of the study, this data conflicts with the December 1998 Groundwater Management Plan, which concluded that seawater intrusion did threaten the groundwater along the coast.

Gray & Osborne, Inc., King County Water District 19 Water Treatment Plant Addendum to 1992 Engineering Report, July 1994.

This report was completed as a supplement to the 1992 Engineering Report, which was approved by the Department of Health, to summarize and expand upon previous information. This report identifies the new treatment plant to be a package plant employing an absorption clarifier concept, utilizing two 350 gpm units. A 2,300 square foot building was identified to house the package filter plant and backwash and finished water pumps, an electrical room, and a laboratory. This report also discusses planning and water resources, design criteria, and a description of the proposed system.

Gray & Osborne, Inc., King County Water District 19 Water Treatment Plant Engineering Report, June 1992.

This predesign report for new surface water treatment facilities was developed in conjunction with the District's 1992 Water System Plan Update to explore different alternatives for meeting the future supply requirements, establish costs for specific alternatives, and recommend a preferred surface water treatment alternative. This report looked at alternatives for surface water treatment, including conventional treatment (flocculation, sedimentation, and filtration), direct filtration, conventional package plants,

adsorption clarifier package plants, tube-type clarification package plants, and slow sand filtration. The recommended alternative included replacing the two existing treatment plants with a single plant located on Beall Road at SW Bank Road. The recommended alternative was modified in a 1994 report and this plant has been online since 1996.

Horton Dennis & Associates, Vashon Coordinated Water System Plan, June 1990.

This document was developed to coordinate the planning and development of water facilities in order to provide future water service in the most efficient manner possible. This plan outlines physical features, land use and zoning, population, water consumption, existing water systems, source, storage, and distribution system requirements, minimum design standards, service areas, review procedures and satellite management, and regional issues, and provides recommendations.

Landau Associates, Water District 19 Well Construction and Testing Report, Beall Test Well, October 2007.

Wilkerson, R. L., King County Water District 19 Comprehensive Water Plan, April 13, 1982.

This document discusses planning issues such as historical development, the existing water system, water quality analyses, land use and population projections, water system demands, source and storage requirements, and capital improvements. Capital improvements recommended included water main replacements to replace deteriorating, undersized water mains throughout the system, water system control valves, and a new 960,000-gallon reservoir.

Vashon-Maury Island Watershed Plan – Draft June 1, 2005.

Vashon-Maury Island 2005 Water Resources Data Report – April 2006.

Vashon-Maury Island 2005 Well Data Report – September 2006.

Vashon-Maury Island Phase 1 Groundwater Model – October 2005.

Low Impact Development – Technical Guidance Manual for Puget Sound – January 2005.

GMA RELATED PLANS, POLICIES AND DEVELOPMENT REGULATIONS

Growth Management Act

The Growth Management Act of 1990 (RCW 36.70A) has a direct impact on utility system planning by requiring a complete inventory of existing utility system facilities and a comprehensive effort toward determining the capacity of utility systems to support anticipated growth. Although the majority of growth management activities are the

responsibility of counties and cities, data and information from special purpose districts is required in order to make decisions on future growth potential and corresponding levels of service. A primary outcome of the growth management planning in King County is the delineation of an Urban Growth Area (UGA) boundary, within which an urban level of service is required. Water District 19 is located outside of the UGA boundary currently defined by King County. In addition, the current (September 2004) King County Comprehensive Plan states that the current Urban Growth Area delineated in 1994 continues to be appropriately sized to accommodate growth expected through the year 2022 and that no significant change is necessary.

COMMENTS FROM AGENCIES AND RESOLUTION

The Washington State Department of Health, Washington State Department of Ecology, King County Department of Natural Resources, and all adjacent purveyors will be provided the opportunity to review this Plan. Comments from each responding agency will be included in the appendices.

CHAPTER 2

BASIC PLANNING DATA

The objective of this chapter is to present basic population planning data and the associated water demand forecasts needed to assess the current and future capabilities of the water system. This chapter presents existing and future population and service connection projections and the water demand associated with the planning element known as an equivalent residential unit (ERU). The chapter also includes projected land use and water demands for 6-, 10-, and 20-year planning periods.

EXISTING POPULATION, SERVICES, AND WATER DEMAND

SERVICE CONNECTIONS

The District served water through 1,472 meters in 2016. Between 2010 and 2016, the District installed 35 new meters, representing a growth rate of approximately 0.40 percent per year. Table 2-1 shows the number of meters within the system for the years 2010 through 2016 by customer class.

TABLE 2-1

Historic Service Connections

Customer Class	2010	2011	2012	2013	2014	2015	2016
Residential	1,210	1,211	1,213	1,219	1,225	1,226	1,235
Commercial	157	157	161	162	164	167	168
Industrial	8	8	8	8	8	8	8
Public	24	24	24	24	24	23	20
Multi-Family	31	31	31	31	32	34	34
School	7	7	5	5	7	7	7
Total Meters	1,437	1,438	1,442	1,449	1,460	1,465	1,472

Not all services are actively used. These meters are on a waiting list that is prioritized for new service. The District tracks meters with no usage, and currently has approximately 160 inactive meters, based on 2016 billing records. The District has collected General Facility Charge payments for more connections than shown in Table 2-1, thereby obligating the District to provide service when requested. Many of these customers have not yet connected to the system. Table 2-2 summarizes historic active service connections.

TABLE 2-2
Historic Active Service Connections

Customer Class	2010	2011	2012	2013	2014	2015	2016
Residential	1,121	1,118	1,111	1,115	1,114	1,123	1,114
Commercial	141	141	140	140	139	141	142
Industrial	8	8	8	8	8	7	6
Public	22	22	22	20	23	20	17
Multi-Family	30	30	30	30	31	30	30
School	5	3	5	5	5	4	3
Total Active Accounts	1,327	1,322	1,316	1,318	1,320	1,325	1,312

HISTORIC RESIDENTIAL POPULATION

The District is currently in a moratorium for accepting applications for new water connections. However, the District does have a waiting list for new services, which has been in place for several years. Growth may occur as unused services become active, recently sold connections connect to the system and, when and if the District provides service to those on the wait list. Land development continues to occur within the District boundaries; however, most new development includes the construction of private wells, which are not connected to the District's system. Current District population is based on connection records and a housing density of two people per housing unit, determined from 2010 Census data for the two Census tract blocks within the District boundary.

Currently, the District has 1,114 active single-family residential connections, generally representing one dwelling unit per connection, based on historic billing data. There are currently 30 active multi-family connections that serve approximately 245 dwelling units. Using this information, and based on an average of two people per dwelling unit, the District served an estimated population of 2,718 people in 2016. Population projections are included in a later section of this chapter.

WATER PRODUCTION

Water production data is collected from source meters on a daily basis (Table 2-3).

The total water withdrawn includes all metered water withdrawn from the District's source creeks and wells. The total produced includes only water produced from the water treatment plant and the wells. The difference in the two volumes is believed to be due to leaks in the raw water transmission mains and minor meter discrepancies.

TABLE 2-3
Water Production by Source

Source	2010	2011	2012	2013	2014	2015	2016
Beall Creek	65,858,500	60,380,300	51,138,000	43,085,000	45,374,600	46,942,600	63,801,300
Ellis Creek	6,396,300	8,643,800	16,410,300	30,325,800	29,341,500	28,711,800	7,492,400
Water Treatment Plant Production	67,246,000	65,840,000	64,772,000	70,632,000	71,299,000	72,676,000	68,281,000
Well 1	3,454,500	2,866,655	17,573,787	18,670,866	21,974,901	11,781,694	4,842,256
Well 2	0	0	0	0	0	0	10,533,300
Well 3 – Morgan Well	0	3,826,800	8,641,400	3,003,000	3,667,900	5,980,500	6,000,934
Well 4	32,653,050	33,734,200	19,326,600	13,422,800	14,867,640	24,431,300	28,464,500
Total Wells 1, 2, 3, 4	36,107,550	40,427,655	45,541,787	35,096,666	40,510,441	42,193,494	49,840,990
Vashon Meadows Well ⁽¹⁾	--	--	--	--	166,789	290,098	428,931
Total Withdrawn (Creeks) gal	67,246,000	65,840,000	64,772,000	70,632,000	71,299,000	72,676,000	68,281,000
Total Produced (Wells), gal	36,107,550	40,427,655	45,541,787	35,096,666	40,677,230	42,483,592	50,269,921
Total, gpd	283,160	291,144	301,404	289,668	306,784	315,506	323,910

(1) District took over system in 2013 and will be added to distribution system in 2018.

The bottom row of Table 2-3 is Average Day Demand, the total amount of water produced over the year divided by 365 to yield gallons per day. The year 2016 was the highest production of any year in the District's recent history. The increase in production may be in part due to the hot, dry weather during 2015 and 2016.

Peak Water Use

The maximum quantity of water produced in a 24-hour period is known as the maximum day demand (MDD). Maximum day demand for the District's sources is determined from daily source production meter records. Table 2-4 presents maximum day demand and the peaking factors based on average day demand.

TABLE 2-4
Historic Maximum Day Demand

Year	Average Day Demand, gpd⁽¹⁾	Maximum Day Demand, gpd	Maximum Day Demand, gpm	Peaking Factor
2010	283,160	734,639	510	2.59
2011	291,281	588,700	409	2.02
2012	303,966	639,600	444	2.10
2013	289,668	657,082	456	2.27
2014	306,327	651,920	453	2.13
2015	314,711	725,821	504	2.31
2016	322,738	702,987	488	2.18
Average				2.23
Ave plus one Standard Deviation				2.41

(1) Demand = Production.

A peaking factor of 2.41 will be used for water demand projections as a conservative estimate. Using a peaking factor above the average value will tend to overestimate the future production demand and will help ensure that the District will have sufficient resources to serve its customers.

Water purveyors have the right and responsibility to determine peaking factors and/or required storage volumes that meet District-established reliability factors. This is especially important to note for purveyors with limited source capabilities, like Water District 19.

The maximum quantity of water produced in a one-hour period during a peak day is known as the peak hour production. The peak hour to maximum day factor is estimated using the guidelines set forth in DOH's Water System Design Manual Equation 5.3, and is based on water demand over the past 6 years. Equivalent Residential Units (ERUs) are explained later in this chapter. The calculated annual peaking factors are included in Table 2-5.

$$\text{Peak Hour Demand (PHD)} = (\text{MDD}/1440) \{(\text{C}) * (\text{N}) + \text{F}\} + 18$$

MDD = Maximum Day Demand (gpd/ERU)

C = Coefficient associated with Ranges of ERUs (C = 1.6)

N = Number of ERUs

F = Factor associated with Ranges of ERUs (F = 225)

(See discussion below regarding ERU)

TABLE 2-5**Annual Peaking Factors**

Year	Maximum Day Demand, gpm	Peak Hour Demand, gpm	Peaking Factor
2010	510	821	1.61
2011	409	635	1.55
2012	444	710	1.59
2013	456	737	1.61
2014	453	705	1.56
2015	504	775	1.55
2016	488	734	1.50
Average			1.60

For projected future water demands, a peak hour factor of 1.6 relative to maximum day demand is used.

CONSUMPTION HISTORY

The District reads service meters and bills customers every 2 months. Table 2-6 presents a breakdown of billed consumption by customer class since 2010.

TABLE 2-6**Historic Consumption by Customer Class, gpd**

Customer Class	2010	2011	2012	2013	2014	2015	2016
Residential	171,854	169,193	177,092	172,704	177,650	190,618	183,619
Commercial	33,942	33,126	34,669	34,987	33,249	36,549	39,670
Industrial	5,618	6,204	5,416	5,877	5,857	6,341	7,550
Public	11,747	8,243	7,156	7,942	8,105	6,962	4,789
Multi-Family	17,865	18,661	19,839	19,317	19,561	18,883	17,321
School	15,998	18,223	28,815	22,517	23,806	14,134	25,547
Total Consumption, gpd	257,024	253,650	272,987	263,344	268,228	273,487	278,496

Single-family and multi-family residential use accounts for approximately 75 percent of District consumption.

Seasonal Variation

Seasonal variation in water use has also been examined in order to identify periods of higher usage and to assist in the development of conservation strategies. In 2016, summer usage (July – September) accounted for approximately 35 percent of annual usage, and

each other season accounted for between 17 to 28 percent. Table 2-7 summarizes seasonal usage by customer class for the year 2016.

TABLE 2-7
Seasonal Consumption Variation by Customer Class for 2016

Customer Class	Consumption (gal)				
	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec	Total Year
Residential	12,683,926	14,707,580	25,410,742	20,783,053	73,585,301
Commercial	3,507,290	3,334,390	4,998,540	4,065,223	15,905,443
Industrial	360,708	963,365	622,239	1,074,031	3,020,343
Public	172,040	308,244	701,976	732,554	1,914,814
Multi-Family	1,712,090	1,610,257	1,934,942	1,685,439	6,942,728
School	946,639	991,257	5,608,564	2,681,176	10,227,636
Total	19,382,693	21,915,093	39,277,003	31,021,476	111,596,265
Percent of Total	17%	20%	35%	28%	100%

The high summer consumption is likely due to irrigation demands. Conservation efforts may be most effective if they are developed to target higher usage during the dry months.

Other Authorized Consumption

The District tracks unbilled water used for District activities like flushing water mains and hydrant testing. These consumption volumes vary irregularly from month to month and year to year. Table 2-8 includes these volumes, reported annually, for the purpose of determining system leakage.

DISTRIBUTION SYSTEM LEAKAGE

Distribution system leakage (DSL) is defined as the difference between metered source production and metered consumption plus any other credibly estimated authorized consumption, such as water used for flushing water mains. DSL includes any water loss due to leaks or unauthorized uses such as illegal service connections, accounting errors, inaccurate source and service meters, and water leaving the system for unmetered uses. Table 2-8 summarizes DSL for recent years.

TABLE 2-8
Distribution System Leakage

Year	Production, gpd	Water Sales, gpd	Other Authorized Consumption, gpd⁽¹⁾	Distribution System Leakage		
				Total, gpd	%	3-Year Rolling Average %
2010	283,160	257,024	1,181	24,955	8.8%	NA
2011	291,144	253,650	1,396	36,098	12.4%	NA
2012	301,404	272,987	2,678	25,739	8.5%	9.9%
2013	289,668	263,344	1,840	24,484	8.5%	9.8%
2014	306,784	268,228	4,071	34,485	11.2%	9.4%
2015	315,506	273,487	3,126	38,893	12.3%	10.7%
2016	332,141	278,496	11,835	41,810	12.6%	12.0%

(1) Other authorized uses include flushing and fire suppression.

The District also estimates system leaks. These volumes are not included as authorized consumption, and therefore are included in the determination of the DSL percentage. DOH guidelines do not include estimated leakage in the definition of “authorized consumption.” Authorized consumption only includes water that was used under permission given by the District and whose usage was tracked. The estimation of the amount of water lost through leaks does help to reduce the possible type of water loss. For example, if the estimation of the leakage amount is correct, another possible explanation of the DSL may be old service meters that are under-reading the amount of water.

DSL is discussed further in Chapter 4.

EQUIVALENT RESIDENTIAL UNITS

An ERU is equivalent to the average consumption by one single-family residence on an average day. The use of equivalent residential units (ERUs) is a means to express water use as a share of the overall system capacity. The value of an ERU is calculated by dividing the total volume of water for the single-family residential customer class by the total number of single-family units. Water use by other customer classes, such as multi-family, commercial, or industrial, can be converted to a corresponding number of ERUs. A distinction is made between single-family and multi-family residential because a typical multi-family dwelling unit uses approximately 50 to 80 percent of the water used by a single-family dwelling.

Table 2-9 summarizes historic ERU values.

TABLE 2-9
Equivalent Residential Unit Calculations

Year	Active Single-Family Residential Connections (ERUs)	Single-Family Residential Consumption, gpd	ERU Value, gpd/ERU
2010	1,121	171,854	153
2011	1,118	169,193	151
2012	1,111	176,608	159
2013	1,115	172,704	155
2014	1,114	177,650	159
2015	1,123	190,618	170
2016	1,114	183,619	165
Average			159
Average Plus one Standard Deviation			166

The average ERU consumption plus one standard deviation is 166 gpd/ERU. This value is used for average water consumption and a maximum day consumption ERU value of 400 gpd (166 gpd x 2.41) will be used for ERU maximum day demand projections. 2015 was a relatively high use water year due to the hot weather. The hotter weather may be more common in the future due to climate change, thus the use of the 2015 data for the estimation of ERU usage.

Table 2-10 presents the current number of ERUs within the system by customer class, based on the average ERU value plus one standard deviation of 166 gpd/ERU.

TABLE 2-10
Current Number of Equivalent Residential Units

Customer Class	2016 ADD ⁽¹⁾ , gpd	No. of ERUs ⁽²⁾
Residential	183,619	1,106
Commercial	39,670	239
Industrial	7,550	45
Public	4,789	29
Multi-Family	17,321	104
School	25,547	154
Other Authorized	11,835	71
DSL (12.6%)	41,810	252
Total	332,141	2,000

(1) ADD – Average Day Demand.

(2) Based on the planning-level ERU value of 166 gpd/ERU.

The calculated number of ERUs in the District will vary from year to year based upon total production and usage patterns between user types. Values for ERUs should be averaged over a minimum of 3 years if the data are available.

FUTURE WATER DEMANDS

POPULATION PROJECTIONS

Water District 19 releases new water service connections slowly and based upon careful annual review of capacity, thus the population served by the District will continue to grow. The District is committed to serve inactive, zero-use connections and connections for which a General Facility Charge has been paid but a water meter is not yet connected to the system. Further sale of water connections to those on the wait list may occur as water availability becomes apparent. Private wells to serve new individual homes and/or businesses may be necessary. In some instances, it may also be possible for developing properties to construct one well to provide service for up to six individual lots. Private well construction within the service area will place increasing stress on the water resources on the Island.

Projecting future population and employment for the service area will help to estimate the possible increase in the number of service connection requests. The population and employment projections have been developed by analyzing past demographic trends and by using the planning data developed by the Puget Sound Regional Council (PSRC).

Table 2-11 presents a summary of the anticipated population and employment base within the service area through the year 2040. The population projections have been developed using the PSRC data for Forecast Analysis Zones (FAZ) 6930, Census Tracts 033027701 and 033027702 and Census Block Groups 027701-001, 027701-003, 027701-004, 027701-005, 027702-001 and 027702-002. The projections were developed using a combination of District data regarding the number and type of connections served and PSRC data regarding anticipated growth. The PSRC data indicates an average occupancy rate of two people per dwelling unit within the District's service area. The projections have been coordinated with the planning data put forth by King County and the State Office of Financial Management (OFM).

TABLE 2-11
Decadal Population and Employment Projections Through 2040

Year	Population Within District Boundary	Projected Population Annual Growth Rate	Employment Within District Boundary	Projected Employment Annual Growth Rate
2010	2,822	1.16%	903	0.57%
2020	3,135	0.17%	955	0.57%
2030	3,187	0.13%	1,016	1.01%
2040	3,228	0.13%	1,123	1.01%

Using the PSRC growth rates and Census data, the population within the District's corporate boundary reached 3,024 in 2016. Water system connection data suggests that the District currently serves a residential population of 2,718, which is approximately 90 percent of the total population within the boundary (Table 2-12).

Approximately 950 people are employed within the corporate boundary of which 90 percent are served by the District, totaling approximately 855 employees.

TABLE 2-12
Historic Population Served Within District Service Area

Year	Active Residential Accounts ⁽¹⁾	Multi-Family Units ⁽²⁾	Total Dwelling Units	Calculated Population ⁽³⁾
2010	1,121	220	1,341	2,682
2011	1,118	220	1,338	2,676
2012	1,111	220	1,331	2,662
2013	1,115	220	1,335	2,670
2014	1,114	224	1,338	2,676
2015	1,123	245	1,368	2,736
2016	1,114	245	1,359	2,718

(1) Based on District billing records. Inactive accounts not included.

(2) Based on District billing records.

(3) Two people/dwelling unit per Census tract data.

Table 2-13 provides a more detailed breakdown of population growth expected within the District's service area over the next 10 years, as well as the anticipated population served 20 years from now. The assumed growth rate is double the PSRC-determined growth rate for the two census tracts that make up Vashon Island. The Vashon Town Plan, adopted in 1994, defines the Town Planning Area and Growth Boundary and identifies the main commercial corridor as a potential area for increased growth and development. The Plan

emphasizes that growth within the Town should reflect established development patterns; the Plan's vision includes continued residential development with restricted up-zoning, limiting the potential for future population density. Because the District's served area includes some commercial and residential developments along the main commercial corridor in addition to large areas of rural and undeveloped land typical of the island, the growth rate was assumed to be higher than that of the entire island.

TABLE 2-13**Population Projections**

Year	Census Block Population	Growth Rate⁽¹⁾	Projected District Population
2017	3,059	1.16%	2,749
2018	3,094	1.16%	2,781
2019	3,130	1.16%	2,813
2020	3,135	0.17%	2,818
2021	3,140	0.17%	2,823
2022	3,146	0.17%	2,828
2023	3,151	0.17%	2,832
2024	3,156	0.17%	2,837
2025	3,162	0.17%	2,842
2026	3,167	0.17%	2,847
2036	3,212	0.13%	2,888

(1) Growth rate is PSRC-determined growth rate multiplied by 2.

WATER DEMAND PROJECTIONS

Projected water demands are imperative to the development of a sound water system plan that addresses the long-term needs of the residents of Water District 19. Due to large lot zoning within portions of the service area, individual wells and small private water systems legally exist within the service area.

The projected population increase and water system demands are presented in Tables 2-14 and 2-15. The demands shown assume an average use per ERU of 166 gallons per day. The peaking factor of 2.41 is used to estimate peak day demands. A 12 percent allowance for DSL has been applied to the demand projections per Table 2-8.

Because the District is currently under a moratorium for new applications, the starting point for the production projections is the number of actual ERUs served as of December 31, 2016 and does not include the zero-use connections reported in 2016. Growth factors projected by the Puget Sound Regional Council, and put forth earlier in this section, have been applied to determine the estimated number of future connections and associated water use.

The District anticipates that 10 zero-use connections annually will start using water. At the end of 2016, the District waitlist consisted of 30 parcels requesting 85 water service ERUs. The projections also assume that 14 ERUs from the waitlist will be added to the system annually. Thus, a total of 24 new ERU per year are included in the assumptions until the waitlist is eliminated (Table 2-13). The zero-use and wait list additions are prioritized ahead of background growth within the service area. Additional system connections are assumed based on the annual population growth after the waitlist is eliminated. Although there are zero-use connections across all customer classes, and the waitlist includes several non-single-family residential customers, this analysis assumes that each new connection will equal one ERU. The District will assess requests for usage exceeding an ERU on a case by case basis. The total number of ERUs served is expected to increase by approximately 17 percent from 2016 to 2026.

According to the PSRC projected growth rates for Vashon Island, background growth within the District's service area is anticipated to total approximately 129 people by 2026, and 169 people by 2036. Applying the projected population growth rates to the District's ERU count results in approximately 98 in total (including non-residential) additional ERUs by 2026 and 122 in total (including non-residential) additional ERUs by 2036. The District anticipates beginning to serve background growth starting in 2023, at which time there will be 86 ERUs that will not be served as shown on Table 2-14.

Table 2-15 includes the anticipated average day and maximum day water use, as well as the average day water production for the next 10 years and 20 years from now. The total annual demand on the District's system is projected to be 2.22 million gallons more in 2026 than the 2016 demand, 0.61 mgd/day. The projected maximum day use is projected to increase from the 2016 value of 0.703 mgd to 0.868 mgd in 2026. Water use projections presented here do not take into account any potential water conservation measures and assume a constant average usage per ERU.

The Board believes the District is best served by creating strong incentives to reduce per-capita peak water use, following models used elsewhere in the region in areas served by sole-source aquifers and with a limited water supply. Strong conservation incentives have been proven to work successfully and have been embraced by the communities served. The Board is in the beginning stages of a significant restructuring of the District's rates to create a stronger conservation incentive. The Board believes this approach can meet customer needs for the present planning horizon.

Figure 2-1 displays the projected maximum day water demand, average day water consumption, and average day water production for the next 10 years and 20 years from now.

TABLE 2-14**Population and ERU Projections**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2036
Consumption ERUs ⁽¹⁾	1,748	1,772	1,796	1,820	1,844	1,868	1,892	1,906	1,919	1,932	1,945
Cumulative Committed ERUs Added (est. 10/yr) ⁽²⁾	10	20	30	40	50	60	70	80	90	100	200
Remaining Committed Zero-Use ERUs ⁽²⁾	244	234	224	214	204	194	184	174	164	154	54
Subtotal ERUs incl. added Committed (i.e., Zero Use)	1,758	1,782	1,806	1,830	1,854	1,878	1,902	1,916	1,929	1,942	2,067
Cumulative Waiting List ERUs Added (est. 14/yr)	14	28	42	56	70	84	85	85	85	85	85
Remaining Waiting List ERUs	71	57	43	29	15	1	0	0	0	0	0
Subtotal ERUs incl. added Committed and Waitlist	1,772	1,796	1,820	1,844	1,868	1,892	1,903	1,916	1,929	1,942	2,067
District Served Population	2,718	2,750	2,781	2,814	2,818	2,823	2,828	2,833	2,838	2,843	2,884
Population Growth Rate ⁽³⁾	1.16%	1.16%	1.16%	1.16%	0.17%	0.17%	0.17%	0.17%	0.17%	0.17%	0.13%
Additional Residential ERUs ⁽⁴⁾	0	0	0	0	0	0	2	2	2	2	14
Additional Non-Residential ERUs (and other authorized usage)	0	0	0	0	0	0	1	1	1	1	10
Subtotal new ERUs from Pop. Growth	0	0	0	0	0	0	3	3	3	3	24
Total Committed ERUs	1,772	1,796	1,820	1,844	1,868	1,892	1,906	1,919	1,932	1,945	2,069
Additional Unserved ERUs from Population Growth	20	20	20	20	3	3	3	3	3	3	2

(1) 2017 ERUs from Table 2-10, excluding DSL.

(2) Includes zero use meters and connections which have been sold but are not yet connected to the system.

(3) Growth rate is PSRC-determined growth rate multiplied by 2.

(4) ERUs from population growth are only added after the remaining wait list ERUs have been completely served (in 2023).

(5) Total over the period from 2027 through 2036.

TABLE 2-15
Water Use Demand Projections without Conservation

Year	Consumption ERUs⁽¹⁾	DSL ERUs⁽²⁾	Projected Water Production⁽⁵⁾ ADD	Annual Demand		Projected Maximum Day Water Production⁽³⁾⁽⁴⁾	Projected Water Production Peak Hour Demand⁽⁵⁾
				mgd	MG/yr	Ac-ft/yr	
2017	1,772	213	329,450	120.2	369.1	744,098	517
2018	1,796	216	333,912	121.9	374.1	754,176	559
2019	1,820	218	338,374	123.5	379.1	764,254	531
2020	1,844	221	342,836	125.5	385.1	774,332	538
2021	1,868	224	347,299	126.8	389.1	784,411	545
2022	1,892	227	351,761	128.4	394.0	794,489	552
2023	1,906	229	354,364	129.3	397.0	800,368	556
2024	1,919	230	356,780	130.6	400.8	805,826	560
2025	1,932	232	359,197	131.1	402.4	811,285	563
2026	1,945	233	361,614	132.0	405.1	816,744	567
2036	2,069	248	384,668	140.4	430.9	868,814	603
							965

(1) 166 gpd/ERU, from Table 2-9.

(2) Equivalent ERUs based on 12 percent DSL, from Table 2-8.

(3) 400 gpd/ERU for consumption ERU and 166 gpd/ERU for DSL ERU.

(4) Includes 12 percent DSL.

(5) PHD/MDD = 1.6.

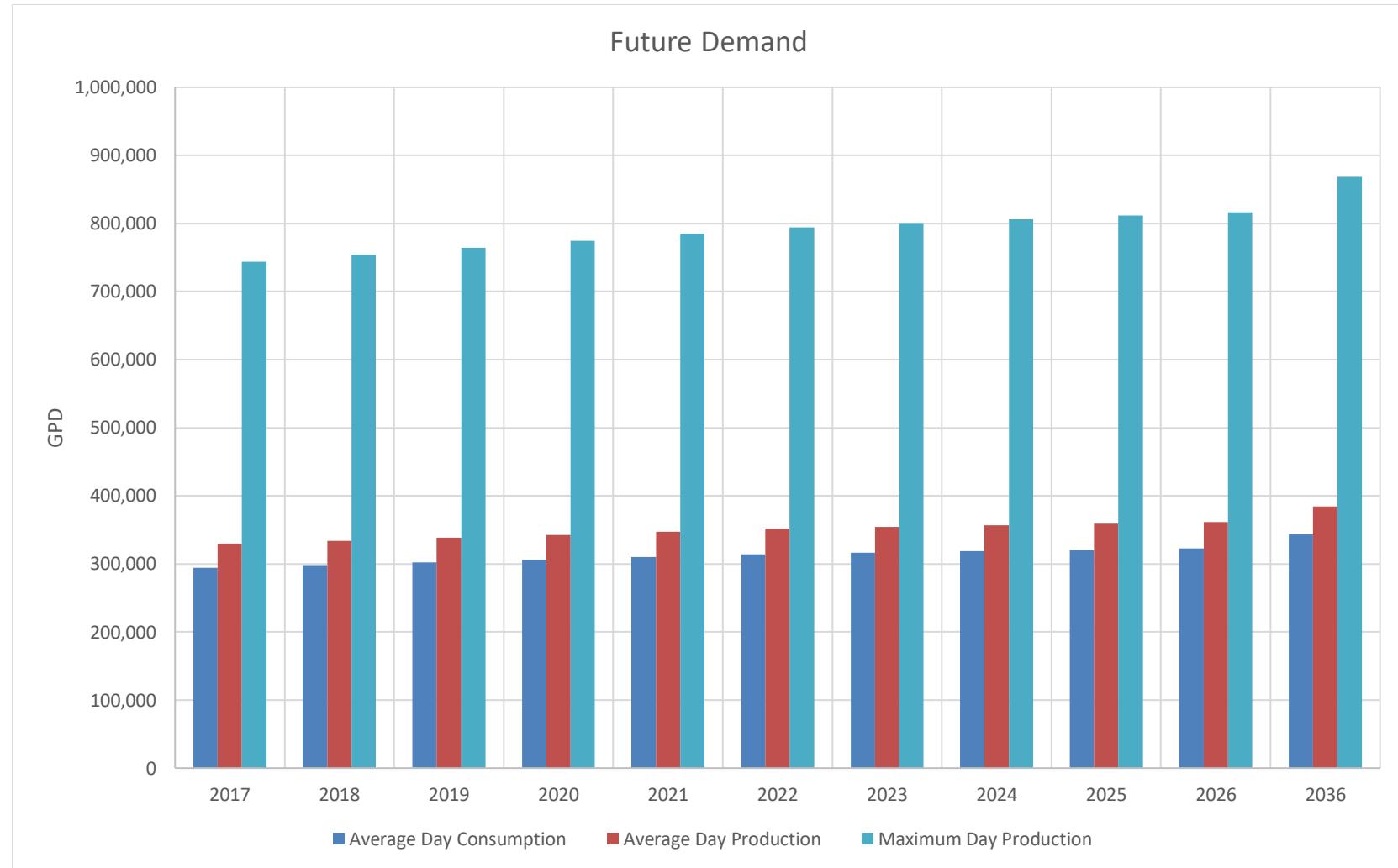


FIGURE 2-1
Projected Water Use

CHAPTER 3

WATER SYSTEM ANALYSIS

OBJECTIVE

Water system planning is based on an analysis of a water utility's ability to meet a level of service standards for existing and future customers. The District has adopted design standards that identify criteria and standards for the water system. These standards are used to evaluate and analyze the existing water system facilities and water quality within the District's system. Based on these analyses, recommended system improvements are identified.

The objective of this chapter is to document design standards and determine if the existing system components are capable of supplying sufficient quality and quantity of water to meet existing and projected demands.

The ability of a water utility to meet current and anticipated future demands is an important consideration in water system planning. In addition to demand considerations, water quality plays a major role in determining the adequacy of a water system. The components that will be analyzed in this chapter are listed as follows:

- System Design Standards
- Water Quality Analysis
- Facility Analysis
- System Deficiencies and Proposed Improvements

SYSTEM DESIGN STANDARDS

Design standards identify performance and design criteria that are applicable to the District. Water quality and the existing facilities will be evaluated according to identified design standards. Based on these analyses, water system deficiencies and recommendations to meet design standards are provided.

Performance and design criteria typically address the sizing and reliability requirements for source, storage, distribution, and fire flow. WAC 246-290 contains general criteria and standards that must be followed in the development of public water systems. In addition, the Washington State Department of Health's (DOH) 2009 *Water System Design Manual* provides specific guidance for water system design. The design standards for the following elements are discussed in the order shown below:

GENERAL FACILITY STANDARDS

1. Average and Maximum Day Demand
2. Peak Hour Demand
3. Storage Requirements
4. Fire Flow Rate and Duration
5. Minimum System Pressure
6. Minimum Pipe Sizes
7. Backup Power Requirements
8. Valve and Hydrant Spacing
9. Other System Policies

WATER QUALITY STANDARDS

1. Applicable Drinking Water Quality Regulations
2. Existing Drinking Water Quality Standards
3. Anticipated Future Drinking Water Quality Regulations
4. Water Quality Monitoring Schedule

WATER SYSTEM DESIGN STANDARDS

DOH relies on various regulations, publications, agencies, and the District itself to establish design criteria. The following gives a brief description of two of the most widely recognized performance and design standards.

- **WAC 246-290, Group A Public Water Systems, Washington State Board of Health (December 2010).**

This is the primary drinking water regulation utilized by the Washington State Department of Health (DOH) to assess capacity, water quality, and overall compliance with drinking water standards.

- **Water System Design Manual (WSDM), Washington State Department of Health (DOH) (December 2009).**

Significant revisions to the former DOH Sizing Guidelines have recently been adopted. These standards will serve as guidance for the preparation of plans and specifications for Group A public water systems in compliance with WAC 246-290.

Table 3-1 lists the suggested DOH *Water System Design Manual* guidance and the District's policies with regard to each standard for general facility requirements. The design standards for the following subjects are discussed in the order shown below:

TABLE 3-1
General Water System Design Standards

Standard	Minimum State Requirements	District Standard
Average Day and Maximum Day Demand	Average day demand should be determined from previous actual water use data. Maximum day demand (MDD) is estimated at approximately 2 times the average day demand if metered data is not available.	Average day demand is determined from historic production data. Maximum day demand is determined by examining maximum day production for the last 6 years. A peaking factor of 2.41 is utilized to project future maximum day demand from average day demand.
Peak Hour Demand	Peak hour demand is determined using the following equation: $\text{PHD} = (\text{MDD}/1440)[(\text{C})(\text{N})+\text{F}] + 18$ <p>C = Coefficient from DOH Table 5-1 N = Number of connections, ERUs F = Factor of range from Table 5-1</p>	Peak hour demand is determined by applying a peaking factor of 1.6 to maximum day demand, based upon DOH Criteria in the adjacent table cell.
Source	Total daily source capacity, in conjunction with any storage that is designed to accommodate peak use periods on a daily or longer basis, shall be sufficient to provide a reliable supply of water equal to or exceeding the MDD. WAC 246-290-222 (4)	<ol style="list-style-type: none"> Two or more supply sources are available with a capability to replenish depleted fire suppression storage within 72-hours while concurrently supplying the MDD for the water system. Combined source capacity for the water system is enough to provide the MDD. Wells pump for a period of 18 hours or less. With the largest source out of service, the remaining source(s) can provide a minimum of ADD for the water system. Pump stations have power connections to two independent primary public power sources, or have portable or in-place auxiliary power available. The firm yield of surface water sources is consistent with the lowest flow or longest period of extended low precipitation on record. <p>(WDOH Design Manual recommendations)</p>
Storage	Water storage shall be sufficient to meet expected system service demands by providing sufficient operational, equalizing, standby and where applicable, fire suppression storage volumes in accordance with WAC 246-290-235. (WAC 246-290-222)	Refer to storage analysis in Chapter 3.

TABLE 3-1 – (continued)

General Water System Design Standards

Standard	Minimum State Requirements	District Standard
Minimum System Pressure	The system should be designed to maintain a minimum of 30 psi in the distribution system during peak hour demand and 20 psi under fire flow conditions during MDD.	Same as DOH Water System Design Manual.
Minimum Pipe Sizes	The minimum size for a transmission line shall be determined by hydraulic analysis. The minimum size distribution system line shall not be less than 6 inches in diameter.	Pipe size standards are outlined in the District's Developer Standards Handbook. A minimum of 8-inch pipe is required except at the discretion of the District. Pipes in commercial and industrial zoned areas must be a minimum of 12-inch, unless the District allows smaller.
Reliability Recommendations	Standby storage equivalent to ADD*2, with a minimum of 200 gpd/ERU. Low and high level storage alarms. Looping of distribution mains when feasible. Pipeline velocities not >8 fps at PHD and not >10 fps during fire flow. Flushing velocities of a minimum of 2.5 fps for all pipelines.	Same as DOH Water System Design Manual, Chapter 5.
Valve and Hydrant Spacing	Sufficient valving should be placed to keep a minimum of customers out of service when water is turned off for maintenance or repair. Fire hydrants spacing at 300' maximum spacing in commercial areas, and 600' maximum spacing in residential areas (King County code).	Valve and hydrant standards are outlined in the District's Developer Standards Handbook. In-line and mainline valves are required at 1,000' maximum spacing. Hydrant spacing per code.

WATER QUALITY STANDARDS

Table 3-2 lists existing and future drinking water regulations and the status of each regulation. Existing state law contains regulations for bacteriological contaminants, inorganic chemicals and inorganic physical parameters (IOCs), volatile organic chemicals (VOCs), synthetic organic chemicals (SOCs), radionuclides, and trihalomethanes (THMs). Six drinking water regulations will become effective in the next 10 years that will define new regulatory requirements for sulfate, radionuclides, additional IOCs and SOCs, arsenic, additional disinfection byproducts, and bacteriological contaminants.

Many of the regulations listed in Table 3-2 define treated source water quality standards and establish monitoring schedules. The implementation schedules for the proposed new regulations are subject to revision and the District will continue to stay informed regarding regulatory deadlines.

TABLE 3-2
Drinking Water Regulations

Rule	Contaminants Affected	District Action
Arsenic Rule	Arsenic	Monitoring
Asbestos	Asbestos	Monitoring
Revised Total Coliform Rule	Coliform	Monitoring
Consumer Confidence Report	Reporting Only	Reporting
Filter Backwash Recycling Rule	Bacteriological	Not Applicable
Ground Water Rule	Microbial	Monitoring
Information Collection Rule	Bacteriological	Monitoring
Inorganic Chemicals, and Physical Parameter	IOCs	Monitoring
Interim Enhanced Surface Water Treatment Rule	Bacteriological	
Lead and Copper Rule	Lead, Copper	Monitoring
Long Term 1 Enhanced Surface Water Treatment Rule	Bacteriological	Monitoring
Long Term 2 Enhanced Surface Water Treatment Rule	Microbial	Monitoring
Radionuclides Rule	Radionuclides	Monitoring
Residual Disinfectant	Total Free Chlorine	Monitoring
Stage 1 and 2 Disinfectants/ Disinfection Byproducts Rule	TTHMs, HAA5, Chlorite, Bromate	Monitoring and Planning
Surface Water Treatment Rule (SWTR)	Microbial	Monitoring
Unregulated Contaminant Monitoring Rule	Acanthamoeba, Aldrin, Dieldrin, Hexachlorobutadiene, Manganese, Metribuzin, Napthalene, Sodium and Sulfate	Monitoring
Volatile and Synthetic Organic Compounds	VOCs, SOCs	Monitoring

Minimum standards for water quality are specified in terms of Maximum Contaminant Levels (MCLs). Primary MCLs are based on chronic and/or acute human health effects. Secondary MCLs are based on factors other than health effects, including aesthetics. MCLs are specified in WAC 246-290 and described further in the following pages and tables. The following sections discuss the applicable water quality regulations, analysis of the District's compliance with these regulations, and a summary of future regulations for each category. A water quality monitoring schedule is presented later in this chapter.

WATER QUALITY ANALYSIS

This section provides analyses of the District's water quality and the system's ability to meet existing and future demands. The District's compliance with water quality and facility design standards is examined, as set forth in the previous section. At the conclusion of the analyses, system deficiencies are identified.

WATER QUALITY MONITORING RESULTS

Bacteriological

Coliform bacteria describe a broad category of organisms routinely monitored in potable water supplies. Though not all coliform bacteria are pathogenic in nature, they are relatively easy to identify in laboratory analysis and they represent an indicator organism. If coliform bacteria are detected, then pathogenic organisms may also be present. Bacterial contamination in a water supply can cause a number of water-borne diseases, so these tests are strictly monitored and regulated by DOH.

WAC 246-290 establishes bacteriological testing requirements for public water systems. Compliance with this rule is based on the presence/absence of total coliforms. The number of routine samples required depends on the system size.

The Revised Total Coliform Monitoring Rule specifies each total coliform positive routine sample must be tested for the presence of E. coli.; if any total coliform positive sample is also E. coli. positive, then the sample must be reported to the state by the end of the day. If a routine sample is positive for total coliform, repeat samples are required.

Within 24 hours of learning of the total coliform positive sample result, at least three repeat samples must be collected and analyzed for total coliform. One repeat sample must be collected from the same tap as the original sample, one repeat sample must be collected within five service connections upstream, and one repeat sample must be collected within five service connections downstream. If one or more repeat sample is positive for total coliform, the sample must be analyzed for E. coli. If the total coliform positive sample is positive for E. coli, the sample must be reported to the state. Another set of repeat samples must then be collected unless an assessment has been triggered and the state has been notified.

The District monitors for bacteriological contaminants in accordance with the sampling schedule provided by DOH in its annual Water Quality Monitoring Report which is included in Appendix E. According to this report, every month the District is required to collect three routine samples within the distribution system. If an unsatisfactory sample should occur, repeat samples are to be collected upstream and downstream of the routine site. The District takes coliform samples in accordance with their coliform monitoring plan, which is included in Appendix E.

According to the rules for systems with filtered surface water, WAC 246-290-664(1b), the District is also required to collect one surface water coliform sample every month. This sample must be collected before disinfection. Every day the system is in operation, the District must also determine the level of inactivation and removal of Giardia lamblia cysts, viruses, and Cryptosporidium cysts. Section 4 of WAC 246-290-664 details the exact procedures to follow.

The District has had no bacteriological violations since the last Water System Plan.

Inorganic Chemicals and Physical Characteristics

WAC 246-290 specifies primary and secondary MCLs for inorganic physical and chemical characteristics. Primary MCLs are based on health effects, and secondary MCLs are based on factors other than health effects, such as aesthetics. Primary and secondary MCLs for inorganic chemical and physical characteristics are summarized in Tables 3-3 and 3-4, respectively.

TABLE 3-3
Water Quality Standards for Inorganic Chemical Characteristics

Chemical	Primary MCL (mg/L)
Antimony (Sb)	0.006
Arsenic (As)	0.01
Asbestos	7 million fibers/liter
Barium (Ba)	2
Beryllium (Be)	0.004
Cadmium (Cd)	0.005
Chromium (Cr)	0.1
Cyanide (HCN)	0.2
Fluoride (F)	4
Mercury (Hg)	0.002
Nickel (Ni)	0.1
Nitrate (as N)	10
Nitrite (as N)	1
Selenium (Se)	0.05
Sodium (Na)	None
Thallium (Tl)	0.002
Chloride (Cl)	250
Fluoride (F)	2
Iron (Fe)	0.3
Manganese (Mn)	0.05
Silver (Ag)	0.1
Sulfate (SO ₄)	250
Zinc (Zn)	5

TABLE 3-4**Water Quality Standards for Inorganic Physical Characteristics**

Characteristic	MCL	MCL Type
Color	15 Color Units	Secondary
Specific Conductivity	700 $\mu\text{mhos}/\text{cm}$	Secondary
Total Dissolved Solids (TDS)	500 mg/L	Secondary

The District's most recent IOC samples were taken in December 2012 at Beall and Ellis Creeks, in April 2017 at Beall Well, in October 2016 at Well 3, and in June 2010 at the Wellfield. Table 3-5 shows only those results that were detected. Sample parameters that were listed as "not detected" or "less than" by the laboratory are omitted from the table.

TABLE 3-5**Inorganic Source Water Quality**

Parameter	Beall & Ellis Creeks	Beall Well	Wells 1, 2, 4	Well 3	MCL (mg/L)
Primary Contaminants					
Arsenic (As)	0.0026 ⁽¹⁾	0.0360 ⁽¹⁾	0.0062 ⁽²⁾	0.0017	0.01
Nitrate (as N)	1.3	<0.2	<0.2	<0.2	10
Sodium (Na)	13	55	37	17	None
Secondary Contaminants					
Manganese (Mn)	<0.01	0.12	0.0480 ⁽³⁾	0.07	0.05
Physical Contaminants					
Color	<15	<15	<15	<15	15 Color Units
Specific Conductivity	200	490	280	220	700 $\mu\text{mhos}/\text{cm}$
Total Dissolved Solids (TDS)	140	320	Not Detected	160	500

(1) Water from Beall Well is blended with surface water from the water treatment plant. The result presented for Beall & Ellis Creeks is the finished water from the water treatment plant.

(2) Arsenic sampling from October 2016.

(3) Manganese sampling from October 2014.

Surface water sources must be sampled for inorganic compounds annually. Nitrate samples are required annually and nitrite samples are required once every 3 years. All sources were sampled for nitrates and nitrites in 2016 and 2017. The WTP nitrate level was 0.66 mg/L, and the Wellfield and Well 3 were both less than 0.2 mg/L, which is the

State Reporting Limit. All sources had nitrite levels less than the State Reporting Limit of 0.2 mg/L.

The District satisfactorily meets all primary and secondary maximum contaminant levels (MCLs), with the exception of manganese levels at the Beall Well and at Well 3.

Arsenic

Arsenic is an inorganic chemical that has received significant attention due to proposed rule revisions. Long-term exposure to low concentrations of arsenic in drinking water can lead to skin, bladder, lung, or prostate cancer. Non-cancerous effects of ingesting arsenic at low levels include cardiovascular disease, diabetes, and anemia, as well as reproductive, developmental, immunological, and neurological effects.

The MCL of 0.01 mg/L became effective in February 2002 and compliance with the new MCL standard began January 23, 2006. The Arsenic Rule makes monitoring requirements consistent with monitoring for other IOCs. Sampling for arsenic is required once every 3 years. Any system that has a sampling point monitoring result exceed the MCL must increase the frequency of monitoring at that sample point to quarterly sampling. Compliance with the MCL is based on the running annual average of the samples. Systems triggered into increased monitoring would not be considered in violation of the MCL until they have completed 1 year of quarterly sampling. However, if any sample result causes the running annual average to exceed the MCL at any sampling point, the system is out of compliance with the MCL immediately.

The District is in compliance with the Arsenic rule. The most recent samples, as shown in Table 3-5, yielded arsenic concentrations of 0.002 to 0.0062 mg/L, well below the MCL of 0.01 mg/L.

Testing has demonstrated that the Beall well has an arsenic level above 30 ppb as well as ammonia. The well discharge is treated via injection of chlorine into a reaction chamber, and subsequently the water is diluted by mixing with raw stream water at the water treatment plant to reduce the arsenic to 6-7 ppb, below the MCL and comparable to the everyday arsenic level in the main wellfield. Historically, the Beall well has been reserved for peak or emergency purposes and to date has not been regularly used in production.

Manganese

The District has recognized the importance of going further than current US EPA standards for manganese which regard the contaminant as an aesthetic consideration or a 'nuisance chemical' and does not regulate its quantity in drinking water on the basis of health. The District aims to maintain level of manganese in the water supply below the secondary MCL of 0.05 mg/L.

Well 3 (Morgan Hill, which shares the main well field water right) is high in manganese. The manganese is noted to precipitate out and settle on the bottom of the 100,000-gallon storage tank, following chlorine injection. Without this procedure, the water typically meets the MCL, but the tank settling time noticeably improves the quality of water withdrawn from Well 3. The 100,000-gallon tank is inspected periodically, but may need to be replaced or reconstructed at some point. It should be noted that the tank is not required for storage capacity. There is currently no formal manganese treatment at Well 3.

Fluoride

Water District 19 does not fluoridate its water. In addition, samples taken at both the wellfield and surface water sources have shown naturally occurring fluoride to be non-detect (not present).

Volatile Organic Chemicals and Synthetic Organic Chemicals

There are currently 21 regulated volatile organic chemicals (VOCs) and 30 regulated synthetic organic chemicals (SOCs). A list of these compounds and their MCLs is included in Table 3-6. Discharge from the WTP was tested for VOCs in 2017 and SOCs in 2016. Several VOCs were reported above the State Reporting Limit, but lower than the MCL. The Wellfield was tested for VOCs and SOCs in 2012. Chloroform was reported at 68 µg/L, which is above the State Reporting Limit. Well No. 3 was tested for VOCs in 2013 and for SOCs in 2010. Chloroform was reported at 23 µg/L, which is above the State Reporting Limit. All sources are in compliance with VOC and SOC levels based on the most recent testing.

TABLE 3-6
Regulated VOCs and SOCs

Organic Chemical	Primary MCL (mg/L)⁽¹⁾	Organic Chemical	Primary MCL (mg/L)⁽¹⁾
Vinyl Chloride	0.002	Chlordane	0.002
Benzene	0.005	Dibromochloro-propane	0.0002
Carbon Tetrachloride	0.005	2,4-D	0.07
1,2-Dichloroethane	0.005	Ethylene dibromide	0.00005
Trichloroethylene	0.005	Heptachlor	0.0004
<i>Para</i> -Dichlorobenzene	0.075	Heptachlor epoxide	0.0002
1,1-dichloroethylene	0.007	Lindane	0.0002
1,1,1-Trichloroethane	0.2	Methoxychlor	0.04
<i>cis</i> -1,2-Dichloroethylene	0.07	Polychlorinated biphenyls (PCBs)	0.0005
1,2-Dichloropropane	0.005	Pentachlorophenol	0.001
Ethylbenzene	0.7	Toxaphene	0.003
Monochlorobenzene	0.1	2,4,5-TP	0.05
<i>Ortho</i> -Dichlorobenzene	0.6	Benzo(a)pyrene	0.0002
Styrene	0.1	Dalapon	0.2
Tetrachloroethylene	0.005	Di(2-ethylhexyl) adipate	0.4
Toluene	1	Di(2-ethylhexyl) phthalate	0.006
<i>Trans</i> -1,2-Dichloroethylene	0.1	Dinoseb	0.007
Xylenes (total)	10	Diquat	0.02
Dichloromethane	0.005	Endothal	0.1
1,2,4-Trichloro-benzene	0.07	Endrin	0.002
1,1,2-Thrichloro-ethane	0.005	Glyphosate	0.7
Arochlor	0.002	Hexachlorobenzene	0.001
Aldicarb	0.003	Hexachlorocyclopentadiene	0.05
Aldicarb sulfone	0.003	Oxamyl (vydate)	0.2
Aldicarb sulfoxide	0.004	Picloram	0.5
Atrazine	0.003	Simazine	0.004
Carbofuran	0.04	2,3,7,8-TCDD (dioxin)	0.00000003

Radionuclides and Radon

Radionuclides include radioactive substances occurring naturally in surface and subsurface waters. Regulated substances include radium-226, radium-228, uranium, and gross alpha and beta particles.

Table 3-7 summarizes radionuclide MCLs as defined by EPA's Radionuclide Rule and Washington State Department of Health's WAC 246-290.

TABLE 3-7

Radionuclide MCLs

Parameter	MCL
Radium-226	3 pCi/L
Radium-228	20 pCi/L
Combined Radium-226 and Radium-228	5 pCi/L
Uranium	30 µg/L
Gross alpha particle activity, excluding uranium	15 pCi/L
Gross beta particle activity	4 millirem/year

The District must sample radionuclides once every 6 years at all sources except the Beall Well, which must be sampled quarterly initially.

Though a radon MCL was included in the originally proposed Radionuclide Rule, it was determined that a radon MCL will now be issued as a separate rule. In November 1999, EPA proposed a preliminary radon MCL of 300 pCi/L. EPA is considering an alternative MCL of 4,000 pCi/L if states or water purveyors implement a multimedia mitigation program aimed at reducing household indoor-air health risks from radon gas from soil as well as tap water. The final Radon Rule publication date is unknown at this time.

DOH and federal regulations now require that a radionuclide analysis be conducted once every 4 years. The system collected samples in 2012 at Well No. 3, in 2015 at the WTP and Wellfield, and in 2017 at the Beall well, which showed gross alpha radiation less than 3.0 pCi/L, Radium-228 less than 0.9 pCi/L, and Combined Radium-226 and -228 less than 0.5 pCi/L. Uranium and gross beta radiation were not detected.

Asbestos

Asbestos is the name for a group of naturally occurring, hydrated silicate minerals with fibrous morphology. Included in this group are chrysotile, crocidolite, amosite, and the fibrous varieties of anthophyllite, tremolite, and actinolite. Most commercially mined asbestos is chrysotile. Asbestos' flexibility, strength, and chemical and heat resistance properties that have adapted it to many uses including building insulation, brake linings, and water pipe.

In recent years, there has been much concern with the health risks associated with the use of asbestos. Several studies and case histories have documented the hazards to internal organs as a result of inhalation of asbestos fibers. Data is limited on the effects of ingestion of asbestos fibers or on the effects of inhalation exposure from drinking water. Ingestion studies have not caused cancer in laboratory animals, although studies of asbestos workers have shown increased rates of gastrointestinal cancer.

The MCL for Asbestos is 7 million fibers/L. The most recent asbestos sample for the District was taken in December 2009 and contained less than 0.194 million fibers/L.

Lead and Copper

In 1991, the EPA promulgated the Federal Lead and Copper Rule (40 CFR 141). The State of Washington adopted this rule in 1995, with minimal changes. The Lead and Copper Rule is intended to reduce the tap water concentrations of lead and copper that can occur when corrosive source water causes lead and copper to leach from water meters and other plumbing fixtures.

Ninety percent of the distribution system lead samples collected according to the procedures outlined in WAC 246-290 must have concentrations below the “Action Level” of 0.015 mg/L. Similarly, 90 percent of the copper samples must have concentrations less than 1.3 mg/L. Systems exceeding the action levels are required to provide public notification and implement a program for reducing lead and copper levels.

The District takes lead and copper samples once every 3 years. Table 3-8 shows the results of the testing completed in October 2015. The District is in compliance with the Rule.

TABLE 3-8
Lead and Copper Testing Results

	Copper	Lead
Action Level, mg/L	1.3	0.015
State Reporting Level, mg/L	0.2	0.002
Maximum Concentration Reported, mg/L	0.17	0.0052
90 th Percentile Concentration	0.17	0.003
Samples Taken	10	10
Samples Exceeding Action Level	0	0
Minimum Concentration Reported, mg/L	Less Than 0.02	Less Than 0.001

Disinfection Byproducts

According to the Washington State Department of Health, some studies of human health effects from exposure to chlorinated water show increased risk of cancer and reproductive and development effects, although other studies show no additional risk. The District is focused on minimizing chlorination and actively working on reducing the disinfection byproducts (DBPs) it produces to keep DBPs below the legal limits. The District will attempt to increase customer awareness about issues such as chlorine and DBPs through education. A home water filter can reduce exposure to these byproducts.

In situations where surface water is mixed with groundwater, such as the District's system, chlorine cannot be eliminated. Under State Law (WAC 246 662 290) chlorine must be added to systems utilizing surface water sources to ensure residual levels are detectable as it exits customers' taps. There are exemptions from chlorination of systems that are possible under code for systems using ground water sources only. The District is required to monitor and report the chlorine residual within the distribution system every calendar day. Samples are taken at the same locations and times as the routine coliform samples.

WAC 246-290-300(6) requires purveyors of public water systems that provide water treated with chemical disinfectants to monitor for disinfectants and disinfection byproducts. The Disinfection/Disinfectants Byproduct Rule (D/DBP Rule) establishes residual disinfectant concentrations and maximum contaminant levels for disinfection byproducts.

Trihalomethanes (THMs) and five haloacetic acids (HAA5) are a group of organic compounds that can be formed as a result of drinking water disinfection by chlorine and are, therefore, often referred to as disinfection byproducts. Total trihalomethanes (TTHMs) include the sum of the concentrations of four disinfection byproducts: chloroform, bromoform, bromodichloromethane, and dibromochloromethane.

The Stage 1 D/DBP rule became effective in February 1999. Under Stage 1 of the D/DBP Rule, the MCLs for TTHM and HAA5 are 80 µg/L and 60 µg/L, respectively, and are based on the running annual average of four quarterly samples. Systems are required to prepare and implement a disinfection byproducts monitoring plan. The Stage 1 D/DBP Rule remained in effect for compliance until October 1, 2013.

Stage 2 of the D/DBP Rule was published in January 2006 and compliance with the new regulations began on October 1, 2013. Under Stage 2 of the D/DBP Rule, the MCLs for TTHM and HAA5 remain 80 µg /L and 60 µg /L, respectively; however, compliance with the MCL is based on the running annual average of each individual sample site instead of the running annual average of all samples combined. The number of samples taken is dependent on the population served and water source. Systems utilizing surface water and serving between 500 and 3,300 people must collect samples from two locations each quarter.

The results from the most recent testing are summarized in Table 3-9. As shown, none of the samples exceeded the MCL levels.

TABLE 3-9
Disinfection Byproducts Testing Results

Sample Date	100th Avenue SW		SW Soper Road		SW 238th Street	
	HAA5 (µg/L)	TTHM (µg/L)	HAA5 (µg/L)	TTHM (µg/L)	HAA5 (µg/L)	TTHM (µg/L)
9/20/2017	5.24	28.61	--	--	--	--
6/6/2017	7.79	21.35	11.48	46.55	4.61	50.64
3/14/2017	28.2	33.23	17.64	28.11	27.6	43.6
12/15/2016	25.66	52.13	54.6	45.7	11.48	56.03
9/22/2016	13.1	14.46	9.91	33.96	7.8	42.97
6/22/2016	1.69	20.41	5.44	33.69	12.24	51.64
3/17/2016	49.1	47.4	39.1	48.7	2.4	41.9
12/16/2015	5.8	33.1	41.5	58.9	23.6	45.3
9/16/2015	5.6	15.3	3.5	39.2	10.6	53.7
6/17/2015	8.7	20.0	13.0	25.7	8.3	40.7
Locational Running Avg.	15.1	28.6	21.8	40.1	12.1	47.4
MCL	60.0	80.0	60.0	80.0	60.0	80.0

Long-Term 1 and 2 Enhanced Surface Water Treatment Rule

The Long-Term 1 and 2 Enhanced Surface Water Treatment Rules (LT1ESWTR and LT2ESWTR) build upon the existing Surface Water Treatment Rule requirements. As the District uses surface water, it is subject to these rules.

Under these rules, water systems are required to ensure that 2-log removal of Cryptosporidium, 4-log virus, and 3-log Giardia lamblia is maintained. In addition, systems serving 500 to 9,999 persons must complete disinfection profiling for a 12-month period. Systems with THM's less than 0.064 mg/l and HAA5's less than 0.048 mg/l may be exempt from profiling.

The District was required to begin monitoring under LT2ESWTR in January 2005 and under LT2ESWTR in October 2008. The District currently takes one sample per month at the Water Treatment Plant, prior to treatment.

WATER QUALITY MONITORING SCHEDULE

Water quality monitoring is required for regulatory compliance and to identify water system conditions. DOH provides guidelines for inorganic and organic monitoring under WAC 246-290-300, Monitoring Requirements, in which each system is required to prepare a Monitoring Plan that will define monitoring schedules and sample locations. Table 3-10 through summarizes the District's water quality monitoring requirements. The District's Monitoring Plan is included in Appendix E.

TABLE 3-10
Water Quality Monitoring Requirements

Parameter	Frequency	Notes
Distribution system		
Asbestos	One sample set every 9 years. Jan 2011 to Dec 2019.	Sampled Dec. 2009
Chlorine Residual	Every calendar day	Taken at same time and location as coliform samples
Coliform Sampling	4 samples per month	See Coliform Monitoring Plan in Appendix E.
Disinfection Byproducts (HAA5, TTHM)	One sample every 3 months	See D/DBP Monitoring Plan in Appendix E.
Lead and Copper	10 samples between Jan 2016 – Dec 2018, June through September	Detailed instructions on sampling requirements included in the DOH Monitoring Report.
Beall and Ellis Creeks		
Nitrates	Annually	Sampled Oct. 2016
Complete Inorganic (IOC)	One sample set every 9 years. Jan 2011 to Dec 2019.	Sampled Dec. 2012
Volatile Organics (VOC)	One sample set every 6 years. Jan 2014 to Dec 2019.	Sampled July 2017
Herbicides	One sample set every 9 years. Jan 2014 to Dec 2022.	Sampled Oct. 2016
Radionuclides	One sample set every 6 years. Jan 2014 to Dec 2019.	Sampled Oct. 2015
Well 3 (Morgan Hill Well)		
Nitrates	Annually	Sampled Oct. 2016
Complete Inorganic (IOC)	One sample set every 3 years. Jan 2014 to Dec 2016.	Sampled Oct. 2016
Volatile Organics (VOC)	One sample set every 6 years. Jan 2014 to Dec 2019.	Sampled Dec. 2013
Herbicides	One sample set every 9 years. Jan 2014 to Dec 2022.	Sampled May 2010
Radionuclides	One sample set every 6 years. Jan 2014 to Dec 2019.	Sampled Aug. 2012
Wells 1, 2, 4 (Wellfield)		
Nitrates	Annually	Sampled Oct. 2016
Complete Inorganic (IOC)	One sample set every 9 years. Jan 2011 to Dec 2019.	Sampled June 2010
Arsenic	One sample set every 3 years. Jan 2014 to Dec 2016.	Sampled Oct. 2016
Volatile Organics (VOC)	One sample set every 6 years. Jan 2014 to Dec 2019.	Sampled Jul. 2017
Herbicides	One sample set every 9 years. Jan 2014 to Dec 2022.	Sampled Aug. 2012
Radionuclides	One sample set every 6 years. Jan 2014 to Dec 2019.	Sampled Oct. 2015

TABLE 3-10 – (continued)**Water Quality Monitoring Requirements**

Parameter	Frequency	Notes
Beall Well⁽¹⁾		
Nitrates	Annually	Sampled Apr. 2017
Complete Inorganic (IOC)	One sample set every 3 years. Jan 2014 to Dec 2016.	Sampled Apr. 2017
Arsenic	Monthly	Submit quarterly results to DOH
Volatile Organics (VOC)	One sample set every 3 years. Jan 2014 to Dec 2016.	
Herbicides	One sample set every 3 years. Jan 2014 to Dec 2016.	
Pesticides	One sample set every 3 years. Jan 2014 to Dec 2016.	Sampled Apr. 2017
Radionuclides	Quarterly	Sampled Apr. 2017

(1) Beall Well was not used for the period January 2014 – December 2016.

SYSTEM ANALYSIS

This section examines system capacity, including water rights, sources, treatment systems, storage, booster stations, and the distribution system.

WATER RIGHTS ANALYSIS

All appropriations of water for public use within Washington State must be made in accordance with existing water rights and the established procedures that govern their implementation and use. The District's existing water rights, including maximum instantaneous and total annual withdrawal limitations, are summarized in Table 3-11. The actual production capacity of each source is examined in the next section.

TABLE 3-11
Water Rights Summary

Water Right	Priority Date	Source Name	Instantaneous Rate	Annual Quantity
			(cfs/gpm)	(ac-ft/yr)
S1-0149C (SWC887)	9/11/1925	Beall Creek	0.90 cfs	651 ⁽²⁾
S1-0192C (SWC836)	11/14/1926	Ellis Creek	0.50 cfs	361 ⁽²⁾
G1-23519C(A) ⁽³⁾	11/30/1979	Wells 1, 2, 3 ⁽¹⁾ and 4	250 gpm	222
G1-23519P(B) ⁽³⁾	11/30/1979	Wells 1, 2, 3 ⁽¹⁾ and 4	250 gpm	78
S1-15998CAL (SWC8145) ⁽⁴⁾	4/14/1960	Beall Greenhouse	180 gpm	55
G1-28746P	12/21/2012	Vashon Meadows	20 gpm	1.16
Totals			1,078 gpm	1,368.16

- (1) Well 3 maximum Qi = 35 gpm and maximum Qa = 45 ac-ft/yr.
- (2) Qa is the quantity that would result from use of these sources for 24 hours per day over a full year. This has not yet occurred, and the rights are therefore not as of yet fully perfected.
- (3) Total wellfield withdrawals are limited to 250 gpm and 300 ac-ft/yr.
- (4) Not currently perfected.

Tables 3-12 and 3-13 summarize the District's available water rights compared to the projected demands, as described in Chapter 2.

TABLE 3-12
Annual Withdrawal Water Rights Analysis

Year	Annual Withdrawal Water Rights		Projected Annual Withdrawal		Water Right Surplus/(Deficit)	
	Ac-ft/yr	MG/yr ⁽¹⁾	MG/yr ⁽²⁾	Ac-ft/yr ⁽²⁾	MG/yr ⁽²⁾	Ac-ft/yr ⁽²⁾
2017	1,368	445.8	120.2	369	325.6	999
2018	1,368	445.8	121.9	374	323.9	994
2019	1,368	445.8	123.5	379	322.3	989
2020	1,368	445.8	125.5	385	320.3	983
2021	1,368	445.8	126.8	389	319.0	979
2022	1,368	445.8	128.4	394	317.4	974
2023	1,368	445.8	129.3	397	316.5	971
2024	1,368	445.8	130.6	401	315.2	967
2025	1,368	445.8	131.1	402	314.7	966
2026	1,368	445.8	132.0	405	313.8	963
2036	1,368	445.8	140.4	431	305.4	937

- (1) District's permitted annual withdrawal.
- (2) Projected annual demand per Table 2-15.

TABLE 3-13
Maximum Day Demand vs Water Rights Analysis

Year	Instantaneous Withdrawal Water Rights (gpm) ⁽¹⁾	Projected Maximum Day Demand (gpm) ⁽²⁾	Water Right Surplus/(Deficit) (gpm)
2017	1,078	517	561
2018	1,078	559	519
2019	1,078	531	547
2020	1,078	538	540
2021	1,078	545	533
2022	1,078	552	526
2023	1,078	556	522
2024	1,078	560	518
2025	1,078	563	515
2026	1,078	567	511
2036	1,078	603	475

(1) District's permitted instantaneous withdrawal.

(2) Projected annual demand per Table 2-15.

Tables 3-12 and 3-13 show that the District holds adequate water rights to meet current and future demands. The challenge for the District will be developing sources in order to fully utilize the available rights, as described in the next section.

SOURCE CAPACITY ANALYSIS

This section analyzes the capacity of the District's sources to meet demands. Capacities of each source vary from the permitted water right withdrawals due to aquifer and well constraints, varying creek levels throughout the year, and regulatory requirements.

The following DOH recommendations are intended to promote high levels of source reliability for service to customers. Purveyors may choose to follow some or all of the DOH recommendations below. Minimum standards are set by WAC 246-290-222 (4) *Total daily source capacity, in conjunction with any storage that is designed to accommodate peak use periods on a daily or longer basis, shall be sufficient to provide a reliable supply of water equal to or exceeding the MDD.*

1. Development of two or more sources with a supply capacity able to replenish depleted fire suppression storage within a 72-hour period while concurrently supplying the maximum day demand.
2. Sources capable of providing the maximum day demand for the system with 18 hours of pumping. This recommendation generally applies to ground water sources.

3. With the largest source out of service, remaining sources(s) are able to provide a minimum of the average day demand for the system.
4. Pump stations with power connections to two independent primary public power sources, or either portable or in-place auxiliary power available.
5. The firm yield of surface water sources is that associated with the lowest flow and/or longest period of extended low precipitation on record.

The District's sources are summarized in Chapter 1. The Beall and Ellis Creeks and the Beall Well are considered one source due to the required treatment of the water at the Water Treatment Plant. Wells 1, 2, 3, and 4 and the Vashon Meadows Well are all considered individual sources, despite several of them sharing a water right.

The District has been monitoring stream flows of both Beall and Ellis Creeks seasonally since 1997. The data indicate that Ellis Creek has a minimum flow of approximately 160 gpm, 65 gpm below the 225 gpm water right. The data from Beall Creek indicates that it has a minimum flow of approximately 310 gpm, 94 gpm below the existing 404 gpm water right. In addition, as part of the agreement executed with Protect Our Water and the Department of Ecology regarding the Beall Water Right, an instantaneous minimum residual flow of 45 gpm must remain in the stream, immediately downstream of the intake structure. Consequently, at low flows the usable flow in Beall Creek is approximately 265 gpm. During periods of minimum stream flow, the assumed usable flow is 425 gpm total from both creeks.

Table 3-14 summarizes the effective capacities of each source. The capacities are reduced for the treatment plant to reflect two hours of backwash per day. The wells' production is reduced to reflect 18 hrs of pumping plus a further reduction for Wells 1, 2 and 4 to reflect a limitation of the wellfield capacity.

TABLE 3-14
Source Capacity Summary

Source	Instantaneous Capacity gpm	24-hr Capacity gpd⁽²⁾
Beall Creek ⁽¹⁾	265	349,800
Ellis Creek ⁽¹⁾	160	211,200
Beall Well	80	86,400
Total Water Treatment Plant	485	647,400
Well 1	80	86,400
Well 2	50	54,000
Well 4	120	129,600
Reduction for Wellfield maximum	(50)	(54,000)
Well 3	26	37,800
Vashon Meadows Well	7.5	10,800
Total Wells	234	264,600
Total Source Capacity	739	912,000

(1) Surface water instantaneous Capacity limited by minimum stream flow.

(2) Treatment capacity limited to 22 hrs/day. Vashon Meadows and Well 3 capacity limited to 18-hours pumping per day.

Maximum Day Capacity

In the following capacity analyses, the capacities of the wells and treatment plant are calculated based 912,000 gpd.

As described later in this Chapter, the District's maximum fire flow requirement is 2,250 gpm for 2 hours, equating to 270,000 gallons of storage. Replenishing this volume within 3 days will require an additional production rate of 90,000 gpd, or 63 gpm, over 72 hours.

Table 3-15 summarizes source capacity compared to projected maximum day demand and the additional supply required to replenish fire suppression storage.

TABLE 3-15
Maximum Day Source Capacity Analysis

Year	ERU	ADD gpd	Projected Maximum Day Demand		Fire Suppression Storage/ 3 Days, gpd⁽²⁾	Total Daily Demand, gpd	Total Source Capacity, gpd⁽³⁾	Surplus/ (Deficit), gpd
			gpd	gpm⁽¹⁾				
2017	1,772	329,450	744,098	517	90,000	834,098	912,000	77,902
2018	1,796	333,912	804,608	559	90,000	894,608	912,000	17,392
2019	1,820	338,374	764,254	531	90,000	854,254	912,000	57,746
2020	1,844	342,836	774,332	538	90,000	864,332	912,000	47,668
2021	1,868	347,299	784,411	545	90,000	874,411	912,000	37,589
2022	1,892	351,761	794,489	552	90,000	884,489	912,000	27,511
2023	1,906	354,364	800,368	556	90,000	890,368	912,000	21,632
2024	1,919	356,780	805,826	560	90,000	895,826	912,000	16,174
2025	1,932	359,197	811,285	563	90,000	901,285	912,000	10,715
2026	1,945	361,614	816,744	567	90,000	906,744	912,000	5,256
2036	2,069	384,668	868,814	603	90,000	958,814	912,000	(46,814)

(1) Flow rate based on 24 hours.

(2) Fire suppression storage of 270,000 gal over three days.

(3) Creek sources operating 22 hours per day, reduced by 10 percent below historic minimum flow; Well 3 and Vashon Meadows Well operating 18 hours per day. Well 2 not in use.

The District has adequate source capacity through the 6-year planning period to meet projected system demands, while still meeting DOH recommended reliability standards. By the end of the 20-year planning period, the deficit is approximately 46,814 gpd (33 gpm). The District has concerns about long-term capacity of the surface water sources, as climate patterns continue to change in the area and will continue to assess creek production, water system demands, and available capacity to ensure reliable and sustainable service.

Assuming the District plans with the recommended WDOH reliability and redundancy recommendations, a small shortfall in the maximum day source capacity for 2036 is projected. The District has a number of possible options to meet this projected deficit. These include programs and incentives to encourage more efficient water use; incentives to curtail water use during times of peak demand; well rehabilitation to increase the available supply; and, as a last resort, the development of a new water source for the District.

Average Day Capacity

DOH recommends that the District be able to meet average day demand with the largest source out of service. The District's largest source is the WTP. The wells, not including Beall Well, have a combined capacity of 234 gpm, or 336,960 gpd assuming the constraints previously discussed. This is not adequate to meet average day demands. In the event that the WTP is out of service, the District may need to request to utilize the

intertie with Heights Water. By 2036, it is projected that an additional 33 gpm would be needed on an average day, with the WTP out of service.

TREATMENT ANALYSIS

The District's water treatment plant treats and filters surface water diverted from Beall and Ellis Creeks and pumped to the plant, as well as water pumped from the Beall Well. The plant has two parallel clarifier-filtration treatment trains, each with a maximum instantaneous design rate of 350 gpm per filter. The plant is capable of operating 24 hours per day during peak demand periods assuming staff availability.

The clarification-filtration process removes particulate matter from the water. Over time this particulate matter reduces the flow rate of water through the clarifiers and filters. As a result, the clarifiers must be rinsed and the filters backwashed on a periodic basis to remove the accumulated particulate matter. The clarifier rinse operation utilizes raw water. The filter backwash process requires the use of previously treated and filtered water. All of the water that is used for rinsing and backwashing is conveyed to the backwash basin (recycle ponds) for later reuse.

The backwash basins provide temporary storage for approximately 290,000 gallons of water used to store the waste stream from clarifier rinses, filter backwashes and filter-to-waste operations. Decanted water is pumped from temporary storage into the treatment plant raw water piping to augment the flow from the creeks and to increase the instantaneous production rate. Since the backwash basin stored volume does not typically change over a 24-hour period no increase in 24-hour capacity is assumed. In addition, the DOH operating permit stipulates that no more than 15 percent of the influent stream into the treatment plant can be recycled water. A magnetic flow meter and manual valve are utilized in regulating the recycle flow. The instantaneous flow is displayed on the SCADA terminal in the operating room as well as a wall mounted remote display.

With a maximum capacity of 700 gpm, the water treatment plant has surplus capacity beyond the 20-year planning period.

STORAGE ANALYSIS

Storage requirements are determined according to the DOH *Water System Design Manual*. The storage requirements are based on the sum of the following:

- Dead Storage
- Operational Storage
- Equalizing Storage
- Standby Storage
- Fire Suppression Storage

Dead Storage

Dead storage is the volume of stored water not available to all customers at the minimum design pressure in accordance with WAC 246-290-230(5) and (6). Dead storage is excluded from the volumes provided to meet the other storage requirements. WAC 246-290-230(5) and (6) require that a minimum of 30 psi be maintained system wide under peak hour demand conditions (equalization storage depleted) and that 20 psi be maintained system wide under maximum day demand plus fire flow conditions (equalization and fire suppression storage depleted).

The highest water service connection served by the reservoirs is 412 feet. In order to maintain 20 psi during a fire flow, a minimum water level of 44 feet must be maintained in the 1 MG Reservoir.

The 625,000-gallon and 100,000-gallon reservoirs supply the system with pumps, and thus do not have any dead storage. The 1 MG Reservoir contains approximately 525,000 gallons of dead storage.

Operational Storage

Operational storage is the volume of the reservoir devoted to supplying the water system while under normal operating conditions. It is the volume in the reservoir between the source pumps on and off. This volume is dependent upon the pump call settings necessary to prevent excessive cycling of source pump motors.

The 1 MG Reservoir has an operational depth of 7 feet. When the water level reaches 72 feet, the pumps from the 625,000-gallon tank come on, and shut off when the water level reaches 79 feet.

The 625,000-gallon and 100,000-gallon tanks are assumed to have operational levels equating to 10 percent of the total storage volume.

Equalizing Storage

Equalizing storage is typically used to meet diurnal demands that exceed the source capacity. The volume of equalizing storage required depends on peak system demands, the magnitude of diurnal water system demand variations, the source production rate, and the mode of system operation. Sufficient equalizing storage must be provided in combination with available water sources and pumping facilities such that peak system demands can be satisfied.

Equalizing storage is calculated using the following equation:

$$V_{ES} = (Q_{PH} - Q_s)150 \text{ minutes}$$

V_{ES} = Equalizing storage component (gallons)

Q_{PH} = Peak hourly demand (gpm)

Q_s = Total source of supply capacity, excluding emergency sources (gpm)

The equalizing storage required is summarized in Table 3-16. Peak hour demands are as presented in Chapter 2.

Standby Storage

Standby storage is provided in order to meet demands in the event of a system failure such as a power outage, an interruption of supply, or break in a major transmission line. The amount of emergency storage should be based on either the reliability of supply and pumping equipment, standby power sources, and the anticipated length of time the system could be out of service, or simply the number of ERUs in the system.

Standby storage is calculated using the following equation:

$$V_{SB} = 2(ADD) - 1440 \text{ minutes (Qs)}$$

V_{SB} = Required standby storage component (gallons)

ADD = Average daily demand for the design year (gallons)

Q_s = Total source of supply capacity, with the largest source out of service (gpm)

DOH recommends that a standby storage volume be not less than 200 gallons/ERU.

Standby storage requirements for the District according to the above formula are presented in Table 3-16. Use of the formula creates a larger need for storage than using 200 gal/ERU.

Fire Suppression Storage

Fire suppression storage is provided to ensure that the volume of water required for fighting fires is available when necessary. The amount of water required for fire suppression storage is specified in terms of rate of flow in gallons per minute (gpm) and an associated duration. Fire flows must be provided at a residual water system pressure of at least 20 pounds per square inch (psi).

Fire suppression storage is calculated using the following equation:

$$V_{FSS} = NFF \cdot T$$

V_{FSS} = Required fire suppression storage component (gallons)

NFF = Necessary fire flow (gpm)

T = Duration (minutes)

The largest fire flow requirement within the District is 2,250 gpm for 2 hours. This equates to a fire suppression storage volume of 270,000 gallons.

The standby storage component or the fire suppression storage component, whichever volume is smaller, can be excluded from a water system's total storage requirement provided that such practice is not prohibited by: (1) a locally developed and adopted Coordinated Water System Plan; (2) local ordinance; or (3) the local fire protection authority or County Fire Marshal (reference WAC 246-290-235(4)). None of these apply in the case of the District. Therefore, only standby storage will be included as a required storage.

Storage Summary

Table 3-16 summarizes the District's available storage and required storage volumes. The gross storage volume in Table 3-16 is less than that calculated by tank diameter and overflow level, of 1,725,000 gallons, the operational maximum water level is 1 foot below the overflow level.

TABLE 3-16

Storage Analysis

	2016	2022	2026	2036
Gross Storage Volume	1,637,741	1,637,741	1,637,741	1,637,741
Dead Storage	525,696	525,696	525,696	525,696
Available Storage	1,112,045	1,112,045	1,112,045	1,112,045
Operational Storage	153,067	153,067	153,067	153,067
Equalizing Storage	23,066	31,465	35,174	43,852
Fire Suppression Storage	270,000	270,000	270,000	270,000
Standby Storage	419,482	476,541	501,621	543,801
Required Storage	444,454	661,073	689,862	740,721
Storage Surplus/(Deficit)	667,591	450,972	422,183	371,324

The District has adequate storage capacity through the 20-year planning period. The 100,000-gallon reservoir is not online year-round; however, with a surplus of approximately 366,000 gallons projected by 2036, there is still adequate storage capacity even if the 100,000-gallon tank is offline.

DISTRIBUTION SYSTEM ANALYSIS

The District's system is analyzed using Innovyze's InfoWater hydraulic modeling software which operates in a GIS environment. The InfoWater model is configured with a graphical user interface. Each model element, including pipes, valves, pumps, and reservoirs, is assigned a unique graphical representation within the program. Each element is also assigned a number of attributes specific to its function. Element attributes include spatial coordinates, elevation, water demand, pipe length, diameter, and pipe status (open/closed), as well as pump, valve and reservoir characteristics. Model input is accomplished through the creation and manipulation of these objects and their attributes. The InfoWater software produces the model output in the form of flows and pressures throughout the simulated water system.

MODEL LAYOUT AND CONSTRUCTION

In order to create a realistic representation of the District's water system, the model was created using the water system base map and information obtained through conversations with the District. A map detailing existing pipes and nodes is included in Appendix F.

Source

All of the District's sources are included in the hydraulic model. Each source consists of a fixed-head reservoir simulating the aquifer or treatment plant output.

Service Domain

The model includes all distribution mains with the exception of several dead-end pipes less than 4 inches in diameter that do not have hydrants on them. Model demands are assigned to nodes in all areas where services or facility demands actually exist. All demand nodes are modeled to maintain pressures of 20 psi under maximum day demands and fire flow conditions, and 30 psi under peak hour conditions.

Storage

In InfoWater, reservoirs are modeled as "tanks" with finite size using actual reservoir dimensions and elevations. The model includes the District's storage tanks. Dimensions and critical elevations of the storage facilities are provided in Chapter 1.

Per WAC 246-290-230(6), fire flows must be provided when equalizing storage (ES) and fire suppression storage (FSS) have been depleted from the reservoirs and while maintaining a system-wide minimum pressure of 20 psi. Similarly, peak hour demands must be met while maintaining a system-wide minimum pressure of 30 psi with equalizing storage depleted. Table 3-17 summarizes reservoir levels used in the model and storage volumes depleted. Only the 1 MG tank levels are pertinent to the model,

since the 625,000-gallon tank pumps into the 1 MG tank. The 100,000-gallon tank is not modeled as active.

TABLE 3-17
Reservoir Model Levels

Demand Scenario	1 MG Reservoir Level, ft			
	2016	2022	2026	2036
Max. Day Demand and Fire Flow	59.55	58.70	58.39	57.66
Peak Hour Demand	77.20	76.36	76.04	75.31

MODEL DEMANDS

Existing system demands were determined for the District's service area from existing production data. Demands are distributed evenly across all nodes.

SCENARIOS

The InfoWater modeling software allows the user to input a variety of demands and scenarios. For the purpose of this plan, the following sets of demands were developed in the hydraulic model:

- 2016 Average Day Demand: These demands were used for model calibration and verification of existing demands.
- 2016 and 2036 Maximum Day Demand: These existing and projected demands were used to evaluate the system's ability to meet the required fire flows for the Department of Health requirement of 20 psi.
- 2016 and 2036 Peak Hour Demand: These existing and projected demands were used to verify the system is capable of meeting the Department of Health Standards to supply domestic water at a minimum system-wide pressure of 30 psi.

These scenarios were used to determine the improvements required to meet the current and projected expansion of the District's water system.

MODEL CALIBRATION

For the purposes of model calibration, fire flow tests were conducted in April 2016 at four locations throughout the District's water system. Two additional locations were tested in June 2016 following completion of pipe improvements along Ridge Road.

The field results were used to calibrate the hydraulic model through adjustment of system elevations, friction coefficient factors, and verification of pipe sizes and system connectivity. Table 3-18 describes the locations of the nodes used for the fire flow tests and model calibration.

TABLE 3-18
Calibration Node Numbers and Locations

Zone	Location	Flow Node	Pressure Node
494	SW Bank Road	J-48	J-47
494	SW 204 th Street	J-322	J-82
350	Tramp Harbor Road SW/Ellisport Road	J-324	J-323
240	77 th Avenue SW	J-325	J-326
305	Ridge Road	J-176	J-177
200	Chautauqua and SW 204 th	J-170	J-162

The calibration was conducted under 2015 average daily demand conditions in lieu of 2016 demand data. Table 3-19 presents actual field hydrant flow test data along with the corresponding results from the calibrated model.

TABLE 3-19
Hydraulic Model Calibration Results

Location	Flow Node	Pressure Node	Static Pressure, psi		Residual Pressure, psi		Flow gpm
			Field	Model	Field	Model	
SW Bank Road	J-48	J-47	56	54	55	52	1,061
SW 204 th Street	J-322	J-82	71	69	67	58	1,289
Tramp Harbor Road SW/Ellisport Road	J-324	J-323	146	139	100	95	1,278
77 th Avenue SW	J-325	J-326	70	74	10	10 ⁽¹⁾	336
Ridge Road	J-176	J-177	43	43	33	34	1,021
Chautauqua and SW 204 th	J-170	J-162	60	61	45	47	964

- (1) Calibrating the residual pressure in the model required downsizing a portion of the water main serving the area tested. District staff indicated that pipe records of the area may not be accurate, and that small diameter pipe may have been installed during repairs in the past.

All modeled static pressures are within 5 percent of field results. The model results generally predict lower pressures than field conditions.

The residual pressures are all within 10 percent, except for the SW 204th Street location. Again, the model results are lower than the field results, and are thus acceptable for this analysis.

MODEL SIMULATION AND RESULTS

Results for the hydraulic modeling can be found in Appendix F.

Peak Hour Demand

According to Department of Health Waterworks Standards and WAC 246-290-230, a water system must maintain a minimum pressure of 30 psi in the distribution system under peak hour demand conditions. The District's existing distribution system was modeled under 2016 peak hour demand conditions. The District is able to meet the system-wide requirement of 30 psi under 2016 peak hour demands, with the exception of five nodes. The projected 5-year, 10-year, and 20-year peak hour demands were also modeled to determine pressure availability throughout the system. Table 3-20 includes the achievable pressure at the deficient nodes, as well as the location of each low pressure node. All future pressure modeling was done without the improvements listed in Chapter 8.

TABLE 3-20

Deficient Nodes under PHD

Node	2016	2022	2026	2036	Location/Notes
	Pressure (psi)				
J-150	23	22	22	21	Immediately downstream of PRV, at top of hill. On Vashon Highway SW, north of SW Quartermaster Drive
J-226	31	30	30	29	Immediately downstream of PRV, at top of hill. On Ridge Road SW, north of SW 204 th Street
J-200	27	26	25	23	At end of a long, dead-end main. On SW 216 th Street, just east of Morgan Hill Well site.

Available Fire Flow

WAC 246-290-230 states, "If fire flow is to be provided, the distribution system shall also provide maximum day demand (MDD) plus the required fire flow at a pressure of at least 20 psi at all points throughout the distribution system and under the condition where the designed volume of fire suppression and equalizing storage has been depleted."

Table 3-21 provides the general fire flows required in the District and a few specific fire flows for locations throughout the District. A map indicating the available fire flows throughout the District is included on Figure 3-1.

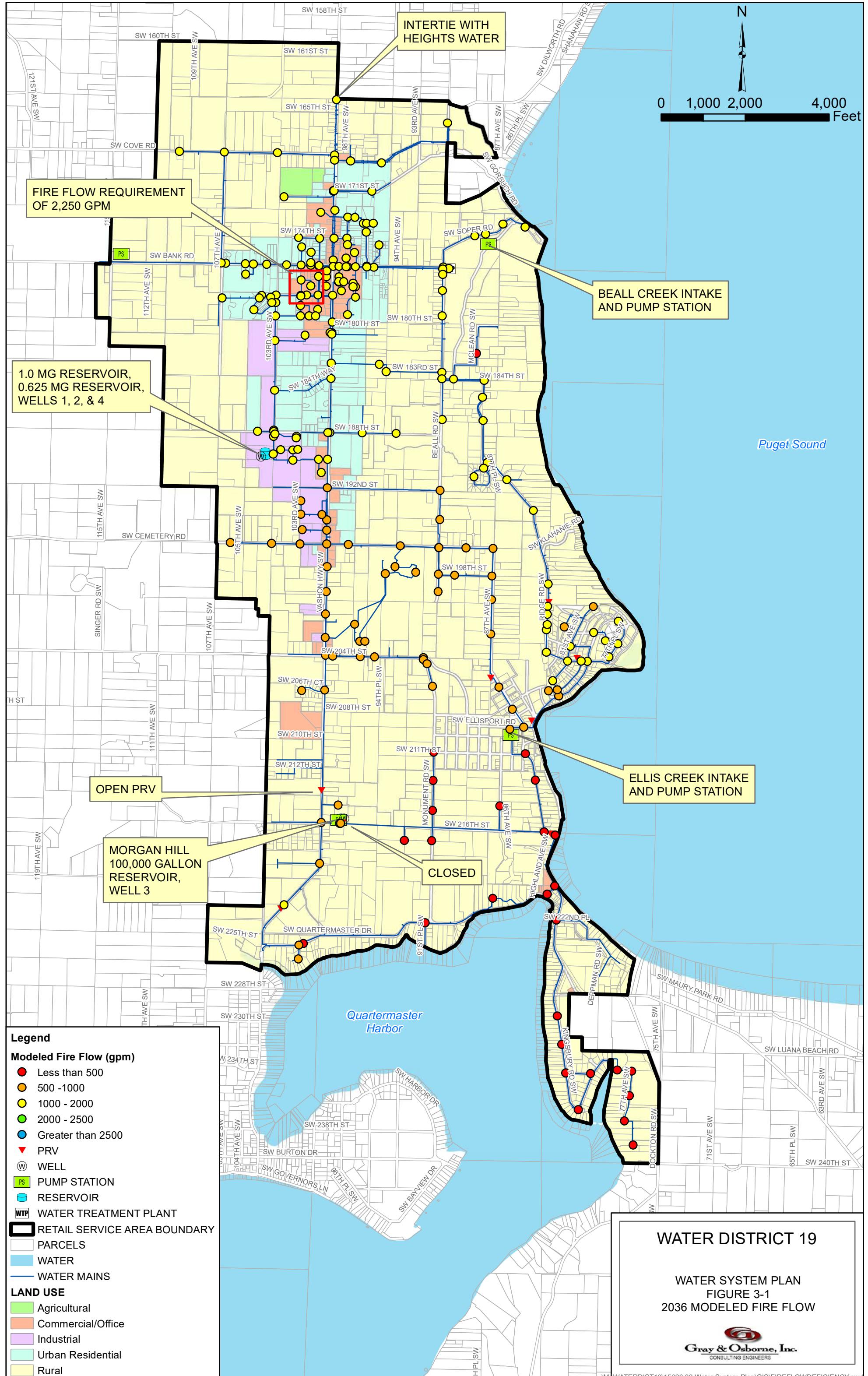


TABLE 3-21
Minimum Required Fire Flows

Classification/Location	Fire Flow Requirement, gpm⁽¹⁾	Duration, hrs.
Single-Family	1,000	2
Multi-Family	1,500	2
Commercial/Industrial	2,000	2
Schools	2,000	2
IGA Vashon Market	2,250	2
Vashon High School	2,000	2
Thriftyway	2,000	2
K2 Buildings	2,000	2

(1) Established by King County Code section 17.08.060 and Chapter 246-293 WAC.

The hydraulic model was used to simulate the required fire flows throughout the system. As a basis for recommending improvements, fire flows were run for the existing system conditions. Many areas of the system are shown to have deficient fire flow under the present-day demands as well as the future demands in 2036. Any of the nodes identified as having a fire flow demand of 2,000 gpm or greater were found to be deficient. The future modeling scenarios were conducted without any of the improvements listed in Chapter 8. The following general areas within the system are deficient:

- The primarily commercial area in the vicinity of the SW Bank Road and Vashon Highway SW intersection. Fire flow demand in this location is generally 2,000 gpm. This area also includes IGA Vashon Market, which has a fire flow demand of 2,250. Some nodes can achieve the required 2,000 gpm, but a number of other nodes are deficient and are able to achieve only approximately 1,700 to 1,800 gpm.
- The south portion of the District's service area including the 350 and 240 Zones as well as Maury Island. This area is generally not looped and is located far from the 1 MG reservoir and the WTP. Achievable fire flows are below 400 gpm.
- The small single-family development along SW 206th Court, just west of Vashon Highway SW. The achievable fire flow is approximately 700 gpm.
- The commercial development at the intersection of SW 188th Street and 103rd Avenue SW. The demand in this location is 2,000 gpm, but only 1,700 gpm is achievable because of high elevations.

- The commercial development along Vashon Highway SW between SW 188th Street and SW Cemetery Road, and west along SW Cemetery Road to 105th Avenue SW. Commercial fire flow demands are 2,000 gpm; achievable flows are approximately 1,000 gpm in this area, with the lowest flows limited by high elevations.

Capital improvement projects to address the deficiencies listed above are discussed in Chapter 8.

SUMMARY OF SYSTEM CAPACITY

The District has adequate annual and instantaneous water rights, treatment capacity, and storage capacity to accommodate the projected growth through the 20-year planning period. The District's source capacity is exceeded by 2036 as demonstrated in Table 3-15, while adhering to the recommended WDOH reliability criteria. Table 3-22 summarizes facility capacity in terms of ERUs.

TABLE 3-22

ERU Capacity Summary

System Element	Capacity	ERUs
Source of Supply		
Annual Water Right	1,368 ac-ft/yr	7,375 ⁽¹⁾
Instantaneous Water Right	1,078 gpm	3,881 ⁽²⁾
Source Capacity	739 gpm ⁽³⁾	2,275 ⁽²⁾ / 2,069 ⁽³⁾
Storage	1,112,045 (gal)	3,856
Distribution System	Varies	NA

(1) Based on average day ERU demand of 166 gpd.

(2) Based on maximum day ERU demand of 401 gpd.

(3) ERU capacity, while meeting WDOH recommended criteria, as previously discussed and presented in Table 3-14 (912,000 gpd/1440 min/day) and Table 3-15.

Projects addressing the distribution system deficiencies are identified and described in Chapter 8 – Capital Improvement Plan.

CHAPTER 4

WATER USE EFFICIENCY PROGRAM

OBJECTIVE

A viable water use efficiency plan is a requirement of water system planning. Public awareness and participation are necessary for the District to develop an active and beneficial water use efficiency plan. The following chapter presents the District's Water Use Efficiency Program.

WATER USE EFFICIENCY PLANNING REQUIREMENTS

The Washington Legislature passed the Water Use Efficiency Act of 1989 (43.20.230 RCW) which directs the Department of Health (DOH) to develop procedures and guidelines relating to water use efficiency. In response to this mandate, the Department of Ecology (Ecology), the Washington Water Utilities Council, and DOH jointly published a document titled Conservation Planning Requirements (1994). In 2003, the Municipal Water Supply – Efficiency Requirements Act (Municipal Water Law) was passed and amended RCW 90.46 to require additional conservation measures. The Municipal Water Law, among other things, directed DOH to develop the Water Use Efficiency Rule (WUE Rule), which is outlined in the Water Use Efficiency Guidebook and became effective January 22, 2007. These documents provide guidelines and requirements regarding the development and implementation of conservation and efficiency programs for public water systems. Conservation and efficiency programs developed in compliance with these documents are required by DOH as part of water system planning documents and by Ecology as part of a public water system water right application. Conservation must be evaluated and implemented as an alternate source of supply before state agencies approve applications for new or expanded water rights.

As an extension to the Conservation Planning Requirements, the WUE Rule sets more stringent requirements for public water purveyors. The WUE Rule is comprised of three fundamental elements:

1. Planning requirements;
2. Distribution leakage standards; and
3. Goal setting and performance reporting.

This chapter provides a discussion of the requirements and the impact the WUE Rule has on the District.

PAST CONSERVATION/WUE PROGRAMS

The District adopted a Water Use Efficiency Program as part of the 2008 Water System Plan. Through the development of this program, the District sought to meet the following goals and objectives:

1. Reduce peak period usage by 2 percent annually through the 6-year planning period, by primarily targeting irrigation use.
2. Reduce overall usage by offering rebates on select fixtures and appliances up to \$100 each.
3. Reduce and maintain system leaks to below 10 percent per year.

To meet these goals, the District implemented a variety of supply and demand side measures that are listed below:

1. Toilet replacement program.
2. Clothes washer replacement program.
3. Include a water conservation message on the District website and newsletter.
4. Participate in USEPA WaterSense High-Efficiency Fixture Program.
5. Develop water rate structures with an emphasis on water conservation.
6. Continue existing public outreach measures.
7. Contract with leak detection services contractor 2 days per year to identify suspected leaks and initiate repairs.

EFFECTS OF PAST PROGRAMS

The District has had a water conservation program in place since 1996. Both supply and demand measures have been included in the program, and the District has sought to focus efforts on the customer classes that use the most water, as well as seasonal usage issues.

Maximum day demand has ranged from a peak in 2010 of approximately 735,000 gpd to approximately 589,000 gpd in 2011. Over this time, the maximum day demand has varied greatly, but has not reached the same peak as it did in 2010, despite increased meter connections. The goal of a 2 percent peak period reduction per year was not met consistently over the past 6 years, but the District plans to aim for a 2 percent peak day reduction per year moving forward.

System leaks are discussed in Chapter 2 and in a later section of this Chapter. The District's 3-year rolling average DSL hovered around 10 percent from 2010 through 2016. The DSL determined in 2016 is the highest seen during this period, at 12.6 percent. The District is committed to bringing annual DSL below 10 percent primarily through leak detection, and pipe and meter replacements throughout the system.

PLANNING REQUIREMENTS

Under the WUE Rule, water systems are required to implement planning methods to forecast future demands and determine necessary measures to reduce usage and demand. Elements of the planning requirements include:

- Data collection;
- Demand forecasts; and
- Selection and evaluation of WUE measures.

DATA COLLECTION AND REPORTING

The WUE Rule requires regular collection of production and consumption data. Data must be reported in the District's planning documents and an annual performance report to DOH. Water use data will be used by the District for the following:

- Calculating leakage;
- Forecasting demand for future water needs;
- Identifying areas for more efficient water use;
- Evaluating the success of the District's WUE program;
- Describing water supply characteristics; and
- Aiding in decision-making about water management.

Table 4-1 summarizes the water use data collection requirements.

TABLE 4-1
Summary of Water Use Data Collection

Data Type	Includes
Source of Supply Meter Data	Monthly and annual totals of water produced, purchased from another water system, and/or supplied to other water systems through interties
Service Meter Data	Total annual water consumed, annual water consumed by each customer class, and customer class seasonal variations.

This data is needed to meet the planning and performance reporting requirements and to check compliance with the distribution system leakage standard of the WUE Rule.

DEMAND FORECAST

Demand forecasting is an essential element of planning. It provides a basis for comparison for growth and usage, and also helps in scheduling system improvements. For the purposes of the WUE Rule, forecasting is used in goal setting and measuring the success of the WUE program.

Complete demand forecasts are provided in Chapter 2 of this plan. A summary is included in Table 4-2. These forecasts do not include anticipated reductions in use from conservation and efficient water use efforts.

TABLE 4-2
Water System Demand Forecast

	2017	2018	2019	2020	2021	2022	2026	2036
Consumption (166 gpd/ ERU) ADD, mgd	0.294	0.298	0.302	0.306	0.310	0.314	0.323	0.343
Production (186 gpd/ ERU) ADD, mgd	0.329	0.334	0.338	0.343	0.347	0.352	0.362	0.385
Annual Demand, MG	120.25	121.88	123.51	125.48	126.76	128.39	131.99	140.40
Maximum Day Demand (400 gpd/ERU), mgd	0.744	0.754	0.764	0.774	0.784	0.794	0.817	0.869
Peak Hour Demand (640 gpd/ERU), gpm	827	838	849	860	872	883	907	965

WUE MEASURES

The WUE Rule requires the evaluation or implementation of water use efficiency measures to help meet the WUE goals. The WUE Guidebook states several measures that must be implemented or evaluated and provides a list of measures that can be counted as additional measures in the WUE program. WAC 246-290-810 identifies the minimum number of water use efficiency measures that must be evaluated based on system size. The District serves between 1,000 and 2,499 connections and therefore must evaluate or implement five water use efficiency measures.

Additional discussion of the District's measures is included later in this chapter.

DISTRIBUTION SYSTEM LEAKAGE

The *Conservation Planning Requirements* set the maximum allowable amount of lost and unaccounted for water at 20 percent of total source production. The WUE Rule requires that water distribution systems have a leakage rate less than 10 percent of finished water production based on a 3-year rolling average.

The District's DSL for 2016 was calculated at 12.6 percent, and the latest 3-year rolling average was determined to be 12.0 percent, as seen on Table 2-8. A discussion of the District's DSL is included in Chapter 2.

GOAL SETTING AND WUE MEASURES

Under the WUE Rule, the District must set water use efficiency goals and measure progress each year toward meeting these goals. Goals must be established through a public process and reported on annually to customers and DOH by July 1 of each year. The WUE goals established through a public process are for a 6-year period, and should be re-evaluated each cycle. Goals must include a measurable outcome, address water supply or demand characteristics, and include an implementation schedule. The District must also evaluate or implement efficiency measures to help meet these goals. Performance reports are required to be made available to the public; this requirement may be fulfilled by including the performance report information in the annual Consumer Confidence Report. Annual water system production total, distribution system leakage information, and a description of the WUE goals and progress of achieving them must also be included in this publication.

GOALS

The District has been researching various water use efficiency and conservation measures that could complement and expand upon its existing measures and expand water savings. As was demonstrated in Chapter 2, the largest water customer class and consumer of the District's water supply are single-family residences. The focus of the historical water conservation program has been to provide programs and information targeted towards this customer class and to reduce peak demand during periods of low rainfall. A review of historical consumption data confirmed that this is still an important focus for the District.

In preparation for the WUE goal and measure adoption, the District reviewed its existing water use efficiency program as well as the proposed goals for 2008-2014. On November 8, 2008, the Board of Commissioners formally adopted two conservation/water use efficiency goals and associated measures, followed by a public presentation on November 13, 2008 at Chautauqua Elementary School. This meeting was open to the public and information was advertised in the Beachcomber newspaper in advance. The WUE goals in this plan were presented at a public meeting with the Board of Commissioners and interested customers in November 2021.

The existing water use efficiency program and newly adopted measures focus primarily on the demand side of water efficiency within the utility's customer base. Supply side water efficiency has been addressed since 2010 through the District's ongoing leak detection program, and will continue as described in a later section of this Chapter.

At present the District has approximately 1,312 water customers; over 80 percent of these services are single family residential, as described in Chapter 2. In 2008, the District established a goal to reduce peak day demand system-wide for the next 6 years. As the District works to finance and install the remainder of the radio-read meters in accordance with its adopted water meter replacement schedule, water use efficiency goals will be reviewed annually to determine if the District can financially support a more aggressive water use efficiency goal, and if additional reductions are realistic and achievable.

The following current goals apply to all customer classes within the District. The District plans to continue these goals through the next 10 years.

1. Reduce peak day usage by 2 percent annually through the 10-year planning period, by primarily targeting irrigation use.
2. Reduce overall usage by offering rebates on select fixtures and appliances up to \$100 each.
3. Reduce and maintain system leaks to below 10 percent per year.

Table 4-3 summarizes maximum day demand per ERU and total MDD with an annual reduction of 2 percent.

TABLE 4-3
2 Percent Annual MDD Reduction

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
MDD, gpm per ERU (with 2 percent reduction per year)	400	392	384	376	369	362	354	347	340	333
Max Day Demand, MGD ⁽¹⁾	0.744	0.739	0.734	0.729	0.724	0.718	0.709	0.700	0.690	0.681

(1) Calculated based on projected MDD reduction for consumption with DLS maintained at the current rate of 12 percent.

EVALUATION OR IMPLEMENTATION OF WUE MEASURES

The District serves between 1,000 and 2,499 connections, and therefore, must evaluate or implement five supplementary water use efficiency measures. The following sections describe both the mandatory and supplementary water use efficiency measures evaluated, and indicate which have been, or will be, implemented by the District.

Mandatory Measures

Implement Source and Service Metering and Meter Calibration

Source water pumped to the Water Treatment Plant (WTP) is metered at both Beall and Ellis Creek stations. Separate meters are also installed at each of the District's wells. Service meters are required on all connections. All services have been metered since 1947.

Implement Leak Detection and Water Accounting

The District has been operating a leak detection program on its water system since 2010. A systematic approach to finding and repairing leaks in the distribution system was adopted utilizing an outside contractor. The District focuses on areas of suspected leakage and areas where water mains are at the theoretical end of their useful life in an effort to conform to state water accountability measures. The District also codified a monitoring program to accurately track flushing use, main break water losses, fire department usage and compliance sampling.

Implement Customer Education

Outreach to water customers and residents has been in the form of brochures, newsletters, billing messages and dedicated space in the annual Consumer Confidence Report.

Implement Conservation Rate Structure

The District's current rate structure is inclining block for residential and commercial customers. The District steepened its rates in 2008 with a focus on encouraging water conservation. In 2011, the District further increased rates and adopted a schedule of rate increases through 2012. The District will continue to evaluate customer behavior and revenue streams to test the feasibility further adjustments.

Evaluate Reclaimed Water Opportunities

The District does not have wastewater treatment facilities. Most of the Island is served by septic systems; however, King County does operate a single wastewater treatment facility, located at 9615 SW 171st Street in the central part of the Island. As a result, a reclaimed program would need to be initiated by King County. If such a program was initiated, the District would evaluate the feasibility of their participation.

A few smaller, commercial operations include their own wastewater treatment facilities, such as Island Spring, a tofu-manufacturing outfit located at 18846 103rd Avenue SW. It is anticipated that a reuse program would have significant cost for the District, which may be prohibitive.

The District has identified several potential areas that could use reclaimed water, including:

- Irrigation of public green spaces;
- Uses for commercial and industrial cooling water;
- Groundwater recharge and storage of reclaimed water; and
- Gray water use programs for subsurface irrigation.

A King County Reclaimed Water Evaluation form is included in Appendix H.

Supplementary Measures

As discussed previously, the District must implement or evaluate five supplementary measures. The District has chosen the following measures, most of which it already implements.

Customer Assistance

Customer assistance entails providing information to water customers that facilitates conservation. The District assists higher demand customers, primarily commercial and industrial customers, in identifying and evaluating savings opportunities. Site visits are offered and follow through is encouraged.

Bills Reflecting Consumption History

Bills showing consumption history provide information to the customer and to the purveyor regarding water use trends. In 2009, the District implemented a new customer billing format and template to include a bimonthly water consumption chart showing consumption over the previous year. This allows the customer to observe the difference in water consumption during the same period for both the current and previous year.

Water Conservation Kits

Water conservation kits containing easily installed water saving devices are distributed to customers. The water conservation kits contain a 2.5 gallons per minute (gpm) showerhead, 2.0 gpm kitchen faucet aerator, 1.5 gpm bathroom faucet aerator, toilet tank bank (flushes with 1 gallon less of water), and water conservation information. The kits are free to new customers. To date, the District has distributed 14 of these kits to customers.

The District is a registered partner in the USEPA WaterSense program. Promotion of the use of WaterSense rated fixtures is included in the standard conservation messaging provided to customers.

Landscape Management

Water use management of large irrigation operations for agriculture, nurseries, and landscaping can increase the irrigation efficiency of these operations. Moisture sensors, flow timers, low volume sprinklers, drip irrigation, weather monitoring, low water demand landscaping, and other practices can be encouraged by the water utility.

The District has provided water conservation messaging to its customers since 2009, focusing its efforts on summer use and irrigation conservation. The message is distributed in spring in the Consumer Confidence Report, as a note on each water statement and on the District website.

Summary of Supplemental Measures

Table 4-4 provides a summary of implemented measures. The District is required to evaluate or implement five supplemental measures, and is currently implementing 18.

TABLE 4-4
Water Use Efficiency Measures

Measures for Implementation	Customer Classes Affected
Conservation Rate Structure	4
Customer Assistance	4
Bills Reflecting Consumption History	4
Water Conservation Kits	4
Landscape Management	2
Total	18

TARGET WATER SAVINGS PROJECTIONS

Table 4-5 compares the average day demand with and without water use efficiency saving. The water use efficiency saving projections including a decrease in distribution system leakage to 10 percent and peak day usage decrease by 2 percent per year. At the end of the 10-year planning period, these water use efficiency measures will account for total savings of 6,457 gpd, or 21 MG total.

TABLE 4-5
Projected Water Use Efficiency Savings

Year	Production w/o WUE		Production with WUE		Average Day Savings (gpd)	Maximum Day Savings (gpd)
	Avg. Day (gpd)	Max. Day (gpd)	Avg. Day (gpd)	Max. Day (gpd)		
2017	329,450	744,098	329,450	744,098	0	0
2018	333,912	754,176	327,950	739,808	5,962	14,368
2019	338,374	764,254	332,332	735,426	6,042	28,828
2020	342,836	774,332	336,714	730,956	6,122	43,376
2021	347,299	784,411	341,097	726,404	6,202	58,007
2022	351,761	794,489	345,479	721,776	6,282	72,713
2023	354,364	800,368	348,036	713,334	6,328	87,034
2024	356,780	805,826	350,409	704,600	6,371	101,226
2025	359,197	811,285	352,783	695,955	6,414	115,330
2026	361,614	816,744	355,157	687,400	6,457	129,344

PERFORMANCE REPORTING

The District must report progress toward water use efficiency goals annually. The annual report must include:

- Total source production;
- Distribution system leakage in percentage and volume; and
- Goal description, schedule, and quantitative progress toward meeting goals.

The latest annual report is included in Appendix H.

WATER LOSS CONTROL ACTION PLAN

The District currently exceeds 10 percent distribution system leakage and must implement a Water Loss Control Action Plan (WLCPAP). The following elements are included in the Plan:

- Water loss control methods implemented to strive for the DSL requirement;
- IWA Water Audit completed to identify likely areas of leakage;
- Schedule for reducing leakage and meeting the DSL requirement; and

- Discussion of how methods will be financed.

WATER LOSS CONTROL METHODS

Data Accuracy and Collection Methods Assessment

The District is constantly working to improve the accuracy of its water production and consumption data. All connections within the District are metered; the District plans to replace all older meters with radio-read meters on a continuous basis to reduce errors by meter readers and enhance data reporting. The District has replaced approximately 30 percent of meters throughout the system as of 2017 and plans to replace 180 meters per year moving forward. All meters should be replaced by the end of 2021.

The District is also currently developing a plan for increased communication, reporting, and transferring of information between Utility Billing and Operations staff. In the past, Operations staff would only sporadically receive reports on unusual meter reads, such as accounts that read zero for multiple billing periods or accounts that read dramatically more than usual. With a more consistent reporting schedule, Operations staff will be able to more promptly address broken or inaccurate meters.

IWA WATER AUDIT

As part of the WLCAP, the District has completed the IWA Water Audit, which is included in Appendix H. The District obtained a score of 68 out of 100. A variety of actions are recommended through the audit for refining data and reducing losses.

SCHEDULE

As discussed previously, the District's 3-year rolling average of DSL is 12 percent. The District will work over the next 3 years to reduce annual DSL to 10 percent or less to keep the rolling average under 10 percent.

FINANCING

The District currently spends approximately \$1,500 annually for leak detection efforts. A budget for controlling leakage has been included in the financial analysis in Chapter 9.

CHAPTER 5

SOURCE WATER PROTECTION

OBJECTIVE

This chapter contains information on the District's Watershed Control Plan and Wellhead Protection Plan. The Environmental Protection Agency (EPA) and DOH require public water utilities to develop these plans in order to protect the water supply and the health of water system customers.

WELLHEAD PROTECTION PROGRAM

Water from underground aquifers, commonly referred to as groundwater, forms the primary source of drinking water for approximately 65 percent of Washington State residents. To protect groundwater supplies, the Environmental Protection Agency (EPA) and Washington Department of Health (DOH) require public water utilities to develop a wellhead protection program as a component of their water system plans. The purpose of a wellhead protection program is to develop a program to prevent groundwater contamination. The minimum requirements for a wellhead protection plan are specified in WAC 246-290-135(3).

A successful wellhead protection program consists of a number of elements that must be developed before the plan can be fully implemented. These elements are described below and form the basis of the District's Wellhead Protection Program.

- A *Susceptibility Assessment* that determines the susceptibility of each source of contamination.
- A *Delineated Wellhead Protection Area (WPA)* based on all reasonable available hydrogeological information, inclusive of the Susceptibility Assessment.
- An *Inventory* of potential sources of contamination within each wellhead protection area.
- A *Spill Response Plan* for each wellhead protection area containing documentation for coordination with local first responders.
- A *Contingency Plan* for providing alternate sources of drinking water in the event that contamination does occur and management recommendations to reduce the likelihood those potential contamination sources will pollute the drinking water supply.

SUSCEPTIBILITY ASSESSMENTS

Separate susceptibility assessments have been completed for the District's active wells. Assessments for Wells 1 and 2 were submitted to the Department of Health in 1994, and assessments for the Morgan Hill Well and Vashon Meadow Well were developed in 2016. Susceptibility assessment results for each water source are shown in Table 5-1. Susceptibility assessments are an important initial step in selecting appropriate delineation methods to define the wellhead protection area boundaries. Drinking water supplies vary in their susceptibility to contaminants discharged at the surface. Wells with increased susceptibility generally are shallow or were poorly constructed. In addition, wells located in an unconfined aquifer with no confining layer above the aquifer have a much higher susceptibility than those drawing water from confined aquifers deep below the ground surface.

TABLE 5-1
Susceptibility and Vulnerability Rating

Name of Source	Source Number	Susceptibility Rating	Vulnerability Risk ⁽¹⁾
Well 1	S01	High	Moderate
Well 2	S02	High	Moderate
Well 3/Morgan Hill Well	S03	Low	N/A
Well 4	S04	High	Moderate
Vashon Meadow Well	S05	Low	N/A
Beall Well	S07	Low	N/A

(1) Due to a low susceptibility rating, a vulnerability risk code is not applicable (N/A) and area waivers are not necessary.

WELLHEAD PROTECTION AREA DELINEATIONS

In developing a wellhead protection program, the first step is to establish the land areas around each well from which groundwater may flow to the well. These areas are likely to contribute pollutants to the groundwater and are referred to as "zones of contribution" (ZOC). The time-of-travel for a given zone is determined by estimating the distance in feet of a hypothetical particle of water traveling through the aquifer to a pumping well over a selected period of time. Zones of contribution require proper land use management to minimize the possibility of contaminants entering the groundwater system. The most commonly accepted tools for delineating wellhead protection zones include the calculated fixed radius method, analytical models, and numerical models.

The Calculated Fixed Radius Method and the Analytical Computer Model are used to analyze the wellhead protection area zones of contribution. As required by WAC 246-290-135, wellhead protection areas are estimated for 6-month, 1-year, 5-year, and

10-year periods. The delineation of the District's zones of contribution is shown on Figure 5-1.

POTENTIAL CONTAMINANT SOURCES

Within a wellhead protection zone, there are many diverse activities that may contaminate an aquifer and potentially prevent its use as a viable drinking water source (Table 5-2). It is important that these activities are properly inventoried and, if necessary, regulated to prevent degradation of groundwater quality. Relevant activities and sources at a minimum include land use practices, industrial and commercial operations, underground storage tanks, hazardous materials storage and use, septic tanks, and dry wells. These activities are potential sources for groundwater contamination. A discussion of these practices and their potential effects on groundwater, and the regulatory requirements that may apply are included in the sections that follow. However, the first step in identifying potential contaminant sources is to develop an inventory of businesses and industries that handle hazardous products.

LANDFILLS

A landfill is a disposal facility in which solid waste is permanently placed. Minimum functional standards for solid waste hauling are regulated by the Washington State Department of Ecology under WAC 173-304. These regulations set siting and closure criteria, performance standards, and operating requirements for landfills. Abandoned and improperly maintained landfills and dumpsites are often a major source of groundwater contamination. Leachate from landfills poses a threat to groundwater quality should it migrate to the water table. The Department of Ecology is responsible for mitigating dumpsite cleanup when potentially hazardous leachates are present.

There are no active or closed landfills within the zones of contribution of the District's wells.

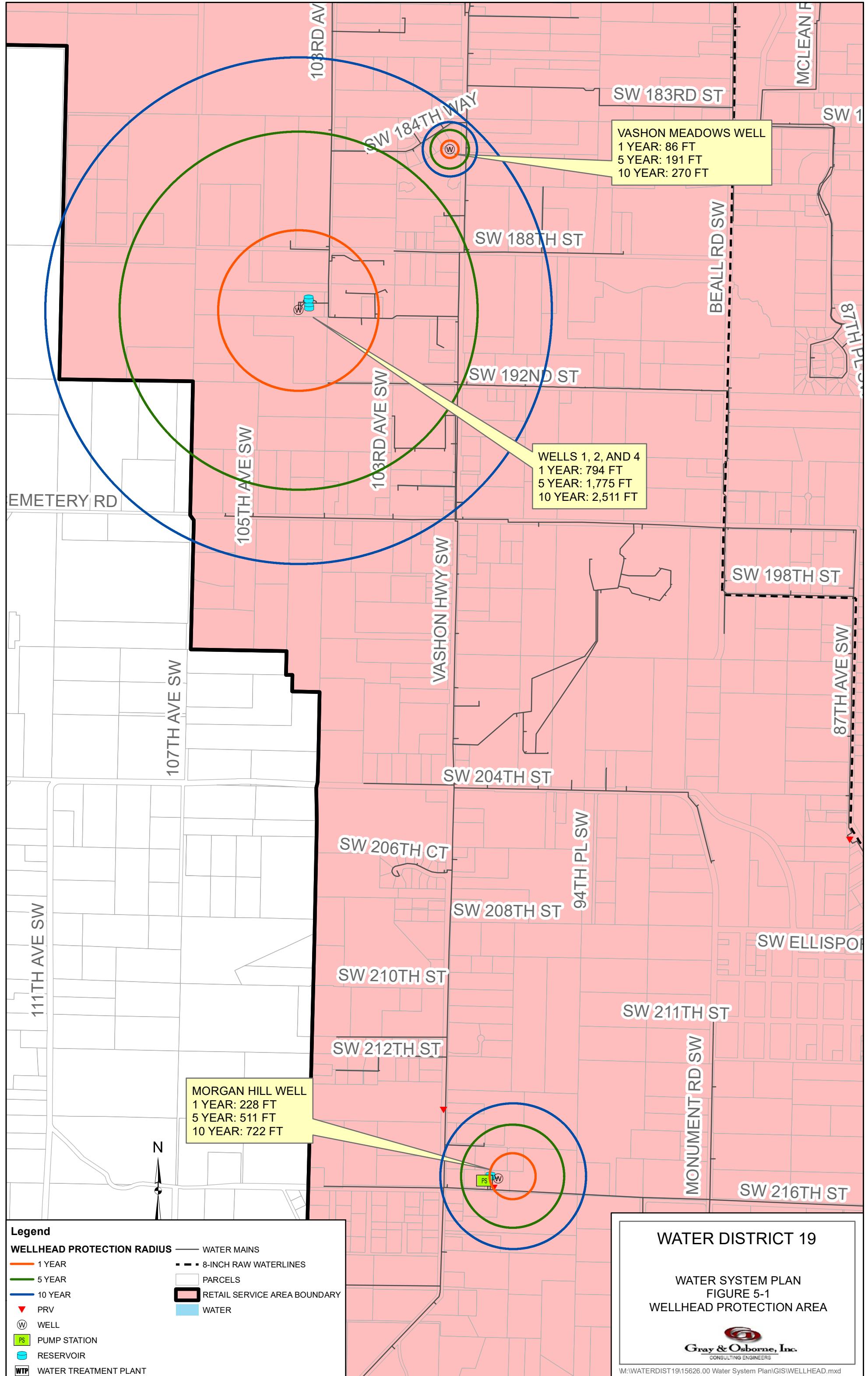
INDUSTRIAL AND COMMERCIAL ACTIVITY

Industrial and commercial activities pose a potential threat to groundwater quality due to the use of hazardous materials. Examples of these activities include gasoline service stations and auto repair shops (petroleum fuels, heavy metals), dry cleaners (dry cleaning solvents), printers and publishers (solvents, inks, and dyes), and metal plating shops (cyanides and heavy metals). Industrial and commercial activities may be regulated by the State, but only for specific functions. Municipalities also have the option of prohibiting or restricting industrial or commercial development within WPAs through the adoption of a local ordinance.

TABLE 5-2
Inventory of Potential Contaminant Sources

Commercial/Industrial Activity	Contaminants
Automobile/Truck Service	Waste oils, solvents, acids, paints, soaps
Dry Cleaners	Solvents (perchloroethylene, petroleum solvents, Freon) Spotting chemicals (trichloroethane, methylchloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate)
Cemeteries	Fertilizers, pesticides
Country Clubs/Golf Courses	Fertilizers, herbicides, pesticides, swimming pool chemicals, automotive wastes
Electric/Electronic Equipment Manufacturers	Nitric, hydrochloric and sulfuric acid, heavy metal sludges, ammonium persulfate, cutting oil and degreasing solvent, corrosive soldering flux, waste plating solution, cyanide, methylene chloride, perchloroethylene, trichloroethane, acetone methanol
Furniture/Wood Manufacturing	Paints, solvents, degreasing and solvent recovery sludge
Metal Plating Shops	Sodium and hydrogen cyanide, metallic salts, alkaline solutions, acids, solvents, heavy metal-contaminated wastewater/sludge
Lawns and Gardens	Fertilizers, herbicides, pesticides
Painters, Publishers	Solvents, inks, dyes, oils, miscellaneous organics, photographic chemicals
Sand and Gravel Mining	Diesel fuel, motor oil, hydraulic fluids
Scrap, Salvage and Junkyards	Used oil, gasoline, antifreeze, PCB-contaminated oil, lead acid batteries

Various commercial activities lie within the wellhead contribution area including a landscaping/gardening center, grocery store, gas station, hardware store, lumber manufacturer, medical supplies manufacturer as well as cafes and restaurants.



HAZARDOUS MATERIAL TRANSPORT, USE, AND STORAGE

Hazardous material storage is a specific function of industrial and commercial businesses. At the Federal level, hazardous material storage, use, and discharge is regulated through the Resource Conservation and Recovery Act (RCRA), Code of Federal Regulations (CFR) Title 40, Parts 240 to 280. Areas where hazardous materials are handled subject to RCRA regulation are known as RCRA sites. RCRA sites are not necessarily contaminated, but since significant amounts of hazardous materials are handled there is the potential for contamination if a spill, leak, or discharge should occur. At the State level, these activities are regulated by the Ecology's Dangerous Waste Regulations (WAC 173-303). The State maintains a database of dangerous waste generators that can be searched by county. However, generators of small quantities of dangerous waste (< 220 lbs./month) are not included in Ecology's database. No RCRA generators are located within the wellhead contamination zone.

The Northwestern Regional Office Unit Supervisor for Ecology's Hazardous Waste and Toxins Reduction Program is Raman Iyer (425) 649-7053.

The King County Hazardous Waste Management Program has a Business Waste Line available at 206-263-8899 during business hours to report complaints or violations and to reach a Hazardous Waste contact or investigator. However, waste spills or leaks can also be reported directly to 911.

UNDERGROUND STORAGE TANKS

Underground storage tanks (USTs) and leaking underground storage tanks (LUSTs) are a significant threat to groundwater quality. Most petroleum products stored in USTs are less dense than water and when released into the vadose (unsaturated) zone can migrate to the water surface of an unconfined aquifer or in groundwater. Petroleum products are mobile in aquifers with increasing mobility when organic matter in soils is low. The greatest amount of petroleum contaminant movement is in the lightest hydrocarbons (e.g., gasoline) with the greatest solubility in water. The most common causes of leaks are structural failure, corrosion, improper fittings, and improper installation.

Ecology regulates USTs under WAC 173-360. The regulation requires that owners and operators of nonexempt underground storage tanks comply with the following:

- Notification, reporting, and record keeping.
- Performance standards and operating closure requirements.
- Registration and licensing.
- Financial responsibility.

The WAC allows a number of exemptions including tanks whose capacity is 110 gallons or less, farm and residential tanks with less than 1,100 gallons, heating oil tanks less than 1,100 gallons per premises, and septic tanks.

Owners and operators of all existing nonexempt USTs must have a permit from Ecology. A valid permit is a requirement for delivery of regulated substances and must be updated annually. As a condition of the permit, the owner must have completed the following requirements:

- An assessment of the tank condition by a licensed tank service provider approved by Ecology.
- Replacement of leaking tanks and site cleanup.
- Installation of leak detection devices.
- Proof of insurance to compensate a third party in the event of bodily injury or property damage stemming from a leaking tank. One million dollars insurance is required for petroleum marketing facilities.

In addition to the above requirements, all existing nonexempt USTs must provide cathodic and spill and overflow containment protection.

Installation and replacement of nonexempt USTs must meet the specifications and performance and design standards listed in the WAC. Ecology follows the federal UST guidelines, which at this time requires secondary containment, such as double-walled tanks or impermeable containment liners. The standards are performance based centered on the ability to detect a leak. Double walled tanks are generally installed where interstitial leakage detection systems are not required.

Nonexempt UST inspections are performed by Ecology primarily through the permitting process. Though routine annual inspections are not performed, Ecology inspectors do prioritize sites considered potentially hazardous. Technical assistance visits are also conducted at the request of the owner or operators.

When USTs are taken out of service, Ecology regulations refer to this as “closure.” Closed USTs must be emptied, cleaned, and either removed or filled with an inert substance such as sand. If the UST is left in place and filled with an inert substance this is referred to as “closed in place”.

Ecology maintains a database of all permitted nonexempt USTs in the State, as required by RCRA, Subtitle 1. The database provides the site name and address, tank identification number, date of installation, size, tank status, and the substance stored on the site. An additional database maintained by Ecology contains information about known LUSTs and corrected LUSTs. Both databases are updated twice a year.

Most of the potential contaminant sites located within the District's watershed protection area are USTs associated with commercial or industrial activity. The potential sources of contamination are listed in Table 5-3 of this report and keyed to Figure 5-2 located at the back of the document.

SEPTIC SYSTEMS

The majority of properties on Vashon Island are served by septic systems. King County is responsible for regulating and permitting residential and small commercial on-site sewage disposal systems within the County, excluding federal facilities. Contaminants associated with septic tank effluent include pathogenic organisms, toxic substances, and various nitrogen compounds including ammonia and nitrate that are highly soluble in water. The District will send a letter to current septic system owners within the source protection zone to notify them of the possible influence of their septic systems on the aquifer, and will also continue to monitor nitrates at the wellfields.

Most septic drain fields discharge effluent to the unsaturated zone. However, the potential exists for discharge from drain fields to percolate to the saturated zone and contaminate groundwater supplies.

A properly designed septic system can provide reasonable protection from groundwater contamination by pathogenic organisms. Nitrate and ammonia discharging from septic systems are problematic and can lead to nitrate buildup in the groundwater. An improperly designed septic tank drain field in excessively porous soil can allow pathogens to reach groundwater unimpeded. Evidence of this type of septic system failure is not readily visible since drainage from these systems does not cause ponding or odor problems and are extremely difficult to trace. There are two practical ways to protect against contamination from septic system failures.

1. Ensure all new septic systems installed in areas of excessively draining soils in the wellhead protection areas are carefully designed and properly installed.
2. Ensure all supply wells draw water from beneath a low permeability geologic stratum.

The greatest threat from septic systems is from improper use. Septic systems are not designed to remove most chemicals from water. Solvents, fuels, waste oil, photo chemicals, and a whole host of other wastes pass through septic systems without any effective treatment and, ultimately, discharge to groundwater. Many solvents also pass relatively easily through low permeability geologic strata. Therefore, the most effective method to improve protection from septic systems in a wellhead protection area is to take action to reduce the amount of inappropriate materials being discharged into septic systems. Public education, assistance with appropriate toxic waste disposal, and

enforcement authority over improper disposal are important methods to prevent hazardous contamination from septic systems. If citizens are made aware of what should NOT be put in their septic systems and why, and if assistance is available for finding an alternative for toxic wastes, the likelihood exists that they will dispose of toxic wastes more appropriately. The simpler it is to dispose of toxic waste in an environmental manner, the more likely it is that citizens will conform. General information on proper storage and disposal of hazardous wastes and a convenient location for hazardous waste drop-off would greatly reduce the tendency of residents disposing of toxic wastes in their septic systems.

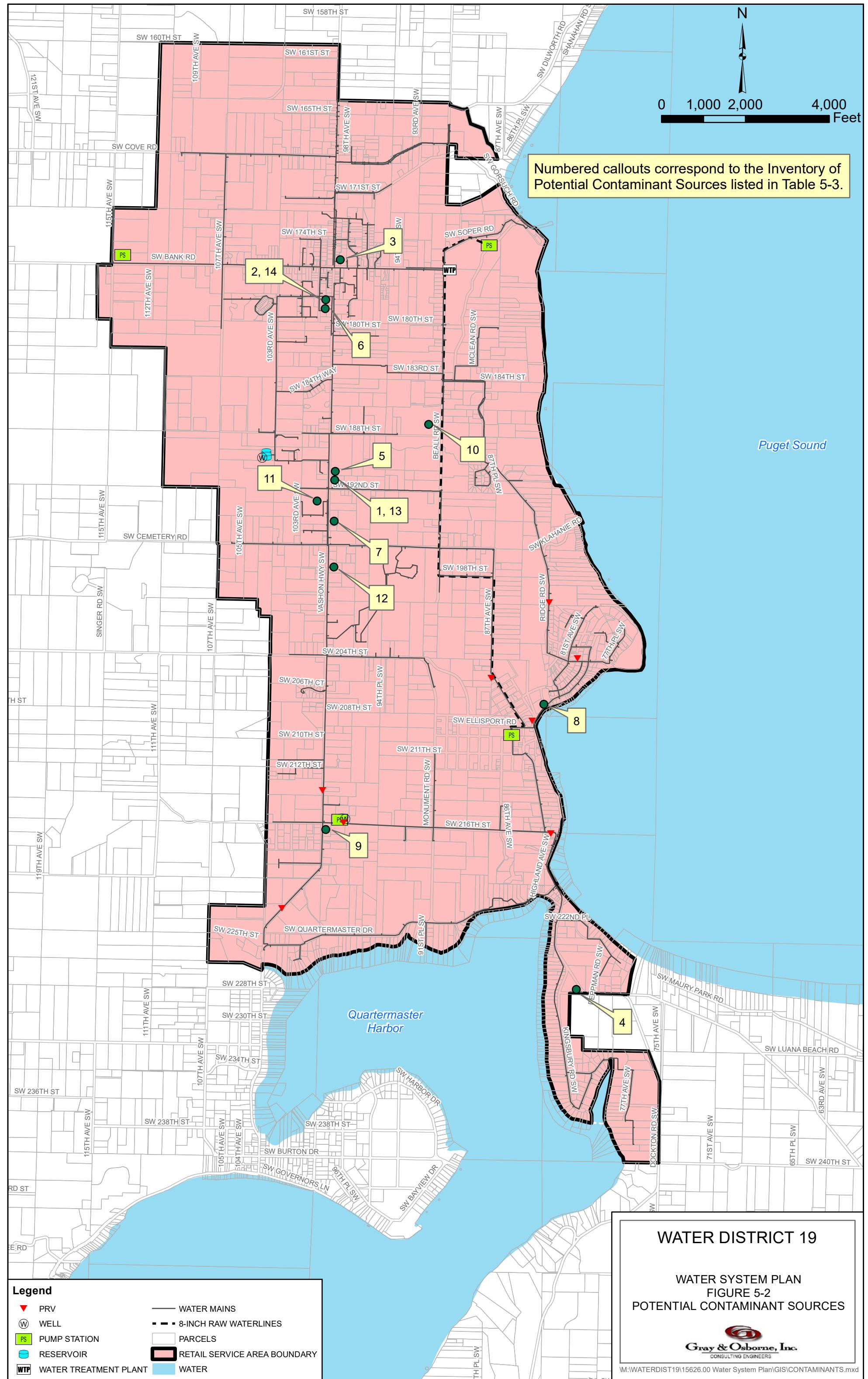
ACCIDENTAL SPILLS AND LEAKS

Accidental spills or releases of contaminants can potentially impact groundwater supplies. Potential sources of spills and leaks include USTs, accidents, and poor disposal practices. Transportation routes are of concern due to the potential for hazardous materials spills from cargo vehicles. Also, industrial and commercial operations in the WPA are potential locations for accidental spills and leaks.

It is important that spills and leaks receive a quick and thorough response. A quick response can make the difference between a few cubic yards of contaminated material needing disposal and a massive groundwater cleanup effort costing millions of dollars. In order to have a quick response, the responsible party and any witnesses need to take the responsibility and realize that they can greatly reduce liability if they respond quickly. A program to educate the public and hazardous materials handlers would help to increase the likelihood of a quick response in the event of a hazardous materials spill in the WPA.

Generally, any report of a spill or leak in the WPA should be directed to the county emergency response number, 911. Staff at the 911 service will contact the appropriate response agencies. Vashon Highway, which passes through the District's 10-year wellhead protection area, is a location where accidental spills can occur. The Washington State Patrol is the first responder for hazardous material spills on Vashon Island. The State Patrol then notifies the DOE, who in turn authorizes an independent contractor to clean up the spill. The following are additional possible responders to hazardous waste spills and leaks in the District's WPA:

- Vashon Island Fire and Rescue
- King County Sheriff
- King County Public Works Road Division
- King County Health Department
- Washington State Department of Transportation



Legend

- The legend contains seven entries:

 - PRV (red triangle)
 - WELL (blue circle)
 - PUMP STATION (green square)
 - RESERVOIR (cyan circle)
 - WATER TREATMENT PLANT (purple square)
 - WATER MAINS (black line)
 - 8-INCH RAW WATERLINES (black dashed line)
 - PARCELS (white box)
 - RETAIL SERVICE AREA BOUNDARY (pink box)
 - WATER (light blue area)

WATER DISTRICT 19

WATER SYSTEM PLAN FIGURE 5-2 POTENTIAL CONTAMINANT SOURCES



IMPROPERLY SEALED OR SECURED WELLS

Improperly sealed or secured wells can act as direct conduits for contaminants to reach groundwater. It is recommended that any abandoned wells be securely capped to prevent unauthorized access. If wells remain out-of-service for an extended period of time, it is recommended that they be decommissioned and permanently abandoned to prevent aquifer cross-contamination.

There are two wells located in the area surrounding the existing District wells which are no longer used. While both wells have been filled with bentonite to within 18 feet of ground surface, the District will recognize these wells as possible conduits to the groundwater.

CONFIRMED AND SUSPECTED CONTAMINATION SITES

Under the Model Toxics Control Act Cleanup Regulation, WAC 173-340, Ecology is responsible for ensuring that all hazardous waste sites are properly remediated. Hazardous waste sites include confirmed and suspected sites of contamination as well as LUSTs. A separate inventory for each, which includes the status of cleanup efforts, is maintained by Ecology. Ecology conducts an initial site investigation within 90 days of learning of a potentially contaminated site. If this investigation shows that remedial action is required, the site will appear on the Confirmed and Suspected Contaminated Sites Report. The sites are also given a Washington Ranking Code BIN number between 1 and 5, with 1 indicating the greatest assessed risk to human health and the environment and 5 indicating the least. The contaminant type and the affected media, such as groundwater, are also noted. Once the remedial action has been completed, Ecology's Toxics Cleanup Program determines if the site can be removed from the list.

INVENTORY DATA SOURCES

The above inventory of potential contaminant sources was compiled using various data sources. Agencies such as Ecology and EPA maintain contaminant databases that list businesses that handle and store potential contaminants. The following databases were used to create the inventory for the water District 19's wellhead protection area:

- Underground Storage Tank Report, August 2016. This version of the Underground Storage Tanks Report was obtained from Ecology's Toxics Cleanup Program. This list was used to locate the facilities that contain underground storage tanks and verifies facilities located by field surveys in the wellhead protection areas.
- Leaking Underground Storage Tank Report, August 2016. This version of the Leaking Underground Storage Tank (LUST) Report was also obtained from the Ecology Toxics Cleanup Program. The LUST report lists the site

name, address, age, volume, and status of sites that contain leaking underground storage tanks.

- Dangerous Waste and Materials Generators. The EPA's RCRA program has been taken over by Ecology within the State of Washington and is regulated under the Dangerous Waste Regulations (173-303 WAC).
- Title III Facilities. Title III facilities are identified as those facilities that generate, treat, store, or dispose of hazardous materials in sufficient quantity to pose a threat to the community. There are several different types of Title III facilities depending upon the quantity and the nature of the material handled. All companies that are designated as Title III facilities must report to the County on an annual basis. This reporting was a result of the 1986 Superfund Amendments and Reauthorization Act. Title III of the act was subsequently renamed to the Emergency Planning and Community Right to Know Act (EPCRA).
- Confirmed and Suspected Contaminated Sites Report, August 2016. Ecology maintains the Confirmed and Suspected Contamination Sites Report. The list is updated as new information becomes available. Each site is given a site status code indicating the status of the cleanup process.

INVENTORY OF POTENTIAL CONTAMINANT SOURCES

An essential element of wellhead protection is an inventory of all potential sources of groundwater contamination in and around the delineated wellhead protection areas. The purpose of the inventory is to identify past, present, and proposed activities that may pose a threat to a water supply source.

Within a source protection zone, there are many diverse activities that may contaminate an aquifer, thereby impacting the water supply. A discussion of these activities, their potential effects on groundwater, and the regulatory requirements that may apply are included in the following sections.

The zone of contribution for the District's wells includes mainly rural properties and undeveloped forested land, some of which is publicly owned. Access to the well site is limited, however, access within the zone of contribution is open; Vashon Highway SW and a number of smaller roads are in the vicinity of the wells.

Locations of potential contaminant sources within the District's service area are shown in Table 5-3. The names and types of the sources are listed in each table. Data sources are discussed on page 5-9. The District will attempt to notify businesses that are potential contaminant sources for the District's water. There are potential sources of contamination that fall under the following categories: Underground Storage Tank

(UST), Leaking Underground Storage Tank (LUST), Dangerous Waste and Materials Generators (RCRA), or Confirmed or Suspected Contaminated Site (CSCS).

Other purposes for maintaining an inventory of potential contaminant sources are to assist in the development of plan management strategies, to establish a mailing list for notifying potential contaminant sources within the wellhead protection areas, and to notify agencies regarding inventory findings. An accurate inventory and description of hazardous material handlers is required in WAC 246-290-135.

In January 2016, K2 installed a monitoring well to evaluate the extent of trichloroethene (TCE) in the groundwater at the site of its former manufacturing plant, located at 19215 Vashon Highway SW. The Department of Ecology expressed concern with a known TCE plume at the site and has requested that the vertical extent of the plume be determined to evaluate any potential impact on the District's sources. K2 plans to install a deep well for monitoring and sampling.

Table 5-3 lists all documented potential contaminant sources within the WPAs of the District's sources. All sources are numbered and keyed to the delineation map, Figure 5-2. Table 5-2 presents typical commercial and industrial activities and the potentially hazardous chemicals that may be associated with them.

TABLE 5-3**Inventory of Potential Contaminant Sources**

No.	Site Name	Site ID	Street Address	Type	Contaminants	Size
1	Vashon Athletic Club	2998	19120 Vashon Highway SW	LUST - Awaiting Cleanup	Benzene, Hon-Halogenated Solvents, Gasoline, Other	Unknown
				LUST - Cleanup Started		
2	Vashon Auto Center Island Mart	8946	17817 99 th Avenue SW	LUST - Cleanup Started	Benzene, Hon-Halogenated Solvents, Diesel, Gasoline, Other	Unknown
3	Vashon E Shopping Center Chevron 94252	5865	9740 SW Bank Road at Vashon Highway	LUST - Cleanup Started	Benzene, Gasoline	Unknown
				LUST - Monitoring		
				LUST - Cleanup Started		
4	Engels Repair and Towing	100811	22725 Dockton Road SW	UST - 3 Removed Tanks	Unleaded gasoline, Leaded gasoline	111 to 1,100 gal
				UST - 4 Operational Tanks	Unleaded Gasoline, Diesel	5,000 to 9,999 gal
5	Mom's Grocery and Deli	101970	19124 Vashon Highway SW	UST - 4 Operational Tanks	Unleaded gasoline, Diesel	10,000 to 19,999 gal and 5,000 to 9,999 gal
				UST - 1 Closed in Place Tank	Unleaded gasoline	5,000 to 9,999 gal
6	Vashon Mart	11720	17803 Vashon Highway SW	UST - 4 Removed Tanks	Diesel, Kerosene, Used Oil, Unknown	1,101 to 2,000 Gal
				UST - 4 Operational Tanks	Unleaded gasoline, diesel	2,001 to 4,999 gal, 10,000 to 19,999 gal
7	Williams Heating, Inc.	11602	19410 Vashon Highway SW	UST - 1 Removed Tank	Unleaded gasoline	111 to 1,100 gal
				UST - 4 Operational Tanks	Unleaded Gasoline, Diesel	5,000 to 9,999 gal

TABLE 5-3 – (continued)**Inventory of Potential Contaminant Sources**

No.	Site Name	Site ID	Street Address	Type	Contaminants	Size
8	Ellisport Creek	2204	Chautauqua Beach Drive SW	CSCS	Petroleum Products, PAHs	N/A
9	FUDS Vashon Nike 61	4667	2500 99 th Avenue SW	CSCS	Metals	N/A
10	Harrington Beall Greenhouses	647	18527 Beall Road SW	CSCS	Asbestos, Metals, Pesticides, Petroleum Products, PAHs	N/A
11	K2 Corp	12390	19215 Vashon Highway SW	CSCS	Petroleum, TCEs	N/A
12	Vashon Allied Arts	12841	19704 Vashon Highway SW	CSCS	Benzene, Lead, NHOs, Petroleum	N/A
13	Vashon Athletic Club	2998	19120 Vashon Highway SW	CSCS	Benzene, NHOs, Petroleum	N/A
14	Vashon Auto Center Island Mart	8946	17817 99 th Avenue SW	CSCS	Benzene, NHSs, NHOs, Petroleum	N/A

Notes: UST = Underground Storage Tank, LUST = Leaking Underground Storage Tank

RCRA = Dangerous Waste and Materials Generators which are regulated by Ecology under RCRA.

CSCS = Confirmed or Suspected Contaminated Sites

WELLHEAD PROTECTION AREA MANAGEMENT STRATEGIES

Wellhead protection areas have been defined and potential sources of contamination were identified in Table 5-3. In order for this to result in actual protection for the District's wells, a management plan must be put into place. The goals of a management plan should include the following elements:

- Reduce the likelihood that potential groundwater contaminants will be disposed, spilled, leaked or otherwise discharged in the wellhead protection area such that they could contaminate groundwater.
- Increase the likelihood that any potential groundwater contaminants, which get disposed, spilled, leaked, or otherwise discharged in the wellhead protection area, be cleaned up before they can reach the public water supply wells.
- Detect any groundwater contamination, which may occur before public health is affected.
- Develop a plan of action based on the event that a major source of the City's water supply should become contaminated.

MINIMUM REQUIREMENTS

Minimum management requirements for wellhead protection plans are specified in WAC 246-290-135 (3)(c)(iv)-(vii). These requirements are listed as follows:

- (iv) Notification to owners and operators of potential sources of contamination of the wellhead protection areas and the findings of the wellhead protection plan.
- (v) Notification to regulatory agencies and local governments of the wellhead protection areas and the findings of the wellhead protection plan.
- (vi) A contingency plan to assure that water system customers will have an adequate supply of potable water in the event of temporary or permanent loss of the principal source of supply.
- (vii) Documentation of coordination with local emergency incident responders including notification of wellhead protection area boundaries, results of susceptibility assessment, inventory findings and contingency plan.

RECOMMENDED ADDITIONAL ACTIONS

In addition to the minimum requirements in the regulation, there are other measures the District could consider to enhance the effectiveness of its wellhead protection program:

- Public education regarding appropriate handling and disposal of potential groundwater contaminants.
- Public assistance for appropriate disposal of potential groundwater contaminants.
- Groundwater monitoring to detect groundwater contamination before it reaches the District's wells.
- Formation of a Local Wellhead Protection Committee.
- Ordinances to empower the District to take action as necessary to protect their water supply from contamination.

NOTIFICATIONS

Minimum requirements for notification of wellhead protection areas are issued to owners and operators of potential sources of contamination, to regulatory agencies and local governments, and to local emergency incident responders.

Notices to Owners of Potential Sources of Contamination

Several potential sources of contamination have been discussed above, including industrial and commercial activities, hazardous materials storage, underground storage tanks, septic tanks, accidental spills, and confirmed and suspected contamination sites. All developed properties within the wellhead protection area that use septic tanks must also be considered potential contamination sites. Some septic tank owners will have other potential sources of contamination such as industrial and commercial activities, hazardous materials storage, and underground storage tanks. Any one of these property owners could also have an accidental spill or could discover that they have a contaminated site. A few operations that merit special attention in the notification process include auto shops, registered underground storage tank, and hazardous materials handlers.

It is recommended that a standard letter be sent to all business owners identified on the list of potential contaminant sources. The standard letter would state that their property is in the wellhead protection area, include a map of the wellhead protection area, and state that the activities of their business may be a potential source for groundwater contamination. The letter would include brochures available from the County advising how to safely dispose of chemicals and how to manage wastes to protect groundwater. It

is also recommended that residents within the WPAs be notified through public service messages of their potential impact upon the District's drinking water supply. Landowners with on-site septic systems should be notified that, when operated properly, septic systems would not be a significant threat to the District's wells. However, the dumping of chemicals into septic systems, on to the ground, or into storm drains in the wellhead protection area could contaminate the District's water supply and that enforcement action may be taken.

A sample letter is included in Appendix E.

Notification to Regulatory Agencies and Local Governments

WAC 246-290-135 requires that notification be provided to regulatory agencies and that an inventory of potential sources of contamination in the area be identified. The regulatory agencies and local government office that must receive the notification are listed as follows:

Washington State Department of Ecology
Water Resources Division
P.O. Box 47775
Olympia, WA 98504-7775
Phone: (360) 407-6000

Washington State Department of Health
Division of Drinking Water
Northwest Drinking Water Operations
20425 72nd Ave. South, Building 2, Suite 310
Kent, WA 98032
Phone: (253) 395-6750

Washington State Department of Community
Trade & Economic Development
Division of Growth Management
906 Columbia Street S.W.
P.O. Box 48300
Olympia, WA 98504-8300
Phone: (360) 753-2222

Environmental Health Services Division
King County Health Department
401 5th Ave., Ste. 1100
Seattle, WA 98104
Phone: (206) 263-9566

As part of the notification process, a copy of this Wellhead Protection Program should be sent to the agencies noted above.

Notification to Local Emergency Incident Responders

It is required by regulation that documentation of coordination with incident responders be provided. The following incident responders have been contacted and provided with information regarding the District's WPAs (Table 5-4).

TABLE 5-4
Emergency Incident Responder Contact Information

	Address	Emergency	Business
County 911 Program		911	(206)296-3910
County Sheriff	King County Superior Court 516 3 rd Avenue Seattle, WA 98104	911	(206)296-3311
Public Works Road Division			(206)477-8100
County Health Department	401 5 th Avenue, #1300 Seattle, WA 98104		(206)296-4600
Local Police Department		911	(206)477-6655
Fire Department	10020 SW Bank Road Vashon, WA 98070	911	(206)463-2405
Washington State Patrol	General Administration Building PO Box 42600 Olympia, WA 98504-2600	911	(360)753-0500
Emergency Response, Washington State Department of Transportation	Transportation Building PO Box 47358 Olympia WA 98504-7358	911	(360)705-7287
Spill Response Program - WA Dept. of Ecology	PO Box 47775 Olympia, WA 98504-7775	(360) 407-6300	(800)258-5990

SPILL/INCIDENT RESPONSE PROGRAM

Spill response planning is an important element of an emergency management plan and a wellhead protection program. Specific response procedures for wellhead protection areas must be determined prior to the occurrence of a contamination incident. The information obtained as a result of the susceptibility assessment and the wellhead protection area inventory can be used to determine what types of spill response measures are necessary for the protection of drinking water sources. In order to be accepted by local emergency responders, spill response procedures for wellhead protection areas must be realistic and be easy to implement.

In order for spill response procedures to be effectively executed, coordination, cooperation, and communication among the responding agencies, organizations, and individuals are imperative. Depending on the magnitude and type of the release, any of the following organizations may be involved in a spill response for a wellhead protection area in Washington State.

- Department of Ecology (Ecology): The Spill Response Team is responsible for determining the source and cause of the release, and responsible party. If the responsible party is unknown, Ecology will investigate to determine who is responsible and ensure that containment, clean up, and disposal proceedings begin. The number for Ecology's 24-Hour Spill Response Program is (360) 753-2353.
- Department of Health (DOH): The Department of Health is developing a set of standard operating procedures, in conjunction with organizations such as Ecology's Spill Operations Section and the Association of Fire Chiefs that first responders can use in wellhead protection areas, critical aquifer recharge areas, and other sensitive groundwater areas. DOH also provides assistance through laboratory support and services if necessary to the cleanup effort.
- Department of Transportation (DOT): The Washington State DOT can provide spill response assistance through traffic control, equipment, and personnel for non-hazardous cleanup activities on state and interstate highways.
- Washington State Patrol: The State Patrol is responsible for managing spills on interstates and state highways.
- King County Fire District No. 13: Initial response to a hazardous spill will most likely be from the Island Fire Department. The Fire Department will be notified of the wellhead protection area boundaries. The District will be working with the Fire Department to put an effective plan in place.

WATERSHED CONTROL PROGRAM

In Washington State, water supply systems using a surface water source must develop and implement a watershed control program in order to protect the water supply and the health of water system customers.

The objective of this section is to document the District's program of watershed control to protect and improve source water quality. This program identifies pollutants within a watershed that may affect source waters. Protection of these sources can be accomplished through monitoring and limiting and controlling all adverse effects to the best extent possible.

The Vashon-Maury Island Watershed Plan was completed in 2005. The District participated in the development of the Plan and supports its recommendations. Regulatory requirements for watershed protection are presented below. The District's most recent Watershed Protection Plan, was completed during development of the previous Water System Plan in 2008 and is presented in Appendix I.

REGULATORY REQUIREMENTS

Specific criteria against which the adequacy of source water protection is evaluated is provided in the following regulations:

- WAC 246-290-135 (5), Source Protection
- WAC 246-290-668, Watershed Control

Source Protection

In accordance with WAC 246-290-135, subpart (5), the District's Water System Plan shall include a description of the watershed including location and size, hydrology, land ownership, and activities that may adversely affect source water quality. The WAC also requires a description of relevant written agreements, monitoring activities, and assessment of water quality.

Watershed Control

In concert with source protection, WAC 246-290-668 requires an evaluation of the District's Watershed Control Program at least every 6 years. The latest evaluation was completed for the District in 2008. The program shall describe the District's watershed and characterize the hydrology. All changes in the watershed over the previous 6 years and any changes that adversely affect source water quality must be described. The purveyor shall also have a monitoring program in place to assess the adequacy of the Watershed Control Program.

WATERSHED DESCRIPTIONS AND CHARACTERISTICS

LOCATION AND SIZE

The location and size of the District's watershed is shown in Figure 5-3. The Beall Creek drainage basin consists of approximately 42 acres, located in the SW 1/2 – SE 1/4 of S29 T23N and R03E in King County. The Ellis Creek drainage basin consists of approximately 474 acres, located in the NW 1/4 of S27 T23N and R3E in King County. Both drainage basins are located on the east side of Vashon Island and drain into Puget Sound.

The District owns the majority of the land in both watersheds, and continues to purchase parcels within the watersheds as they become available. The District controls the area through visual inspections and regular monitoring.

ROADS AND TRAILS

Within the Ellis Creek watershed, Cemetery Road, 204th Street, Monument Road, Ellisport Road, and Vashon Highway SW comprise the major roadways, though a number of other smaller roads also exist within the boundary. Large roads within the Beall Creek watershed include Beall Road, 180th Street, Soper Road, and McLean Road. Zoning within the watersheds is entirely rural.

HYDROLOGY AND GEOLOGY

The drainage basin soils are broadly classified as Alderwood and Everett complexes. These soils are generally well-draining. A large portion of each of the watersheds is composed of steep slopes and cliffs; erosion is a potential concern, particularly in the Beall Creek watershed. Base flow in the Creek is due to groundwater discharge. The District owns all of the land that includes the steep canyon along Beall Creek, and so the potential for development or land alteration within these hazardous areas is limited.

LAND USE AND OWNERSHIP

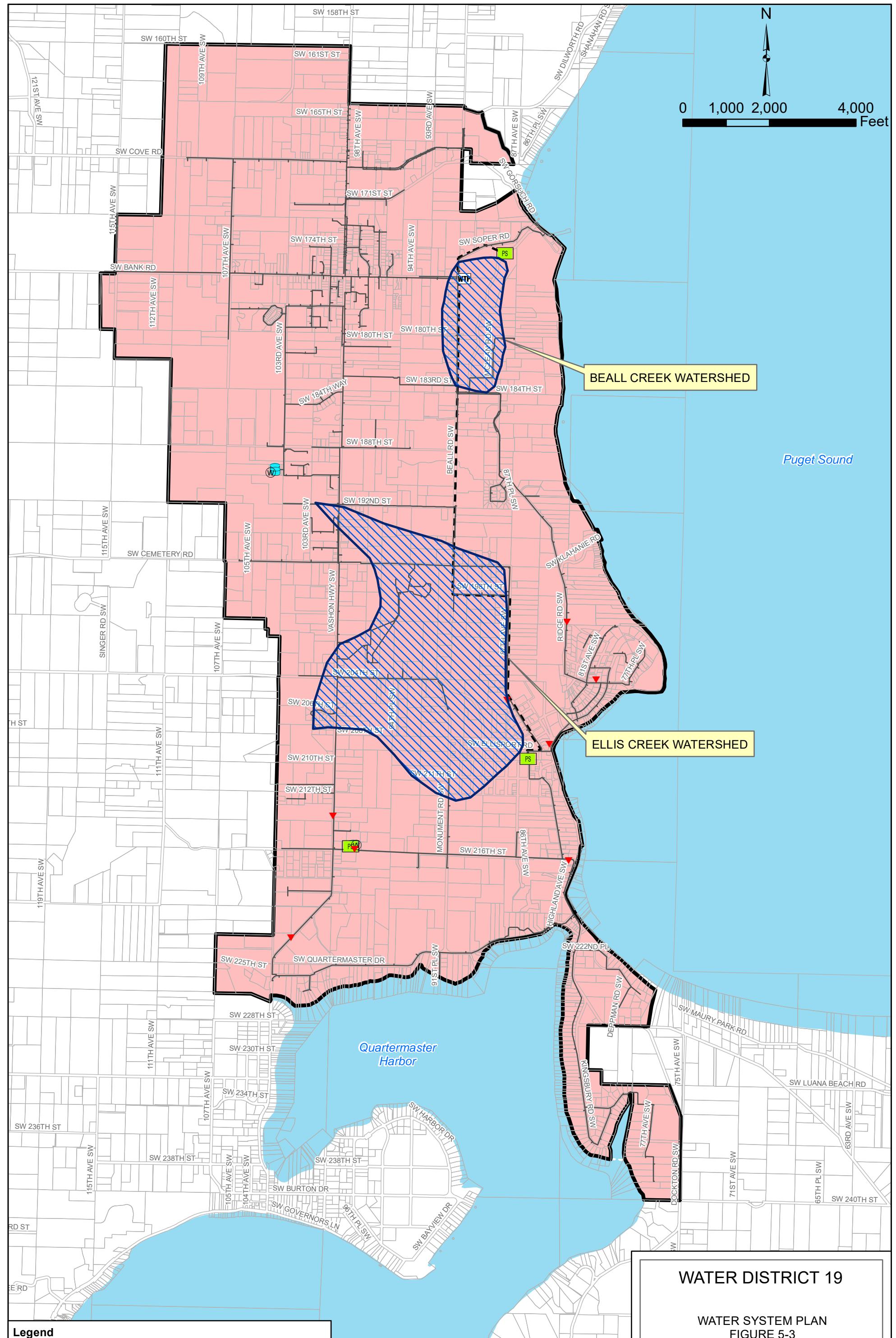
The drainage basins have mixed ownership, though much of each watershed is owned by the District.

Ownership within the watershed is described in the 2008 Watershed Report by Landau Associates, included in Appendix I. Land use within the drainage basin is limited to operations relating to the District's water system. Ownership was determined from King County's iMap application.

WATERSHED MONITORING

The activities of the private landowners within or adjacent to the watershed represent a potential threat to the source water quality. District staff regularly patrols the watershed and visually inspect the area to monitor potential hazards and changing conditions. All staff members that are responsible for monitoring activities in the watershed are knowledgeable about the watershed boundaries, access points, and the potential impacts that various activities can have on the District's watershed.

The current zoning of the watersheds controls the amount and extent of development in the area and limits the allowed number of livestock or the extent of agricultural activities.



WATER DISTRICT 19

WATER SYSTEM PLAN FIGURE 5-3 WATERSHED AREAS



CONSULTING ENGINEERS

CONDITIONS AND ACTIVITIES THAT ADVERSELY AFFECT SOURCE WATER QUALITY

The District's watershed is susceptible to natural and man-made disasters such as landslides or mudslides, and contamination from outside sources such as neighboring land uses and vandalism. Disasters and damage such as these present a potential risk to water quality and water quantity within the watershed.

Potential sedimentation sources within the watershed include land-use activities such as logging and road construction/maintenance. As the District owns its watershed area, these activities are not of concern. Naturally occurring landslides can potentially contribute to sedimentation along the creeks that feed the water supply sources.

A detailed analysis of the District's source water quality can be found in Chapter 6 of this document.

CURRENT WATERSHED CONTROL PLAN

Currently, the County and the District have policies and procedures in place to protect the watersheds. These policies include providing educational programs and materials to residents of the watersheds to promote responsible use of potential pollutants such as fertilizers and automotive chemicals, livestock and pet management, septic system maintenance, and stormwater runoff education. The District conducts regular monitoring of its sources in accordance with DOH requirements to ensure against contamination and to identify and address problems as soon as they arise. The Vashon-Maury Island Watershed Plan identified a number of other possible activities and procedures that could be implemented to help protect the Island's watersheds.

REGULATION OF AGRICULTURE

No documented agricultural use occurs within the Beall and Ellis Creek watersheds. However, it is possible that homeowners within the watersheds may have pets and livestock. King County Code 21A.30.010 through 21A.30.60 regulates livestock ownership to limit environmental impacts and to protect water quality. The Code sets maximum limits on the number of animals allowed and requires that livestock owners implement best practices to limit impacts.

The District should continue the current actions it takes to protect the watershed and look for additional means to increase its watershed protection, if possible. Further outreach and education of landowners within the watersheds can help protect the District's resources.

RECOMMENDED WATERSHED PROTECTION MEASURES

The following is a list of actions the District may consider for additional protection of its watershed.

INCREASE KNOWLEDGE OF WATERSHED ACTIVITIES

Over the years, ownership of land within and adjacent to watersheds can change. The District should actively track ownership changes and notify the land owner of the potential effects proposed land uses may have on the watershed. The District should also contact the County to be notified of all planning activities or building permits that occur within its watersheds' boundaries.

EDUCATION PROGRAM

The District could educate the public concerning the importance of the watershed. Signs should be posted at each entrance/access to the watershed. The sign should have emergency telephone numbers, a brief message concerning the watershed as the District's water supply, and a statement if a permit for entry is required. Business owners and residents within the watershed should be notified via mailings to raise public awareness about the vulnerability of drinking water to contamination. The District already issues annual consumer confidence reports – educational materials could be included with these reports. Emergency contact numbers could be provided as well as contaminant disposal information. A bill insert may be included that contains a map delineating the boundaries of the watershed.

The District could raise volunteers such as service or scouting clubs to assist with watershed monitoring. Public investment is a sure means to instill protection of the District's resources.

Signs denoting the District's watershed are posted at all vehicle access points to the watershed

EROSION PREVENTION

Any entities that perform road building or other development within or near the watershed area should utilize Best Management Practices when performing these activities. Steep slopes that may be particularly prone to erosion are classified as erosion hazard areas by King County and are subject to stricter development standards under King County Code 21A.24.220 and 21A.38.200. These include limited clearing schedules for erosion hazard areas as well as prohibitions on clearing and development on steep slopes located nearby sensitive water bodies.

CONTINGENCY PLAN

All Group A public water supply systems must develop a contingency plan in the event that a main source of water is lost due to contamination or by some other unforeseen event. Beall Creek and Ellis Creek are the District's largest sources of water supplying approximately 66 percent of the water used by the District.

If contamination were to occur to one of the District's largest sources of water, the District is not able to compensate by increasing the capacity of the other remaining sources. The District may receive an increase of water in the event of emergency through the intertie with Heights Water to make up for an offline source by mutual agreement.

Until an actual contamination event takes place it is not possible to anticipate where the contamination will come from or when it will occur. Due to the location of each source, it is unlikely that all sources could be contaminated at the same time. Therefore, in the event of contamination to a major source of water, it is recommended that one or several of the following actions be implemented:

- Isolate the contaminated source from the system and utilize the remaining water sources and storage to supply customers.
- Request an increase to the supply of water provided by a public intertie with a neighboring utility.
- As required, impose outdoor watering restrictions and usage curtailment.
- Supplement the storage tanks with water hauled from a nearby public water system and/or provide bottled water.
- In the event of long-term loss of use of a wellfield or spring, a site for additional source capacity should be investigated.

King County Emergency Management can provide assistance in emergency planning. The telephone number for King County Emergency Management is (206) 296-3830.

SUMMARY OF RECOMMENDATIONS

Following is a summary of recommendations from this WHP. The recommendations are categorized by required actions based on minimum requirements of WAC 246-290-135, and voluntary actions based on recommendations of the Wellhead Protection Program Guidance Document.

REQUIRED ACTIONS

- Provide notification to owners of potential sources of contamination within the Wellhead Protection Areas for each water source.
- Provide notification to regulatory agencies and local government.
- Provide notification to emergency responders.

RECOMMENDED ACTIONS

- Provide information to owners of potential sources of contamination as to how they can minimize the possibility of contaminating the District's water supply.
- Post informational signs at the borders of the wellhead protection area.
- Host informational public meetings utilizing King County resources regarding septic tanks, hazardous waste management, and groundwater protection.

CHAPTER 6

OPERATION & MAINTENANCE PROGRAM

OBJECTIVE

The objective of this chapter is to provide an evaluation of the District's operation and maintenance (O&M) program and its ability to ensure satisfactory management of the water system operations in accordance with WAC 246-290 –100, -300, -310, -320, -440, -480, and –490, and WAC 246-292-020, -050, and -090. The District's Operation and Maintenance Manual and specific component related documentation are maintained by the District for use by operations personnel. This information is considered sensitive information and is not intended for general distribution to the public.

The O&M Program should include the following elements:

- Water System Management and Personnel
- Operator Certification
- System Operation and Control
- Comprehensive Monitoring Plan
- Emergency Response Program
- Safety Procedures
- Cross-Connection Control Program
- Customer Complaint Response Program
- Recordkeeping and Reporting
- O&M Improvements

The following comments are presented as an assessment of the adequacy of each section of the District's Operation and Management Program.

WATER SYSTEM MANAGEMENT AND PERSONNEL

Water District 19 is authorized under RCW Title 57 to operate and maintain a public water utility system. The District operates under a Commissioner system wherein three Commissioners are elected by the citizens of the District. By resolutions, the Board of Commissioners makes and establishes policies that govern the operation of the District. The Board holds regular public meetings on the second Tuesday of each month. Water system staff includes: General Manager (John Martinak), Operations Lead (Armin Wahanik), and Supervisor, Customer & Administrative Services (Melody Snyder).

OPERATOR REQUIREMENTS

Washington State WAC 246-292 sets forth the certification requirements required to operate a Public Water System. Each water system is classified to establish minimum operator certification requirements. For Water District 19 the Water Treatment Plant Classification is Class 3. The Distribution System Classification is Class 2. This requires a minimum certification of Water Treatment Plant Operator (WTPO) 3, Water Distribution Manager (WDM) 2 and Cross-Connection Specialist (CCS) for the Certified Operator of Responsible Charge. The Certified Operator of Responsible Charge will be designated by the District. The other operators are required to be certified at a minimum of one level lower than the minimum level of the Certified Operator of Responsible Charge (Table 6-1).

TABLE 6-1

Operator Requirements

Water District 19 Operator Certification Requirements	Washington State Classification	Minimum Operator of Responsible Charge Certification Level	Minimum Operator Certification Level
Water Treatment Plant	Class 3	WTPO 3	WTPO 2
Distribution System	Class 2	WDM 2	WDM 1
Cross-Connection Control Program	n/a	CCS	

The primary responsibilities of key District personnel are summarized on the Organization Chart shown in Table 6-2. Engineering and legal counsel for the District is provided by outside consultants approved by the Board of Commissioners. These consultants' report to and coordinate with the General Manager and/or other staff as directed. Financial consultants are utilized as needed for bond counsel and accounting requirements.

TABLE 6-2
Water District 19 Organization Chart

Name	Title	Certification
Seth Zuckerman	Board of Commissioners President (term expires 2023)	N/A
Mike Weller	Board of Commissioners Secretary (term expires 2025)	N/A
Robin Pfohman	Board of Commissioners (term expires 2027)	N/A
John Martinak	General Manager	N/A
Armin Wahaniuk	Operator in Responsible Charge	WTPO 3
Keith Kassik	Systems Operator Lead	WTPO 2, WDM 2, CCCS
Jeff Roeser	Operations Technician	WTPO 2
Melody Snyder	Supervisor, Customer & Administrative Services	N/A
Kathleen Good	Office Assistant	N/A

ONGOING TRAINING

Washington State requires that all certified operators complete three or more Continuing Education Units (CEU) within each 3-year period. Programs sponsored by Washington Environmental Training Resources Center (WETRC), Evergreen Rural Water of Washington (ERWOW) and the American Waterworks Association (AWWA) Pacific Northwest Subsection are the major sources of CEUs for certified operators in Washington State. The District requires state certification of operations personnel and sponsors attendance of personnel at appropriate safety and technical seminars.

Besides providing CEUs, operator training is an important component in maintaining a safe and reliable water system. At a minimum, all personnel performing water system related duties should receive training in the following areas:

- Confined space
- Trenching and shoring (Competent Person)
- Traffic Flagging
- Asbestos cement pipe safety
- Cross Connection Control
- Right-to-Know/Hazard Communication
- CPR/First Aid

Water District 19 water system operators usually complete more than the required CEUs within a given period. All utility workers are certified Water Treatment Plant Operators

as well as Water Distribution Managers. In addition, field staff is trained in asbestos cement pipe safety, CPR and first aid, and traffic flagging. The District policy regarding Cross Connection Control (CCC) is to have a minimum of one individual trained and certified.

SYSTEM OPERATION AND CONTROL

A description of the normal operation of each facility is given in the following sections. The normal and alternate operating conditions of key system facilities are indicated below.

SOURCES OF SUPPLY

The District obtains water from three groundwater wells located on one wellfield, two separate surface water sources at Beall Creek and Ellis Creek, Beall Well and Morgan Hill Well. Water from the surface water sources and Beall Well is treated at the water treatment plant.

Currently, at the wellfield, the District operates Wells 1 and 4 on a regular basis, and Well 2 is used as a last on/first off source. These wells are pumped directly into the 0.625 MG reservoir.

The Morgan Hill Well pumps into the 100,000-gallon tank. The source occasionally has elevated manganese levels, but some of the manganese is noted to precipitate out in the tank after application of sodium hypochlorite. The District does not currently operate a manganese removal facility at Well 3.

The Beall Creek Pump Station is the primary source of water to the water treatment plant. The Beall Creek Pump Station contains two pumps, each with a capacity of 400 gpm. The Ellis Creek Pump Station contains two pumps, each with a capacity of 200 gpm. The raw water pumps at these booster stations are controlled by the PLC at the WTP through the telemetry system and run in conjunction with the water treatment plant filters. The PLC will initiate plant startup and the telemetry will call for a preselected raw water pump to start. The raw water pumps may also be operated manually at the pump station site.

The Beall Well is located adjacent to the water treatment plant and pumps into the plant following pretreatment with hypochlorite to absorb naturally occurring ammonia. The Beall Well is run in conjunction with the surface water sources. It is blended with the surface water prior to entering the plant to allow for blending and reduction of Beall Well arsenic concentration. The Beall Well is currently pumped only during periods of excessive demand and unforeseen source disruptions.

WATER TREATMENT PLANT

The District's water treatment plant treats water from Beall and Ellis Creeks and the Beall Well. Water level in the 1.0 MG reservoir will call the WTP and one or both of the surface water sources to come online. During periods of high turbidity in the creeks, above 10 NTU, the treatment plant is taken offline.

The Beall Creek and Ellis Creek supplies reach the plant via 6-inch raw water transmission lines. As the raw water enters the treatment plant, turbidity is recorded by an influent turbidimeter. Raw water is then dosed with a primary coagulant (polyaluminum sodium silicate or "PASS-C") and a filter aid polymer (Superfloc 573C). The water then passes through an in-line static mixer. The flow is then split to be routed to both of the two identical absorption clarifier/multi-media filter package treatment units. The water passes through the clarifier graded quartz media inducing contact coagulation and flocculation, providing turbidity removal. The clarified water then passes over a weir, into a trough, another weir, and into the multi-media filtration chamber. Filtered water effluent is then disinfected using sodium hypochlorite. From here the water flows into one or both clearwells.

The water treatment plant has two clearwells, each receiving treated water from one of the two package treatment units. Each clearwell has a capacity of 53,650 gallons. The disinfected water flows out of the baffled clearwells into a pump chamber common to both clearwells. Two finished water pumps and two backwash pumps draw water from this pump chamber. The finished water pumping system controls the pumping of water from the clearwell to the reservoir based on water levels in the clearwell and the 1.0 MG reservoir. A series of float switches in the clearwell monitors the water level in the clearwell. A pressure transducer monitors the level in the clearwells and controls the starting and stopping of the finished water pumps and the package treatment units. This is displayed on the SCADA system monitor screen. Each of the finished water pumps has a capacity of 700 gpm and is equipped with a 50-hp motor. The discharge rate of each pump is controlled by a manually operated butterfly valve.

A backwash is triggered by a head buildup across the filters. When the headloss in the filters reaches 30 inches, the WTP will complete a backwash cycle. Backwash water is sent to the onsite settling ponds and then recycled back into the flow into the plant at a maximum rate of 15 percent of the inflow rate from the surface water sources.

The treatment plant is required to provide 1-log Giardia and 2-log virus inactivation through chlorine disinfection. To verify compliance, the WTP computes an inactivation ratio by comparing the product of hydraulic residence time and the measured minimum daily chlorine residual to a regulatory standard value for a given temperature and pH. The ratio of the plant's daily achieved value to the published standard is the inactivation ratio and must be greater than 1.0 to receive disinfection credit for the Giardia and virus inactivation. A recent tracer study completed by the Department of Health at the treatment plant, which investigated the residence time within the disinfection basin,

confirmed that the level of disinfection during the critical cold-weather months from the most recent 12-month period was found to be in compliance with the requirements of the Surface Water Treatment Rule.

RESERVOIRS

Water District 19 operates three steel reservoirs, with capacities of 1.0 MG, 625,000 gallons and 100,000 gallons. The Water Treatment Plant pumps directly into the distribution system which supplies water into the 1.0 MG reservoir. Water is pumped from Wells 1, 2 and 4 into the 625,000-gallon reservoir. Water is transferred via a booster station from the 625,000-gallon reservoir into the 1.0 MG reservoir. The 1.0 MG reservoir sets that grade for the 494 Zone. The 1.0 MG reservoir calls for water if the water level drops between 7 to 11 feet. The settings and lead lag status between the wells and the WTP are operator adjusted. A water level drop of approximately 5 feet in the 625,000-gallon reservoir will trigger the wells to come on. The operational cycle for the wells is set by the operator.

The 100,000-gallon reservoir located in the 494 Zone is filled by the Morgan Hill Well and is pumped into the distribution system.

TELEMETRY

The water treatment plant, the Beall Creek pump station, the Ellis Creek pump station, the wellfield, and two reservoirs are all linked together by a telephone-based telemetry system.

This system allows the operator to control and monitor operations at the treatment plant, the wellsite, and the 625K and 1MG reservoirs. This includes on/off control of pumps, monitoring of operational parameters and alarm functions to alert operators of operational deviations. All of these features are accessed through a Supervisory Control and Data Acquisition (SCADA) system at the plant.

A level indicator in the District's 1.0 MG reservoir is connected via telemetry lines to the treatment plant's programmable logic controller (PLC). This signals water production to commence or cease. When the reservoir is drawn down to a selected level; the treatment plant will go online and or a booster pump to pump from the 625,000-gallon reservoir at the wellsite will turn on. Preselected water levels signal deactivation of the production run when the reservoir is full.

AUXILIARY POWER

The District maintains a permanent 100kW generator at the wellfield to supply auxiliary power to the wells and booster station at the site in the event of a power outage. The generator is equipped with an automatic transfer switch. This is currently the District's only auxiliary power source. The District is looking into options for additional backup

power. For the WTP to operate in a power outage backup power is required at the WTP and at least one of the two surface water sources.

PREVENTIVE MAINTENANCE

Water District 19 maintains a detailed preventative or routine operation and maintenance program in order to ensure proper operation of all mechanical facilities and maximize the efficiency and life of the system. Routine operations include any activities required to ensure that the District's facilities function efficiently and that quality and pressure requirements and water system demands are met. District staff makes daily rounds to visually check system facilities, monitors of flow and reservoir recording devices on a regular basis, and responds to customer inquiries. Additionally, preventive maintenance such as regular servicing of pumps and motors, exercising valves and hydrants, cleaning reservoirs and flushing pipelines is conducted for overall operation and maintenance of the system. The primary components of the District's overall operations and maintenance program are described below.

RESERVOIRS

Each day, free chlorine residuals are measured from water in the reservoirs. The existing three reservoirs are scheduled to be inspected and cleaned every 5 years. A diver is contracted to enter the reservoirs and provide video footage of the inspection. If inspection reveals excess sediment settled on the reservoir floor, or if otherwise necessary, the reservoir is cleaned with a water vacuum. Other periodic maintenance of the reservoirs includes inspecting and pressure washing the exterior surfaces of the reservoirs to remove built-up moss every 5 years, or more frequently if needed, and inspecting the interior coatings on each reservoir every ten years to determine if repainting is necessary.

DISTRIBUTION SYSTEM, VALVE AND HYDRANT MAINTENANCE

The District currently exercises all valves in the system every 2 years. All fire hydrants in the system are exercised annually and after any construction occurs in the immediate area of the hydrant. Valves that fail testing are noted for future maintenance or replacement. Distribution System maintenance is currently tracked/recorded using hard copy sheets.

FLUSHING AND DEAD-END WATERLINES

The Water District currently flushes every zone below the 494 Zone and all dead end mains annually. The 494 Zone is flushed on every two years. Non routine flushing occurs in response to water quality concerns.

WATER TREATMENT PLANT

A maintenance schedule for the water treatment plant is outlined in Table 6-3.

TABLE 6-3

Water Treatment Plant Maintenance Schedule

Component	Inspection and Maintenance
Daily Inspection/Maintenance	
Chemical Feed Pumps	Check pumps for operation. Replace tubing and fittings if necessary
Chemical Feed Tanks	Check solution levels. Make up solution if necessary.
Clarifier	Check floc condition above filter.
Turbidimeter	Check the flow through the turbidimeters. The desired flow rate should be in the range of 250 to 750 mL/min.
Valves	Visually check all valves for operation and leaks.
Filters	Visually check filters for proper operation.
Elect Panel/Motor Control Center	Visually check unit for proper operation.
Motors	Visually check motors for proper operation, oil levels, temperature and packing conditions
Weekly Inspection/Maintenance	
pH meter	Calibrate
Motors	Clean oil, dust, dirt, water and chemicals from the exterior of motor. Make sure motor air intake and outlets (fan cooled motor) are unobstructed.
All Pumps and Mechanical Seals	Check seals for leakage.
Monthly Inspection/Maintenance	
Motors	Check motor bearing temperature. If bearings are running hot, consult motor manufacturer's instructions.
Turbidimeters	Drain & clean turbidimeter body. Calibrate. Check continuous turbidimeter against portable. Replace tubing if necessary
Chlorine Analyzer	Replenish reagents. Clean measuring cell.
Quarterly Inspection/Maintenance	
Plant Controls	Check operation through one cycle. Test controller inputs (level switches and alarms) and check for proper plant response.
Chemical Feed Tanks	Drain and clean tanks.
Annual Inspection/Maintenance	
Heater and Thermostat	Inspect and clean units.
Motors	Machinery Condition Vibration Analysis
Chlorine Analyzer	Replace pump tubes.
Turbidimeter	Replace Lamps
Flowmeters	Check calibration and adjust as necessary
Filters	Check media depth and effective size
Recycle Ponds	Remove residue from one pond. Alternate to other pond the following year.

In addition, the following water treatment plant maintenance tasks are completed as determined by the general condition of the component:

- Painting
- Paving and road repairs
- Fencing
- Insulating
- Electrical system upgrading
- Plumbing revisions
- Clearwell and pump chamber cleaning
- Filter media replacement

WELLS

The wellheads and pumping facilities are inspected daily. Flow meter reading is recorded inside the pump house. The sodium hypochlorite solution barrel consumption is recorded daily and filled if necessary. Well draw down levels are recorded. A detailed inspection of the above-ground appurtenances at each well occurs annually. Groundwater levels are recorded annually at each well site after the wells have been off for an entire month, to measure the static water levels in the aquifer.

METERS

Accurate water metering is an essential financial and conservation-oriented component of water system infrastructure. A substantial amount of revenue may be lost through inaccurate metering of residential, commercial, and industrial accounts. The importance of accurate master or source meter readings cannot be overestimated. Without accurate master or source meter readings, the water utility cannot determine lost and unaccounted for water volumes. Service meters are calibrated and/or replaced according to the following schedule:

- 3/4-inch and 1-inch mechanical meters are replaced after 15 years of service with electromagnetic meters (Sensus IPERL meters). Select electromagnetic meters are tested every 5 years.
- 2-inch through 4-inch meters are tested and calibrated every 5 years. Meters larger than 4 inch are tested and calibrated every 3 years. The District currently has only one meter in regular service larger than 4 inch.

The District keeps a meter inventory to track installation and replacement schedules for all of its meters. Current inventory is shown in Table 6-4. The District is replacing older meters with radio read meters. It has been budgeted to replace 180 meters each year with new AMR “Sensus” meters.

TABLE 6-4
Service Meter Inventory

Year of Installation	5/8"	3/4"	1"	1.5"	2"	3"	4"	8"
Pre 2001	434	16	29	8	10			1
2001	4				1			
2002	16		2	2	2			
2003	108		10	3				
2004	34		2			1	2	
2005	22		5					
2006	11		1		1			
2007	43	1	7					
2008	37	1	1					
2009	9							
2010	8		1					
2011	54	12	1		1			
2012	27		3					
2013	121	2						
2014	111	1	2	1	8			
2015	134		3				1	
2016	133	8	1		2		1	
Total	1,306	41	68	14	25	1	4	1

INVENTORY OF MATERIALS

The District maintains an inventory of parts and supplies including all appurtenances needed to make emergency repairs. At a minimum, the materials on hand and the inventory include the materials necessary to repair leaks for every size and type of pipe in the system. Spare valves, 8 inches and smaller, are included in the inventory.

All materials necessary to install or repair water services of 5/8 inch to 1 inch is kept on-hand, along with pipe couplings of various sizes and materials. Spare repair bands for varying sizes and materials of pipe are also stocked.

RECOMMENDED PREVENTIVE MAINTENANCE SCHEDULE

Table 6-5 includes a listing and schedule of normal maintenance and operations activities. The frequency listed is a minimum and the actual frequency should be adjusted as necessary to meet system requirements.

TABLE 6-5
Preventative Maintenance Schedule

Frequency	Maintenance
Daily	Check distribution system and note any suspected leaks
Monthly	Collect routine coliform samples
Annually	Flush system
Annually	Exercise hydrants
Annually	System leakage survey
Biennially	Exercise valves
Every 5 Years	Inspect and if necessary clean the District reservoirs
Refer to Table 6-3	Water Treatment Plant Maintenance

WATER QUALITY MONITORING

The District's schedule for Water Quality Monitoring is shown on Table 6-6 and 6-7. Additional information on the District's coliform monitoring program is identified in the Coliform Monitoring Plan (Appendix E). This document includes specific testing location sites as well as information regarding the District's public notification process.

Copies of most recent water quality tests performed on the District's system are contained in the Appendices for reference. They are also included in the District's most recent Consumer Confidence Report.

TABLE 6-6
Water Quality Monitoring

Monitoring Group	Sample Location	Notes
Bacteriological	S05	One Sample per month
Bacteriological	Distribution System	Four Samples per month
Chlorine Residual	S05, S06, S09	Daily samples or as approved by DOH
Gross Alpha/Radium 228	S05, S06, S09	One Sample each source every 6 years
Herbicides	S05, S06, S09	One sample each source every 9 years
Pesticides	S05, S06, S09	One Sample each source every 3 years
Inorganic Contaminants (IOCs)	S05, S06, S09	One Sample each source every 3 years
Nitrates	S05, S06, S09	One sample every year

TABLE 6-6 – (continued)

Water Quality Monitoring

Monitoring Group	Sample Location	Notes
Volatile Organic Compounds (VOCs)	S05, S06, S09	One Sample each source every 6 years
Lead and Copper	Distribution System	Ten Samples every 3 years
Total Trihalomethane (THM)	Distribution System	Two Samples Quarterly (March, June, Sept., Dec.)
Halo-Acetic Acids (HAA5)	Distribution System	Two Samples Quarterly (March, June, Sept., Dec.)
Asbestos	Distribution System	One sample every 9 years

Beall Well (S10) has not been operated since 2011. When the Beall Well is next put into service, the following full sampling schedule will be initiated.

TABLE 6-7
Beall Well Water Quality Monitoring

Monitoring Group	Sample Location	Notes
Gross Alpha/Radium 228	S10	Initial – quarterly
Herbicides	S10	1 sample each source every 3 years
Pesticides	S10	1 Sample each source every 3 years
Inorganic Contaminants (IOCs)	S10	1 Sample each source every 3 years
Nitrates	S10	1 sample every year
Volatile Organic Compounds (VOCs)	S10	1 Sample each source every 3 years
Arsenic	S10	Quarterly

Notes:

S05 = Treatment Plant (Beall and Ellis Creek).

S06 = Morgan Hill Well.

S09 = Wells 1, 2 and 4.

S10 = Beall Well.

All water quality testing is performed in accordance with annual monitoring schedules provided by DOH. Test results are submitted to DOH as required and are kept on file at the District office/treatment plant.

Monitoring results are reported to consumers annually in the District's Consumer Confidence Report. The District has State waivers through 2021 for a variety of monitoring requirements.

EMERGENCY RESPONSE

The District has developed emergency response procedures for various events that are likely to occur on Vashon Island and impact the District's ability to deliver water service to customers in accordance with District policies and regulatory requirements. This section summarizes the District's Emergency Operations Plan.

Although some of the details of the emergency response program should and are considered confidential for security purposes, an overview of the program is put forth in this section. As indicated, primary contacts for various agencies, neighboring jurisdictions, media, and outside assistance are identified to provide the user an easy reference in the event of an emergency situation.

The District has established an Emergency Management Team to prepare for emergencies and mitigate impacts if and when they do occur. The current Emergency Management Team is identified in Table 6-8.

TABLE 6-8
General Emergency Management Team

Team Member	Position	Phone Number
Board President	Emergency Management Coordinator	206-463-9007
Board Secretary	Public Information Officer	206-463-9007
Board Member	Liaison Officer	206-463-9007
John Martinak	Assistant Emergency Management Coordinator - Contact Person, Incident Commander	206-463-9007, 206-305-7658 (mobile)
Armin Wahanik	Contact Person: Water Treatment Plant Operator in Responsible Charge	206-463-9007
Keith Kassik	Field Section	206-463-9007, 206-962-1993 (mobile)
Melody Snyder	Finance Section	206-463-9007

Table 6-9 provides Emergency call numbers.

TABLE 6-9
Water District 19 Emergency Call-Up List

Contact	Number
District	
District Office	206-463-9007
Emergency/24 hr. Employee On-Call	206-463-9007 ext.9
Police, Fire, Medic	911
WTP	206-463-0355
John Martinak, General Manager	206-463-9007 206-305-7658 (mobile)
Seth Zuckerman – Commissioner	707-672-2777 (mobile)
Mike Weller – Commissioner	206-228-6325 (mobile)
State	
State Dept. of Health Office:	253-395-6750
King County Public Health	206-296-4606
State Department of Ecology	206-649-7000
State Department of Fish/Wildlife	206-392-7190
State Department of Transportation	206-562-4009
County	
King County Roads	206-296-8100
King County Emergency Management	206-296-3830
	After Hours: 206-296-3311
Utilities	
Century Tel	206-463-3617
Comcast Cable (ISP)	877-824-2288
Puget Sound Energy (Gas and Electric)	888-225-5773
Assistance	
Underground Utility Locating Service	811
	Dispatch: 1-800-424-5555
Heights Water Association	206-463-0014
Water Quality Laboratories	
Water Management Laboratories	253-531-3121
Amtest Laboratories	425- 885-1664

TABLE 6-9 – (continued)**Water District 19 Emergency Call-Up List**

Contact	Number
Media	
Vashon-Maury Island Beachcomber	Editor: 206-463-9195 After Hours: 1-877-481-4901 Office: 1-800-208-7015
KIRO 7 TV Radio 97.3 FM	206-728-8308 (television) 206-726-7000 (radio) newstips@kirotv.com
KING 5 TV	206-448-3850 newstips@king5.com
KOMO 4 TV Radio 97.7 FM	206-477-5666 (television) 206-404-4000 (radio) tips@komo4news.com
KUOW – Radio 94.9 FM	206-543-2710
KNKX - Radio 88.5 FM	800-677-5758 (Seattle) 253-535-8332 (Tacoma)
Voice of Vashon Radio 101.9 FM	206-463-0301 http://www.voiceofvashon.org/

*Ask to notify radio.

EMERGENCY RESPONSE PROCEDURES

Although it is impossible to anticipate all potential types of emergencies, and impractical to develop procedures for every possibility, the District has developed several key procedures to address the majority of emergencies that would be expected on Vashon Island. These types of emergencies have been verified by the District through a vulnerability assessment and through hazard mitigation planning and include:

- Power Failure
- Severe Earthquake
- Severe Snowstorm
- Fire
- Flooding
- Civil Disturbance
- Water Quality Issues such as Bacteriological detection or VOC/SOC and Inorganic Chemical Detection

POWER FAILURE

Various types of weather can cause loss of power, such as wind, lightning, freezing rain, freezing snowstorm. Additionally, power can be lost through traffic accidents. During a District-wide power outage, the District can rely on existing storage but may need to employ water shortage response measures to eliminate non-essential water uses. The District also has a 100kW generator at the wellfield to supply auxiliary power to the wells and booster station at the site. The procedure for a power failure is for District personnel to first check reservoir levels visually to evaluate the available storage remaining in each tank. Puget Sound Energy will be contacted to determine the anticipated length of the power outage. Customers will be notified of the emergency. Water conservation will be requested through radio, television, newspaper, road signs and/or police loudspeaker.

SEVERE EARTHQUAKE

A severe earthquake could result in transmission line breaks, distribution system breaks and structural damage to the treatment plant, reservoirs and to vaults which house critical valving and meters. Table 6-10 addresses the possible emergency events and response actions that should be taken in the event of an earthquake.

The nature of the emergency would depend on the area of the District's transmission system in which the break occurred.

TABLE 6-10
Severe Earthquake Emergency Response

System Component	Action
Water Transmission Lines	<ul style="list-style-type: none">• Close valves to isolate breaks.
Reservoirs	<ul style="list-style-type: none">• Check reservoir level.• Notify water customers of emergency and request customers to conserve water.• Shutdown source pumps.• Isolate break, check the base water system section maps for valve locations.• Repair break.• Disinfect isolated section.• Observe structures for visual signs of structural damage, leakage, cracks, etc.• Also check storm drainage system in the vicinity for significant flows.• If non-observable leakage is suspected, isolate one reservoir at a time and monitor water level for at least 24 hours.• If structural damage is apparent, drain reservoir and inspect the interior of the tank.

TABLE 6-10 – (continued)**Severe Earthquake Emergency Response**

System Component	Action
Pumping Station, Critical Valving and Meters	<ul style="list-style-type: none"> • All meter and valve vaults should be inspected following a major earthquake to check for joint leakage caused by earth movements.
Supply Facilities	<ul style="list-style-type: none"> • Inspect all supply facilities, for leakage or other structural damage.

SEVERE SNOWSTORM

Heavy snowfall could bring motor vehicle traffic to a standstill, impeding employee access to problem areas. Heavy snowfall should not interrupt water supply, but will likely interrupt power availability for extended periods of time. Table 6-11 addresses the possible emergency events and response actions that should be taken in the event of a severe snowstorm.

TABLE 6-11**Severe Snowstorm Emergency Response Actions**

System Component	Action
Water Transmission Lines	<ul style="list-style-type: none"> • Transportation to monitor system and make repairs will be limited. • Contact King County Public Works, Roads Division, to expedite plowing to any problem area.
Reservoirs	<ul style="list-style-type: none"> • No immediate effect. Snow may prevent access to Storage Reservoirs and Treatment Plant.
Pumping Station, Critical Valving & Meters	<ul style="list-style-type: none"> • Have chains and other snow gear ready for maintenance equipment and vehicles. • Move equipment and stored chemicals in close proximity of building if safe to do so. • Valve locations should be made available for maintenance personnel and kept current.
Wells	<ul style="list-style-type: none"> • Determine need to commission alternate sources (Well 2, Well 3, and Beall Well).
Supply Facilities	<ul style="list-style-type: none"> • Inspect all supply facilities, for leakage or other structural damage. • Clear snow from roads and walkways.

FIRE

A fire emergency can occur very quickly without warning. Firefighting requires large quantities of water, potentially creating high velocity flows through the water distribution system. Table 6-12 addresses the possible emergency events and response actions that should be taken in the event of a severe fire. (Charcoal ash & debris from fires)

TABLE 6-12
Fire Emergency Response Actions

System Component	Action
Water Transmission Lines	<ul style="list-style-type: none">• If needed, respond to water quality issues caused by fire flow.
Reservoirs	<ul style="list-style-type: none">• No immediate effect.
Pumping Station, Critical Valving & Meters	<ul style="list-style-type: none">• Call Fire Department.• Move equipment and stored chemicals in close proximity of building if safe to do so.• Valve locations should be made available for maintenance personnel and kept current.• Maintain 20 psi minimum in distribution system. Formulate replenishment plan.
Wells	<ul style="list-style-type: none">• Determine need to commission emergency sources (Well 2, Well 3, and Beall Well).
Supply Facilities	<ul style="list-style-type: none">• Inspect all supply facilities, for leakage or other structural damage.

HIGH WATER AND FLOODING

Table 6-13 addresses the possible emergency events and response actions that should be taken in the event of a large flood event.

TABLE 6-13
Flooding Emergency Response Actions

System Component	Action
Reservoirs	<ul style="list-style-type: none"> • No effect. Reservoirs are above flood level. No action is necessary. Damage to the exterior or the reservoirs would most likely be minimal
Pumping Station, Critical Valving and Meters	<ul style="list-style-type: none"> • Pump Stations are protected with a cinder block building. Check that access is not impeded by flooding or resulting landslides, particularly at the Beall Creek pump station.
Wells	<ul style="list-style-type: none"> • Pump casings are housed in the buildings. There is minimal risk to these facilities.
Administrative Office	<ul style="list-style-type: none"> • If computers are compromised by water damage, district operations will be hindered.

CIVIL DISTURBANCE

During local emergencies there is always a potential for civil unrest for a variety of reasons. In the case of the District, malevolent acts against the water system will have far reaching impacts in the community. These acts are federal crimes, and response to any such acts will be closely coordinated with the Federal Bureau of Investigation (FBI) and local law enforcement. Table 6-14 addresses the possible emergency events and response actions that should be taken in the event of a civil disturbance.

TABLE 6-14
Civil Disturbance Emergency Response Actions

System Component	Action
Water Transmission Lines	<ul style="list-style-type: none"> • Check chlorine residuals throughout the distribution system. • Monitor security of fire hydrants and blowoffs.
Reservoirs	<ul style="list-style-type: none"> • No effect. All reservoirs are surrounded by a 6-foot fence and barbed wire. Damage to the exterior or the reservoirs would most likely be minimal.
Pumping Station, Critical Valving and Meters	<ul style="list-style-type: none"> • Pump Stations are protected with a cinder block building, locking doors and monitored intrusion alarm. It is unlikely these structures would be damaged during civil unrest.

TABLE 6-14 – (continued)**Civil Disturbance Emergency Response Actions**

System Component	Action
Wells	<ul style="list-style-type: none"> Sites are surrounded by a 6-foot fence and barbed wire. Buildings are of mixed construction with locking doors. Pump casings are housed in the buildings. There is minimal risk to these facilities.
Supply Facilities	<ul style="list-style-type: none"> Site is surrounded by a 6-foot fence and barbed wire. Building is metal construction with steel locking doors and intrusion alarm. Use of the recycle ponds should be curtailed due to contamination risk.
Administrative Office	<ul style="list-style-type: none"> Unfenced building locked after hours. Possible risk of intrusion by a mob looking for provisions or money. If computers are compromised, district operations will be hindered.

CONTAMINATION OF WATER SUPPLY

Water contamination occurs when impurities enter the potable water supply. There are many potential causes of contamination, including rotting vegetation, backflow of hazardous material, or bacterial contamination of the water supply. Table 6-15 addresses the possible emergency events and response actions that would be taken in the event that contamination of the water supply occurs.

TABLE 6-15
Contamination Emergency Response Actions

System Component	Action
General	<ul style="list-style-type: none"> If possible, locate the source of the contamination. Contact DOH as required depending on the nature of the issue. Notify news outlets if directed by WDOH. Send District location map to news outlets.
Sources	<ul style="list-style-type: none"> Sample all wells and finished water from WTP.
Distribution System Contamination	<ul style="list-style-type: none"> Disinfect and flush distribution lines as dictated by the nature of the contamination. Perform chemical and free chlorine residual analysis at various locations.

TABLE 6-15 – (continued)**Contamination Emergency Response Actions**

System Component	Action
Reservoir Contamination	<ul style="list-style-type: none"> • Resample to confirm contamination. • Check distribution system for presence of contamination. • Isolate reservoir from system. • Inspect vent screens, hatches, and piping to identify source of contamination. • If reservoir water is contaminated and therefore considered unsuitable for consumption, drain and clean reservoir. • Consider disinfecting reservoir if bacteriological standards are exceeded. Follow AWWA Standards. A 50 ppm chlorine solution in the 100,000-gallon reservoir can be obtained by adding 86 gallons of 5.25 percent chlorine bleach.

BACTERIOLOGICAL PRESENCE DETECTION PROCEDURE

Procedures for notifying system customers, King County Public Health, and DOH of water quality emergencies are an important component of an emergency response program. Many public water systems will occasionally detect positive coliform samples, usually as a result of minor contamination in distribution mains or sample taps, or because of improper bacteriological sampling procedures. However, the persistent detection of coliforms in the water supply, particularly E. coli or fecal bacteria, may require issuing a public boil water notice to ensure the health and safety of the water customers. Emergencies such as floods, earthquakes, and other disasters can affect water quality as a result of damage to water system facilities, thereby warranting a boil water order in advance of supply. The District maintains an example “Boil Water Notice” for use in such instances; this is included for reference in Appendix M. Bottled water should be provided for customers who are unable to boil their water, such as during a power outage. WAC 246-290-320 requires water utilities to follow specific procedures in the event coliform bacteria are detected in the water system.

A generalized District location map is provided in Appendix M to be provided to the news agencies should they need to be contacted.

VOC/SOC AND INORGANIC CHARACTERISTICS DETECTION PROCEDURES

Volatile organic chemicals (VOC's), synthetic organic chemicals (SOC's), inorganic chemicals and certain physical characteristics are monitored according to WAC 246-290-300. Water quality standards are based on maximum contaminant levels (MCL's) and maximum residual disinfectant levels (MRDLs). WAC 246-290-320, -480 describe the required protocol following a MCL or MRDL violation.

CROSS-CONNECTION CONTROL

The District's cross-connection control program was established by District Resolution No. 1026 in January 2003; a copy of the plan is included in Appendix L. The District has implemented all the elements of and is in complete conformance with WAC 246-290-490. The program is summarized below:

PRIORITY SERVICE

The following establishments are required to have a backflow prevention device to prevent contaminating the District's system (WAC 246-290-490, Table 9):

- Radioactive material processing plants or nuclear reactors
- Agricultural (farms and dairies)
- Wastewater treatment plants, lift stations and pump station
- Hospitals, medical centers, medical/dental or vet clinics, plasma centers, blood plasma centers
- Mortuaries
- Laboratories
- Metal plating industries
- Petroleum processing or storage plants
- Food processing and beverage bottling plants, canneries, packing (slaughter) houses
- Film processing facilities
- Piers and docks, graving docks, boat marinas, dry docks
- Commercial laundries and dry cleaners
- Premises with unapproved auxiliary supply
- Car washes
- Chemical plants
- Premises where both reclaimed water and potable water are provided
- Premises with fire sprinkler systems and/or private hydrants
- Irrigation Systems (individually metered and supplied by domestic supply) with chemical addition
- Survey access denied or restricted

NEW AND EXISTING CROSS-CONNECTION CONTROL DEVICES

New and existing cross-connection devices are catalogued and checked initially by District staff. It is the responsibility of the customer to ensure proper testing of the devices on an annual basis thereafter. The District sends reminders to customers with cross connection devices to test them. The District tracks all cross-connection control devices and penalties are levied for non-compliance, such as failure to annually test the backflow device. Backflow prevention devices are required on all potential cross connections, in accordance with State guidelines. A condition for new services is an evaluation by the cross-connection control certified District staff to determine what type of backflow device is needed. The annual testing result for each device is recorded by the District. An example of the records kept in the database is included in Appendix L.

PUBLIC NOTIFICATION PROCEDURES

The District has established specific procedures to comply with the statutory notification requirements for Tier 1 water quality violations. The District would enlist the services of Vashon Island's local radio and television station, the Voice of Vashon, 1650 AM and cable channel 21 to broadcast the appropriate message. Major regional TV networks including KING-5, KIRO, and KOMO news would be notified to broadcast notice as well. In addition, message boards would be distributed along the major traffic arteries, a phone bank would be initiated and door-to-door canvassing would begin.

Tier 2 and 3 violations would be handled in the established and required manner.

WATER QUALITY GOALS

The District has adopted the Department of Health "Treatment Optimization Program" (TOP). The TOP is an effort to improve the performance of surface water treatment facilities such as the facility operated by the District. TOP focuses on particle removal and disinfection to maximize public health protection from microbial contaminants. The specific elements of TOP are:

1. Filtered water turbidity is less than 0.10 NTU 95 percent of the time, based upon maximum daily values recorded.
2. Filtered water is below 0.10 NTU within 15 minutes of filter being in production.
3. Maximum filtered water turbidity is 0.3 NTU.
4. Filters are backwashed before breakthrough.
5. Raw water turbidity changes do not affect filtered water turbidity.
6. Required CT values are achieved at all times.
7. Raw water turbidity is monitored at least every 4 hours.
8. Effluent turbidity is continuously recorded for each filter.
9. Combined filter effluent turbidity is continuously recorded.

The adoption of TOP was codified in District Resolution 1097, approved on February 28, 2006.

CUSTOMER COMPLAINT RESPONSE PROGRAM

The District maintains records of customer complaints at the District office. Since the last plan, 420 complaints have been filed, ranging in nature from low or no water pressure to brown water. The District is committed to addressing complaints in a timely manner.

RECORD KEEPING AND REPORTING

The District maintains records of the following items at the District office and Water Treatment Plant:

1. Water production data
2. Billing records
3. Non-billed water use
4. Water quality records
5. Customer complaints
6. Maintenance and repair records

SANITARY SURVEY FINDINGS

The latest sanitary survey was conducted in 2016 and is included in this plan as Appendix K. DOH inspected and evaluated the District's wells, reservoirs, and distribution system.

The survey found no significant deficiencies with the District's operations and system and corrections were made. A number of operational tasks were identified for the District to conduct to improve its system:

- Seal two openings to electrical conduit for Well #2 (S04).
- Morgan Hill Site – Seal apparent opening in well cap with silicone or caulk to prevent entry of dust, insects, or other contaminants. Ensure any valve or vent that permits air to enter the well has a 24-mesh screen facing downward.
- Temporary Tank site at 115th Avenue SW and SW Bank Road – Please ensure vents and openings to the storage tank have 24-mesh screen, facing downward to prevent rainwater entry.

- Please retrofit the vent on the 625,000-gallon tank to: (1) better prevent rainwater and other windblown contaminants from entering the tank; and (2) still provide adequate ventilation.
- Seal openings in all hypochlorite solution tanks and install air vent. Recommend venting to the outside of the building where applicable.
- Verify the sanitary integrity of the Morgan Hill tank. Please provide photos of the access hatch and air vent from your next routine inspection. Within 30 days, please provide the date of the next routine inspection. Reoccurring every sanitary survey.
- Temporary Tank site at 115th Avenue SW and SW Bank Road – Please provide calculations demonstrating that storage and pumping capacity for the remote pumping site are sufficient to meet the anticipated demand. Refer to email Derek Pell sent on 8/12/2016.
- Recommend annual inspections of combination air vacuum relief valves and valve vaults.
- Continue to work with fire department on proper use of hydrants. Consider the level of service the District wants to provide and whether or not that should include brown water complaints resulting in fire department misuse of hydrants.
- Morgan Hill Site – Recommend installing hard board walls. The current insulation provides good home for rodents and represents a health risk to individuals in the facility.
- Temporary Tank site at 115th Avenue SW and SW Bank Road – Recommend ASME pressure relief between shut off valve and each pressure tank.

OPERATION & MAINTENANCE IMPROVEMENTS

The list below identified areas where the District would like to focus improvements.

1. Frequency of distribution valve exercising.
2. Frequency of fire hydrant testing.
3. Frequency of distribution system air valve testing.
4. Continue water meter replacements to recover lost revenue and reduce

distribution system “leakage.”

5. Destratify reservoirs to limit risk of water aging by utilizing *in situ* mixers.
6. Continue replacement of aging water main infrastructure to increase reliability and reduce distribution system leakage.

CHAPTER 7

DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS

OBJECTIVE

The objective of this chapter is to document the District's design and construction standards to allow the District to obtain DOH approval to utilize the alternative review process for construction of new and replaced water distribution facilities. Through this process, a purveyor needs no further approval from DOH for distribution project reports, construction documents, or installation of distribution reservoirs and storage tanks, booster pump facilities, transmission mains, distribution mains, pipe linings, and tank coatings. Source of supply facilities are not eligible for the alternative review process

This chapter includes project review procedures, system standard, policies, and procedures, and construction certification and follow-up procedures.

The District's Developer Standards Handbook and Standard Details are available in Appendix N.

CHAPTER 8

CAPITAL IMPROVEMENT PLAN

The District proposes to undertake an extensive capital improvement program over the next 6 years that will invest \$4.8 million (in present dollars) in several areas of focus. The primary investment will be made in replacing the district's aging pipeline infrastructure, at an estimated cost of \$4.1 million in today's dollars over the next decade.

The capital improvement program in this plan includes a number of service improvements over the next 10 years, which are grouped as follows:

1. **Replacing and upsizing old distribution system waterlines** – The largest series of investments will be spent on replacing aging distribution lines at a cost of \$4.1 million in the first decade of the plan and another \$3.2 million in the next decade, which represents nearly 70 percent of the entire capital budget. Besides improving the quality of water delivered to customers, these projects will also have the benefit of reducing overall water system leakage, increasing the amount of water available to serve customer demand.

Much of the current distribution system has been in the ground for 40 years or more, and is now at or beyond its anticipated useful life. While these sections of pipe continue to convey water to District customers, certain events such as turning on a fire hydrant, or a leaking pipeline can create colored water incidents at various locations in the systems, depending on the location of the event. Brown, red, orange, or yellow water is caused by rust in the water. The different colors can be attributed to varying chemical oxidation states of the iron (rust) and by varying concentrations of the rust in the water. The two major sources that can cause water to be colored are either the District's water mains or the plumbing within the customer's house, apartment, or business. Colored water occurs due to a sudden increase in the velocity of the water traveling through pipe. To ameliorate the problem, the District strives to flush the entire system annually, but at times the process can be interrupted to attend to new service connections, installations, repairs, and system repairs, and component replacements.

In addition, some areas within the District have insufficient fire flow due to undersized mains, and some areas have no fire hydrants currently. The modeling analysis in Chapter 3 indicates a need for upsizing mains throughout the District to improve fire flow.

Under this plan, the District will replace water mains in the lower parts of the distribution system that have experienced the greatest deterioration, starting with mains that run along SW 216th Street from Vashon Highway to Tramp Harbor Road. The next major project will be on Vashon Highway, from SW 204th Street down to Quartermaster Harbor.

Following this, mains along SW Kingsbury Road will be replaced. The fourth major distribution project will be to replace under-sized pipe along Bank Road, from 107th Avenue SW to 115th Avenue SW, with an 8-inch diameter line, which will solve long-term problems of inadequate pressure and supply. At the end of this line, a section of pipe from 115th Avenue SW to the customers at the end of this line will be installed early in 2020 to provide water from the current satellite system located at 115th, which the District hopes to upgrade at the same time. This end of line work will be completed by District personnel utilizing District equipment.

2. **Improving source reliability** – the District has established a routine of maintenance projects that will rehabilitate its wells on a six-year rotation, which means that every 2 years one of the three production wells will be rehabilitated. There are several options for such rehabilitation, and the District will explore options as new processes come online. The District will spend in excess of \$400,000 over the course of this planning cycle to improve source reliability, and has made provisions to invest \$1.0 million in developing new water sources in early 2030s, if that should become necessary
3. **Replacing outdated computer and control systems and software to better control water production and storage** – Water District 19 relies on control systems and software to manage certain portions of the water system. The systems, collectively known as Supervisory Control and Data Acquisition, or SCADA, monitor critical water levels in reservoirs, and provides the control for the water treatment plant where creek water is cleansed and treated prior to entering the distribution system. The District will spend \$150,000 to improve control systems, starting at the two creek sites, moving on to the treatment plant and then to the main wellfield.
4. **Replacing computer systems due to old technology that will not be supported after mid-2020** – The District will be required to replace both of its servers; one for the office and the other for the water treatment plant since Microsoft will cease to support the software after mid-2020. The District plans on replacing both computers and associated software early in 2020 to ensure that support is not interrupted. This is estimated to cost approximately \$50,000.

5. **Equipment for replacing short sections of distribution pipe** – The District has relied on subcontractors for most of the small projects that require some digging, both for repair and replacement. The District plans to purchase a mini excavator and trailer to provide the equipment necessary to perform “short” runs less than 1,000 feet. The District has identified eight projects that will be conducted by District staff over the course of this planning period. The projects envisioned will cleanup many of the sources of brown water in the District. This is estimated to cost approximately \$75,000.

CAPITAL IMPROVEMENT PROJECTS

SOURCE IMPROVEMENT PROJECTS

SO-1 – Well 4 Rehabilitation (2019, completed as of 2022)

The District’s wellfield is in need of rehabilitation due to a decline in production capacity. The wellfield production is currently limited to a rate below the original yield of the wellfield. This limit is in place in order to avoid damage to the aquifer by over pumping and to reduce wear on the well infrastructure. Well 4 is currently operated at a peak rate of 120 gpm, though the original predicted capacity of the well was 250 gpm at the time of installation. The well was operated at a rate of 180 gpm in the past, though excessive drawdown was noted at this flow rate. The wellfield total instantaneous yield is currently limited to 200 gpm, when Wells 1, 2, and 4 are operated simultaneously. This project will involve rehabilitation of the well through screen cleaning, flushing, jetting, and/or air sparging the well, depending on the condition of the well infrastructure. The rehabilitation work will include inspection of the existing well, pump testing, and drawdown monitoring to determine the aquifer condition and the improved well capacity.

Project Cost: \$69,400

SO-2 – Well 2 Rehabilitation (2021)

Similar to project SO-1, this project will involve rehabilitation of Well 2, which is also located at the District’s wellfield. Well 2 is currently operated at a flow rate of 50 gpm, though the original predicted capacity of the well was 250 gpm at the time of installation. The project will rehabilitate Well 2 through well screen cleaning, flushing, jetting, and/or air sparging, depending on the condition of the well infrastructure. The rehabilitation work will include inspection of the existing well and drawdown monitoring.

Project Cost: \$75,000

SO-3 – Well 1 Rehabilitation (2023)

Similar to project SO-1, this project will involve rehabilitation of Well 1, which is also located at the District's wellfield. Well 1 is currently operated at a peak rate of 80 gpm, though the original predicted capacity of the well was 250 gpm at the time of installation. Well 1 is the highest-yield source for the District, and as such is especially important for the District to maintain in good operational condition.

Project Cost: \$75,000

SO-4 – Beall Creek Overhaul (Grant) (2025)

The District plans to improve the stream habitat in the vicinity of the Beall Creek intake structure. The stream habitat in this location is inhibited by the infrastructure related to the intake structure and Creek diversion. Currently, the District is mandated to maintain a minimum flow rate within the Creek of 0.1 cfs at the intake structure to provide sufficient flow for fish habitat and passage. However, this alone is likely not sufficient to provide a robust habitat. This project will provide improved habitat in the vicinity of the intake through restoration of the streambed, increased riverine plantings, and installation of fish passage elements where required.

The District plans to pursue grant funding to pay for this project.

Project Cost: \$125,000 (Grant Funding Assumed)

SO-5 – Well 4 Rehabilitation (2025)

The District is budgeting for additional rehabilitation work on Well 4, based on the assumption that the rehabilitation work will need to be repeated approximately every 6 or 7 years. This work is planned to be conducted in 2025 to ensure that the improved capacity of the well is maintained.

Project Cost: \$75,000

SO-6 – New Water Source (2036)

The District has made provision for the possibility of developing an additional water source by the end of the 20-year planning period in order to ensure adequate source capacity for customer demand. As noted in Chapter 3, the District's current sources (not assuming increased capacity from well rehabilitation work) may be insufficient for the projected maximum day water demands by 2036. The District has included this project as a contingency, in the event that yield from its surface water sources decreases due to a potential reduction in streamflow from warmer summers in the future. Development of a new source, in conjunction with leak reduction and water use efficiency measures, will help to provide assurance that future water demands can be met. The District projects that its existing water rights will suffice to cover anticipated demand through the 20-year planning period.

Project Cost: \$1,600,000

EQUIPMENT

EQ-1 – Mini-Excavator and Trailer (2019, completed as of 2022)

The District plans to purchase an additional mini-excavator and trailer to assist in utility repair and replacement work.

Project Cost: \$75,000

SYSTEM CONTROLS PROJECTS

The District's existing telemetry and controls system is outdated. The District plans to improve the telemetry system at both surface water intakes at Beall Creek and Ellis Creek, as well as at the treatment plant and at the wellfield. These improvements will be conducted in order of importance based on the condition of the existing telemetry system at each location.

C-1 – Beall Creek RTU (SCADA) (2019, completed as of 2022)

Project Cost: \$29,620

C-2 – Ellis Creek RTU (SCADA) (2019, completed as of 2022)

Project Cost: \$29,620

C-3 – WTP SCADA (2020, currently in progress as of 2022)

Project Cost: \$75,000

C-4 – Wellsite SCADA (2020, completed as of 2022)

Project Cost: \$17,000

ADMINISTRATION

A-1 – District Server Replacement (2020, completed as of 2022)

The existing computer system at the District's headquarters is outdated and runs on software that, as of 2021, is no longer supported by the developer. This project will include upgrading the computer hardware at the District headquarters and purchasing the necessary associated software.

Project Cost: \$17,000

DISTRIBUTION MAIN PROJECTS

D-1 – SW Bank Road (115th to End of Line) (2021, completed as of 2022)

This project will replace approximately 260 feet of 2-inch galvanized iron water main with 8-inch ductile iron pipe along SW Bank Road from 115th Avenue SW to the west end of the line. Additionally, this project will replace the services and provide new fire hydrants on this length of main.

Project Cost: \$181,400

D-2 – 107th Avenue SW (2021, completed as of 2022)

This project will replace approximately 1,500 feet of 2-inch galvanized iron water main with 8-inch ductile iron pipe along 107th Avenue SW from SW Bank Road to the south. Additionally, this project will replace the services and provide new fire hydrants on this length of main.

Project Cost: \$179,900

D-3 – SW 216th Street Main Replacement and Monument Road SW Connection (2022)

This project will replace approximately 650 feet of 6-inch steel water main along SW 216th Street from Vashon Highway SW to the Morgan Hill Well site, 1,150 feet of 6-inch steel water main along Vashon Highway SW from SW 216th Street to SW 212th Street, and 2,650 feet of 6-inch asbestos cement water main along SW 216th Street from Monument Road SW to Tramp Harbor Road. This project will replace all services and replace the fire hydrants on this length of main.

The project also includes a new connection along Monument Road SW between SE 211th Street and an existing dead-end 8-inch main located just south of SE 204th Street. This connection will involve the construction of 1,770 feet of new 8-inch ductile iron water main and the installation of four new fire hydrants.

Project Cost: \$1,742,000

D-4 – Vashon Highway South (2024)

This project will replace approximately 4,000 feet of 6-inch steel water main with 12-inch ductile iron pipe along Vashon Highway SW from SW 206th Ct to SW 216th Street. Additionally, this project will replace the services and replace the fire hydrants on this length of main.

Project Cost: \$1,186,000

D-5 – Kingsbury Road SW and South End (2026)

This project will replace approximately 2,300 feet of 6-inch steel and asbestos cement water main with 8-inch ductile iron pipe along Kingsbury Road SW from SW Dockton Road to SW 234th Street. Additionally, this project will replace the services and the fire hydrants on this length of main.

Project Cost: \$786,000

D-6 – SW Bank Road (from 107th Avenue SW to 115th Avenue SW) (2027)

This project will replace approximately 2,620 feet of 2-inch galvanized iron water main with 8-inch ductile iron pipe along SW Bank Road from SW 107th Avenue SW to 115th Avenue SW. Additionally, this project will replace the services and provide new fire hydrants on this length of main.

Project Cost: \$818,000

D-7 – SW 216th Street to Vashon Highway (2028)

This project will replace approximately 1,200 feet of 2-inch ABS water main with 8-inch ductile iron pipe along SW 216th Street from Vashon Highway extending west. Additionally, this project will replace the services and provide new fire hydrants on this length of main.

Project Cost: \$400,000

D-8 – SW 211th Place to Vashon Highway (2028)

This project will replace approximately 1,100 feet of 4-inch asbestos cement water main with 8-inch ductile iron pipe along SW 211th Place from Vashon Highway extending west. Additionally, this project will replace the services and provide new fire hydrants on this length of main.

Project Cost: \$383,000

D-9 – SW 181st Street to Vashon Highway (2029)

This project will replace approximately 1,100 feet of 4-inch steel water main with 8-inch ductile iron pipe along SW 181st Street from Vashon Highway extending east. Additionally, this project will replace the services and provide new fire hydrants on this length of main.

Project Cost: \$325,000

D-10 – SW 212th Place to Vashon Highway (2029)

This project will replace approximately 1,100 feet of 2-inch galvanized iron water main with 8-inch ductile iron pipe along SW 212th Street from Vashon Highway extending west. Additionally, this project will replace the services and provide new fire hydrants on this length of main.

Project Cost: \$410,000

D-11 – 98th Avenue SW to Gorsuch Road (2029)

This project will replace approximately 410 feet of 2-inch galvanized iron water main with 8-inch ductile iron pipe along 98th Avenue SW from SW Gorsuch Road extending north. Additionally, this project will replace the services and provide new fire hydrants on this length of main.

Project Cost: \$137,000

D-12 – SW 192nd Street to Vashon Highway (2030)

This project will replace approximately 1,300 feet of 1.5-inch galvanized iron water main with 8-inch ductile iron pipe along 192nd Street SW from SW Gorsuch Road extending north. Additionally, this project will replace the services and provide new fire hydrants on this length of main.

Project Cost: \$398,000

D-13 – SW 204th Street to Vashon Highway (2030)

This project will replace approximately 900 feet of 2-inch water main with 8-inch ductile iron pipe along SW 204th Street from Vashon Highway SW extending west. Additionally, this project will replace the services and provide new fire hydrants on this length of main.

Project Cost: \$345,000

STORAGE PROJECTS

S-1 – Tank Farm Booster Station

The District currently operates a booster station that pumps water from the 0.625 MG reservoir to the adjacent 1 MG reservoir. The capacity of the booster station is currently 500 gpm. This project will increase the capacity of the booster pump station to 2,250 gpm, matching the high fire flow requirement in the downtown area. The 0.625 MG reservoir would be able to supplement the storage requirement in the 1 MG reservoir, and would be able to maintain a high water level in the 1 MG tank for a longer duration during high-flow events. This would increase fire flow availability in the downtown area and could help to provide higher pressures throughout the 494 Zone during normal demands.

Project Cost: \$1,070,000

Figure 8-1 includes the location of capital improvement projects, and a summary is provided in Table 8-1.

TABLE 8-1
Capital Improvement Plan (2019-2026)

Category	Capital Improvement Project	Category	Cost (2019 \$)	Estimated Life (yrs)	Plan Date
Water Source	Well 4 Rehabilitation ⁽¹⁾	SO-1	\$69,400	10	2019
Field Equipment	Mini Excavator and Trailer ⁽¹⁾	EQ-1	\$75,000	10	2019
System Controls	Beall Creek RTU (SCADA) ⁽¹⁾	C-1	\$29,600	10	2019
System Controls	Ellis Creek RTU (SCADA) ⁽¹⁾	C-2	\$29,600	10	2019
System Controls	Water Treatment Plant SCADA ⁽²⁾	C-3	\$75,000	10	2020
Admin	District Server Replacement ⁽¹⁾	A-1	\$50,000	10	2020
System Controls	Wellsite SCADA ⁽¹⁾	C-4	\$17,000	10	2020
Water Mains	Bank Road (115 th – EOL) ⁽¹⁾	D-1	\$181,400	50	2021
Water Mains	107 th Avenue SW ⁽¹⁾	D-2	\$179,900	50	2021
Water Source	Well 2 Rehabilitation ⁽³⁾	SO-2	\$75,000	10	2021
Water Mains	216 th Main Replacement ⁽⁴⁾	D-3	\$1,742,000	50	2022
Water Source	Well 1 Rehabilitation	SO-3	\$75,000	10	2023
Water Mains	Vashon Highway South	D-4	\$1,186,000	50	2024
Water Source	Beall Creek Overhaul (Grant) ⁽⁵⁾	SO-4	\$125,000	20	2025
Water Source	Well 4 Rehabilitation	SO-5	\$75,000	10	2025
Water Mains	Kingsbury and South End	D-5	\$786,000	50	2026
Capital Projects 2016 – 2026			\$4,770,900		

(1) Completed as of 2022.

(2) Currently in progress as of 2022.

(3) Well 2 Rehabilitation may not occur as planned (company sold to new owner).

(4) Includes Monument Road connection.

(5) Requires grant funding to proceed.

TABLE 8-2
Capital Improvement Plan (2027-2036)

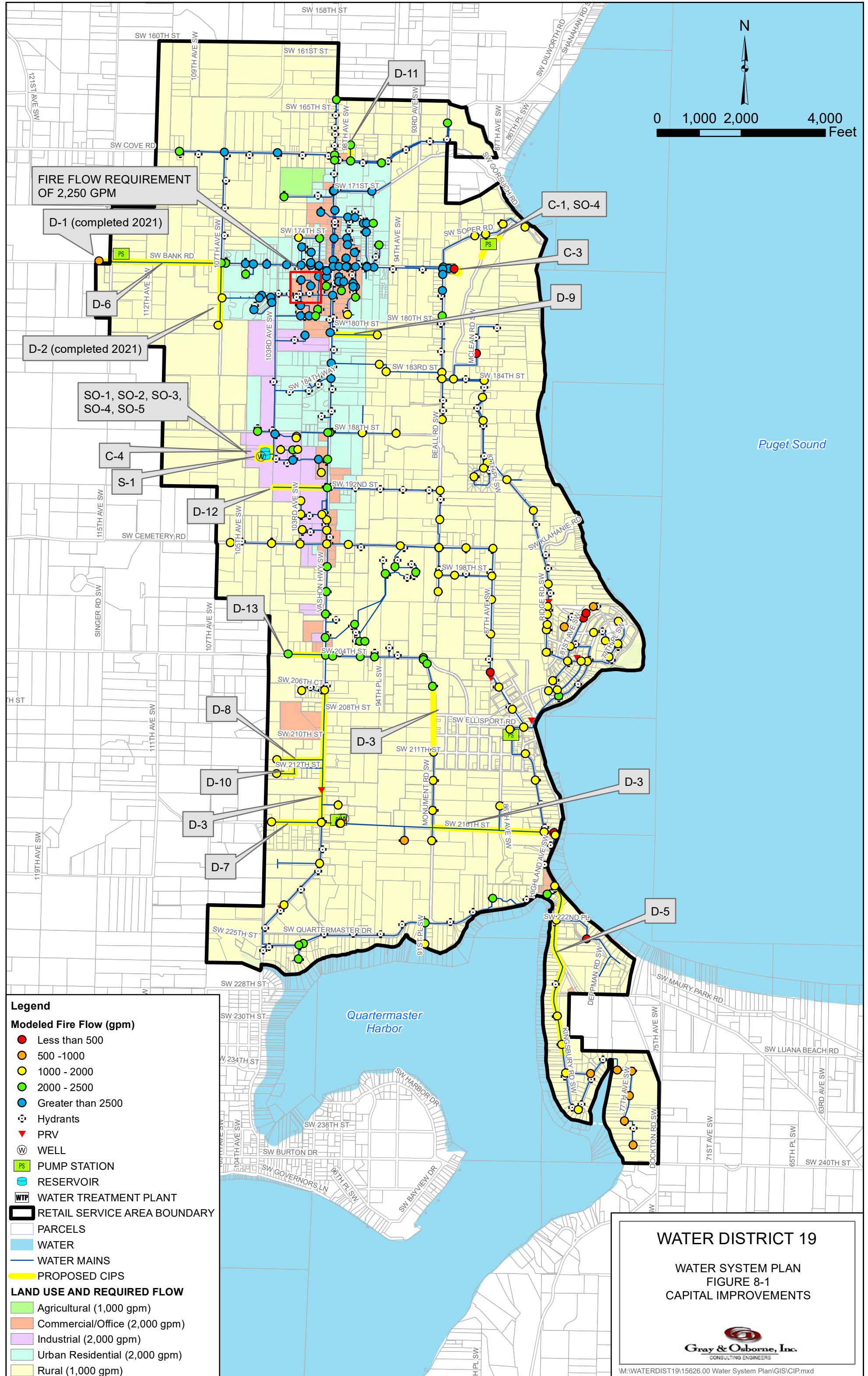
Category	Capital Improvement Project	Category	Cost	Estimated Life (yrs)	Plan Date
Water Mains	Bank Road (107 th – 115 th)	D-6	\$818,000	50	2027
Water Mains	SW 216 th Street to Vashon Highway	D-7	\$400,000	50	2028
Water Mains	SW 211 th Place to Vashon Highway	D-8	\$383,000	50	2028
Water Mains	SW 181 st Street to Vashon Highway	D-9	\$325,000	50	2029
Water Mains	SW 212 th Place to Vashon Highway	D-10	\$410,000	50	2029
Water Mains	98 th SW to Vashon Highway	D-11	\$137,000	50	2029
Water Mains	SW 192 nd Street to Vashon Highway	D-12	\$398,000	50	2030
Water Mains	SW 204 th Street to Vashon Highway	D-13	\$345,000	50	2030
Water Source	New Water Source	SO-6	\$1,600,000	50	2036
Storage	Tank Farm Booster Station	S-1	\$1,070,000	50	2032+
Capital Projects 2027 – 2036			\$5,883,000		
Total Capital Projects Plan Years 2016 – 2036			\$10,653,900		

Table 8-3 includes a breakdown of the total CIP costs by project category.

TABLE 8-3
Capital Improvement Project Breakdown

Category	Expense	Percent
Source	\$2,019,400	19.0%
Controls	\$151,200	1.4%
Mains	\$7,288,300	68.4%
Computer	\$50,000	0.5%
Storage	\$1,070,000	10.0%
Equipment	\$75,000	0.7%
Total	\$10,653,900	100.0%

Chapter 9 includes an analysis of the District's financial program and presents the District's plan to fund these improvements.



ASSET MANAGEMENT

Asset management is defined by DOH as “... the practice of managing all utility assets to address the total cost of owning, operating, upgrading, and replacing them, while delivering the appropriate level of service.” At this point in time, the District does not have a formal Asset Management Plan.

The District currently maintains an inventory in a Quickbooks database to track system element, installation years, age of facilities, and to estimate system valuation. The system valuation is used to target an appropriate amount of money to set aside each year for capital improvements. The existing inventory is not a complete picture of the District’s assets, and some of the more recent system improvements have not yet been accounted for, partially due to staffing changes. Staff plans to implement a more robust asset management system in the near future.

The District’s Asset Management Plan will include an asset inventory summarizing the age, condition rating, replacement cost, and criticality of the major water system assets and will relate these items to planned Capital Improvement Projects described in this chapter. This inventory can then be used to assess the adequacy of the District’s Capital Improvement Program to maintain current levels of service over the long term.

A useful metric to assess whether a utility’s capital expenditures are adequate to maintain the utility’s current level of service long-term is to compare the total annualized replacement cost of the utility’s assets to the utility’s average annual Capital Improvement Program budget. The total annualized replacement cost is defined as the cost of each asset divided by the expected useful life of that asset, summed for all assets. It is representative of the rate at which the utility’s assets are declining in value (in dollars per year), assuming straight-line depreciation. If the utility is spending approximately as much every year on capital improvement projects as the rate at which its assets are declining in value (in dollars per year), the utility can reasonably be expected to maintain its current level of service, assuming that its capital spending is primarily focused on renewal of existing infrastructure (as it is for the District). If it is spending significantly less, the utility’s level of service could be expected to decline over time, and if it is spending significantly more, the utility’s level of service could be expected to improve over time.

As described later in Table 9-4, the District estimates an annualized depreciation cost of the system assets of about \$200,000 to \$300,000. As noted previously, the estimated depreciation cost is likely an underestimate, as the District’s system inventory is incomplete and may not account for the totality of the system assets. The District’s efforts to set up a formal Asset Management Program in the coming years will produce a more accurate estimate of system valuation. From Table 8-1, the amount the District plans to spend on capital improvement projects over the 10-year planning period (2020 to 2030) is \$5,883,000, or an average of about \$588,300 per year. Since the average annual planned spending on capital improvement projects is greater than the water system’s

annualized depreciation cost, it can be concluded that the District plans to invest sufficient resources in its Capital Improvement Program to maintain its current level of service over the long term.

CHAPTER 9

FINANCIAL ANALYSIS

INTRODUCTION

Water District 19 provides a service to the community that is essential to public health and to the protection of the environment, but that is also highly capital-intensive. Most water utility costs are independent of water usage or consumption due to the nature of funding large capital improvements, and the relatively stable costs of operating labor, insurance, and other expenses. Fixed costs, which are incurred whether or not customers consume water, are associated with making the service available at the point of consumer use. A smaller proportion of a utility system's cost is variable and changes with the volume of water consumed and/or used (i.e., the cost of purchased water supplies, power for pumping, treatment chemicals, etc.). However, if demand were to exceed reliable supply, large capital costs would be incurred to bring new water sources on line.

As a publicly owned and operated system, the District strives to maintain reasonable water rates through efficient management of funds and careful financial planning. In addition, the District is able to keep rates low because public utilities: (1) do not pay federal income taxes; (2) receive lower interest rates on financing through tax-exempt bonds and state revolving fund low-interest loans; and (3) do not have to pay dividends to stockholders. As a special utility district, Water District 19 is not burdened with competing interests for funds and is able to dedicate 100 percent of revenues to the maintenance and operation of the District. Operating funds in excess of operating expenses and debt service on financing are reinvested in the utility system. This helps to reduce the need to secure outside funding for all capital improvements, which reduces financing costs, and results in lower utility rates.

This chapter contains a review of the District's water utilities revenue and expenses. It sets forth recommended rates necessary to fund the proposed capital improvement program. The District's fund reserves have increased over the past several years, the result of a deliberate attempt to begin setting aside money to cover the expected spending on this Capital Improvement Plan.

CURRENT WATER RATES AND CHARGES

The District charges for water service on a bi-monthly basis for both metered customers, and those who hold a water unit and have not yet installed service to their property. Metered water users are charged a bimonthly base charge that is dependent on the meter size, and a volume charge (Table 9-1). The base charge is dependent upon the meter size and the volume charge is dependent upon the type of classification of the customer's meter, residential or commercial. The current base charge for a standard 5/8-inch meter is \$65 for a 2-month period. For residential use, the volume rate increases from \$1.58 per

100 cubic feet for usage less than 1,000 CF up to \$6.88 per CCF for usage over 6,000 CF. Current water rates and charges are outlined in the Rates and Fees table and summarized in Tables 9-1 and 9-2.

TABLE 9-1
Bimonthly Water Service Base Charges 2018

Meter Size	Bimonthly Base Charge
5/8"	\$65.00
1"	\$108.55
1-1/2"	\$216.45
2"	\$346.45
3"	\$650.00
4"	\$1,082.90
6"	\$2,166.45
8"	\$3,057.82

TABLE 9-2
Bimonthly Water Volume Charge

Cubic Feet	Residential Volume Rate	Commercial Volume Rate
0-1,000	\$1.58	\$1.80
1,001 – 2,000	\$2.11	\$2.21
2,001 – 4,000	\$2.79	\$2.59
4,001 – 6,000	\$4.51	\$3.40
> 6,000	\$6.88	\$4.54

The District's current general facility charge is \$11,900 per water unit (connection).

EXISTING WATER FUNDS

This section reviews past revenues and expenses and estimates future revenue, expenses and cash reserves. The District maintains three funds: Cash/Maintenance, Capital Improvement and Construction. The Cash/Maintenance Fund is the District's major operating fund. Revenue from water sales is deposited into this account. Salaries, insurance, meter replacement and day to day operations are funded by this account. The Capital Improvement Fund is used to fund asset replacements to the system. The District transfers money out of the Cash/Maintenance Fund as needed. The District in recent years has begun setting aside more cash to replace outdated infrastructure that is nearing the end of its useful life. As such, projections regarding future balances assume a steady transfer of cash from the Cash/Maintenance Fund at a higher rate than in years past

(\$240,000 per year as opposed to \$120,000 per year historically). The Construction Fund is funded largely through sales of what the District terms “Water Units” (general facility charge for new connections). The fund is used for new assets such as water main additions and source development, or significant upgrades to existing waterlines, such as increasing the capacity of water mains. However, the following tables in this chapter combine the three funds for simplicity’s sake.

HISTORICAL OPERATING REVENUES AND EXPENSES

This section presents historical operating revenues and expenses from the year 2012 through 2016 (Tables 9-3 and 9-4). Operating revenues and expenses include debt payments, planned interfund transfers to the Capital Improvement Fund account, and all other cash flows not related to capital construction activities. Though the general facility charge revenue is placed into the Maintenance Fund it is quickly transferred out into the Construction Fund.

While historical revenues and expenses are not necessarily indicative of future cash flows, they are a starting point for projecting future income and expenses. Ultimately, the financial health of a utility will be determined primarily by its ability to set monthly rates at a level that funds annual operation and maintenance (O&M) expenses, debt service and the planned transfer of funds. Sufficient reserves should be maintained for unanticipated capital costs and interruptions in our customers’ ability to pay. The District plans to maintain a minimum cash balance of \$600,000 at the end of each year. This accounts for 3 months of operating revenue in cash reserves (approximately \$300,000), plus an additional \$300,000 in reserves to cover possible emergency equipment replacement or repair.

TABLE 9-3**Historical Operating Revenue**

Income	2012	2013	2014	2015	2016
Residential					
Base	\$564,060	\$565,070	\$583,810	\$588,370	\$600,040
Usage	\$215,140	\$200,470	\$208,200	\$235,880	\$217,820
Adjustments	(\$15,160)	(\$10,360)	(\$6,780)	(\$6,970)	(\$8,050)
	\$764,040	\$755,180	\$785,230	\$817,280	\$809,810
Commercial					
Base	\$128,340	\$129,410	\$142,910	\$152,960	\$166,390
Usage	\$117,430	\$119,400	\$111,780	\$133,160	\$141,010
Adjustments	(\$1,940)	\$0	(\$730)	(\$60)	\$0
	\$243,830	\$248,810	\$253,960	\$286,060	\$307,400
Other Income					
Fire Mains	\$0	\$60	\$390	\$390	\$390
Service Installs	\$186,350	\$64,660	\$180,460	\$234,340	\$194,290
Misc. Fees	\$8,340	\$7,620	\$7,060	\$6,750	\$5,650
Late Fees	\$12,750	\$13,290	\$9,520	\$11,410	\$10,130
Sewer Billing	\$360	\$430	\$430	\$430	\$430
Street Lights	\$6,290	\$8,490	\$8,660	\$8,430	\$8,430
Misc. Income	\$16,720	\$10,430	\$21,750	\$36,420	\$2,630
Net Water Unit Transactions	\$0	(\$14,000)	\$0	\$32,250	\$0
	\$230,810	\$90,980	\$228,270	\$330,420	\$221,950
Income from Operations	\$1,238,680	\$1,094,970	\$1,267,460	\$1,433,760	\$1,339,160
Investment Income	\$4,590	\$3,900	\$3,840	\$5,280	\$13,000
Total Income	\$1,243,270	\$1,098,870	\$1,271,300	\$1,439,040	\$1,352,160

TABLE 9-4**Historical Operating Expense**

	2012	2013	2014	2015	2016
Personnel					
Administration:					
Salaries	\$135,470	\$138,350	\$138,000	\$142,980	\$137,330
Overtime	\$0	\$50	\$520	\$1,150	\$660
Meetings/Education	\$12,520	\$7,360	\$8,180	\$12,160	\$8,290
Paid Time Off	\$17,450	\$21,540	\$25,560	\$21,520	\$26,720
Admin Taxes	\$16,710	\$14,880	\$14,120	\$14,140	\$14,140
Admin Benefits	\$36,010	\$36,810	\$40,250	\$57,530	\$62,300
	\$218,160	\$218,990	\$226,630	\$249,480	\$249,440
Field Labor					
Regular Pay	\$119,890	\$119,350	\$131,730	\$135,190	\$140,250
Overtime	\$7,910	\$9,220	\$10,640	\$11,750	\$13,610
On-Call	\$3,750	\$3,700	\$3,590	\$3,550	\$3,670
Compliance	\$250	\$470	\$500	\$490	\$480
Meetings/Training	\$6,560	\$9,690	\$3,830	\$5,450	\$3,030
Paid Time Off	\$15,820	\$23,200	\$16,050	\$21,650	\$40,530
Field Taxes	\$15,630	\$21,930	\$16,700	\$23,070	\$25,170
Field Benefits	\$44,890	\$56,060	\$55,370	\$60,520	\$64,890
	\$214,700	\$243,620	\$238,410	\$261,670	\$291,630
Commissioners					
Salaries	\$5,510	\$3,840	\$5,120	\$4,210	\$5,690
Taxes	\$310	\$290	\$400	\$330	\$450
Education	\$0	\$200	\$70	\$0	\$0
	\$5,820	\$4,330	\$5,590	\$4,540	\$6,140
Total Labor Expense	\$438,680	\$466,940	\$470,630	\$515,690	\$547,210

TABLE 9-4 – (continued)**Historical Operating Expense**

	2012	2013	2014	2015	2016
Administration					
Office Expenses					
Office Supplies	\$4,110	\$3,740	\$3,530	\$4,320	\$2,960
Mailing Expenses	\$5,550	\$5,470	\$5,740	\$4,850	\$5,220
Computing Equip and Support	\$9,280	\$13,730	\$19,370	\$22,530	\$22,950
Building & Phones	\$14,150	\$16,660	\$17,020	\$20,180	\$18,520
Street Lighting	\$4,130	\$4,240	\$4,440	\$4,500	\$4,680
Property Taxes and Sewer	\$3,550	\$3,880	\$4,320	\$4,430	\$4,440
Total Office	\$40,770	\$47,720	\$54,420	\$60,810	\$58,770
Water Production					
Wells	\$35,740	\$37,030	\$40,450	\$43,310	\$45,590
Raw Water	\$20,610	\$17,260	\$16,340	\$14,790	\$13,720
Treatment	\$41,220	\$34,830	\$42,940	\$53,590	\$48,600
Tanks	\$500	\$4,560	\$400	\$670	\$610
Distribution					
Leaks and Maintenance	\$21,440	\$18,850	\$46,700	\$25,520	\$49,010
Locates	\$300	\$230	\$330	\$220	\$260
Vehicle Expense	\$11,950	\$12,090	\$13,050	\$7,190	\$5,410
Other Op. Expense					
Cross Connect	\$0	\$0	\$0	\$70	\$0
Meters	\$30,500	\$38,700	\$40,510	\$61,690	\$58,580
Safety Equip	\$1,160	\$980	\$820	\$2,190	\$1,400
Insurance	\$17,380	\$22,760	\$25,560	\$26,920	\$27,800
Travel	\$540	\$3,130	(\$1,660)	\$5,140	\$60
Conservation	\$2,460	\$1,640	\$1,370	\$1,290	\$80
Interest Expense	\$16,620	\$14,630	\$12,640	\$11,160	\$10,050

TABLE 9-4 – (continued)**Historical Operating Expense**

	2012	2013	2014	2015	2016
Regulatory	\$10,660	\$8,170	\$12,870	\$9,110	\$6,160
State Audits	\$0	\$80	\$11,610	\$0	\$0
Bank Charges	\$3,000	\$3,410	\$4,200	\$5,120	\$2,170
Comprehensive Plan	\$0	\$0	\$0	\$3,420	\$37,860
Sample Non-Reg	\$0	\$0	\$0	\$5,800	\$7,760
Professional Fees	\$16,760	\$31,140	\$24,400	\$17,190	\$38,560
Dues & Membership	\$3,550	\$2,940	\$1,380	\$4,790	\$1,960
Misc. Expense	\$550	\$1,220	\$1,280	(\$370)	\$2,320
Emergency Plan	\$150	\$0	\$0	\$610	\$640
GIS Maintenance	\$5,430	\$3,300	\$1,260	\$6,300	\$470
Communications Field	\$3,160	\$3,240	\$3,140	\$4,230	\$6,250
Total Other Operating Expense	\$111,920	\$135,340	\$139,380	\$164,660	\$202,120
Total Expenses	\$723,130	\$774,850	\$824,640	\$886,450	\$971,300
Net Operating Income	\$520,140	\$324,020	\$446,660	\$552,590	\$380,860
Depreciation Expense	(\$202,200)	(\$209,400)	(\$211,300)	(\$235,000)	(\$297,900)
	\$317,940	\$114,620	\$235,360	\$317,590	\$82,960

TABLE 9-5
Summaries of Historical Cash Flows

	2012	2013	2014	2015	2016
Beginning of Year Balance	\$783,600	\$769,244	\$707,026	\$794,385	\$813,800
Total Ordinary Income	\$1,243,270	\$1,098,870	\$1,271,300	\$1,439,040	\$1,352,160
Total Ordinary Expense	(\$723,130)	(\$774,850)	(\$824,640)	(\$886,450)	(\$971,300)
Net Ordinary Income	\$520,140	\$324,020	\$446,660	\$552,590	\$380,860
Other Income	\$1,304	\$4,962	\$2,899	\$725	\$642
Debt Service	(\$333,800)	(\$371,100)	(\$266,200)	(\$243,700)	(\$181,900)
Transfer to Capital Improvement Fund	(\$202,200)	(\$209,400)	(\$211,300)	(\$235,000)	(\$297,900)
Miscellaneous Transactions	\$200	\$189,300	\$115,300	(\$55,200)	\$99,400
End of Year Balance	\$769,244	\$707,026	\$794,385	\$813,800	\$814,902

PROJECTED CASH FLOWS

Projected estimates for revenue and expense are based upon historical values and factors such as customer growth, interest rate, inflation, cost of living adjustments (COLA) for salaries, etc. (Table 9-6).

TABLE 9-6
Factors Used in Projection of Costs

Factor	Annual Percent Increase
Interest	3.50%
Labor Cost	5.00%
General Inflation	2.50%
Power/Electricity Costs	1.50%
Insurance Costs	6.00%
Office Supplies/Mail Expense	1.50%
Computer and Internet ¹	2.00%
Phone/Communications	1.50%
Rate Increases 2022	10.00%
Rate Increases 2023	5.0%
Rate Increases 2024	8.0%
Rate Increase 2025	4.0%
Rate Increases 2026 -2030 (Alternates Annually)	8.0% (even years) 4.0% (odd years)

The revenue projections include the rate increases implemented in 2017 through 2021, and assume additional rate increases each year beginning July 1, 2022. Overall income will increase through a combination of base fees, usage fees and increased water usage from new water units coming online.

Table 9-7 presents the projected revenue and income through the 10-year planning period. Projected water sale revenue assumes 24 new connections to the system each year (see Chapter 2). Ten of the 24 new connections are assumed to be from customers who already own a water share but are not yet consuming water, and thus are already paying monthly base fees. These connections are included in the projections as a percentage growth rate applied to both the base charge and usage fees for all customers, as it is unclear at this time which customer class any future connections will belong to.

Table 9-8 projects expenses through the 10-year planning period. Salaries are increased based upon the assumed Cost of Living Adjustment, while other costs are estimated based upon the inflation rate. Bank Service Charge and Investment Income are estimated based upon the interest rate, which is less than 1 percent. The prior year's ending balance

is used to estimate investment income.

Table 9-9 summarizes the projected Operating Revenue and Expenses and projects end-of-year cash balances through the 10-year planning period.

Table 9-10 presents the Capital Improvement projects that area scheduled through the planning period and how each project is funded; through District cash, through borrowing, or a combination of both. Loans are assumed to have a 25-year term at 3.5 percent interest.

TABLE 9-7**Projected Operating Revenue⁽¹⁾**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Residential										
Base	606,684	611,470	669,650	695,690	704,734	784,369	829,862	902,060	944,457	1,026,625
Usage	236,650	236,290	300,500	351,840	356,400	396,673	419,680	456,193	477,634	519,188
Adjustments	(8,440)	(5,710)	(10,200)	(24,320)	(24,300)	(24,300)	(24,300)	(24,300)	(24,300)	(24,300)
	834,894	842,050	959,950	1,023,210	1,036,834	1,156,742	1,225,243	1,333,953	1,397,791	1,521,513
Commercial										
Base	156,310	154,760	171,150	178,000	180,314	200,690	212,330	230,802	241,650	262,674
Usage	145,490	141,930	174,740	173,300	175,604	195,447	206,783	224,773	235,337	255,812
Adjustments	0	(810)	1,800	(520)	(500)	(500)	(500)	(500)	(500)	(500)
	301,800	295,880	347,690	350,780	355,418	395,636	418,612	455,075	476,487	517,985
Fire Mains	1,170	1,170	1,270	1,330	1,300	1,447	1,531	1,664	1,742	1,894
Service Installs	0	0	0	6,700	6,700	6,700	6,700	6,700	6,700	6,700
Misc. Fees	5,050	5,100	5,200	4,400	4,400	4,400	4,400	4,400	4,400	4,400
Late Fees	11,590	10,230	9,640	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Sewer Billing	430	360	430	545	545	545	545	545	545	545
Street Lights	8,430	8,430	8,430	8,500	8,500	8,500	8,500	8,500	8,500	8,500
Misc. Income	20,760	23,580	18,157	34,920	34,940	34,940	34,940	34,940	34,940	34,940
Adjustments and Fees	47,430	48,870	43,127	58,795	58,785	58,932	59,016	59,149	59,227	59,379
Income from Operations	1,184,124	1,186,800	1,350,767	1,432,785	1,451,037	1,611,311	1,702,871	1,848,177	1,933,505	2,098,877
Investment Income	12,142	19,700	27,500	16,600	8,400	9,200	10,100	11,100	12,200	13,400
Total Income	1,196,266	1,206,500	1,378,267	1,449,385	1,459,437	1,620,511	1,712,971	1,859,277	1,945,705	2,112,277

(1) 2017-2020 include actual budgetary data for those years. 2021 through 2026 include projections.

TABLE 9-8⁽¹⁾**Projected Operating Expense**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Personnel										
Administration										
Salaries	139,640	142,740	153,500	165,000	173,300	181,965	191,063	200,617	210,647	221,180
Overtime	1,820	1,300	1,600	850	900	945	992	1,042	1,094	1,149
Regulatory	6,620	8,850	3,385	2,220	2,200	2,270	2,344	2,421	2,502	2,587
Paid Time Off	62,580	20,720	26,700	27,000	28,400	29,820	31,311	32,877	34,520	36,246
Admin Taxes	17,020	14,120	14,650	18,100	19,060	20,013	21,014	22,064	23,168	24,326
Admin Benefits	70,540	47,420	60,000	61,960	65,100	68,355	71,773	75,362	79,130	83,086
	298,220	235,150	259,835	275,130	288,960	303,368	318,497	334,382	351,061	368,574
Field Labor										
Base Wages	113,030	136,820	151,200	174,715	183,400	192,570	202,199	212,309	222,924	234,071
Overtime	58,610	37,530	38,650	61,550	63,200	65,513	67,936	70,475	73,134	75,920
On-Call	4,390	4,460	6,000	26,000	27,300	28,665	30,098	31,603	33,183	34,843
Meetings/Trainings	6,850	12,680	12,600	16,600	17,500	18,375	19,294	20,259	21,271	22,335
Paid Time Off	26,320	23,670	30,600	36,600	38,400	40,320	42,336	44,453	46,675	49,009
Field Taxes	23,990	24,350	26,500	32,500	34,100	35,805	37,595	39,475	41,449	43,521
Field Benefits	55,740	91,420	92,200	121,400	127,500	133,875	140,569	147,597	154,977	162,726
	288,930	330,930	357,750	469,365	491,400	515,123	540,027	566,170	593,614	622,424
Commissioners										
Salaries	7,980	5,700	6,600	6,100	7,400	7,770	8,159	8,566	8,995	9,444
Taxes	620	390	520	470	500	525	551	579	608	638
	8,600	6,090	7,120	6,570	7,900	8,295	8,710	9,145	9,603	10,083
Total Labor Expense	595,750	572,170	624,705	751,065	788,260	826,786	867,234	909,697	954,277	1,001,081
Office Expenses										
Office Supplies	4,200	2,990	3,600	3,060	3,100	3,100	3,100	3,100	3,100	3,100
Mailing Expenses	5,450	4,730	4,900	6,300	6,400	6,496	6,593	6,692	6,793	6,895
Computing and Support	26,160	33,100	34,900	31,960	32,600	33,326	34,069	34,829	35,606	36,401
Building and Equipment	25,370	13,580	14,850	12,390	12,600	12,768	12,940	13,116	13,296	13,480

TABLE 9-8⁽¹⁾ – (continued)**Projected Operating Expense**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Street Lighting	5,040	4,420	4,500	4,400	4,500	4,568	4,636	4,706	4,776	4,848
Property Taxes and Sewer	5,820	5,820	6,900	7,100	7,300	7,472	7,647	7,827	8,011	8,200
Total Office	72,040	64,640	69,650	65,210	66,500	67,729	68,986	70,270	71,582	72,923
Operations (Non-Labor)										
Water Production										
Wells	39,490	41,690	52,545	65,180	64,100	65,663	67,271	68,923	70,623	72,370
Raw Water	0	0	0	0	0	0	0	0	0	0
Treatment	114,350	77,756	61,600	49,140	49,900	50,819	51,766	52,740	53,743	54,776
Tanks	810	1,270	7,800	630	700	715	730	746	762	779
Distribution										
Leaks and Maintenance	37,700	50,840	81,480	61,370	63,200	64,883	66,630	68,444	70,326	72,282
Meters	16,100	16,840	22,600	17,640	17,800	18,087	18,380	18,680	18,989	19,305
Locates	5,990	8,180	7,500	10,400	10,800	11,232	11,681	12,149	12,635	13,140
Vehicle Expense	8,200	11,860	9,280	14,425	15,800	17,350	19,055	20,931	22,994	25,263
Other Op Expense										
Safety Equip	1,450	2,630	6,000	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Meeting/Education Field										
Insurance	27,830	30,570	31,000	33,000	35,000	37,100	39,326	41,686	44,187	46,838
Travel	1,390	4,030	1,100	50	100	100	100	100	100	100
Conservation	1,210	530	750	350	400	406	412	418	425	431
Interest Expense	8,940	7,830	3,700	6,222	5,031	3,797	31,896	29,953	57,409	67,830
Regulatory	7,010	31,890	19,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
State Audits	9,940	0	0	12,700	0	0	15,875	0	0	19,844
Bank Charges	630	560	500	650	700	702	704	706	708	711
Comprehensive Plan	12,530	7,370	3,000	800	800	800	800	800	800	800
Sample non-reg	1,150	0	1,600	250	300	311	321	333	344	356
Professional Fees	26,450	32,790	23,000	21,900	21,900	21,900	21,900	21,900	21,900	21,900
Dues & Membership	3,770	5,150	3,500	3,800	3,900	4,037	4,178	4,324	4,475	4,632

TABLE 9-8⁽¹⁾ – (continued)

Projected Operating Expense

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Misc. Expense	7,490	19,830	29,600	22,240	23,100	23,995	24,935	25,922	26,958	28,046
GIS Maintenance	430	430	0	0	0	0	0	0	0	0
Communications Field	4,750	4,910	6,900	7,600	7,800	7,995	8,195	8,400	8,610	8,825
Total Other Operating Expense	114,970	148,520	129,650	122,062	111,531	113,642	161,142	147,041	178,415	212,812
Total Expenses	1,005,400	993,766	1,066,810	1,157,122	1,188,591	1,236,906	1,332,874	1,369,621	1,454,345	1,544,729
Net Operating Income	190,866	212,734	311,457	292,263	270,846	383,604	380,096	489,656	491,360	567,547
Gain/Loss of Fixed asset	352	352	300	300	300	300	300	300	300	313
Depreciation Expense	(259,245)	(264,958)	(262,428)	(276,730)	(313,430)	(304,857)	(342,033)	(365,939)	(377,572)	(400,487)
Net Income	(68,027)	(51,872)	49,329	15,833	(42,283)	79,047	38,363	124,018	114,088	167,374

(1) 2017-2020 include actual budgetary data for those years. 2021 through 2026 include projections.

TABLE 9-9⁽¹⁾
Summary Projected Cash Flows

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Beginning of Year Cash	\$814,902	\$946,301	\$1,099,568	\$1,147,918	\$1,238,714	\$1,013,793	\$615,130	\$805,270	\$659,349	\$752,228
Total Ordinary Income	\$1,184,124	\$1,186,800	\$1,350,767	\$1,432,785	\$1,451,037	\$1,611,311	\$1,702,871	\$1,848,177	\$1,933,505	\$2,098,877
Total Ordinary Expense	\$1,005,400	\$993,766	\$1,066,810	\$1,157,122	\$1,188,591	\$1,236,906	\$1,332,874	\$1,369,621	\$1,454,345	\$1,544,729
Net Ordinary Income	\$178,724	\$193,034	\$283,957	\$275,663	\$262,446	\$374,404	\$369,996	\$478,556	\$479,160	\$554,147
Other Income	\$12,142	\$19,700	\$27,500	\$16,600	\$8,400	\$9,200	\$10,100	\$11,100	\$12,200	\$13,400
CIP Self-Funding	\$0	\$0	(\$203,640)	(\$142,000)	(\$436,300)	(\$722,800)	(\$84,900)	(\$530,521)	(\$242,162)	(\$313,315)
Existing Debt Service	(\$59,467)	(\$59,467)	(\$59,467)	(\$59,467)	(\$59,467)	(\$59,467)	(\$32,248)	(\$32,248)	(\$32,248)	\$0
CIP Debt Service	-	-	-	-	-	-	(\$72,809)	(\$72,809)	(\$124,071)	(\$124,071)
End of Year Balance	\$946,301	\$1,099,568	\$1,147,918	\$1,238,714	\$1,013,793	\$615,130	\$805,270	\$659,349	\$752,228	\$882,389

(1) 2017-2020 include actual budgetary data for those years. 2021 through 2026 include projections.

Table 9-10 demonstrates the District's historical and future debt burden due to funding capital projects. The water utility currently has existing debt for two projects: Well 4 and the Gorsuch Road water main. These debts will be paid in full as of 2025. The District will generate sufficient cash from operations to self-fund approximately \$2.7 million in capital projects through 2026, with the remaining capital cost of \$2.7 million to be funded through borrowing by the District. Table 9-10 includes the estimated cost of each capital project, escalated to the year of construction assuming 2.5 percent annual inflation (this is indicated in Table 8-1 as well).

TABLE 9-10⁽¹⁾**Capital Improvement Funding and District Debt**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Capital Improvement Cost	-	-	\$203,640	\$142,000	\$436,300	\$1,922,800	\$84,900	\$1,375,400	\$237,800	\$957,700
District Self-Funding	\$0	\$0	\$203,640	\$142,000	\$436,300	\$722,800	\$84,900	\$530,521	\$242,162	\$313,315
District Borrowing	\$0	\$0	\$0	\$0	\$0	\$1,200,000	\$0	\$844,879	\$0	\$644,385
Existing Debt	\$328,200	\$277,200	\$225,100	\$171,900	\$117,900	\$63,100	\$33,400	-	-	-
Total Debt⁽²⁾	\$328,200	\$277,200	\$225,100	\$171,900	\$117,500	\$63,100	\$1,160,591	\$1,087,782	\$1,808,591	\$1,684,519

(1) 2017-2020 include actual budgetary data for those years. 2021 through 2026 include projections.

(2) Total debt is calculated based on existing debt plus CIP Debt incurred in previous years – this is the total of the debt burden calculated for each year, rather than the annual debt payment. CIP debt is realized in the year following the year of initiation of the project (for example, the \$1,922,800 Capital Improvement cost is shown as partially self-funded (\$722,800) in 2022 with District funds, plus \$1,200,000 is borrowed (Capital Improvement Debt) in 2022. However, the debt is not shown in the “Total Debt” until 2023.

CUSTOMER SERVICE RATES AND CHARGES

Title 57.08.005 of the RCW gives water districts authority to fix, alter, regulate, and control rates and charges and to levy charges for connection to the water system. The only stipulation is that connection charges must be uniform over the same class of customers or over the same level of service. Factors may be considered when determining customer classes or level of service, including the difference in cost of service for different customers, the difference in operation and maintenance of various parts of the system, different levels of service provided to different customers, the quantity and quality of water distributed, capital contributions and the cost of system improvements.

Rate-based charges are applied to the utility's customers as an element of the total service charges for utility services. Charges are collected through an established set of rates and rate schedules and are normally applied, as close as is practical, to the use of service.

A Utility develops the user charges based on either short-term cash flow requirements or long-term cost-of-service principles. For cash flow-based ratemaking, utility charges are a function of annual operation and maintenance costs, capital expenditures including debt service, funding or drawdown of cash reserves, and other revenue sources such as interest earnings and General Facility Charge revenues. While there are various methods that can be employed in developing rates, each is considered and evaluated based on the ability of each to achieve the following objectives:

1. Financially stable – effective in recovering the costs of providing capacity.
2. Practical – easy to understand, publicly acceptable, and feasible for the District to administer.
3. Equitable – fair in apportioning the total cost of capacity among new customers.
4. Legally justifiable – can assure that the capacity charge would be upheld by the courts.

SUMMARY

The projections presented above assume that a mix of self-funding, loans and grant funding will be utilized. While there are limited grant opportunities, grant funding would reduce the financial burden on the District and is being sought in some of the projects listed in Chapter 8. Loans to the District would increase long term financial liabilities with less impact on operating expenses, allowing the District to maintain higher reserve balances during the term of the loans. When available, the District will seek long-term low interest loans to minimize carrying costs.

APPENDIX A

WDOH PROJECT APPROVAL

Water System Plan Submittal Form

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

Water District 19	38900 R	Water District 19
1. Water System Name	PWS ID# or Owner ID#	Water Systems Owner's Name
John Martinak	206-463-9007	General Manager
Contact Name for Utility	Phone Number	Title
17630 100th Avenue Southwest	Vashon	WA
Contact Address	City	98070
Kerri Sidebottom, P.E.	(206) 284-0860	State
2. Project Engineer	Phone Number	Zip
1130 Rainier Ave S, Suite 300	Seattle	Engineer
Project Engineer Address	City	Title
3. Billing Contact Name (required if not the same as #1)	Billing Phone Number	WA
Billing Address	City	98144
		State
		Zip
4. How many services are presently connected to your system?	1,472	
5. Is your system expanding (<i>circle what applies:</i> seeking to extend service area or increase number of approved connections?)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
6. If the number of services is expected to increase, how many <i>new</i> connections are proposed in the next six years?	120	
7. If your system is private-for-profit, is it regulated by the State Utilities and Transportation Commission?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
8. Is the system located in a Critical Water Supply Service Area (i.e., have a Coordinated Water System Plan)?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
9. Is your system a customer of a wholesale water system?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
10. Will your system be pursuing additional water rights from the Department of Ecology in the next 20 years?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
11. Is your system proposing a new intertie?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
12. Do you have projects currently under review by us?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
13. Are you requesting distribution main project report and construction document submittal exception and if so, does the WSP contain standard construction specifications for distribution mains?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
14. The water system is responsible for sending a copy of the WSP to adjacent utilities for review or a letter notifying them that a copy of the WSP is available for their review and where the review copy is located. Has this been completed?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
15. The purveyor is responsible for sending a copy of the WSP to all local governments within the service area (county and city planning departments, etc.). Has this been completed?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
16. Are you proposing a change in the place of use of your water right?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
17. What is the last year of the plan approval period (the year the shortest WSP projection is made)?	2026	

If answer to questions 7,8, 11, 14 and/or 15 is "yes," list who you sent the WSP to: King County

Is this plan: an Initial Submittal a Revised Submittal

Please enclose the following number of copies of the WSP:

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

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

Northwest Drinking Water Operations
 Department of Health
 20425 72nd Avenue South, Suite 310
 Kent, WA 98032-2358
 253-395-6750

Southwest Drinking Water Operations
 Department of Health
 PO Box 47823
 Olympia, WA 98504-7823
 360-236-3030

Eastern Drinking Water Operations
 Department of Health
 16201 East Indiana Avenue Suite 1500
 Spokane Valley, WA 99216
 509-329-2100

For people with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TDD/TTY call 711).

APPENDIX B

WATER FACILITIES INVENTORY REPORT



WATER FACILITIES INVENTORY (WFI) FORM

Quarter: 1
Updated: 05/11/2020

ONE FORM PER SYSTEM

Printed: 1/11/2021

WFI Printed For: On-Demand

Submission Reason: Contact Update

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

1. SYSTEM ID NO. 38900 R	2. SYSTEM NAME WATER DISTRICT 19	3. COUNTY KING	4. GROUP A	5. TYPE Comm
6. PRIMARY CONTACT NAME & MAILING ADDRESS JIM MCRAE [WS MANAGER] WATER DISTRICT 19 PO BOX T VASHON, WA 98070		7. OWNER NAME & MAILING ADDRESS WATER DISTRICT 19 JIM MCRAE PO BOX T VASHON, WA 98070 GENERAL MANAGER		
STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS 17630 100TH AVE SW CITY VASHON STATE WA ZIP 98070		STREET ADDRESS IF DIFFERENT FROM ABOVE ATTN ADDRESS 17630 100TH AVE SW CITY VASHON STATE WA ZIP 98070		
9. 24 HOUR PRIMARY CONTACT INFORMATION Primary Contact Daytime Phone: (206) 463-9007 x503 Primary Contact Mobile/Cell Phone: (206) 305-1764 Primary Contact Evening Phone: Fax: _____ E-mail: xxxxxxxxxxxxxxxxxxxx		10. OWNER CONTACT INFORMATION Owner Daytime Phone: (206) 463-9007 Owner Mobile/Cell Phone: (206) 305-1764 Owner Evening Phone: Fax: (206) 463-1262 E-mail: xxxxxxxxxxxxxxxxxxxx		
11. SATELLITE MANAGEMENT AGENCY - SMA (check only one) <input type="checkbox"/> Not applicable (Skip to #12) <input checked="" type="checkbox"/> Owned and Managed SMA NAME: WATER DISTRICT 19 SMA Number: 130 <input type="checkbox"/> Managed Only <input type="checkbox"/> Owned Only				
12. WATER SYSTEM CHARACTERISTICS (mark all that apply) <input checked="" type="checkbox"/> Agricultural <input checked="" type="checkbox"/> Hospital/Clinic <input checked="" type="checkbox"/> Residential <input checked="" type="checkbox"/> Commercial / Business <input checked="" type="checkbox"/> Industrial <input checked="" type="checkbox"/> School <input checked="" type="checkbox"/> Day Care <input checked="" type="checkbox"/> Licensed Residential Facility <input type="checkbox"/> Temporary Farm Worker <input checked="" type="checkbox"/> Food Service/Food Permit <input checked="" type="checkbox"/> Lodging <input checked="" type="checkbox"/> Other (church, fire station, etc.): <input type="checkbox"/> 1,000 or more person event for 2 or more days per year <input checked="" type="checkbox"/> Recreational / RV Park				
13. WATER SYSTEM OWNERSHIP (mark only one)			14. STORAGE CAPACITY (gallons) <input type="checkbox"/> Association <input type="checkbox"/> County <input type="checkbox"/> Investor <input checked="" type="checkbox"/> Special District <input type="checkbox"/> City / Town <input type="checkbox"/> Federal <input type="checkbox"/> Private <input type="checkbox"/> State 1,726,000	

- SEE NEXT PAGE FOR A COMPLETE LIST OF SOURCES -

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME			3. COUNTY				4. GROUP		5. TYPE				
38900 R	WATER DISTRICT 19			KING				A		Comm				
15	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 SPRING SPRING IN SPRINGFIELD SPRING FIELD SURFACE WATER SEA WATER RANNEY / INF. GALLERY SURFAC WELL IN A WELL FIELD WELL FIELD WELL	19 USE PERMANENT SEASONAL OTHER	20	21 TREATMENT IRRADIATION (UV) FLUORIDATION FILTRATION CHLORINATION NONE	22 DEPTH DEPTH TO FIRST OPEN INTERVAL IN FEET	23 CAPACITY (GALLONS PER MINUTE)	24 SOURCE LOCATION		TOWNSHIP SECTION NUMBER 1/4, 1/4 SECTION	RANGE 23N 03E		
Source Number	S01	Beall Creek		X		X Y	X X		X	400	SW SE	29	23N 03E	
S02	Ellis Creek			X		X Y	X X		X	200	NE NE	08	22N 03E	
S03	Well # 1		X			X Y	X			670	SW SE	31	23N 03E	
S04	Well #2		X			X Y	X			652	SW SE	31	23N 03E	
S05	Beall/Ellis				X	X Y	X X		X	600	SW SE	29	23N 03E	
S06	Well #3 (100 K Tank Site)	X			X	Y	X			338	35	NW SW	08	22N 03E
S07	32300L/Heights Water	32300 L				X Y X					0		00N 00E	
S08	Well #4 AKM948		X		X	Y	X			616	250	SW SE	31	23N 03E
S09	Wells 1, 2 & 4		X		X	N	X			616	250	SW SE	31	23N 03E
S10	Beall Well APP677	X			X	Y	X X		X	498	80		00N 00E	
S11	Vashon Meadow AFA518	X			X	Y	X			200	11	NE SE	31	23N 03E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE									
38900 R	WATER DISTRICT 19	KING	A	Comm									
			ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS									
				DOH USE ONLY! APPROVED CONNECTIONS									
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)			1493	Unspecified									
A. Full Time Single Family Residences (Occupied 180 days or more per year)			1248										
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			34										
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year			245										
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year			0										
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)													
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)			0	0									
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.			207	207									
28. TOTAL SERVICE CONNECTIONS			1700										
29. FULL-TIME RESIDENTIAL POPULATION													
A. How many residents are served by this system 180 or more days per year? <u>3723</u>													
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
		4	4	4	4	4	4	4	4	4	4	4	4
34. NITRATE SCHEDULE		QUARTERLY				ANNUALLY				ONCE EVERY 3 YEARS			
(One Sample per source by time period)													
35. Reason for Submitting WFI:													
<input type="checkbox"/> Update - Change <input type="checkbox"/> Update - No Change <input type="checkbox"/> Inactivate <input type="checkbox"/> Re-Activate <input type="checkbox"/> Name Change <input type="checkbox"/> New System <input type="checkbox"/> 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: _____						

Intentionally left blank

WS ID WS Name

38900 WATER DISTRICT 19

Total WFI Printed: 1



Water Facilities Inventory (WFI)

Report Create Date: 1/11/2021

Water System Id(s): 38900

Print Data on Distribution Page: ALL

Print Copies For: DOH Copy

Water System Name: ALL

County: -- Any --

Region: ALL

Group: ALL

Type: ALL

Permit Renewal Quarter: ALL

Water System Is New: ALL

Water System Status: ALL

Water Status Date From: ALL **To:** ALL

Water System Update Date ALL **To:** ALL

Owner Number: ALL

SMA Number: ALL

SMA Name: ALL

Active Connection Count From: ALL **To:** ALL

Approved Connection Count ALL **To:** ALL

Full-Time Population From: ALL **To:** ALL

Water System Expanding ALL

Source Type: ALL

Source Use: ALL

WFI Printed For: On-Demand

APPENDIX C

WATER RIGHTS CERTIFICATES AND PERMITS

Water Right Self-Assessment Form for Water System Plan

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

Water Right Permit, Certificate, or Claim # <small>*If water right is interruptible, identify limitation in yellow section below</small>	WFI Source # <small>If a source has multiple water rights, list each water right on separate line</small>	Existing Water Rights				Current Source Production – Most Recent Calendar Year				10-Year Forecasted Source Production (determined from WSP)				20-Year Forecasted Source Production (determined from WSP)			
		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 S1-*0149C (SWC887)		404 gpm		651 af/yr		317 gpm	87 gpm	95 af/yr	556 af/yr	300 gpm	104 gpm	100 af/yr	551 af/yr				
2 S1-*0192C (SWC836)		224 gpm		361 af/yr		208 gpm	16 gpm	34 af/yr	327 af/yr	160 gpm	64 pm	40 af/yr	321 af/yr				
3 G1-23519C(A)	S09	250 gpm		222 af/yr		302 gpm	(52) gpm	191 af/yr	31 af/yr	250 gpm	0 gpm	210 af/yr	12 af/yr				
4 G1-23519C(B)	S06		250 gpm	78 af/yr		35 gpm	0 gpm	40 af/yr	38 af/yr	10 gpm	0 gpm	40 af/yr	38 af/yr				
5 S1-15998CAL (SWC 8145)	S10	180 gpm		55 af/yr		0 gpm	180 gpm	0 af/yr	55 af/yr	145 gpm	35 gpm	14 af/yr	41 af/yr				
6 G1-28746P		20 gpm		1.16 af/yr		10 gpm	10 gpm	1.14 af/yr	0.02 af/yr	20 gpm	0 gpm	1.16 af/yr	0 af/yr				
		TOTALS =	1,078 gpm	1,368.16		872 gpm	206 gpm	361.14 af/yr	1,007.02 af/yr	885 gpm	193 gpm	405.16 af/yr	963 af/yr	885 gpm	193 gpm	431.16 af/yr	937 af/yr

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

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				10-Year Forecasted Purchase				20-Year Forecasted Purchase			
	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															
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:

Current production numbers are as of 2020. 10-year and 20-year projections are for 2026 and 2036, respectively, as the WSP data is through 2016.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
SUPERSEDING
CERTIFICATE OF WATER RIGHT

RECEIVED
MAR 16 1993

Surface Water **10 GT-23319C Issued on December 15, 1982**
(Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

X **Ground Water** [Issued in accordance with the provisions of Chapter 253, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.]

PRIORITY DATE November 30, 1979	APPLICATION NUMBER G1-23519	PERMIT NUMBER G1-23519 P	CERTIFICATE NUMBER G1-23519 C
------------------------------------	--------------------------------	-----------------------------	----------------------------------

NAME
King County Water District #19

ADDRESS (STREET) (CITY) (STATE) (ZIP CODE)
P.O. Box 19 Vashon WA 98070

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 (F SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE 250	MAXIMUM ACRE-FEET PER YEAR 300
-------------------------------	-----------------------------------	-----------------------------------

QUANTITY, TYPE OF USE, PERIOD OF USE

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION-WITHDRAWAL

Well #1 - 750 feet north and 1600 feet west of the southeast quarter corner of Section 31
Well #2 - 750 feet north and 1564 feet west of the southeast quarter corner of Section 31

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION) SW 1/4 SE 1/4	SECTION 31	TOWNSHIP N. 23	RANGE (E. OR W.) W.M. 3 E	W.R.L.A. 15	COUNTY King
--	---------------	-------------------	------------------------------	----------------	----------------

RECORDED PLATTED PROPERTY

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by King County Water District #19 in Sections 4,5,6,7,8,9,16,17,18, Township 22N, Range 3 E, W.M.; Sections 36, Township 23 N, Range 2 E, W.M.; Sections 29,30,31,32, Township 23 N, Range 3 E, W.M.; all situated within King County, Washington

18

三
七

1085

920130750

King County Water Dist. #19
PO Box 19
Yakima, Wa. 98070

PROVISIONS

Static water level (SWL) shall be measured at least once each month. Measurements shall be taken after the pump has been shut off and the water level in the well has been stabilized. The data shall be maintained and made available to Ecology upon request. However, Ecology's Water Resources Section (NWRO) shall be notified if the SWL is determined to be below the level normally recorded at that time of year.

This permit is subject to the implementation of the minimum requirements established in the Interim Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology and Conservation Programs, July 1990.

9201310750

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 Bellevue, Washington,
this 22nd day of January, 1992.*

Department of Ecology

ENGINEERING DATA
OK WC D'Elia

by James R. Bucknell
James R. Bucknell, Section Supervisor Water Resources

FOR COUNTY USE ONLY

RECEIVED

OCT 22 1998

A. F. No. 2D-103, INC.

WATER DIST #19

CERTIFICATE RECORD NO. 2, PAGE NO. 836

STATE OF WASHINGTON, COUNTY OF KING

CERTIFICATE OF WATER RIGHT

(For rights perfected under original, enlargement or secondary permits.)

(In accordance with the provisions of Chapter 117, Laws of Washington for 1917, and the regulations of the State Supervisor of Hydraulics thereunder.)

This is to certify, that Island Mutual Water System of Portage, State of Washington, has made proof to the satisfaction of the State Supervisor of Hydraulics of Washington, of a right to the use of the waters of Unnamed stream, a tributary of Puget Sound, for the purposes of Domestic supply for community under Appropriation Permit No. 841 issued by the State Supervisor of Hydraulics, and that said right to the use of said waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the State Supervisor of Hydraulics of Washington and entered of record in Volume 2, at Page 836, on the 14th day of November, 1984; that the right hereby confirmed dates from November 14th, 1926; that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 0.5 cubic feet per second.

A description of the lands under such right, and to which the water hereby confirmed is appurtenant, or if for other purposes, the place where such water is put to beneficial use, is as follows:

PLACE OF USE			LEGAL SUBDIVISION	No. Acreage Described in Permit	No. Acres Actually Irrigated
Section	Township	RANGE			
4, 5, 6 - 22 N.	3 E. W.M.				
7, 8, 9					

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of herein described, except as provided in Section 39, Chapter 117, Session Laws 1917.

WITNESS the seal and signature of the State Supervisor of Hydraulics affixed this 14th day of November, 1984.

E.P. Portage, Inc.



2856846

CERTIFICATE RECORD NO. 2, PAGE NO. 887

STATE OF WASHINGTON, COUNTY OF King

CERTIFICATE OF WATER RIGHT

(For rights perfected under original, enlargement or secondary permits.)

(In accordance with the provisions of Chapter 117, Laws of Washington for 1917, and the regulations of the State Supervisor of Hydraulics thereunder.)

This is to certify, that Water District No. 19 of King County
 of Vashon, State of Washington, has made
 proof to the satisfaction of the State Supervisor of Hydraulics of Washington, of a right to the use of
 the waters of Beall Creek, a tributary of Puget Sound,
 for the purposes of Domestic supply for Vashon District No. 19
 under Appropriation Permit No. 538 issued by the State Supervisor of Hydraulics, and
 that said right to the use of said waters has been perfected in accordance with the laws of Washington,
 and is hereby confirmed by the State Supervisor of Hydraulics of Washington and entered of record in
 Volume 2, at Page 887, on the 14th day of June, 1925; that the right hereby confirmed dates from September 11th, 1925; that the amount of water to
 which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount
 actually beneficially used for said purposes, and shall not exceed 0.9 cubic feet per second.

A description of the lands under such right, and to which the water hereby confirmed is appurtenant,
 or if for other purposes, the place where such water is put to beneficial use, is as follows:

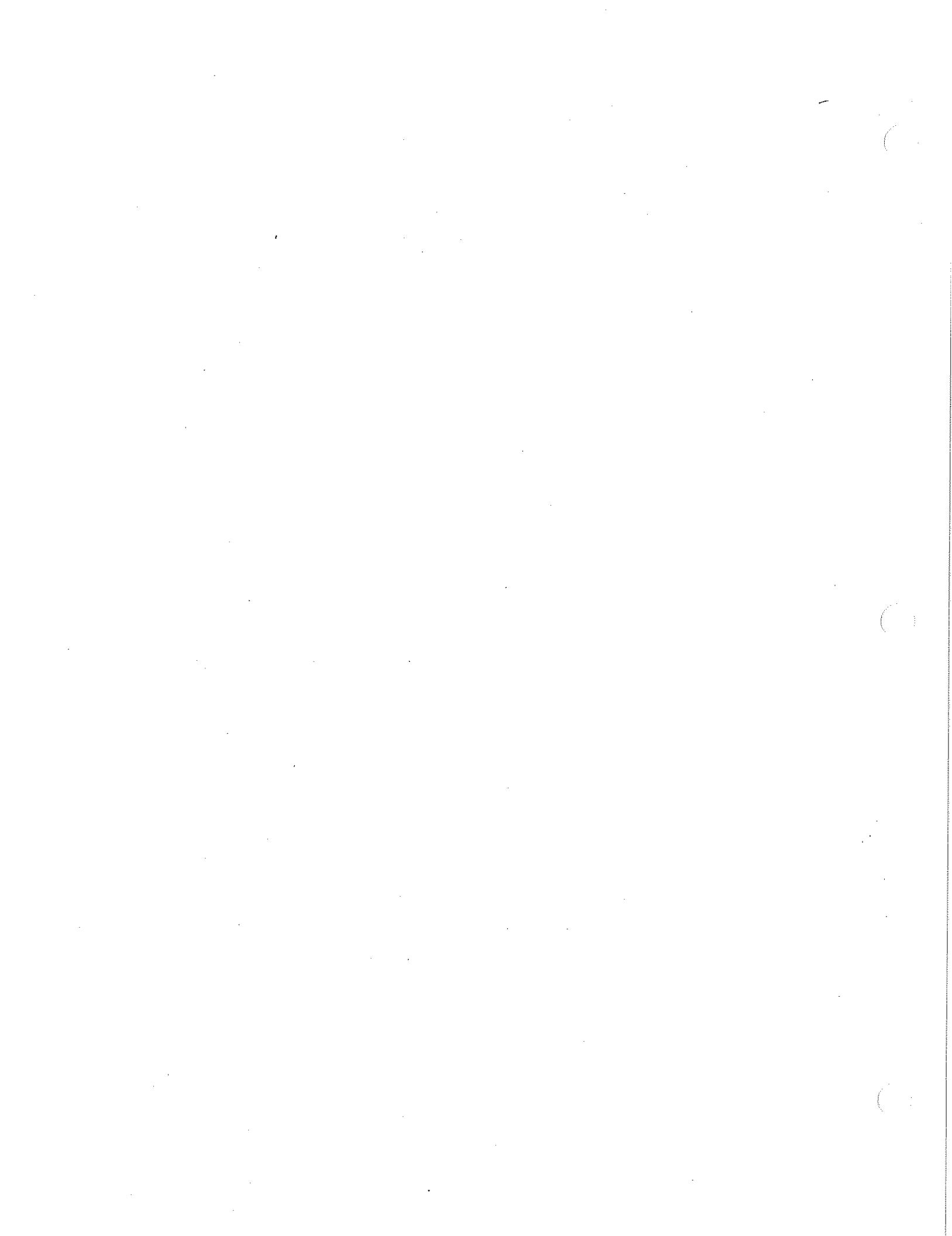
PLACE OF USE			LEGAL SUBDIVISION	NUMBER DESCRIBED IN BOOK	NUMBER IN BOOK
Section	Township	Range			
- 29, 30,	23 N.	3 E.W.M.	Town of Vashon and environs.		
31 & 32-					

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 Section 39, Chapter 117, Session Laws 1917.

WITNESS the seal and signature of the State Supervisor of Hydraulics affixed this 14th day
 of June, 1925.



State Supervisor of Hydraulics.



REPORT OF EXAMINATION

Date of application 4-14-60 Date of examination 4-20-60 Application No. 15998

Name Beall Greenhouse Company Address Vashon, Wash.

Quantity applied for 0.40 c.f.s. Use greenhouse use

Source of appropriation Beall Creek and unnamed springs Tributary of Puget Sound

Legal sub. SW 1/4 of Sec. 29 Twp. 23 N. Rge. 3 E. County King

Measured or estimated quantity streams - 0.40 springs - 0.30 0.90 c.f.s. Probable low flow

Quantity previously appropriated: W.T. 1.085 CWT. 1.285 S.T. 1.075

Other use made of water Town of Vashon and local water district

Diversion works contemplated or observed several pipelines from separate springs join at pumphouse, 1 inch and 2 inch lines then carry pumped water to greenhouse

Other equipment

Irrigable acreage: Planned Present Feasible

Other water rights appurtenant to this land none except claimed pre-1917 use.

Progress of project in use since 1895

Protests

Quantity recommended (total) 0.40 c.f.s. Irrig.

Demand

Power Municipal Other uses 0.40 c.f.s. for greenhouse use

Department of Fisheries and Game report see below

Special remarks and provisions: Diversion intake shall be tightly screened at all times with wire having a mesh opening not greater than .125 (1/8) inch.

The applicant states that the filing for water right in the amount of 0.40 c.f.s. is made so that their claimed pre-1917 use of the water is a matter of record.

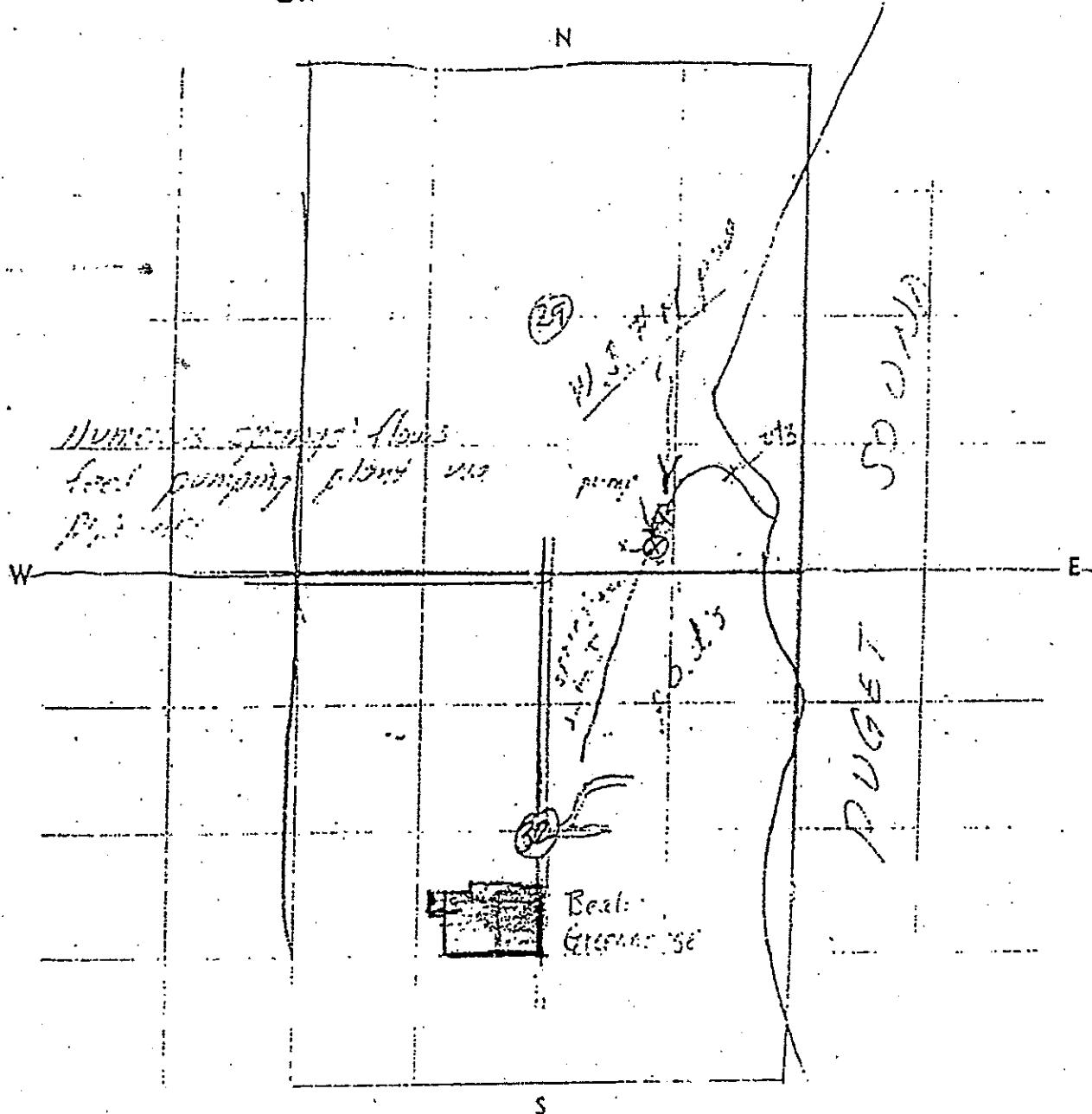
In accordance with section 91.20.060 W.W., I find that there is water available for appropriation from the source in question and that the diversion proposed in the application will not impair existing rights or be detrimental to the public welfare. Therefore, permit should issue as recommended above subject to existing rights and indicated provisions.

Signed this 16th day of June, 1960.
Division of Water Resources

D. Moleman
D. Moleman, Geologist

SECTION PLAT

Sec. 32 Twp. 23 N.R. 3 E 4 W 11



Be sure to show distance and bearing of point of diversion from nearest 1/4-acre corner. Also travelling directions from nearest town or main highway.

Scale: 1 inch = 800 feet

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

REPORT OF EXAMINATION
TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

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

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

PRIORITY DATE November 30, 1979	APPLICATION NUMBER G1-23519	PERMIT NUMBER	CERTIFICATE NUMBER
NAME KING COUNTY WATER DISTRICT No. 19			
ADDRESS (STREET) P. O. Box T	(CITY) Vashon	(STATE) Washington	(ZIP CODE) 98070

Field Examination: March 25, 1980

PUBLIC WATERS TO BE APPROPRIATED

SOURCE Well (6" x 670')
TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE 280	MAXIMUM ACRE-FEET PER YEAR 300
QUANTITY, TYPE OF USE, PERIOD OF USE <u>Domestic Supply - continuously</u>		

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION-WITHDRAWAL
Approximately 750 feet north and 1600 feet west of SE corner of Sec. 31

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION) NE 1/4 SW 1/4 SE 1/4	SECTION 31	TOWNSHIP N. 23	RANGE, I.E. OR W.I. W.M. 3 E	W.R.I.A. 15	COUNTY King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by King County Water District No. 19.

DESCRIPTION OF PROPOSED WORKS

Well, 6" diameter, 670' depth; 30-40 HP motor; small pumphouse.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	1 yr from permit issuance	2 yrs from permit issuance

REPORT PROGRAMS

Background:

The Northwest Regional Office of the Department of Ecology received Ground Water Application G1-23519 from King County Water District No. 19 on November 30, 1979. The intent of the applicant is to withdraw 337 gallons per minute (gpm) from a deep silty sand and gravel aquifer for the purpose of supplementing an existing domestic municipal supply on Vashon Island near the town of Vashon.

Public notice of Ground Water Application G1-23519 was made on February 21 and 28, 1980 and no protests were filed during the protest period which ended March 28, 1980.

Investigations:

The well referred to in Application G1-23519 was field investigated on March 25, 1980. The 6-inch casing was found welded shut and accurately located as specified on the Application G1-23519 in SW $\frac{1}{4}$ SE $\frac{1}{4}$ of Sec. 31, T. 23N, R. 3E.W.M., Vashon Island, King County.

The report on construction and testing of the subject well was received by this department on March 31, 1980. The well log shows a 6-inch diameter hole drilled to 1005 feet below ground surface and backfilled with drill cuttings to 670 feet below land surface. The resulting well is screened below 609 feet below ground surface and taps a silty sand and gravel aquifer which is approximately 100 feet thick at the well site. Aquifer testing on the well indicates that the aquifer is of limited areal extent and probably has a channel configuration. The aquifer test report indicates that the maximum capacity of the well is less than 300 gpm. Mr. Roy Wilkerson, manager of King County Water District No. 19, indicated in an oral communication on May 7, 1980, that the expected maximum pump capacity will be 280 gpm.

The static water level in the well was 382.6 feet below ground surface on September 25, 1979. Because this static level is 29 feet above mean sea level and the well is located over one mile inland, pumping the well is not expected to significantly encourage sea-water intrusion into the aquifer.

The applicant, King County Water District No. 19, serves the population in the vicinity of the subject well within about a two mile radius of the well. There is no expected adverse effect on existing rights from the granting of Application G1-23519 as no other rights have been established in the subject aquifer.

Water District No. 19 now has 940 services and expects 2,440 services by the year 2000. This projection of number of services is based on an average population of three persons per service. Water consumption in District No. 19 was 415 acre-feet in 1979, which indicates a consumption rate of 0.44 acre-foot per service per year. By the year 2000, then, King County Water District No. 19 will require 1075 acre-feet per year, or about 660.0 acre-feet of water in addition to their 1979 appropriation. The subject well would provide 450 acre-feet per year if pumped continuously at the maximum rate of 280 gpm. At an average pumping rate of 260 gpm, pumped approximately 70% of the year, the annual quantity of water would be 300 acre-feet. The 300 acre-feet per year is an appropriate annual quantity for Ground Water Application G1-23519 as it is a realistic annual pumpage for the subject well and is adequate to satisfy projected demand in the water district when taken with Surface Water Application S1-23436 for 363 acre-feet per year from unnamed springs near Ellisport, Vashon Island.

Water right applications and certificates held by King County Water District No. 19 are shown in Table A.

Number	Source	Maximum Rate	Annual Quantity	
Certificate No. 836	Unnamed stream	0.5 cfs	not specified	
Certificate No. 887 (Application) SI-23436	Teall Creek Unnamed springs	0.9 cfs 0.5 cfs	not specified 363*	Cancelled 2/17/81
(Application) GI-23519	Well	280 gpm*	300*	No new SI-23436A

Table A: Water right applications and certificates of King County Water District No. 19. Certificate No. 836 is in the name of Island Mutual Water System though now owned by King County Water District No. 19. (Asterisks indicate amounts recommended by this report.)

Conclusions:

Aquifer testing of the well referred to in Ground Water Application GI-23519 indicates that there is water in the subject aquifer which is available for appropriation. The specific capacity of the well, and the expected pump size indicate a pumping rate of 280 gpm will be the maximum rate.

Projected water demand combined with present use and water rights now held by King County Water District No. 19 indicate that an annual quantity of 300 acre-feet per year is appropriate for and would be fully utilized by the beneficial use of domestic municipal supply.

The present investigation reveals that no adverse effect on existing rights will result from granting Ground Water Application GI-23519 and that the proposed project will not be detrimental to the public welfare.

Recommendations:

In accordance with Section 90.03 and 90.44 RCW, I find that there is water available for appropriation from the source in question and that the appropriation as recommended above will not impair existing rights or be detrimental to the public welfare. Therefore, permit should issue, subject to existing rights and indicated provisions.

I recommend that Ground Water Application GI-23519 from King County Water District No. 19 to withdraw 337 gallons per minute from a well in SW^{1/4}SE^{1/4} of Sec. 31, T. 23N., R. 3E.W.M., be reduced to a maximum rate of 280 gallons per minute not to exceed 300 acre-feet per year.

Installation and maintenance of an access port as described in Ground Water Bulletin No. 1 is required. An air line and gauge may be installed in addition to the access port.

At such time that the Department of Ecology determines that regulation and management of the subject surface waters is necessary and in the public interest, an approved measuring device shall be installed and maintained in accordance with RCW 90.03.360 and WAC 508-64-020 through WAC 508-64-040.

REPORT BY: David P. Coxland

APPROVED BY: William D. Brinkley Jr.
Resources Management
Supervisor

DATE: June 27, 1980

DATE: July 1, 1980



STATE OF WASHINGTON, COUNTY OF King

CERTIFICATE OF SURFACE WATER RIGHT

In accordance with the provisions of Chapter 112, Laws of Washington for 1917, and An Act (Senate Bill No. 106) to amend Title 34, Laws of Washington, relating to Water Resources, and the rules and regulations of the State Supervisor of Water Resources thereunder.]

This is to certify that,

REALL OVERSEAS COMPANY

of Fashion . . . State of Washington . . . has made proof to the satisfaction of the State Supervisor of Water Resources of Washington, of a right to the use of the waters of Beall Creek & unnamed springs tributary of Puget Sound with point or points of diversion within the SISKI, Sec. 29 and KEEET, Sec. 32 Section . . . Twp. 23 N. R. 3 E., W. M. under and subject to provisions contained in Appropriation Permit No. 11834 issued by the State Supervisor of Water Resources, and that said right to the use of said waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the State Supervisor of Water Resources of Washington and entered of record in Volume 17, at Page 2145, on the 16th day of June, 1961, that the priority date of the right hereby confirmed is April 14, 1960; that the amount of water under the right hereby confirmed, for the following purposes is limited to an amount actually beneficially used and shall not exceed 0.40 of a cubic foot per second for greenhouse.

A description of the lands under such right to which the water right is appurtenant, and the place where such water is put to beneficial use, is as follows:

Beginning at a point 595 feet south of the northeast corner of the SW $\frac{1}{4}$, Sec. 32, T. 23 N., R. 3 E.W.M.; thence south 725 feet; thence west 1020 feet; thence north 435.4 feet; thence west 150 feet; thence north to a point 655.3 feet south of the north line of ~~said SW $\frac{1}{4}$~~ ; thence east 420 feet; thence north 60.3 feet; thence east 750 feet to the point of beginning, L33 roads. (Also known as Tax Lot 9.)

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in Sections 6 and 7, Chapter 122 Laws of 1929.

) WITNESS the seal and signature of the State Supervisor of Water Resources affixed this

16th day of June

14 61



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

RECORDED THIS DA

DEC 29 12 44 PM '71

BY THE DIVISION OF
RECORDS & ELECTION
KING COUNTY

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
November 30, 1979	G1-23519	G1-23519P	G1-23519C

NAME
KING COUNTY WATER DISTRICT No. 19

ADDRESS (STREET)
P. O. Box T

(CITY)

Vashon

(STATE)

Washington

(ZIP CODE)

98070

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

PUBLIC WATER TO BE APPROPRIATED

SOURCE
Well (6" x 670')

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	250.0	300

QUANTITY, TYPE OF USE, PERIOD OF USE
Domestic Supply - continuously

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION-WITHDRAWAL
Approximately 750 feet north and 1600 feet west of SE corner of Sec. 31

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION) NE 1/4 SW 1/4 SE 1/4	SECTION 31	TOWNSHIP N. 23	RANGE, (E. OR W.) W.M. 3 E	W.R.I.A. 15	COUNTY King
RECORDED PLATTED PROPERTY					

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)
LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED		

Area served by King County Water District No. 19.

82/12/29 #0557 D
RECD F 4.00
CASHL *****4.00
22

FILED for Record at Request of
Name: King City Water Dist 19
Address: P.O. Box T
Vashon, Wa. 98070

PROVISIONS

82122055
Installation and maintenance of an access port as described in Ground Water Bulletin No. 1 is required. An air line and gauge may be installed in addition to the access port.

At such time that the Department of Ecology determines that regulation and management of the subject waters is necessary and in the public interest, an approved measuring device shall be installed and maintained in accordance with RCW 90.03.360 and WAC 508 64-020 through WAC 508-64-040.

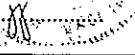
The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.020.

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

Given under my hand and the seal of this office at Redmond Washington, this ..15th... day
of December....., 19...82.....

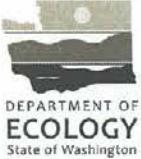
Department of Ecology

ENGINEERING DATA

OK..... 

by 
ROBERT K. MCCORMICK, Regional Manager

FOR COUNTY USE ONLY



Application for a Water Right Permit

For Ecology Use
(Date Stamp)

12
DEC 21
A 9:36
DEPT OF ECOLOGY
WATER RIGHTS UNIT

Follow the attached instructions. Attach additional sheets as necessary.

- GROUND WATER SURFACE WATER
 PERMANENT SHORT TERM TEMPORARY
 DROUGHT

*A NON-REFUNDABLE MINIMUM FEE OF \$50.00 MUST ACCOMPANY THIS APPLICATION.

Section 1. APPLICANT

- I have participated in a pre-application conference with Ecology.

Applicant/Business Name: WATER DISTRICT 19	Phone No: 206-463-9007	Other No:
Address: PO BOX T, 17630 100 TH AVENUE SW		
City: VASHON	State: WA	Zip: 98070
Email Address (if available): water19@water19.com		

Contact Name (if different from above):	Phone No:	Other No:
Relationship to Applicant:		
Address:		
City:	State:	Zip:
Email Address (if available):		

Legal Land Owner or Part Owner Name of the Proposed Place of Use: Place of use is service area of Water District 19	Phone No:	Other No:
Address:		
City:	State:	Zip:
Email Address (if available):		

For Ecology Use	APPLICATION NO: 61-28746	SEPA: Exempt/Not Exempt		
Fee Paid: 50-	Check No: 3771	ECY Coding: 001-001-WR1-0285-000011		
Date Returned _____	By _____	Priority Date _____	By _____	WRIA: _____
Pre-application interviewer: _____				

Section 2. STATEMENT OF INTENT

Do you own the land on which the proposed point of diversion/withdrawal is located? YES NO
If no, do you have legal authority to make this application for use of another's land? YES NO

Briefly describe the purpose of your proposed project: To add an additional source to close the gap between current source capacity and what is necessary to meet anticipated peak day demand. Well owners have come to Water District 19 and requested that the District take ownership of the well and appurtenances.

Anticipated length of time to complete your project: N/A (source already in use)

Water Use List all purposes for which water will be applied to a beneficial use and list quantity required for each.

Purpose(s) of Use	Rate (check one box only) <input type="checkbox"/> Cubic Feet per Second (CFS) <input checked="" type="checkbox"/> Gallons per Minute (GPM)	Acre-Feet per Year (AF/YR) (If known)	Period of Use (Continuously or Seasonal)
MUNICIPAL SUPPLY	20	1.16	Continuously
TOTAL:			

Short Term/Temporary Water Use

Is this a request for a short term project (less than four months and non-recurring)? YES NO

Is this request for a temporary permit? YES NO

If yes to either question above, indicate the dates that the water will be needed:

FROM: ____ / ____ / ____ TO: ____ / ____ / ____

Section 3. POINT OF DIVERSION OR WITHDRAWAL

(Complete A or B, and C below)

A.) If Surface Water Source

B.) If Ground Water Source

<input type="checkbox"/> Spring <input type="checkbox"/> Creek <input type="checkbox"/> River <input type="checkbox"/> Lake <input type="checkbox"/> Other: _____	<input checked="" type="checkbox"/> Well(s) <input type="checkbox"/> Other: _____ Well diameter & depth: <u>6 inch, 200 feet</u> Number of proposed points of withdrawal: <u>1</u> Do you have an existing well? <input type="checkbox"/> YES <input type="checkbox"/> NO If available, attach Water Well Report and pump test. Well Tag ID No. <u>AFA518</u>
Source Name: _____	
Tributary to: _____	
Number of proposed diversion points: _____	
Do you have an existing diversion? <input type="checkbox"/> YES <input type="checkbox"/> NO	

C.) Point of Diversion/Withdrawal – Legal Description

Parcel No.	$\frac{1}{4}$	$\frac{1}{4}$	Section	Township	Range	County
888760TR-A	NE	SE	31	23	03E	KING
Lot(s)	Block(s)		Subdivision			

If known, enter the distances in feet from the point of diversion or withdrawal to the nearest section corner:

2000 Feet (North/ South) and 100 feet (East/ West)
from the (NW SW NE SE _____) corner of Section_____.

Parcel No.	$\frac{1}{4}$	$\frac{1}{4}$	Section	Township	Range	County
Lot(s)	Block(s)		Subdivision			

If known, enter the distances in feet from the point of diversion or withdrawal to the nearest section corner:

_____ feet (North/ South) and _____ feet (East/ West)
from the (NW SW NE SE _____) corner of Section_____.

NOTE: If more than two points of diversion/withdrawal attach additional information on a separate sheet of paper.

Section 4. PLACE OF USE

Attach a copy of the legal description of the property (on which the water will be used) taken from a real estate contract, property deed or title insurance policy, or copy it carefully in the space below.

The place of use (POU) of this water right is the service area described in the most recent Water System Plan approved by the Washington State Department of Health.

$\frac{1}{4}$	$\frac{1}{4}$	Section	Twp.	Range	County	Parcel No.

Do you own all the lands on which the proposed place of use is located? YES NO.

If no, do you have legal authority to make this application for use of another's land? YES NO
Provide owner name(s), address, and phone number: Vashon Meadows Homeowners Association, 10907 SW 232nd Street, Vashon, WA 98070, 206-619-1453

Are there any other water rights or claims associated with this property or water system? YES NO

If yes, provide the water right and/or claim numbers: _____

Attach a map of your project showing the point of diversion/withdrawal and place of use. If platted

property, be sure to include a complete copy of the plat map.

Section 5. WATER SYSTEM DESCRIPTION

Describe your proposed water system (include type and size of devices used to divert or withdraw water from source): Well to be part of existing Water District 19 water system. ½ hp well pump discharges into a 1000 gal reservoir. A 2 hp transfer pump draws water out of the 1000 gal reservoir and discharges into four 80 gal pressure tanks that feed the system.

Section 6. DOMESTIC WATER SUPPLY SYSTEM INFORMATION

(Complete A or B, and C below)

A.) Domestic Water Systems only	B.) Municipal Water Systems only <i>(defined under RCW 90.03.015)</i>
Projected number of connections to be served: _____	Present population to be served water: <u>3000</u>
Type of connections: <i>(e.g., home, recreational cabin)</i> _____	Estimate future population to be served: <u>3315</u> (20 year projection)
C.) Water System Planning	
Do you have a Water System Plan approved by the Washington State Department of Health, Drinking Water Division? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
If yes, date plan was approved <u>04/22/2010</u> Water System Number: <u>38900</u>	
Name of water system: <u>Water District 19</u>	
Are you within the service area of an existing water system? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
If yes, explain why you are unable to connect to the system: _____ _____ _____ _____	

Section 7. IRRIGATION/STOCKWATER/OTHER FARM USES

Irrigation

Total number of acres requested to be irrigated under this application = _____ ACRES

NOTE: Outline the area to be irrigated on your attached map.

Stockwater

List number and kind of stock: _____

Is the proposed project for a dairy farm? YES NO

Other Proposed Farm Uses

Describe all proposed uses: _____

Family Farm Water Act (RCW 90.66):

Calculate the acreage in which you have a controlling interest, including only:

- Acreage irrigated under water rights acquired after December 8, 1977,
- Acreage proposed to be irrigated under this application, and
- Acreage proposed to be irrigated under other pending application(s).

Is the combined acreage under existing rights greater than 6000 acres? YES NO

Do you have a controlling interest in a Family Farm Development Permit? YES NO

If yes, enter Permit No: _____

Section 8. OTHER WATER USES

Hydropower

Indicate total feet of head _____ and proposed capacity in kilowatts: _____

Describe works: _____

Indicate all uses to which power is to be applied: _____

FERC License No: _____

Mining/Industrial Use

Describe use, method of supplying and utilizing water: _____

Other Use

Section 9. WATER STORAGE

Will you be using a dam, dike, or other structure to retain or store water? YES NO

Are you proposing to store more than 10 acre-feet of water? YES NO

Will the water depth be 10 feet or more? YES NO

If you answered yes to any of the above questions, please describe: _____

NOTE: If you will be storing 10 acre-feet or more of water and/or if the water depth will be 10 feet or more at the deepest point and some portion of the storage will be above grade, you must also complete an Application for Permit to Construct a Reservoir and a Dam Construction Permit and Application.

Section 10. DRIVING DIRECTIONS

Provide detailed driving directions to the project site: From Vashon Ferry Dock take Vashon Highway south to a gravel driveway just south of SW 184th Way on the right (west).

Site Address: N/A (identified by tract number)

Section 11. REQUIRED SIGNATURES

I certify that the information provided in this application is true and accurate to the best of my knowledge. I understand that in order to process my application, I grant staff from the Department of Ecology access to the site for inspection and monitoring purposes. Even though the employees of the Department of Ecology may have assisted me in the preparation of the above application, all responsibility for the accuracy of the information rests with me, the applicant.

Jeffrey T. Lakin, General Manager

Print Name

(Applicant or authorized representative)



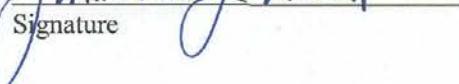
12/18/2012

Date

Jonathon Parrott, Authorized Agent

Print Name

(Legal Owner or Part Owner Place of Use)



12/18/2012

Date

Print Name

(Legal Owner or Part Owner Place of Use)

Signature

Date

Please check the region in which the project is located:

*Submit your application to:

DEPARTMENT OF ECOLOGY
CASHIERING SECTION
PO BOX 47611
OLYMPIA, WA 98504-7611

Central Regional Office
15 W Yakima Avenue, Suite 200
Yakima, WA 98902
(509) 575-2490

Eastern Regional Office
4601 N. Monroe
Spokane, WA 99205-1295
(509) 329-3400

Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008-5452
(425) 649-7000

Southwest Regional Office
PO Box 47775
Olympia, WA 98504-7775
(360) 407-6300

If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872.
Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

If you have questions about your application, contact the Water Resources program at the regional office in which your project is located.



King County Water District No. 19
c/o Jeffrey T Lakin
PO Box T
Vashon WA 98070



**STATE OF WASHINGTON
SUPERSEDING CERTIFICATE OF WATER RIGHT**

Document Title: Certificate of Water Right

Agency: Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008

Applicant: King County Water District No. 19
c/o Jeffrey T Lakin
PO Box T
Vashon WA 98070

Reference Number:

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
November 30, 1979	G1-23519	G1-23519P	G1-23519C (Record A)

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	TRIBUTARY OF (IF SURFACE WATERS)	
Add Morgan Hill Well (Well 3)		
MAX. CUBIC FEET PER SECOND	MAX. GALLONS PER MINUTE	MAX. ACRE-FEET PER YEAR
250*		222**

QUANTITY/TYPE OF USE/PERIOD OF USE

222 acre-feet, Municipal Supply, Year round as needed. NOTE: Superseding Certificate has been split from original Certificate G1-23519C.

* Rate of withdrawal (Qi) from both G1-23519C(A) and G1-23519P(B) may not exceed a total of 250 gpm. Total from Well 3 may not exceed 35 gpm.

** Annual consumptive use (Qa) from both G1-23519C(A) and G1-23519P(B) may not exceed a cumulative total of 300 afy. Total from Well 3 may not exceed 45 afy.

LOCATION OF DIVERSION/WITHDRAWAL

Well 1 – Approximately 725 feet North and 2325 feet West of the SE Corner of Section 31, T22N, R03E.
Well 2 – Approximately 725 feet North and 2325 feet West of the SE Corner of Section 31, T22N, R03E.
Well 3 – Approximately 2475 feet South and 475 feet East of the SW Corner of Section 8, T22N, R03E.
Well 4 – C Approximately 725 feet North and 2325 feet West of the SE Corner of Section 31, T22N, R03E.

LEGAL DESCRIPTION OF LOCATION OF DIVERSION/WITHDRAWAL

1/4 1/4	SECTION	TOWNSHIP N.	RANGE (E. OR W.) W.M.	W.R.I.A.	COUNTY
				15	King

PARCEL #

ADDITIONAL LEGAL IS ON PAGE 2

SUPERSEDING CERTIFICATE OF WATER RIGHT

CONTINUED LEGAL DESCRIPTION FOR LOCATION OF DIVERSION/WITHDRAWAL

SOURCE	PARCEL	LATITUDE ¹	LONGITUDE	QTR/QTR	SEC	T	R
Well 1	3123039154	47.434	122.467	SW/SE	31	23	03E
Well 2	3123039154	47.434	122.467	SW/SE	31	23	03E
Well 3 (Morgan Hill)	0822039038	47.411	122.458	NW/SW	08	22	03E
Well 4	3123039154	47.434	122.466	SW/SE	31	23	03E

1: Calculated from DOH Public Water System Source data layer point location using ArcGIS/Xtools utility.

LEGAL DESCRIPTION FOR PROPERTY ON WHICH WATER IS TO BE USED

The place of use (POU) of this water right is the service area described in the most recent Water System Plan/Small Water System Management Program approved by the Washington State Department of Health, so long as King County Water District 19 is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

PROVISIONS

SPECIAL PROVISIONS

1. Partial Rescission of Certificate

- 1.1. Certificate number G1-23519C(A) shall be issued in the amount of 250 gpm and 222 afy, the quantities shown to have been perfected under the original certificate.
- 1.2. Permit number G1-23519P(B) shall be issued in the amount of 250 gpm and 78 afy, representing the unperfected quantities under the original certificate.
- 1.3. The total combined instantaneous rate of withdrawal (Qi) of both certificate G1-23519C(A) and Permit G1-23519P(B) shall not exceed the maximum Qi of 250 gpm from all points of withdrawal approved for both.
- 1.4. The total combined annual quantity (Qa) from both certificate G1-23519C(A) and Permit G1-23519P(B) shall not exceed the maximum Qa of 300 afy from all points of withdrawal approved for both.

STANDARD PROVISIONS

2. Approval of Proposed Change

- 2.1. The cumulative instantaneous rate of withdrawal (pumping rate) from all points of withdrawal approved for use under groundwater right G1-23519 shall not exceed 250 gallons per minute. The additional point of withdrawal authorized through this change (Morgan Hill Well) shall operate at a pumping rate not to exceed 35 gallons per minute.
- 2.2. The cumulative annual quantity from all points of withdrawal approved for use under groundwater right G1-23519 shall not exceed 300 acre-feet per year. The annual quantity approved for the new point of withdrawal authorized through this change shall not exceed 45 acre-feet per year.

3. Wells, Well logs and Well Construction Standards

- 3.1. All wells constructed in the state shall meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard shall be decommissioned.
- 3.2. All wells shall be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the regional Department of Ecology office issuing this decision. This tag shall remain attached to the well. If you are required to submit water measuring reports, reference this tag number.
- 3.3. Installation and maintenance of an access port as described in WAC 173-160-291(3) is required.
- 3.4. In addition to the required access port, the applicant shall install and maintain, in operating condition, an airline and pressure gage. The pressure gage shall be equipped with a standard tire valve and placed in a location accessible to Department of Ecology personnel. The airline shall extend from land surface to the top of the pump bowls and the total airline length shall be reported to the Department of Ecology upon completion of the pump system.

4. Measurements, Monitoring, Metering and Reporting

- 4.1. An approved measuring device shall be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.
- 4.2. Water use data shall be recorded daily. The maximum monthly rate of diversion/withdrawal and the monthly total volume shall be submitted to the Department of Ecology by January 31st of each calendar year. The Department of Ecology is requiring submittal of daily meter readings to collect seasonal information for water resource planning, management and compliance.
- 4.3. Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.
- 4.4. Reported water use data shall be submitted via the Internet. To set up an Internet reporting account, access <https://fortress.wa.gov/ecy/wrx/wrx/Meteringx/>. If you do not have Internet access, contact the Northwest Region Office for forms to submit your data.

4.5. WAC 173-173 describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements. Installation, operation and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements".
<http://www.ecy.wa.gov/programs/wr/measuring/measuringhome.html>

4.6. In order to maintain a sustainable supply of water, pumping must be managed so that static water levels do not progressively decline from year to year. Water levels shall be measured and recorded monthly, using a consistent methodology. The length of the pumping period or recovery period prior to each measurement shall be constant, and shall be included in the record. Data for the previous year shall be submitted by January 31 to the Department of Ecology.

Static water levels data shall be submitted in digital format and shall include the following elements:

1. Unique Well ID Number
2. Measurement date and time
3. Measurement method (air line, electric tape, pressure transducer, etc.)
4. Well status (pumping, recently pumped, etc.)
5. Water level accuracy (to nearest foot, tenth of foot, etc.)
6. Description of the measuring point (top of casing, sounding tube, etc.)
7. Measuring point elevation above or below land surface to the nearest 0.1 foot
8. Land surface elevation at the well head to the nearest foot.
9. Static water level below measuring point to the nearest 0.1 foot.

5. Department of Health Requirements

Prior to any new construction or alterations of a public water supply system, the State Board of Health rules require public water supply owners to obtain written approval from the Office of Drinking Water of the Washington State Department of Health. Please contact the Office of Drinking Water at Northwest Drinking Water Operations, 20435 72nd Avenue S, Suite 200, K17-12, Kent, WA 98032-2358, (253) 396-6750, prior to beginning (or modifying) your project.

6. Municipal Place of Use

If the criteria in RCW 90.03.386(2) are not met and a Water System Plan/Small Water System Management Program was approved after September 9, 2003, the place of use of this water right reverts to the service area described in that document. If the criteria in RCW 90.03.386(2) are not met and no Water System Plan/Small Water System Management Program has been approved after September 9, 2003, the place of use reverts to the last place of use described by The Department of Ecology in a water right authorization

7. Easement and Right-of-Way

The water source and/or water transmission facilities are not wholly located upon land owned by the applicant. Issuance of a water right change authorization by this department does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtaining such a right is a private matter between applicant and owner of that land.

8. Water Use Efficiency

Use of water under this authorization shall be contingent upon the water right holder's maintenance of efficient water delivery systems and use of up-to-date water conservation practices consistent with established regulation requirements and facility capabilities.

9. Schedule and Inspections

Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, diversions, measuring devices and associated distribution systems for compliance with water law.

10. This Superseding Certificate for G1-23519C(A) is related through a split performed pursuant to Water Resources Program Guidance 2030 to Superseding Permit G1-23519P(B).
11. Final Superseding Document for Recombined Split Certificate—Upon completion of project and satisfaction of all provisions for Superseding Permit G1-23519P(B) a superseding certificate shall be issued which combines the additive and non-additive quantities and all other attributes of both permit G1-23519P(B) and superseding certificate G1-23519C(A). This superseding document shall revert to the original certificate number, G1-23519C.

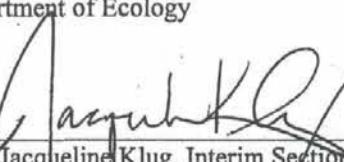
The right to use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.020.

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

*Given under my hand and the seal of this office at Bellevue, Washington,
this 17th day of February, 2010.*



Ted Sturdevant, Director
Department of Ecology

By 
Jacqueline Klug, Interim Section Supervisor
G1-23519C(A)

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

SUPERSEDING PERMIT RECORD B
TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

- Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)
- Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
November 30, 1979	G1-23519	G1-23519P (Record B)	

NAME
King County Water District 19

ADDRESS (STREET)
PO Box T (CITY)
Vashon (STATE)
WA (ZIP CODE)
98070

The applicant is hereby granted a permit to appropriate the following public waters of the State of Washington, subject to existing rights and to the limitations and provisions set herein.

PUBLIC WATERS TO BE APPROPRIATED

SOURCE	WRIA	COUNTY
Add Morgan Hill Well (Well 3)	15	KING
TRIBUTARY OF (IF SURFACE WATERS)		
MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE FEET PER YEAR
	250*	78**
QUANTITY, TYPE OF USE, PERIOD OF USE		

78 acre-feet, Municipal Supply, Year-round as needed. NOTE: Permit G1-23519P (Record B) has been split from original Certificate G1-23519C

* Rate of withdrawal (Qi) from both G1-23519C(A) and G1-23519P(B) may not exceed a total of 250 gpm. Total from Well 3 may not exceed 35 gpm.
** Annual consumptive use (Qa) from both G1-23519C(A) and G1-23519P(B) may not exceed a cumulative total of 300 afy. Total from Well 3 may not exceed 45 afy.

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION-WITHDRAWAL

Well 1 – Approximately 725 feet North and 2325 feet West of the SE Corner of Section 31, T22N, R03E.
Well 2 – Approximately 725 feet North and 2325 feet West of the SE Corner of Section 31, T22N, R03E.
Well 3 – Approximately 2475 feet South and 475 feet East of the SW Corner of Section 8, T22N, R03E.
Well 4 – C Approximately 725 feet North and 2325 feet West of the SE Corner of Section 31, T22N, R03E.

SOURCE	PARCEL	LATITUDE ¹	LONGITUDE	QTR/QTR	SECTION	TOWNSHIP	RANGE
Well 1	3123039154	47.434	122.467	SW/SE	31	23	03E
Well 2	3123039154	47.434	122.467	SW/SE	31	23	03E
Well 3 (Morgan Hill)	0822039038	47.411	122.458	NW/SW	08	22	03E
Well 4	3123039154	47.434	122.466	SW/SE	31	23	03E

1: Calculated from DOH Public Water System Source data layer point location using ArcGIS/Xtools utility.

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

The place of use (POU) of this water right is the service area described in the most recent Water System Plan/Small Water System Management Program approved by the Washington State Department of Health, so long as King County Water District 19 is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

DESCRIPTION OF PROPOSED WORKS

A six-inch diameter well completed at a depth of 363 feet. Casing is in place to 338 feet below top of casing (3 feet above surface). Five-inch diameter screens are installed from 335 feet to 360 feet.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	Completed	September 30, 2019

PROVISIONS

SPECIAL PROVISIONS

1. Partial Rescission of Certificate
 - 1.1. Certificate number G1-23519C(A) shall be issued in the amount of 250 gpm and 222 afy, the quantities shown to have been perfected under the original certificate.
 - 1.2. Permit number G1-23519P(Record B) shall be issued in the amount of 250 gpm and 78 afy, representing the unperfected quantities under the original certificate.
 - 1.3. The total combined instantaneous rate of withdrawal (Q_i) of both certificate G1-23519C(A) and Permit G1-23519P(Record B) shall not exceed the maximum Q_i of 250 gpm from all points of withdrawal approved for both.
 - 1.4. The total combined annual quantity (Q_a) from both certificate G1-23519C(A) and Permit G1-23519P(Record B) shall not exceed the maximum Q_a of 300 afy from all points of withdrawal approved for both.

STANDARD PROVISIONS

2. Approval of Proposed Change
 - 2.1. The cumulative instantaneous rate of withdrawal (pumping rate) from all points of withdrawal approved for use under groundwater right G1-23519 shall not exceed 250 gallons per minute. The additional point of withdrawal authorized through this change (Morgan Hill Well) shall operate at a pumping rate not to exceed 35 gallons per minute.
 - 2.2. The cumulative annual quantity from all points of withdrawal approved for use under groundwater right G1-23519 shall not exceed 300 acre-feet per year. The annual quantity approved for the new point of withdrawal authorized through this change shall not exceed 45 acre-feet per year.
 3. Wells, Well logs and Well Construction Standards
 - 3.1. All wells constructed in the state shall meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard shall be decommissioned.
 - 3.2. All wells shall be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the regional Department of Ecology office issuing this decision. This tag shall remain attached to the well. If you are required to submit water measuring reports, reference this tag number.
 - 3.3. Installation and maintenance of an access port as described in WAC 173-160-291(3) is required.
 - 3.4. In addition to the required access port, the applicant shall install and maintain, in operating condition, an airline and pressure gage. The pressure gage shall be equipped with a standard tire valve and placed in a location accessible to Department of Ecology personnel. The airline shall extend from land surface to the top of the pump bowls and the total airline length shall be reported to the Department of Ecology upon completion of the pump system.
 4. Measurements, Monitoring, Metering and Reporting
 - 4.1. An approved measuring device shall be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.
 - 4.2. Water use data shall be recorded daily. The maximum monthly rate of diversion/withdrawal and the monthly total volume shall be submitted to the Department of Ecology by January 31st of each calendar year. The Department of Ecology is requiring submittal of daily meter readings to collect seasonal information for water resource planning, management and compliance.
 - 4.3. Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.
 - 4.4. Reported water use data shall be submitted via the Internet. To set up an Internet reporting account, access <https://fortress.wa.gov/ecy/wrx/wrx/Meteringx/>. If you do not have Internet access, contact the Northwest Region Office for forms to submit your data.
 - 4.5. WAC 173-173 describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements. Installation, operation and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements". <http://www.ecy.wa.gov/programs/wr/measuring/measuringhome.html>
 - 4.6. In order to maintain a sustainable supply of water, pumping must be managed so that static water levels do not progressively decline from year to year. Water levels shall be measured and recorded monthly, using a consistent methodology. The length of the pumping period or recovery period prior to each measurement shall be constant, and shall be included in the record. Data for the previous year shall be submitted by January 31 to the Department of Ecology.
- Static water levels data shall be submitted in digital format and shall include the following elements:
1. Unique Well ID Number
 2. Measurement date and time
 3. Measurement method (air line, electric tape, pressure transducer, etc.)
 4. Well status (pumping, recently pumped, etc.)
 5. Water level accuracy (to nearest foot, tenth of foot, etc.)
 6. Description of the measuring point (top of casing, sounding tube, etc.)
 7. Measuring point elevation above or below land surface to the nearest 0.1 foot
 8. Land surface elevation at the well head to the nearest foot.
 9. Static water level below measuring point to the nearest 0.1 foot.

5. Department of Health Requirements

Prior to any new construction or alterations of a public water supply system, the State Board of Health rules require public water supply owners to obtain written approval from the Office of Drinking Water of the Washington State Department of Health. Please contact the Office of Drinking Water at Northwest Drinking Water Operations, 20435 72nd Avenue S, Suite 200, K17-12, Kent, WA 98032-2358, (253) 396-6750, prior to beginning (or modifying) your project.

6. Municipal Place of Use

If the criteria in RCW 90.03.386(2) are not met and a Water System Plan/Small Water System Management Program was approved after September 9, 2003, the place of use of this water right reverts to the service area described in that document. If the criteria in RCW 90.03.386(2) are not met and no Water System Plan/Small Water System Management Program has been approved after September 9, 2003, the place of use reverts to the last place of use described by The Department of Ecology in a water right authorization.

7. Easement and Right-of-Way

The water source and/or water transmission facilities are not wholly located upon land owned by the applicant. Issuance of a water right change authorization by this department does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtaining such a right is a private matter between applicant and owner of that land.

8. Water Use Efficiency

Use of water under this authorization shall be contingent upon the water right holder's maintenance of efficient water delivery systems and use of up-to-date water conservation practices consistent with established regulation requirements and facility capabilities.

9. Notice of Project Completion - Applies to G1-23519P(B)

For permit G1-23519P(Record B) as described herein, the water right holder shall file the notice of project completion when the permanent distribution system has been constructed and the quantity of water required by the project has been put to full beneficial use. The certificate subsequently issued will reflect the extent of beneficial use within the limitations of the change authorization. Elements of the project completion inspection may include, as appropriate, the source(s), system instantaneous capacity, beneficial use(s), annual quantity, place of use, and compliance with provisions.

10. Schedule and Inspections

Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use; wells, diversions, measuring devices and associated distribution systems for compliance with water law.

11. This Superseding Permit for G1-23519P (Record B) is related through a split performed pursuant to Water Resources Program Guidance 2030 to Superseding Certificate G1-23519C(A).
12. Final Superseding Document for Recombined Split Certificate—Upon completion of project and satisfaction of all provisions for Superseding Permit G1-23519P(Record B) a superseding certificate shall be issued which combines the additive and non-additive quantities and all other attributes of both permit G1-23519P(Record B) and superseding certificate G1-23519C(A). This superseding document shall revert to the original certificate number, G1-23519C.

This permit shall be subject to cancellation should the permittee fail to comply with the above development schedule and/or fail to give notice to the Department of Ecology on forms provided by that Department documenting such compliance.

Given under my hand and the seal of this office at Bellevue, Washington, this 17th day of February, 2010.

REVIEWED BY
OKAY J.K.

Department of Ecology

By Jacqueline Klug Interim Section Supervisor, Water Resources

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

REPORT OF EXAMINATION FOR PROTESTED CHANGE TO SURFACE WATER CERTIFICATE
TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

Surface Water

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

Ground Water

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

PRIORITY DATE April 14, 1960	APPLICATION NUMBER 15998	PERMIT NUMBER 11834	CERTIFICATE NUMBER 8145
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NAME King County Water District #19	(CITY) Vashon	(STATE) Washington	(ZIP CODE) 98070
ADDRESS (STREET) 17630 100 th Avenue S.W.			

PUBLIC WATERS TO BE APPROPRIATED

SOURCE Well or Wells completed in the Vashon-Maury Island Deep Aquifer as defined in this report.
TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND 180	MAXIMUM GALLONS PER MINUTE 180	MAXIMUM ACRE FEET PER YEAR 55
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QUANTITY, TYPE OF USE, PERIOD OF USE Municipal Supply - Continuously

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION--WITHDRAWAL

Well or wells located within the South ½ of Section 29 or within Section 32, Township 23 North, Range 3 East, Willamette Meridian

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION) G1-23519C	SECTION 29 or 32	TOWNSHIP N. 23N	RANGE, (E. OR W.) W.M. 03E	W.R.I.A. 15	COUNTY King
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LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

The place of use as described in the Water System Plan approved by the Washington State Department of Health in March, 2000. RCW 90.03.386 may have the effect of revising the place of use of this water right if the criteria in section RCW 90.03.386(2) are met.

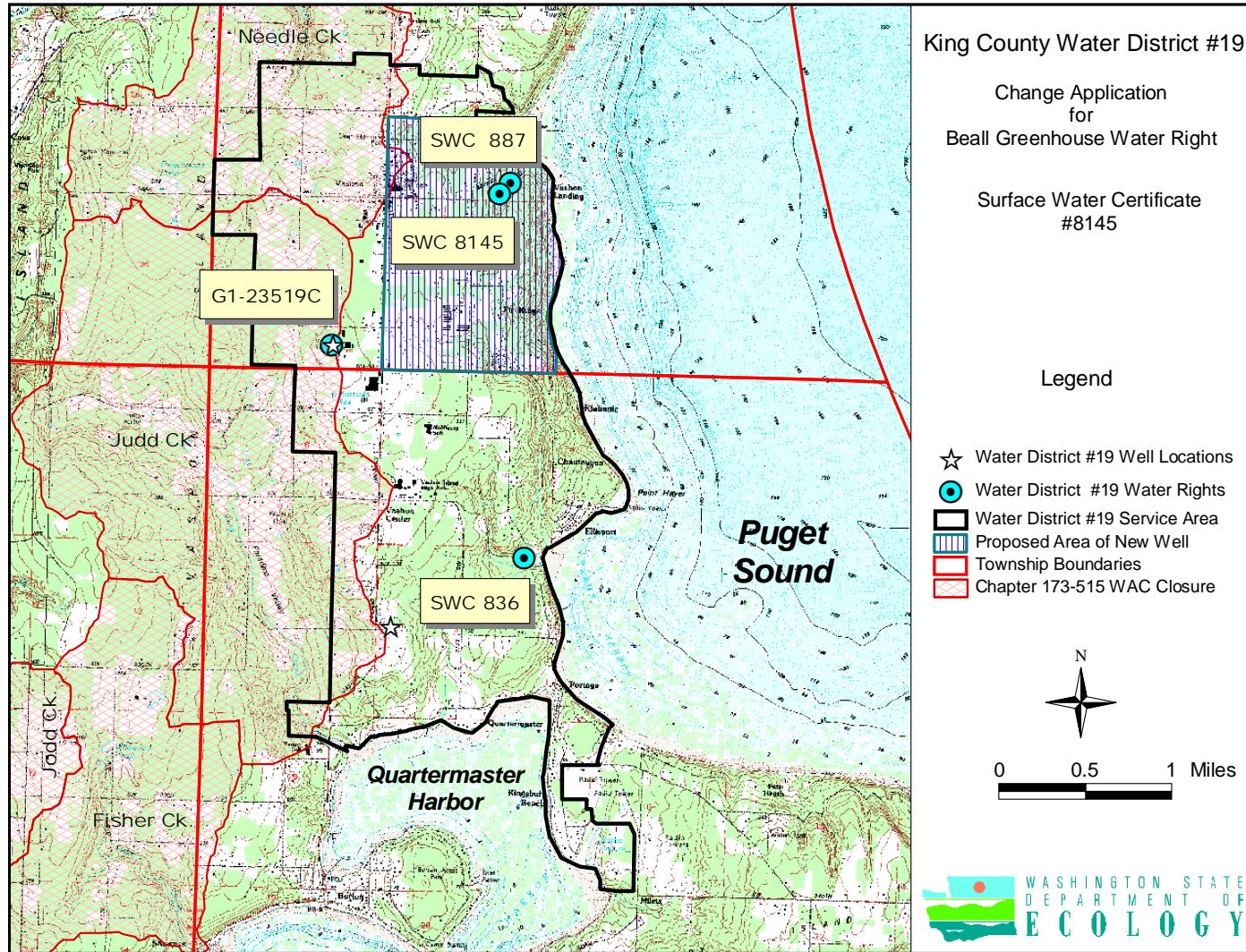


Figure 1: Map showing the location of proposed change and King Co. Water District 19 service area as per its March 2000 Water System Plan.

DESCRIPTION OF PROPOSED WORKS

King County Water District 19 system is identified by the Washington State Department of Health as Public Water System ID No. 38900. The proposed new point(s) of withdrawal will be drilled to a depth of between 500 and 600 feet below the upland surface area of Vashon Island. The well(s) will be constructed with 8-inch casing and equipped with a 50 to 75 HP pump capable of supplying up to 180 gallons per minute at the surface.

Water from the well will be treated and blended with water from the system's currently approved surface and groundwater sources and transported to the district's main storage tank located on 103rd Avenue near district Wells 1, 2 and 4.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
January 1, 2006	January 1, 2011	Not Applicable

REPORT

BACKGROUND INFORMATION

The Beall Greenhouse water right (Surface Water Certificate 8145) was established by riparian appropriation doctrine beginning in the late 1880's and was perfected through use by 1895. After 1895 the right was held as a vested water right until the Beall Greenhouse Company applied to Ecology's predecessor agency for a certificate of water right in 1960. The original applicant, Beall Greenhouse Company, stated in their application (#15998) that water would be used for general greenhouse uses, including steam heat, spraying, irrigation, and cleaning as well as for domestic use to serve ten families.

In a Report of Examination dated June 16, 1960, investigator Dee Molenaar acknowledged that the purpose of the application was to make their vested right a matter of public record. The Molenaar report stated that the total stream flow at the point of diversion was 0.90 cubic feet per second (cfs). The total stream flow near tide water (~ 0.4 miles downstream from the Beall diversion) was estimated in May 1960 by Mr. Molenaar to be 2.50 cfs. The total quantity appropriated through three water rights along Beall Creek is 1.485 cfs or about 60% of total stream flow at the mouth of the stream.

In August of 1985 King County Water District #19 entered into an agreement and passed a resolution of the Board of Commissioners to purchase the watershed of the Beall Company of Vashon Island (Resolution #488). The agreement detailed in the resolution stipulates that Water District #19 will receive the right to acquire the water right if the Beall Greenhouse Company ceases to do business.

At the May 10, 1988 meeting of the Water District #19 Board of Commissioners, exercising of the option to purchase of the Beall water right was discussed. The Board stated the purchase would be considered in terms of the District's present and long-term needs. On June 14, 1988, the Board agreed to exercise their option to purchase the water right and existing infrastructure through the adoption of Resolution #547. The minutes of the June 14, 1988 Board meeting make it clear that the transfer of the Beall Company's water right and water supply would be advantageous to the District. The Beall Company transferred the Certificate of Water Right and all water delivery infrastructure to Water District #19 via a Quit Claim Deed dated July 26, 1988.

The District's Water System Plan (WSP) published in 1992 stated that their system capacity (total of all water rights) was 700 gallons per minute. This number included the 180 gallons per minute (0.40 cubic feet per second) from the Beall water right. The plan stated that the growing complexity of water rights issues was an important consideration and that water rights controlled by the District needed to be maintained to ensure they were not subject to relinquishment.

Following the advice in the 1992 WSP, the District filed an application to change the purpose and place of use of the Beall water right on September 27, 1993. The 1993 application (#S1-27323A), on a new water right application form, contains substantially the same information and requests as the subsequent application for change in water right filed on November 14, 1996 (Application #CS1-*15998ALC), the subject of this report.

Due to the backlog in application processing, the error in format of the original 1993 application was not noticed until processing of the 1996 application began in late 2001. The applicant was informed in January 2002 that processing priority and consideration of relinquishment (chapter 90.14 RCW) for application CS1-*15998ALC would reflect the September 1993 filing date. The applicant in turn has agreed to request a cancellation of the first application.

During the course of this investigation, the district and the local community have raised the issue of whether all or a portion of the Beall Greenhouse water right have been relinquished through non-use as defined in Chapter 90.14 RCW. The applicant was informed that such determinations are made as a matter of course in a change application as per the instructions of the Washington Supreme Court in the 1999 R.D. Merrill decision (137 Wn.2d 118).

In May 2003 the district requested that Ecology make a determination of relinquishment under RCW 90.14.130. The district made the request to allow them to proceed with the application process with some certainty as to the quantities available for the requested changes. On June 23, 2003, the Department of Ecology issued Order No. DE 03 WRNR-5484 detailing its investigation of relinquishment under RCW 90.14.160 and 90.14.180 and found that a portion of the water right under surface water certificate 8145 had been relinquished through non-use for a period exceeding five years, but that 189 acre-feet per year at a rate of 0.40 cfs remained available to district.

The relinquishment order was subsequently appealed by the organization *Protect Our Waters*. The appeal was heard on May 27 and May 28, 2004 by the Pollution Control Hearings Board (PCHB Case No. 03-102; attached to this report as Appendix A). The PCHB in its decision dated August 26, 2004 found that, while Ecology was correct in finding that SWC 8145 was not fully relinquished, it had erred in finding that 189 acre-feet remained based upon 1985 being the year when an exemption to relinquishment based on a claim of "determined future development" was established. The PCHB found that the exemption was established upon the final purchase of the right in 1988 and that the remaining quantities under the right should be 0.40 cfs (180 gpm) and 74.8 afy.

Protect Our Water appealed the PCHB decision to King County Superior Court (Case No. 04-25081-1 SEA) on the grounds that the board had erred in finding that all quantities under the right were not relinquished. King County Water District 19 appealed on the basis that the PCHB erred in reducing the annual quantity from 189 afy to 74.8 afy based on evidence submitted at the hearing which supported higher consumption during the period between 1985 and 1988.

In July 2005 *Protect Our Waters*, King County Water District 19, and Ecology reached agreement without going to trial in King County Superior Court. The agreement, attached to this report as Appendix B, stipulates that all parties will cease litigation regarding the extent and validity of water rights under SWC 8145, that the district will voluntarily relinquish all but 55 acre-feet of annual quantity under SWC 8145 while retaining the full 0.40 cfs (180 gpm) of instantaneous quantity, that the district will monitor stream flow and use at its existing Beall Creek diversion, that the district will abide by its existing 0.1 cfs downstream flow requirement, that the district will

endeavor to increase its bypass flow to 0.2 cfs, and that Ecology will proceed to complete its review of the district's request to replace the point of diversion for SWC 8145 with a well.

Attributes of the Original Certificate (SWC #8145)

Name on Certificate:	Beall Greenhouse Company
Priority Date:	April 14, 1960
Instantaneous Quantity:	0.40 cubic feet per second (cfs)
Annual Quantity:	Not Specified
Points of Diversion:	SW $\frac{1}{4}$ of SE $\frac{1}{4}$ of Section 29, Township 23 N, Range 3 E W $\frac{1}{2}$ of NE $\frac{1}{4}$ of Section 32, Township 23 N, Range 3 E
Purpose of Use:	Greenhouse Use
Period of Use:	Continuously
Place of Use:	Beginning at a point 595 feet south of the northeast corner of the SW $\frac{1}{4}$ Sec. 32, T. 23 N., R. 3 E., W.M.; thence south 725 feet; thence west 1020 feet; thence north 435.6 feet; thence west 150 feet; thence north to a point 655.3 feet south of the north line of said SW $\frac{1}{4}$; thence east 420 feet; thence north 60.3 feet; thence east 750 feet to the point of beginning, less roads. (also known as Tax Lot 94)

Proposed Changes

Name of Applicant:	King County Water District #19
Date of Application for Change:	September 27, 1993
Instantaneous Quantity:	180 gallons per minute (gpm)
Annual Quantity:	55 acre-feet per year (afy)
Point of Withdrawal:	Well(s) located in South $\frac{1}{2}$ of Section 29 and Section 32 , T23N, R03E, W.M.
Purpose of Use:	Municipal supply
Place of Use:	Area Served by King Co. WD #19 (as per March 2000 WSP)
Notice of Publication:	Vashon-Maury Island Beachcomber: January 29, 2003 and February 5, 2003
Protests:	36 Protests Received (See Table 8)

Purpose of the Change Application

The purpose of the application is to transfer the Beall Greenhouse surface water right to the district, to the place of use to area served by the district, to change the purpose of use to municipal supply, and to replace the surface diversions with a well.

INVESTIGATION

In considering this application, my investigation included, but was not limited to research and/or review of:

- The State Water Code
- The State Environmental Policy Act (SEPA)
- Washington State Department of Fish and Wildlife Comments
- Relinquishment Order DE 03 WRNR-5484
- PCHB Decision on Case No. 03-102 (Appendix A)
- Settlement Agreement between POW and King County Water District 19 (Appendix B)
- Existing water rights on file for King County Water District #19 Water System
- Records of other water rights in the vicinity
- Notes from site visits on December 7, 2001 and November 23, 2003.
- Correspondence from Water District Officials, The Washington Department of Fish and Wildlife, Protestants, and others.
- Topographic, local area, and GIS maps.
- King County Water District #19 Water System Plan dated March 2000.
- Vashon/Maury Island Water Resources Study, J.Carr, 1983
- Vashon-Maury Island Groundwater Management Plan, King County, 1998

State Water Code

Chapters 90.03 and 90.44 RCW authorize the appropriation of public water for beneficial use and describe the process for obtaining water rights including the process to amend or change existing rights. Chapter 90.54 RCW provides general guidance on the management of water resources. Laws specifically governing the water right permitting process are RCW 90.03.250 through 90.03.340 and RCW 90.44.060. Changes or amendments to these rights are covered under RCW 90.03.380 and RCW 90.44.100. RCW 90.54.020 provides instructions to Ecology on the interactions between surface and groundwater.

Both the Surface Water Code (Chapter 90.03 RCW) and Groundwater Code (Chapter 90.44 RCW) of Washington allow changes to existing water rights if such a change can be made without impairing existing water rights. King County Water District 19 seeks to transfer a surface water right (SWC 8145) to the district, change the purpose of use from greenhouse use to municipal supply, change the place of use from the Beall Greenhouse Company property to the area served by the district, and change the means of obtaining water under the right from a stream diversion and spring collector system to a well capable of directly withdrawing groundwater from an aquifer.

The transfer and the changes in purpose, place of use, and point of diversion are accomplished under RCW 90.03.380(1), which reads:

"The right to the use of water which has been applied to a beneficial use in the state shall be and remain appurtenant to the land or place upon which the same is used: PROVIDED, HOWEVER, That the right may be transferred to another or to others and become appurtenant to any other land or place of use without loss of priority of right theretofore established if such change can be made without

detriment or injury to existing rights. The point of diversion of water for beneficial use or the purpose of use may be changed, if such change can be made without detriment or injury to existing rights."

Since the requested change involves replacing a surface water diversion with a well an additional different set of requirements contained within the Groundwater Code (RCW 90.44.100) need to be satisfied that for this aspect of the change. RCW 90.44.100(1) states that:

"An amendment to construct replacement or a new additional well or wells at a location outside of the location of the original well or wells or to change the manner or place of use of the water shall be issued only after publication of notice of the application and findings as prescribed in the case of an original application. Such amendment shall be issued by the department only on the conditions that: (a) The additional or replacement well or wells shall tap the same body of public ground water as the original well or wells; (b) where a replacement well or wells is approved, the use of the original well or wells shall be discontinued and the original well or wells shall be properly decommissioned as required under chapter 18.104 RCW; (c) where an additional well or wells is constructed, the original well or wells may continue to be used, but the combined total withdrawal from the original and additional well or wells shall not enlarge the right conveyed by the original permit or certificate; and (d) other existing rights shall not be impaired. The department may specify an approved manner of construction and shall require a showing of compliance with the terms of the amendment, as provided in RCW 90.44.080 in the case of an original permit."

State Environmental Policy Act (SEPA)

This water right change application is categorically exempt under SEPA WAC 197-11-305 and WAC 197-11-800(4).

Washington Department of Fish and Wildlife Comments

Mr. Steve Bessow of the Washington Department of Fish and Wildlife has provided Ecology with a letter, dated March 6, 2002, in which he acknowledges that a change from a surface water diversion to a well will allow the district "additional municipal water while offering some protection to Beall Creek and the surrounding area."

Mr. Bessow recommends that for every one gallon per minute (0.02 cfs) of flow that is taken from the creek the district purchase one acre of land or development rights within the stream watershed, particularly within 100 feet of the stream bed. The Beall Creek watershed was purchased by the district in 1985, thus addressing Mr. Bessow's concerns.

Mr. Bessow further recommends that the district diligently pursue efforts to remedy downstream barriers to fish passage. The district has informed Ecology that it will work with downstream property owners to ensure that any such barriers are removed or that alternatives for fish passage are installed. In addition the district in 2004 renovated its diversion to ensure that bypass flows are not interrupted through its diversion structure.

Existing Rights for the King County Water District 19 Water System

There are currently four water rights held by King County Water District 19 (Table 1). The Beall Creek and Ellis Creek surface water rights represent the primary sources for the district. Groundwater from Wells 1, 2, and 4, operated as a wellfield, provide for peak flow periods and for late summer supply when surface water flows are decreased. In the event of an emergency the district has an additional groundwater source (Well 3) that can provide up to 45 gpm and an intertie with Heights Water, located north of the district boundary.

Table 1: Water Rights held by King County Water District 19

Cert. No.	DOH No.	Priority	Source	Qtr-Qtr	Location	Qi (cfs)	Qi (gpm)	Qa (afy)
SWC 887†	38900-01	01-Sep-1925	Beall Creek	SW/SE	T23N-R03E-S29	0.9	404	652
SWC 836†	38900-02	14-Nov-1926	Ellis Creek	NE/NE	T22N-R03E-S08	0.5	224	362
G1-23519C	38900-03 38900-04 38900-08	30-Oct-1979	Well # 1 Well # 2 Well # 4	SW/SE SW/SE SW/SE	T23N-R03E-S31 T23N-R03E-S31 T23N-R03E-S31	0.56	250	300
SWC 8145*	N/A	14-Apr-1960	Beall Creek	SW/SE W/NE	T23N-R03E-S29 T23N-R03E-S32	0.4	180	55
Total						2.36	1,058	1,369

† - Qa not quantified on certificate. Amount shown assumes 100% usage at certificated Qi, but may limited by actual stream flows.

* - See Appendix B

Water District 19 water rights if fully developed are capable of providing up to a maximum Qi of 2.36 cfs (1,058 gpm) or 1.53 million gallons per day (MGD). The Qa under its four water rights of 1,369 afy, again assuming full development, corresponds with an average daily supply of 1.22 MGD.

Actual peak day supplies will be greatly dependant on surface water flows which supplies nearly two thirds of the district's capacity. The capacity is limited during late summer by low stream flows. SWC 887 has a requirement to leave a minimum of 0.1 cfs (45 gpm) within Beall Creek below the district's diversion. Its current pumping capacity is limited to 350 gpm and summer low flows are typically between 400 and 600 gpm (0.9 to 1.3 cfs). During the summer of 2005 Beall Creek flows decreased to as low as 350 gallons per minute (Jeff Lakin, pers. Comm., 2005).

Other Water Rights in the Vicinity

In addition to those water rights held by King County Water District 19, there are 8 water right certificates, 12 long form water right claims, 13 short form water right claims, and approximately 14 exempt water wells in the south half of Section 29 and in Section 32, Township 23N, Range 3E. Listed below are records found for certificated water rights (Table 2) and claims to vested water rights (Table 3).

Ecology has authority when processing a water rights application to make a tentative determination regarding the extent and validity of water rights that are pertinent to its investigation. A formal determination of the extent and validity of water rights is a right reserved to the courts under the Water Code.

Table 2: Certificated water rights in Sections 29 and 32, Township 23N, Range 3E

File #	Person	Priority	Purpose	Qi	Qa	Acres	TRS	QQ/Q	Source
G1-*10993C	G. PAUGH	6/22/1970	DS	8 gpm	1		T23N-R3E-S29		WELL
G1-20280C	Mount View Comm. Club	9/7/1972	DM	35 gpm	4.5		T23N-R3E-S29		WELL
S1-*02535C	KING J	2/26/1929	DS	0.01 cfs			T23N-R3E-S29	NW/SW	STREAM
S1-*07459C	SCALES L	9/23/1946	DS	0.01 cfs			T23N-R3E-S29	SW/NE	STREAM
S1-*10446C	SCALES L	6/28/1951	IR	0.12 cfs		12	T23N-R3E-S29	SW/NE	STREAM
S1-*15853C	UTZ B	1/18/1960	IR,DS	0.07 cfs	17	8	T23N-R3E-S29		BEALL CK
S1-22760C	WILLIAM B GRIFFIN	11/15/1976	DS	0.02 cfs	1		T23N-R3E-S32		SPRING
S1-23256C	WILLIAM E. SHEPHERD	11/13/1978	DS	0.005 cfs	2		T23N-R3E-S32		SPRING

Table 3: Claims to vested water rights in Sections 29 and 32, Township 23N, Range 3E

File #	Person	Form	Purpose	Qi	Units	Qa (afy)	Ir Acres	TRS	QQ/Q	Source
G1-021331CL	ARTHUR J. PATIENCE	Long	ST	9	gpm	1		T23N-R3E-S29	SENW	WELL
G1-066302CL	EDWARD R. BABCOCK	Long	DG	10	gpm	1		T23N-R3E-S29	NWNE	WELL
G1-140586CL	JOAN GRANT	Long	DG	10	gpm	2		T23N-R3E-S32		WELL
G1-155562CL	LEONARD NEVLER	Long	IR,DG	10	gpm	2	3	T23N-R3E-S29		WELL
S1-001572CL	WAYNE H. SARGENT	Long	DG	8	gpm	4		T23N-R3E-S29	SWNE	SPRING
S1-001573CL	WAYNE H. SARGENT	Long	IR	4	cfs	2	2	T23N-R3E-S29	SWNE	CREEK
S1-005938CL	GILBERT KIESECKER	Long	DG	1	gpm	1	1	T23N-R3E-S29	SWSW	SPRING
S1-066310CL	EDWARD R. BABCOCK	Long	FP		cfs			T23N-R3E-S29	NWNE	STREAM
S1-098383CL	MARTIN L PENHALLEGON	Long	DG	1	cfs	6		T23N-R3E-S32	NE	SPRING
S1-120821CL	FRED SCHLICK	Long	DG	0.01	cfs			T23N-R3E-S29	SE	STREAM
S1-141827CL	ROY G. BAILEY	Long	DG	25	gpm			T23N-R3E-S32	NWNW	CREEKS
S1-164925CL	JERRY R LA JAMBE	Long	IR	5	gpm	1		T23N-R3E-S29	SWSE	SPRING
G1-034001CL	ELLIS E. TILTON	Short	DG		gpm			T23N-R3E-S32	NWSW	
G1-037795CL	K. E. TILTON	Short	DG		gpm			T23N-R3E-S32	NWSW	
G1-041739CL	ESTHER TILTON	Short	IR		gpm			T23N-R3E-S32	NWSW	
G1-042499CL	TERENCE E. SULLIVAN	Short	DG		gpm			T23N-R3E-S29		
G1-076154CL	DANIEL S. CAMPBELL	Short	ST,DG		gpm			T23N-R3E-S29		
G1-077441CL	WM. FADDEN	Short	ST,DG		gpm			T23N-R3E-S29		
G1-087829CL	D. V. MEGALE	Short	DG		gpm			T23N-R3E-S32		
G1-089159CL	DAVID BRAUN	Short	ST,IR		gpm			T23N-R3E-S29		WELL
G1-114584CL	W. H. DE RANGO	Short	ST,IR		gpm			T23N-R3E-S29		
G1-137294CL	A. R. BERGERON	Short	IR,DG		gpm			T23N-R3E-S29		
S1-071498CL	JANE E. ROGERS	Short	DG		cfs			T23N-R3E-S32		STREAM
S1-071499CL	JANE E. ROGERS	Short	DG		cfs			T23N-R3E-S32		SPRING
S1-146261CL	CLAUD I. HEPWORTH	Short	DG		cfs			T23N-R3E-S32		SPRING

A search of well records in Ecology's Well Log database produced 14 matches for wells located in the south half of section 29 and in Section 32, the area sought for locating the proposed new well. The records for these wells are presented as Table 4.

Table 4: Exempt Wells in Area of Proposed Well

Log ID	Owner	Well Tag	Parcel No.	Depth	Compl. Date
304403	DERECK CHURCHILL	AFJ539	2923039134	82	1-Nov-2000
256293	DON SMITH	AFA532	2923039271	381	12-Sep-1999
256294	JEROME SMITH	AFA517	2923039050	142	5-Dec-1999
305253	LARRY YEAKEL	AAW887	3223039196	180	1-May-2001
357551	LINDA BURNS	AHH186	2923039137	130	25-Feb-2003
94964	MARK BURNS		2923039137	320	25-Nov-1996
190706	DICK GRAY	AFA547	3223039138	483	3-Jul-1999
190705	EAGLES CLUB	AFA544		182	14-Jul-1999
340971	KIMMELL GARDEN STORE			20	1-Jul-1945
94720	LIAM O'NEIL			150	1-Jul-1985
256298	SARAH CANDON	ACY836		137	30-Nov-1999
100693	STAN KOSKO	AEP436		128	18-Dec-1998
98469	TOM SHERMAN		3223039001	385	30-Dec-1992
369221	VASHON HOUSEHOLD	AHH177	3223039014	218	25-Aug-2003

The wells listed in Table 4 completed at depths of 320 feet or greater have been italicized since these wells are likely completed below the Vashon Principal Aquifer. The owners of these wells should be contacted prior to drilling any proposed new well intended to supply water from SWC 8145.

Site Visit

The area chosen for the proposed new well has been visited on numerous occasions beginning in November 2001. On December 7, 2001 and on November 23, 2003 the site of the original points of diversion of SWC 8145, the current district Beall Creek diversion and the site of the proposed well at the district's treatment plant on Beall Road were examined.

Topographic and Local Area Maps

Thematic and topographic maps used in this report and the underlying investigation were created using digital GIS data obtained from King County and the Department of Ecology databases. Maps were generated and a cross-section drawn using ArcGIS software distributed by ESRI Inc.

King County Water District 19 Water System Plan (2000)

The King County Water District 19 Coordinated Water System Plan dated March 2000 contains data on the water delivery infrastructure, current water usage, and forecasts on growth.

Current Water Use

The latest period for which usage data is available is 1995 to 1998. Table 5, which provides production and consumption figures for the years 1995 to 1998, is derived from the March 2000 District 19 Water System Plan.

Table 5: District Production				
Year	Avg. Daily Consumption (gpd)	Avg. Daily Production (gpd)	Annual Production (MGY)	Annual Production (afy)
1995	390,920	427,793	156.1	479.2
1996	367,018	373,504	136.3	418.4
1997	346,040	388,005	141.6	434.6
1998	399,526	405,260	147.9	545.0

Hydrogeology

There are three, and possibly four, water-bearing sedimentary units underlying Vashon-Maury Island. A generalized geological cross-section based on the 1:100,000 scale Geological map of King County (Sacket and Booth, 2002) was created using a LIDAR Image obtained from the Puget Sound Lidar Consortium (see Figure 2).

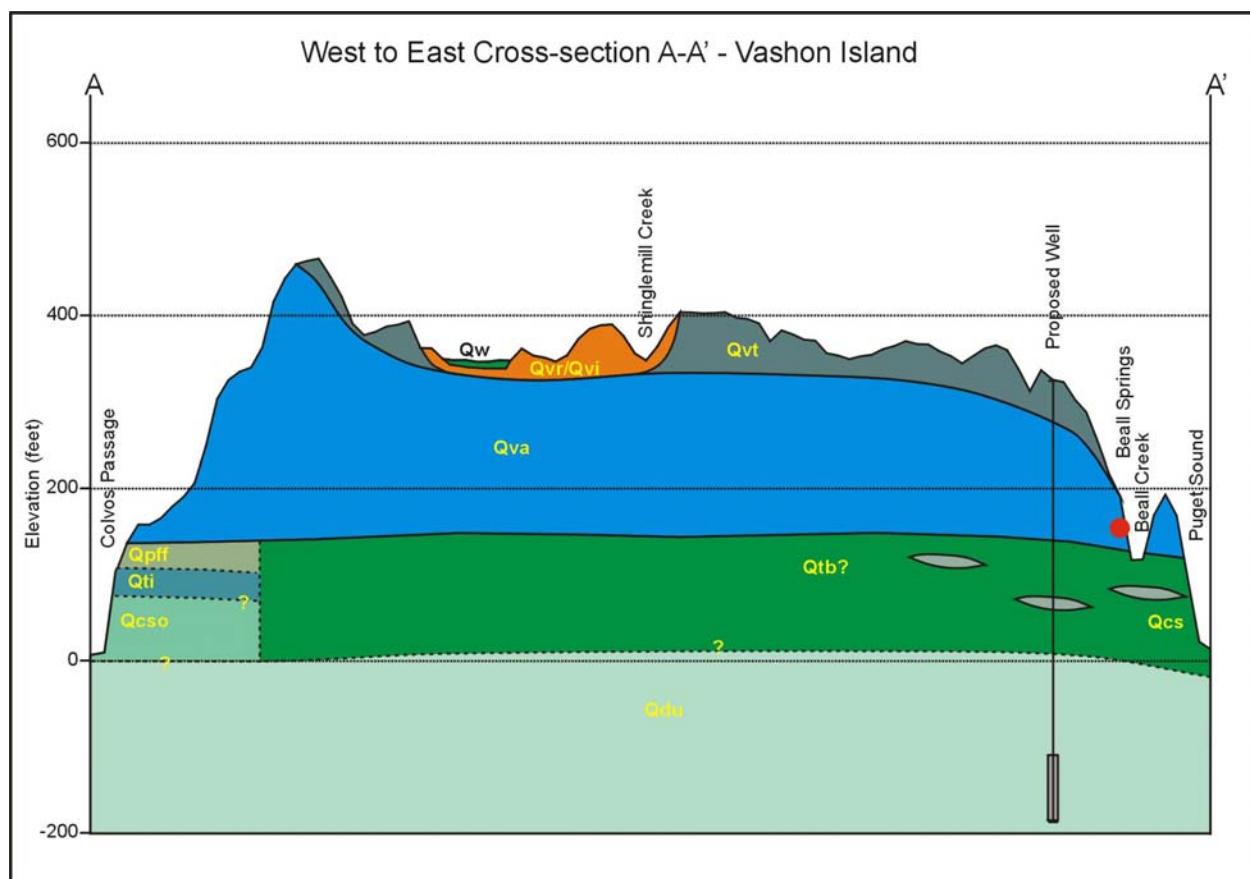


Figure 2: Generalized hydrogeological cross-section through Vashon Island (After Sacket and Booth, 2002)

Table 6: Vashon Island Surficial Deposits (See Figure 2)		
Unit	Description	Age (approx.)
Qw	Wetland deposits (Holocene)	<12K
Qvr	Vashon Recessional outwash deposits (~12,000 years)	12K
Qvi	Vashon Ice contact deposits	12K to 17K
Qvt	Vashon Till	12K to 17K
Qva	Vashon Advance outwash deposits (~17,000 years)	17K
Qcs	Clay and silt (Pre-Fraser)	17K to 40K
Qtb	Transitional beds (Pre- to Early Fraser. May include Qob)	17K to 40K
Qpf	Deposits of pre-Fraser glaciations. Qpff are silt and clay dominant and Qpfc sand and gravel dominated.	>40K
Qti	Older till	40K to 80K
Qcs	Older clay and silt	>80K
Qdu	Drift, undivided glacial deposits (may include non-glacial deposits)	>17K

The bulk of surficial materials seen on Vashon Island are by-products of the Fraser Glaciation, the most recent glacial episode in the Puget Sound Basin, which occurred between approximately 17,000 and 12,000 years before the present in the area of Vashon Island. The sedimentary record of Fraser Glaciation is represented, from oldest to youngest, by Vashon Advance Outwash (Qva), Vashon Till (Qvt)

and Vashon Recessional Outwash (Qvr) deposits. Ice contact deposits (Qvi) are often mixed with recessional outwash. Immediately underlying the Qva are transitional sediments (Qtb) deposited in front the advancing glacier, in both salt and freshwater bodies (periglacial lakes). Beneath the Qtb are deposits left by at least two, and in some places possibly three, similar glacial episodes and by non-glacial sediments deposited between glaciations. Recent, as yet un-published, surficial mapping contracted by King County Department of Natural Resources suggests that materials exposed on the west side of the island are older than those on the east side.

The area surrounding Beall Springs, and most of the area of the upper Beall Creek watershed, is underlain by sand and gravel of the Qva. This is capped above the creek gully by Qvt. In the lower portion of the creek valley, between the district's diversion and the shore of Puget Sound, the area is mapped as being underlain by clay and silt (Qcs), which appears to be the equivalent of the Lawton Clay, commonly mapped as Qtb.

Logs for several wells in the Beall Creek area indicate the presence of one or more sand dominated lenses within an otherwise clay silt rich unit (Qcs or Qtb), within which several wells serving single and group domestic needs have been completed. These water-bearing intervals may not be laterally or longitudinally extensive and would therefore not make good aquifers for a municipal supply well.

Table 7: Vashon/Maury Island Aquifers

Aquifer Name	Host	Elevation	Description
Perched Aquifer	Qvr (+/- Qvt)	200 to 400	Shallow unconfined aquifer. Is susceptible to spills and other sources of chemical and biological contamination. Water levels vary significantly between winter and summer.
Principal Aquifer	Qva	0 to 300	So named because it is widely used by private and public wells on Vashon Island. Is confined where overlain by till and unconfined where till has been eroded. Water levels are less variable than perched aquifers, but in places can vary appreciably, especially near streams. Provides base flows for most island streams.
Intermediate Aquifer	Qtb (and/or Qob)	-200 to +100	Discontinuous lenses of sand within otherwise silt dominated deposits. Water levels less variable, but discontinuous nature of coarse lenses can make this aquifer less reliable as a municipal source. In places may include Qob.
Deep Aquifer	Qob (and/or Qpfc)	-200 to -300?	Regionally extensive, but not well established as a productive aquifer on Vashon Island. Wells completed in what appears to be Qob in the central portion of the island reliably produce several hundreds of gallons per minute. The District's main wells are completed in this aquifer.

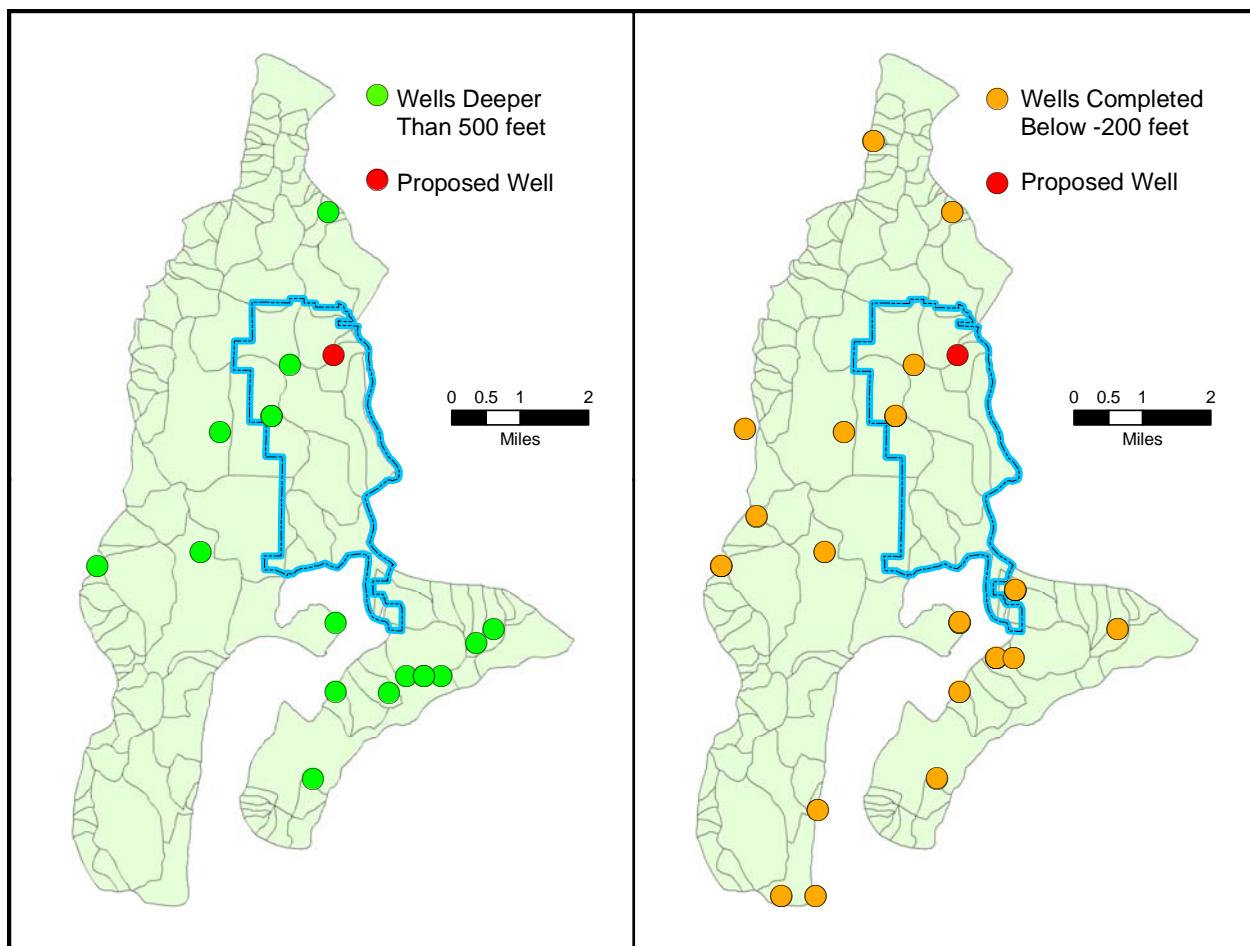


Figure 3: Deep Wells on Vashon/Maury Island

The well proposed through this change will be completed beneath the clay and silt unit (Qcs or Qtb) within what is regionally mapped as the Olympia Beds (Qob) or as Pre-Fraser coarse grained glacial deposits (Qpfc). An erosional surfaces that separates Qtb and Qob (or Qpfc) cuts across older units such that it is difficult in places with no surface exposure of the contact to determine which units are encountered below the contact in drill holes. Mapping to date on Vashon Island has not yet adequately separated the glacial or interglacial

materials deposited before the Fraser Glaciation. These are therefore portrayed on the cross-section (Figure 2) as unclassified Quaternary deposits (Qdu).

Groundwater under Vashon-Maury Island can be roughly separated by host stratigraphy into four aquifers. These are from top to bottom of the island, the Perched Aquifer, Principal Aquifer, Intermediate Aquifer, and Deep Aquifer (Table 7).

King County Water District 19 has proposed utilizing the Vashon Deep Aquifer as its new source for the Beall Greenhouse water right (SWC 8145). This aquifer is the equivalent of a sub-sea level aquifer that is encountered throughout the Puget Sound Basin. In most parts of the basin the Deep Aquifer is laterally extensive. In South and East King County, draw-downs from pumping wells completed in the Deep Aquifer can extend for several miles if wells pump at sufficiently high rates (i.e. >1,000 gpm). The same phenomenon has also been reported for Deep Aquifer wells located on the Kitsap Peninsula. A pumping rate of 180 gpm would not typically cause a measurable draw-down beyond a distance of a mile.

Ecology's well log database has records of 872 wells on Vashon Island (including Maury Island). Seventeen of these wells are completed at a depth of 500 feet or more and 25 are completed at an elevation of -200 feet or lower (Figure 3). A review of several logs for the wells completed deeper than -200 feet elevation suggests these were completed within the Olympic Beds (Qob) or older, pre-Fraser glacial deposits (Qpfc or as Qdu in Figure 2).

The distance from the proposed well to the nearest well that appears to be completed in the deep aquifer, and which is not owned by the district, is located more than 2 miles north of the proposed well site at the district's Beall Treatment Plant location. The next nearest deep aquifer well is located nearly 3.5 miles southwest of the treatment plant site.

Three wells located in the area proposed for a well appear from their wells logs to be completed in the Transitional Beds (Qtb). Other wells in the vicinity of the treatment plant site appear from well logs to be completed within the Qva hosted Principal Aquifer.

FINDINGS

In accordance with state law, the following considerations must be addressed during the process of evaluating this change request:

- Will the change result in enlargement of the original right?
- Does the new point(s) of withdrawal utilize the same source as the original right?
- Will the change cause impairment to other existing rights?
- Will the public interest be negatively impacted?
- If the application was protested, what are the protestors concerns?
- Is the new purpose of use considered a beneficial use of water?

Potential for Enlargement

Under RCW 90.03.380 only water which has previously been put to beneficial use is available for transfer or change, RCW 90.44.100 prohibits a change involving groundwater from enlarging the quantities assigned under the right when replacing or adding a point of withdrawal, and RCW 90.14.180 states that water which had not been used, without due cause, for a period exceeding five years causes a relinquishment of the right which then reverts to the state. Combined reading of these statutes is considered in change investigations when making a tentative evaluation of the extent and validity of the right that is available for change.

This evaluation was made as part of the relinquishment investigation that resulted in Relinquishment Order DE 03 WRNR-5484. The relinquishment order was subsequently appealed to the PCHB as Case No. 03-102, and through appeal of PCHB decision to King County Superior Court as Case No. 04-25081-1 SEA, which was settled out of court by the parties in July of 2005. The result of the order, subsequent litigation and the July 2005 settlement was that the Beall Greenhouse water right (SWC 8145) retains its original Qi (0.4 cfs or 180 gpm) and retains 74.8 afy of Qa, of which 55 afy will be transferred. The remaining 19.8 afy will be voluntarily relinquished as per the settlement agreement.

The proposed change will not result in an enlargement of the right.

Source of Water

The source of supply for the original Beall Greenhouse water right is Beall Creek and the springs which feed the creek. These springs originate within exposures of a sand and gravel aquifer hosted within the Vashon Advance Outwash (Qva) in the upper headwaters of Beall Creek (Figure 2).

There are no outside sources of water on Vashon Island. All water on the island occurs as rainfall. Rainfall which does not flow directly into Puget Sound via streams percolates through the soils and recharges the island's aquifers. Shallow aquifers on Vashon, hosted within the Advance and Recessional outwash deposits (Qva and Qvr respectively) support base flows within surface streams. A portion of the groundwater within the Qvr and deeper Qva penetrates to deeper sediments including the Qtb (Transitional Beds), the Qob (Olympia interglacial deposits), and deeper sand and gravel hosted aquifers.

It is evident that the waters of Beall Creek and the springs which feed the creek are in large part derived from groundwater. It is also clear that water within the Qva recharges deeper aquifers hosted in the Qtb and Qob.

The EPA has designated Vashon-Maury Island as a sole source aquifer. Although this designation does not require physical connectivity of groundwater in all aquifers underlying the surface of the island, on Vashon this appears to be the case.

Western water case-law for surface water and the Washington State Groundwater Code (Chapter 90.44 RCW) require that when a change is made to the point at which water is diverted or withdrawn it is required that both the original and replacement diversion or point of withdrawal share the same source of water.

Neither statute nor case law provides clear guidance on what criteria should be used to make a determination of when two points share the same source of water. In science it is understood that surface and ground waters represent parts of the same integrated resource and that withdrawing water from one can have both direct and indirect impacts on the other. The direct impacts are fairly simple to measure, such as when pumping a well adjacent to a stream causes a measurable decrease in flow. Indirect effects, however, present difficulties since many of the effects are delayed over time and diffused over a larger area for groundwater withdrawals relative to surface water diversions where the impact to stream flow is immediate.

The following criteria were used to determine that ground water hosted in the Qob (Olympia Beds) or Qpfc (coarse grained Pre-Fraser glacial deposits) represent the same source as surface water within Beall Creek. First, water in both is derived from the same source of recharge, namely rain fall percolating from the surface of Vashon Island. Second, a significant portion of the water that supplies Beall Creek originates as groundwater hosted by Qva that is exposed by creek erosion in the upper portion of the creek watershed. Groundwater hosted in older Qob or

Qpfc is recharged by the flow within Qva that penetrates downward rather than laterally. Third, the materials separating individual aquifers on Vashon Island are not of sufficiently low permeability to block effective flow of water between aquifers. The term “Leaky Aquitard” is often used to describe silt and clay aquitards within the Puget Sound Basin. Finally, both the original Beall diversion and the proposed well are located on the same side of the island and thus not separated by either a topographic or hydrological divide.

It is therefore determined that both the original diversion and the proposed replacement well(s) share the same common source of water.

Impairment of Existing Water Rights

The common requirements of both Chapter 90.03 and 90.44 RCW are that the change shall not result in the impairment of existing water rights. In order to minimize the potential for impairment the district has agreed to complete its new well within the Deep Aquifer on Vashon Island.

Few wells on Vashon Island are completed in the Deep Aquifer. The nearest wells completed in what appears to be the Deep Aquifer are those wells west of the town center which serve King County Water District 19. The majority of wells on Vashon Island are completed in Principal Aquifer hosted within Qva. A lesser number of wells appear to be completed in sand-dominated lenses or layers of the silt-rich Qtb.

Older glacial and interglacial sand and gravel deposits often form extensive regional aquifers elsewhere in the Puget Sound Basin. Although the depth of Puget Sound and Colvos Passage surrounding the island makes it unlikely that the Deep Aquifer on Vashon Island is hydraulically connected with similar aquifers off-island, it is likely that this aquifer is present under most if of the island.

What remains relatively uncertain is whether the aquifer is present within the area of the new well or wells proposed for this change since no wells in the immediate area appear to completed below the Qtb. In order to protect wells completed in the Qtb from impairment, the testing of any well proposed for this change must include monitoring of wells within ½ mile that are known or suspected to be completed in the Qtb. Ecology will review the results of testing prior to approving the well for production purposes.

This investigation finds that the proposed changes will not impair existing water rights.

Public Interest

An evaluation of how a proposed change might impact the public interest is required under Chapter 90.44 RCW when a water rights change involves groundwater. In water rights changes the elements of the public interest that are most commonly considered are the potential of the proposed change to benefit or negatively impact the environment and public health and safety.

Under SWC 887 the district is authorized to divert water at a rate of up to 0.90 cfs (400 gpm) at its existing Beall Creek diversion. The Beall Greenhouse water right, SWC 8145 further authorizes its owner (the district since 1985) to withdraw an additional 0.40 cfs (180 gpm which currently is limited to serve only greenhouse and associated domestic uses on the Beall Greenhouse properties). The district is therefore currently authorized under its existing water rights to divert up to 1.30 cfs from Beall Creek, so long as it maintains a minimum flow of 0.10 cfs (48 gpm) below its diversion to supply downstream riparian users.

During late summer the flows on Beall Creek are typically about on the order of 1.40 cfs (600 gpm) or less depending on the amount of rainfall during the previous winter. If the district were to fully utilize the quantities under both SWC 887 and 8145, and Beall Creek flows were 600 gpm or greater its legal requirement to maintain flows would be satisfied. It is uncertain however whether flows would be sufficient to maintain fish habitat in the creek.

In order to alleviate concerns over fish habitat in Beall Creek the district agreed in 2001 to amend its application so that water under SWC 8145 is withdrawn from a groundwater source, thus diffusing and delaying the impact that diverting the water would have on Beall Creek.

If the district were to have proceeded with its original change proposal to change only the place and purpose of use, this evaluation of the potential impacts of the change to the public interest, particularly the impacts to the environment, would not be required under the surface water code. Specifically, under RCW 90.03.380 an investigation of a change requires only that such the change not impair existing water rights. Since the proposed change would not alter the requirement that the district provide 0.10 cfs for downstream users, it is unlikely that impairment of other water rights would occur, since only one other water right holder utilizes the creek below the district’s diversion and the creek at the point where this right is diverted has a much greater base flow (~2.5 cfs in late summer).

Any withdrawal of groundwater will have an impact on hydraulically connected surface water bodies and wetlands. Similarly, a diversion of surface water will have an impact on the surface water bodies from which water is diverted. Under this change proposal the applicant seeks to replace a stream diversion and spring collector system with a well completed in an aquifer with limited hydraulic continuity with the creek and existing shallow aquifer sources.

The difference in the hydraulic effects on surface water between a surface diversion and groundwater withdrawal are significant. When water is diverted directly from a stream or intercepted at the site of springs feeding the stream the impacts of the diversion are immediate with a direct lessening of flow in the stream equal to the amount diverted.

Surface tension between water and the sand and gravel within an aquifer added to the physical resistance of aquifer materials to water flow result in groundwater flowing at much slower rates than is found in free flowing surface water bodies. Stream flow is generally measured in feet per second, lakes in feet per day, and groundwater flow in feet per years or longer. These physical properties of groundwater water result in a delayed impact of withdrawals on surface water bodies with which ground water is in hydraulic connection.

In addition to delayed timing of effects, groundwater withdrawals have a more dispersed effect due to the larger recharge and discharge areas of groundwater relative to surface water bodies. Groundwater bodies typically are more extensive than a single surface water body drainage area. Beall Creek has a surface drainage area covering approximately two square miles. Rain fall that directly affects the flows of Beall Creek comes only from within the creek’s surface water drainage area. The area of recharge for the Vashon Advance Outwash (Principal) Aquifer covers approximately two-thirds of the area of Vashon Island. The recharge area for the Deep Aquifer covers nearly the whole of the island.

Aquitards are low permeability hydrostratigraphic layers where water flow is much slower than aquifers. The presence of an aquitard between a well and a surface water body will further delay the effects of pumping and widen the area from which well water is drawn.

Rainfall that does not directly drain from surface water bodies percolates beneath the surface to recharge first the Principal Aquifer and from there groundwater that does not directly supply base flows to creeks or to Puget Sound, percolates to deeper groundwater aquifers and eventually discharges into Puget Sound.

Sea run cutthroat trout are known to exist within Beall Creek below the district’s existing surface water diversion. Whether these fish historically traveled beyond the area of the diversion is not known. It is apparent, however, that the fish have survived in the creek despite historical usage of both water rights at or near their maximum withdrawal rates during the late summer period. Both rights apparently

have not been historically utilized at maximum quantity. Such usage might overload the capacity of the creek to supply water for fish habitat.

The change as now proposed, from a surface diversion to a well, will not likely lead to over utilization of the creek. The proposed change will result in more flows being available in Beall Creek during the late summer period, when the demand is greatest for the people and fish, than would otherwise occur if the two district water rights to Beall Creek were used. The proposed groundwater source will have an effect on surface water bodies, but that effect will be both delayed and dispersed.

The effects of the change on public health and safety are an important consideration in the evaluation of this proposed change. In 1993, when the first change application was received for the Beall Greenhouse water right, the district was under a moratorium imposed by the Department of Health due to a lack of adequate treatment for its surface water sources. This moratorium and a later self-imposed moratorium in the later 1990's, based on the extent of its supplies, has resulted in many residents within the district's boundaries seeking other sources of water for their domestic needs.

There are at least 70 wells operated by private individuals within the district's boundaries (Figure 4). Since 1993 some 50 new wells, most tapping the Vashon Principal Aquifer, have been drilled within the district's boundaries. These new wells, apparently drilled under the exemption to water rights permitting under RCW 90.44.050 and with King County approval, currently withdraw as much or more water than would be available to the district through the Beall Greenhouse water right. There is one significant difference however between the district and the owners of these new exempt wells – the district has strict regulatory responsibilities regarding the quality of water it provides and the manner in which it manages the resource. In addition, the district is directly answerable to the citizens within its service boundaries (including those who are using exempt wells) through the election of district commissioners.

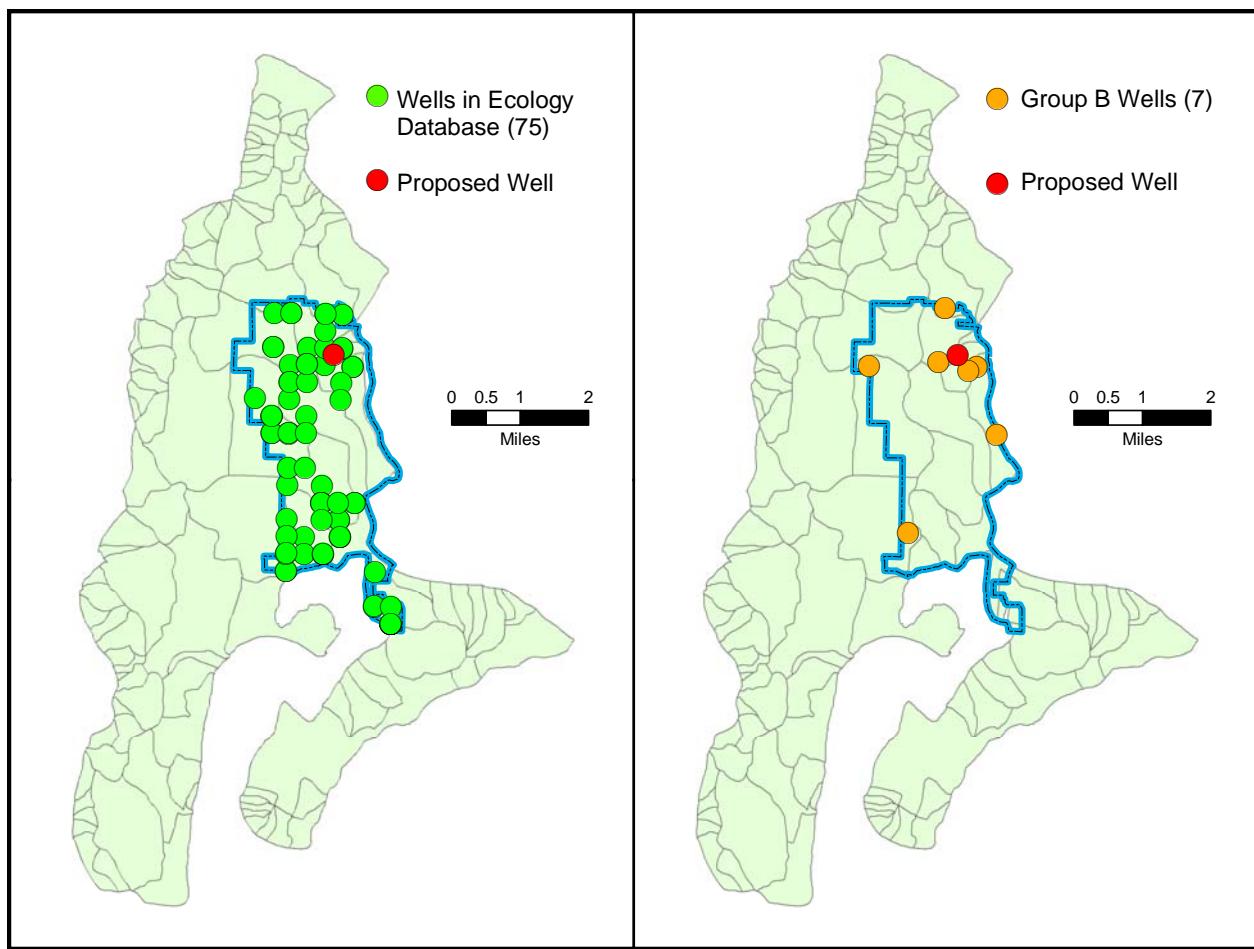


Figure 4: Wells drilled according to Ecology databases and Group B wells located within the boundaries of Water District 19.

Some of the protests received regarding this application and comments made by members of community regarding the proposed change cited a need for Ecology to limit growth on Vashon Island through its authority under the Water Code. The laws of Washington State place the responsibility for community planning with municipal and county authorities, not with the Department of Ecology.

King County government had adopted growth management and zoning plans for Vashon that fully address the issue of growth on the island. Approval of this application for change is not contrary to the public interest as expressed through the adoption by elected officials of existing community plans for Vashon Island. These plans, while acknowledging that there are limitations to growth, none-the-less envision growth and work to accommodate it, primarily with the boundaries of Water District 19.

This investigation of the effects of the proposed change in purpose of use, place of use, and point of withdrawal on the interests of the public finds that the public will be better served through improved stream flow conditions on Beall Creek and by greater protection of health and safety through approval of the change.

Beneficial Use

Municipal supply is a beneficial use of water in accordance with the definitions provided in RCW 43.27A.020, RCW 90.14.031, and RCW 90.54.020.

Concerns of Protestors

The district's applications for transfer and changes to the Beall Greenhouse water right (SWC 8154) elicited 36 protests from members of the Vashon Island community (Appendix C). The concerns of the protestors can be grouped within eight categories; Statutory relinquishment or abandonment, degradation of water quality, impairment of existing water rights, community growth, degradation of fish habitat, water quantity available for transfer, general environmental quality, and whether the right is in fact held by the district (Table 8).

The most numerously cited reason for protest, that the Beall Greenhouse right had relinquished due to non-use for a period exceeding five years, was the subject of litigation between the King County Water District 19, Ecology and the environmental group Protect Our Water.

The case was litigated at the Pollution Control Hearings Board (Case No. 03-102) which found that Qi was not relinquished and that Qa was partially relinquished leaving 74.8 afy remaining under the right. The PCHB decision was appealed to King County Superior Court (Case No. 04-25081-1 SEA), which resulted in an agreement in July 2005 through which all parties acknowledged that SWC 8145 is partially relinquished and that 180 gpm (Qi) and 55 afy (Qa) shall remain available under the right for the proposed change.

Table 8: Protest Categories

Relinquishment	Water Quantity	Impairment	Fish Habitat	Growth	Water Quality	General Environment	Water Right Ownership
32	25	22	10	10	4	1	1

The water quantity concerns dealt with both the quantities available for transfer and with general water availability from within the aquifer. The issue of water available under the right has been settled, both through PCHB decision (Appendix A) and through the settlement agreement (Appendix B). The larger question of whether water is available (sustainable) from the aquifer can be addressed through examination of long term water level monitoring of the island's aquifers.

Water level monitoring data throughout the island has been the subject of an on-going program initiated by King County Department of Natural Resources and Parks. During the 1980's and 1990's this data was collected as part of the Groundwater Management Program funded by King County and the Department of Ecology. Since 2002 the county has funded the monitoring program. Based on its monitoring program, King County Department of Natural Resources and Parks reported at a 2004 meeting of the Vashon-Maury Island Groundwater Protection Committee that groundwater levels on Vashon-Maury Island are not declining.

The third most common concern expressed by protestors is that approval of the change might result in impairment of existing water rights. The proposed change involves replacing an instream diversion with a well, thus Ecology is required under the water code to make a determination that the new well will not impair existing water rights. To ensure this Ecology will require that the district monitor two wells within a radius of 1 mile during testing of its replacement well. Ecology will also require that the district complete its well within the Deep Aquifer, which is separated from groundwater sources used by other water right holders by low permeability clay and silt. As a further protection against impairment of existing water rights, final approval and use of the new point of withdrawal will require Ecology approval. Other water rights holders are therefore protected through this change from impairment.

The fourth most numerously cited reason for protest is that the change would result in a decrease in stream flows in Beall Creek that could threaten cutthroat trout habitat. The issue of environmental impacts that could result from approval of the proposed change is covered in the Public Interest evaluation section of this report where a finding is made that the proposed change will not negatively impact stream flows.

In addition to the four categories of protest discussed above, there were some general comments on community growth within protest letters and a specific protest regarding ownership of the Beall Greenhouse water right by the present owner of the original greenhouse property.

Ecology lacks authority under the Water Code to regulate community growth. This authority resides primarily with King County through zoning ordinances and growth management plans created and adopted by them under the State's Growth Management Act. Water District 19 is required to accommodate growth through its Water System Plan and is responsible for providing services to the community.

The opposition by a portion of the Vashon community regarding the proposed changes and subsequent litigation which came to an end in July 2005 did not stop development or growth on Vashon Island between 1993 and the present. This is in part due to the "safety valve" of the exemption to water right permitting under RCW 90.44.050 that has resulted in some 70 or more new wells being drilled within the district's boundaries and to a lesser degree through water system improvements made by the district. Elsewhere on the island growth has been accommodated by other water systems growing into their existing water rights and through the drilling of exempt wells.

Zoning within portions of the district service area allows for subdivision of properties into parcels less than 5 acres in area. Current King County ordinances and regulations prevent owners of these properties serving their water needs through exempt wells in most circumstances. In rural areas of the island most lots are larger than 5 acres and exempt wells are less restricted under county regulations. The primary reason that zoning allows smaller lots in and around the town center is to direct future growth on the island to this area while retaining the rural character of the areas zoned for 5 and 10 or larger acre parcels.

Some of the protestants cited that utilization of SWC 8145 will negatively affect water quality. While it is possible that over utilization of a water resource may lead to a reduction in the ability of the resource to dilute existing or potential contamination, the water use in itself does not lead to degradation of water quality. In the present case the applicant does not seek to utilize a new source of water, but seeks only to use an existing and long used source. As such, use of this water right will not lead to a further diminishment of resource, nor to a degradation in water quality.

A more general protest was received citing potential environmental harm that might be caused by the utilization of water under SWC 8145. All human activity has some impact on the natural environment. The use of water is no exception to this fact. In the present case, however, the issue is also one of the legal right to use a water right that was vested through beneficial use before the adoption of the water code in 1917 and was later entered into record in the 1960's as SWC 8145. Questions surrounding the validity and extent of the water have been settled. The wise stewardship of the water right and the Beall Creek environment will remain a responsibility of King County Water District 19 and of the citizens who elect its officers.

The one protest that questioned ownership of SWC 8145 by King County Water District 19 was examined through a review of documents filed with King County and others that were supplied by the district. These documents show that the water right was sold separately to the district in August 1988 by the Beall Greenhouse Company, prior to when the land occupied by greenhouse operation was sold to the protestant in 1992. Ecology is satisfied based on its review of these documents that the district has authority to make application for the proposed change to SWC 8145. The department, however, makes no formal finding here as to official ownership of the water right. The protestant has been fully informed of the results of Ecology's investigation into the ownership of the water right.

RECOMMENDATIONS

I recommend the request for change to Surface Water Certificate 8145A be approved, subject to the provisions listed below:

1. The amount of water granted is a maximum limit that shall not be exceeded and the water user shall be entitled only to that amount of water within the specified limit that is beneficially used and required.
2. The amount of water available for proposed changes to Surface Water Certificate 8145 (S1-15998ALC) has been tentatively determined as follows:
 - a. The instantaneous quantity (Qi) available 180 gallons per minute (0.40 cubic feet per second)

- b. The annual quantity (Qa) available is 55 acre-feet per year
3. The transfer of the water right from the Beall Greenhouse Company to King County Water District 19 should be approved.
 4. The change in purpose of use from Greenhouse Uses to Municipal Supply should be approved.
 5. The change in place of use from the Beall Greenhouse Property to the area served by King County Water District 19 as approved in its most recently approved Water System plan should be approved.
 6. The change from points of diversion on Beall Creek to a well or wells located with the South ½ of Section 19 or in Section 32, both in Township 23 North, Range 2 East, Willamette Meridian should be approved provided that the following conditions are satisfied:
 - a. All wells utilized under this change shall be completed in the Deep Aquifer as described within this report.
 - b. A 24-hour aquifer test (pump test) and monitoring program shall be conducted under the supervision of a licensed hydrogeologist or qualified professional engineer for each well completed to accomplish the change.
 - i. A minimum of one and preferably two wells located within a distance of 1-mile shall be monitored for water level responses during the aquifer test.
 - ii. The monitoring wells shall be completed at a depth below the Principal Aquifer hosted by the Vashon Advance Outwash (Qva), and preferably within an aquifer hosted in either the Transitional Beds (Qtb) or deeper water bearing sediments as described in this report.
 - iii. The monitoring wells shall be sampled before and after the aquifer test to test for increased salinity.
 - iv. Additional monitoring wells, including wells completed in shallower aquifers, may be added at the discretion of the district.
 - c. A report prepared by a licensed hydrogeologist or qualified professional engineer documenting the well testing shall be submitted to Ecology for each well to be used under water right Certificate 8145. The report shall provide the following information:
 - i. The transmissivity, storativity and hydraulic conductivity of the aquifer,
 - ii. The sustainable yield of the well,
 - iii. The potential for sea water intrusion,
 - iv. The location and distance of other wells that might be effected by pumping and the estimated drawdown that might be expected at that location and within the aquifer in which the well is completed, and
 - v. A finding that use of the well shall not cause impairment of existing water rights.
 - d. If, after a period of five years from the date of approval of these changes, the applicant has not successfully satisfied the conditions listed above in item 6a through 6c, the approved point of withdrawal shall revert to that currently authorized under Certificate 8145, namely points of diversion located within the SW ¼ of the SE ¼ of Section 29, Township 23 N, Range 3 E and/or within the W½ of the NE¼ of Section 32, Township 23 N, Range 3 E.
 - e. The five-year development schedule for the replacement well may be extended if due diligence has been pursued and the public interest is best served by such an extension in accordance with the provisions RCW 90.03.320 and Water Resources Policy 1050.
 7. All points of withdrawal and/or surface water diversions approved through this report and that may be added in future shall meter water use. Meter readings shall be recorded at minimum frequency of once per week. These records shall be maintained in an electronic spreadsheet so that weekly, monthly and annual usage can be examined separately and be made available to Ecology upon request.
 8. In order to protect the resource, static water level (SWL), represented by depth to water, shall be measured at least once each month at each well utilized under this water right, including additional or replacement wells drill in the future. Measurements shall be taken after the pump has been shut off a reasonable time to allow water level to return to normal. Ecology's Water Resources program (NWRO) shall be notified if a below normal seasonal drop is measured in SWL, otherwise this data shall be maintained and be made available to Ecology upon request.
 9. Any approved surface diversions or points of withdrawal (wells) under this water right that are no longer planned to be used shall be properly decommissioned within a reasonable amount of time.
 10. Installation and maintenance of an access port as described in Ground Water Bulletin No. 1 is required. An air-line and gauge may be installed in addition to the access port.
 11. If it can be shown that the requested changes have a detrimental effect on existing rights, it shall be the responsibility of the water right holder to mitigate for this impact and/or alter or cease withdrawal of water.

The applicant is advised that a superceding certificate of water right will issue for only that quantity of water that has been withdrawn and applied to actual beneficial use. Such quantity applied to actual beneficial use shall not exceed the quantity specified in this report of exam and will be calculated based on the best information available to Ecology, including metering data and/or water duty analysis.

A superceding certificate of water right will not be issued until a final investigation is made.

CONCLUSIONS

In accordance with chapters 90.03 and 90.44 RCW, I conclude that Surface Water Certificate 8145 is in good standing and is eligible for change. I have determined that the change to Surface Water Certificate 8145 will not enlarge the right and that the water use will be beneficial. Approval of this change request will not cause impairment of existing rights or be detrimental to the public interest. Based on these conclusions, this change request should be approved subject to existing rights and the above-indicated provisions, and a superseding certificate should be issued.

REPORT BY: _____ DATE: _____
Douglas H. Wood, M.S., P.Geo., LHG

APPENDIX D

HEIGHTS WATER INTERTIE AGREEMENT

AGREEMENT FOR EMERGENCY INTERTIE

THIS AGREEMENT is made this 4th day of April, 2006 between WATER DISTRICT NO. 19, a municipal corporation (“District”), and HEIGHTS WATER ASSOCIATION, a nonprofit water association (“Association”), for the purposes set forth herein.

SECTION I: RECITALS

1.1 The District and the Association are the owners and operators of water systems and are engaged in the distribution of water to consumers in King County. The District’s corporate boundary is located adjacent to the Association’s service area boundary.

1.2 The Association desires to obtain a supplemental source of water supply for emergency purposes and the District is willing to allow an emergency intertie between the District’s and the Association’s water system for such purpose subject to certain terms and conditions.

1.3 The District desires to obtain a supplemental source of water supply for emergency purposes and the Association is willing to allow an emergency intertie between the Association’s and the District’s water system for such purpose subject to certain terms and conditions

In consideration of the terms and conditions contained herein, the parties agree as follows.

SECTION II: EMERGENCY INTERTIE

2.1 The District and the Association agree to allow an emergency standby source of water through an intertie connection between the District and the Association water systems, at the location described and depicted on Exhibit “A” attached hereto. This connection shall be an emergency standby connection, and water shall only be drawn through this point when an emergency occurs. An emergency shall be considered any event that causes the Association’s or District’s water pressure to drop below 20 psi as a result of water line failure, pump problem, or reduced water supply.

2.2 The Association and the District agree the party requesting the Intertie to be opened shall notify the other in writing at least 48 hours in advance of the date the requesting party desires to receive water through the intertie. In the case of immediate need by the requesting party, water shall be provided immediately upon oral notification of such immediate need. Each party shall designate an appropriate person to receive oral notification. Follow-up written notice of such a request shall be made by the requesting party to the other party.

2.3 The Association and the District agree to pay for all water delivered through the intertie at the supplier's respective current single family lowest average rate.

2.4 The Association and the District agree bills shall be rendered on a bi-monthly basis for the amount of water delivered. All bills shall be paid within 30 days of the date of billing. Any billings not paid within such 30-day period shall accrue interest at the rate of 12 percent per annum until paid.

2.5 The Association and the District agree to use reasonable efforts to provide an uninterrupted supply of water when requested to do so through the intertie. Neither party shall be liable for any

shortage or interruption in the delivery of water to the requesting party. In addition, neither party shall be liable for any failure, interruption, or shortage of water, or any loss or damage resulting therefrom to the requesting party or any of its members or customers resulting from any cause beyond the control of the supplier. Neither the Association nor the District guarantees the availability of water through the intertie at all times, or provides any representation or assurance as to water pressure or volume. Further, during critical water shortage periods as determined by the supplier, the supplier may close the intertie until the supplier deems sufficient water exists to make water available to the requesting party. In the event the Association or the District imposes water usage restrictions within their respective systems, the other agrees to adopt and impose water usage restrictions no less restrictive than those imposed by the first as a pre-condition to receiving water through the intertie.

2.6 The Association and the District agree to restrict the resale of water purchased under this agreement to their respective rate payers or customers within their respective water service boundaries for use therein.

2.7 The Association and the District agree that all water delivered to the requesting party shall be measured by metering equipment to be installed by the supplier. The District shall own, operate, and maintain the intertie up to the Association side of the intertie vault. The Association shall own, operate, and maintain any water line from the Association side of the intertie vault to the Association water system. The requesting party shall be responsible for the flushing of such intertie water line at a reasonable time interval at their own discretion to ensure water quality.

2.8 The Association and the District acknowledge that in order for the Association to receive water from the District through the intertie, the water must be pumped from the District's water system to the Association's water system. When the Association requests to receive water from the District through the intertie, the Association shall provide a portable pump, generator, and any other equipment necessary for the Association to receive water, and connect the equipment to the District's facilities, at the Association's expense. The connection of such equipment to the District's facilities shall be consistent with Association and District standards and policies.

2.9 Each party shall notify the other when there is a need to flush intertie water lines, obtain water supply through the intertie, or operate the intertie for any other reason. The Association and the District agree to dispatch representatives to the intertie location to coordinate valve operation and flow initiation regardless of the circumstances requiring said operation.

SECTION III: GENERAL PROVISIONS

3.1 Each party shall approve the terms and conditions of this Agreement by resolution and provide the other party with a certified copy of same. Each party represents to the other that it has the full power and authority to enter into this Agreement.

3.2 If either party commences any legal action relating to the provisions of this Agreement, the prevailing party shall be entitled, in addition to all other amounts to which it is otherwise entitled in this Agreement, to all cost of litigation, including but not limited to, costs, expert witness and reasonable attorney's fees, including all such costs and fees incurred on appeal.

3.3 The District agrees to hold harmless and indemnify the Association and its employees and agents from any and all claims, damages, costs, and other liabilities caused by the District's sole

negligence or concurrent negligence, but only to the extent of the District's concurrent negligence, and arising by reason of participation in, in connection with, or relating to the performance of this Agreement. In addition, the District agrees to defend, indemnify, and hold harmless the Association from any and all claims, damages, costs, and other liabilities arising out of any use by the District or its customers of any water provided through the intertie, including emergency use for fire purposes and normal domestic use and consumption made by or on behalf of the District's customers.

The Association agrees to hold harmless and indemnify the District and its employees and agents from any and all claims, damages, costs, and other liabilities caused by the Association's sole negligence or concurrent negligence, but only to the extent of the Association's concurrent negligence, and arising by reason of participation in, in connection with, or relating to the performance of this Agreement. In addition, the Association agrees to defend, indemnify, and hold harmless the District from any and all claims, damages, costs, and other liabilities arising out of any use by the Association or its members or customers of any water provided through the intertie, including emergency use for fire purposes and normal domestic use and consumption made by or on behalf of the Association's members or customers.

3.4 The Association and the District agree that neither party may assign its rights and/or duties under this Agreement to another without the prior written consent of the other, which consent may be withheld at its sole discretion.

3.5 This Agreement shall take effect upon the ratification of this Agreement by both the District Board of Commissioners and the Association Board of Trustees.

3.6 The Association and the District agree this Agreement may be terminated at any time in the event (1) either party or any of its representatives operate the intertie valve without the prior approval by the other to do so, or (2) any public agency or court of law orders either party to terminate and cease such emergency intertie connection. In addition, each party has the right to cancel and terminate this Agreement upon giving 30 days advance written notice to the other party.

3.7 Any notice to be given or documents to be delivered by any party to the other shall be delivered in person or by certified mail and addressed to the following addresses:

District: District Manager, Water District 19
P.O. Box T 17630 100th Avenue SW
Vashon, WA 98070

Association: President, Board of Trustees
Heights Water
P.O. Box 820
Vashon, WA 98070

3.8 This Agreement constitutes the entire agreement between the parties with respect to the subject matter hereof and may be modified only by an agreement in writing signed by both parties hereto. This Agreement supersedes the prior agreement between the parties titled "Agreement for Emergency Intertie", dated July 20, 1998.

3.9 Each party agrees to comply with all federal, state, and local regulations in the operation of its water system connected to the emergency intertie which is the subject of this Agreement.

KING COUNTY WATER DISTRICT NO. 19
("District")

By Frank Jackson
FRANK JACKSON, President, Board of Commissioners

HEIGHTS WATER
("Association")

By James G. Chun
JAMES G. CHUN, President, Board of Trustees

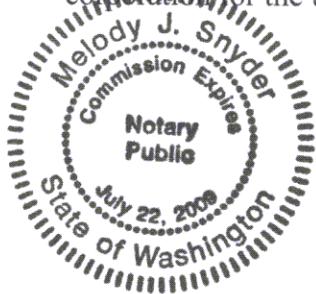
STATE OF WASHINGTON

)

COUNTY OF KING

) SS.
)

I certify that I know or have satisfactory evidence that Frank Jackson is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the President of Water District No. 19, a municipal corporation, to be the free and voluntary act of such municipal corporation for the uses and purposes mentioned in the instrument.



Dated March 14th, 2006

Melody Snyder

Notary Public in and for the State of Washington,
residing at Rashm Island WA.
My Appointment Expires 07/22/09

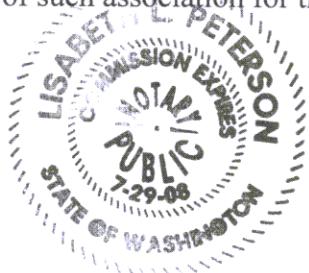
STATE OF WASHINGTON

)

COUNTY OF KING

) SS.
)

I certify that I know or have satisfactory evidence that James Chun is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the President of Heights Water Association, a private non-profit mutual water association, to be the free and voluntary act of such association for the uses and purposes mentioned in the instrument.



Dated 4/3/06

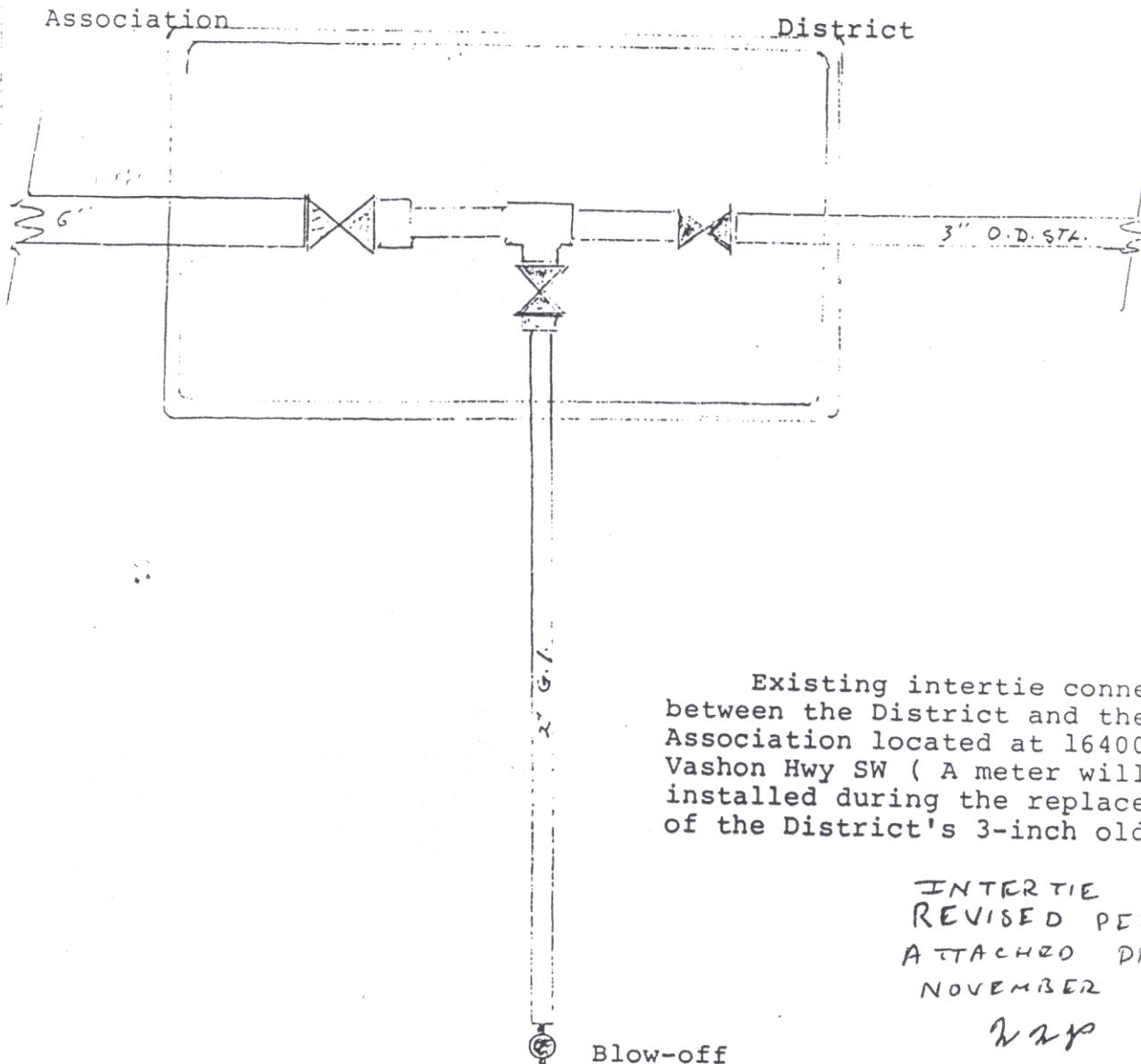
Lisette Peterson

Notary Public in and for the State of Washington,
residing at Renton WA.
My Appointment Expires 7/29/08

FOR PAGE 5 -

SEE COPY OF EXHIBIT "A" IN THE FORMS FILE.

1
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EXHIBIT "A"



Existing intertie connection
between the District and the
Association located at 16400
Vashon Hwy SW (A meter will be
installed during the replacement
of the District's 3-inch old w. main)

INTERIE
REVISED PER
ATTACHED DRAWINGS
NOVEMBER 2002.

2240

Blow-off

FRANCHISE NO. 14055

In the matter of the application for a franchise to operate, maintain, repair, and construct water mains and service lines, and appurtenances in, over, along, and under County roads and rights-of-way in King County, Washington.

The application of the Water District 19 for a franchise to operate, maintain, repair and construct water mains and service lines, and appurtenances in, over, along, and under County roads and rights-of-way located within the area described in attached Exhibit "A" has been heard on this 5 day of March, 2001. All of the property described in Exhibit "" lies outside the limits of any incorporated Town or City.

Legal notice of the franchise application and of the hearing has been given as is required by law.

The King County Council, having considered the interests proposed and advanced, and finding that the granting of this franchise is in the public interest, ORDERS that a franchise be granted to the Water District 19, the Grantee, subject to the conditions set forth in Exhibit "B" attached hereto, this franchise and Ordinance No 14055. This franchise grants the right, privilege, authority and franchise to operate, maintain, repair and construct mains and service lines and appurtenances as a part of its distribution system in, over, along, and under County roads and rights-of-way located within the area described in Exhibit "A".

14055

This franchise is granted subject to all of the terms and conditions contained herein, within Ordinance No. 14055 and Exhibit "B", and shall expire in twenty-five years on, 2026.

Dated this 12 day of March, 2001

KING COUNTY, WASHINGTON

BY Mark Smith

TITLE King County Executive

The undersigned accepts all the rights, privileges, and duties of this franchise subject to all terms, conditions, stipulations, and obligations contained herein, within Ordinance and Exhibit "B".

WATER DISTRICT 19
GRANTEE

BY Jean Berg
TITLE Commissioner

Dated this 20 day of April, 2001.

Exhibit "A"

Beginning at the southwest corner of Section 30-23-3;
Thence north along the west line of said Section 30 to the
northwest corner of the southwest quarter of the southwest
quarter of said Section 30;
Thence east along the north line of the southwest quarter of the
southwest quarter of said Section 30 to a point where it
intersects with the southwest corner of the northeast quarter of
the southwest quarter of said Section 30;
Thence north along the west line to a point where it intersects
with the northwest corner of the southeast quarter of the
northwest quarter of Section 30;
thence east along the north line of the southeast quarter of the
northwest quarter of Section 30 to its intersection with the
southwest corner of the northeast quarter of the northwest
quarter of Section 30;
thence north along the west line of the northeast quarter of the
northwest quarter of Section 30 to a point where it intersects
with the east margin of H. Stearn Road;
thence north along said east margin to its intersection with the
southwest corner of the south one-half of the south one-half of
the northeast quarter of the northeast quarter of Section 30;
thence east along the north line of said south one-half to a
point where it intersects with west margin of the Vashon Highway;
thence east along said line to its intersection with the east
margin of the Vashon Highway area north of the south one-half of
the northwest quarter of northwest quarter of Section 29,
Township 23, Range 3 North;
thence east along the north line of said south one-half to a
point where it intersects with the northeast corner of said south
one-half;
thence south along the east line said south one-half to a point
where it intersects with the southeast corner of the north one-
half of the north one-half of southwest quarter of the northwest
quarter of Section 29;
thence east along said north line to a point where it intersects
with the east margin of 91st Avenue Southwest in said Section 29;
thence north along said east margin to a point where it
intersects with the north margin of Dilworth Road Southwest;
thence east along said line to its intersection with the
extension of the west line of Lot 1 of King County Short Plat No.
59150086, Auditor's File #9404219003;
thence south being the west line of said Lot 1 of said short plat
to its intersection with the south line of Lot 2 of said King
County Short Plat;
thence south along the extension of the west line of Lot 2 of
said short plat to its intersection with the south line of
Section 29, Township 23, Range 3;
thence west along said south line to a point where it intersects
with east 195 feet of east of the southwest corner of Section 29;

thence north from said point North 00° 17' 18 $\frac{1}{2}$ west 330 feet to a point North 00° 17' 18 west 330 feet;

thence west from said point North 89° 56' 50 West 165 feet, AKA, west to a point where it intersects with the west margin of 91st Avenue Southwest if extended to the south;

thence south along the centerline of Section 29 to a point 995 east;

thence east at a 90 degree angle to the east margin of Southwest 171st Street;

thence south along the east margin of said road to a point where it intersects with the Vashon Wharf Right-of-Way east shoreline of Vashon Island to the south line of Section 29;

thence west along said line to a point east margin of Beall Road Southwest;

thence south along the said east margin to a point where it intersects with the south line of the northeast quarter of the northeast quarter of Section 32, Township 23, Range 3 East;

thence east along said line to a point intersect with the southwest corner of the northeast quarter of northeast quarter of Section 32, Township 23, Range 3 East;

thence east along the south line of said northeast quarter to a point 626.92 feet;

thence South 4° 28' 38 $\frac{1}{2}$ East to its intersection with the south line of northeast quarter of said Section 32;

thence east along said line to a point intersects with east shoreline of Vashon Island;

thence south along said line to the north line of the northwest quarter of Section 16, Township 22, Range 3 East;

thence South 26° 47' west to a point where it north margin of southwest point, Robinson Road, west along said margin to its intersection with the north corner of the east half of southwest quarter of the northwest quarter of said Section 16;

thence south along the west line of said east half to a point where it intersects with the southeast corner of northwest quarter of the southeast quarter of the southwest quarter of the northwest quarter of said Section 16;

thence east along said line to its intersection with the northeast corner of the southwest quarter of the southeast quarter of the southwest quarter of the northwest quarter of said Section 16;

thence south along the west of said southwest corner to its intersection with the south line of the northwest quarter of Section 16, Township 22, Range 3 East;

thence east along said south line to its intersection with the east margin of Dockton Road Southwest;

thence south along the east margin of said road to its intersection with east margin of 75th Avenue Southwest;

thence south along said east margin to its intersection with the south margin of Southwest 240th Street being located in Section 21, Township 22, Range 3;

thence west along the said south margin to its intersection with

the east shoreline of Quartermaster Harbor;
thence northwest and south along said shoreline to its
intersection with east margin of the Vashon Highway, located in
Section 18, Township 22, Range 3 East;
thence south along said east margin to its intersection with the
south margin of Southwest 228th Street, located in Section 18,
Township 22, Range 3 East;
thence west along the south margin to its intersection with
southwest corner of northwest quarter of the northeast quarter of
said Section 18;
thence north along the west line of said southwest corner to a
point where its intersection with the northwest corner of the
south one-half of the south one-half of the south one-half of
Section 7, Township 22, Range 3;
thence east along the north line of said south half to the west
margin of 103rd Avenue Southwest in said Section 7;
thence north along said margin to point where it intersects with
the west line of the east half of the east half of said Section
7;
thence continuing north along said west line to its intersection
with the northeast corner of northwest quarter of the southeast
quarter of Section 6, Township 22 North, Range 3;
thence west along the north line of said northeast corner to a
point where it intersects with the centerline of said Section 6;
thence north along said centerline to a point where it intersects
with the north line of said Section 6;
thence west along the north to a point where it intersects with
the northeast corner of the west half of the west half of Section
6, Township 22 North, Range 3 East;
thence west along the north of said section 6 to a point where it
intersects west of margin of 115th Avenue Southwest located in
Section 1, Township 22 North, Range 2 East;
thence north along said west margin to a point where it
intersects with the south line of the north half of Section 36,
Township 23 North, Range 2 East;
thence west along said south link to point where it intersects
with the southeast corner of the east half of the east half of
the east half of the northwest quarter Section 36, Township 23
North, Range 2 East;
thence north along the west line of said east half to a point
where it intersects with the north margin of the Southwest Bank
Road;
thence east along said north margin to its intersection with the
center of Section 25, Township 23 North, Range 2 East, a True
Point of Beginning.

EXHIBIT "B"
TERMS AND CONDITIONS APPLICABLE TO UTILITIES
FRANCHISES GRANTED BY KING COUNTY

THIS FRANCHISE is subject to the following terms and conditions:

1. DEFINITIONS

References to any County official or office also refers to any office that succeeds to any or all of the responsibilities of the named office or official. References to laws or "applicable laws" include federal, state, and local laws and regulations adopted pursuant to those laws; unless otherwise stated, references to laws include laws now in effect, as the same may be amended from time to time during the operation of this franchise. In addition, the following definitions shall apply:

Cable Services. The term "Cable Services" is used as defined in 47 United States Code 522 (5), as amended.

Cable System. The term "Cable System" is used as defined in 47 United States Code 522 (6), and King County Code 6.a.010 (J) as amended.

County Road Rights-of-Way. The term "County Road Rights-of-Way" includes any road, street, avenue, or alley located within the area described in the attached Exhibit "A", it does not include recreational or nature trails except where the trails intersect or are within roads, streets, avenues or alleys.

Director. The term "Director" refers to the chief executive of the King County Department of Transportation.

Grantee. The term "Grantee" refers to the WATER DISTRICT 19 its successors and those assignees approved pursuant to paragraph 16 herein.

Utility. The term "utility" refers either to the Grantee or, depending on the context, to any other person, firm, or corporation, public or private, which may hold a franchise to maintain and operate similar facilities in, under, over, across, and along any of the County property described in Exhibit "A".

Council. The term "Council" refers to the King County Council, acting in its official capacity.

Other Governing Body. The term "Other Governing Body" refers to any public official or other public board or body as may have the power and jurisdiction to permit or regulate the installation and maintenance of utilities and other facilities in, under, over, across, and along any of the county property described in Exhibit "A".

2. ACCEPTANCE BY GRANTEES OF TERMS AND CONDITIONS

The full acceptance of this franchise and all of its terms and conditions shall be filed with the Clerk of the Council within thirty (30) days from March 5, 2001, by the Grantee. Full acceptance of this franchise is a condition precedent to its taking effect, and unless this franchise is accepted within the time specified, this grant will be null and void and have no force or effect.

3. NON-EXCLUSIVE FRANCHISE

This franchise is not exclusive. It does not prohibit King County from granting franchises for other public or private utilities, in, under, over, across, and along any County property, including County road rights-of-way.

This franchise does not prevent or prohibit King County from constructing, altering, maintaining or using any County road rights-of-way covered by this franchise. King County retains full power to make all changes, relocations, repair, maintenance, etc. as it may deem fit.

4. JURISDICTION

This franchise is intended to convey limited rights and interest only as to those roads and rights-of-way in which King County has an actual interest. It is not a warranty of title or of interest in County road rights-of-way.

Whenever any of the County road rights-of-way as designated in this franchise, by reason of the subsequent incorporation of any Town or City or extension of the limits of any Town or City, shall later fall within the City or Town limits, this franchise shall continue in force and effect until such time as the incorporation and/or annexation is complete according to applicable State law, after which time the County will no longer have any responsibility for maintenance of any County roads, rights-of-way or other County property within the area of annexation/incorporation.

None of the rights granted to the Grantee shall affect the jurisdiction of King County over County road rights-of-way or the County's power to perform work upon its roadways, rights-of-way or appurtenant drainage facilities including by constructing, altering, renewing, paving, widening, grading, blasting or excavating.

All of the rights herein granted shall be subject to and governed by this franchise; provided, however, that nothing in this franchise may be construed in any way as limiting King County's rights to adopt ordinances which are necessary to protect the health, safety and welfare of the general public.

5. REGULATION OF USE AND CONTROL

This franchise does not deprive King County of any powers, rights, or privileges it now has or may later acquire in the future to regulate the use of and to control the County road rights-of-way

covered by this franchise.

This franchise authorizes the use of County rights-of-way solely for the delivery by the Grantee of water to its customers. Additional uses of County rights-of-way by the Grantee, including for cable communication services, shall first require a separate franchise from King County which conforms to the requirements of K.C.C. 6.27 as amended, or K.C.C. 6.27A as amended, and other applicable law.

Any use of the Grantee's equipment or facilities in County rights-of-way by others, including for telecommunication or cable communication services, is prohibited unless separately authorized and approved in writing by King County. The Grantee agrees that prior to authorizing any person to use the Grantee's equipment or facilities located in County rights-of-way, the Grantee will require the user to provide the Grantee with an affidavit that it has obtained the necessary franchise or other approval from the County to operate and provide the proposed service in County rights-of-way. At least thirty (30) days prior to executing any agreement with a potential user for the use of the Grantee's equipment or facilities, the Grantee shall fax the affidavit to the King County Office of Cable Communication at 206-296-0842.

6. EMINENT DOMAIN

This franchise and the limited rights and interests for the operation, maintenance, repair, and construction of Grantee's transmission and service lines and appurtenances are subject to the exercise of eminent domain. In the event of an exercise of eminent domain by King County, the value to be attributed to all the rights and interests granted under this franchise shall not exceed the actual amount the Grantee paid to King County in obtaining this franchise.

7. ENFORCEMENT

Failure of King County, on one or more occasions to exercise a right or to require compliance or performance under this franchise or any applicable law, shall not be deemed to constitute a waiver of such right or a waiver of compliance or performance, unless such right has been specifically waived in writing. Failure of King County to enforce or exercise its rights under any provision of this franchise or applicable law does not constitute a waiver of its rights to enforce or exercise a right in any other provision of this franchise or applicable law.

8. INDEMNITY AND HOLD HARMLESS

The Grantee agrees to indemnify and hold harmless King County as provided herein to the maximum extent possible under law. Accordingly, the Grantee agrees for itself, its successors, and assigns to defend, indemnify and hold harmless King County, its appointed and elected officials, and employees from and against liability for all claims, demands, suits, and judgments, including costs of defense thereof, for injury to persons, death, or property damage which is caused by, arises out of, or is incidental to Grantee's exercise of rights and privileges granted by this franchise. The Grantee's obligations under this section shall include:

- (a) Indemnification for such claims whether or not they arise from the sole negligence of the Grantee, the concurrent negligence of both parties, or the negligence of one or more third parties.
- (b) The duty to promptly accept tender of defense and provide defense to the County at the Grantee's own expense.
- (c) Indemnification of claims made by the Grantee's own employees or agents.
- (d) Waiver of the Grantee's immunity under the industrial insurance provisions of Title 51 RCW, which waiver has been mutually negotiated by the parties.

In the event it is necessary for the County to incur attorney's fees, legal expenses, or other costs to enforce the provisions of this section, all such fees, expenses and costs shall be recoverable from the Grantee.

In the event it is determined that RCW 4.24.115 applies to this franchise agreement, the Grantee agrees to defend, hold harmless and indemnify King County to the maximum extent permitted thereunder, and specifically for its negligence concurrent with that of King County to the full extent of Grantee's negligence. Grantee agrees to defend, indemnify and hold harmless the County for claims by Grantee's employees and agrees to waiver of its immunity under Title 51 RCW, which waiver has been mutually negotiated by the parties.

King County shall give the Grantee timely written notice of the making of any claim or of the commencement of any such action, suit, or other proceeding covered by the indemnity in this section. In the event any such claim arises, the County or any other indemnified party shall tender the defense thereof to the Grantee and the Grantee shall have the duty to defend, settle, or compromise any claims arising hereunder and the County shall cooperate fully therein.

Notwithstanding the above, the County shall have no obligation to tender a defense as a condition of the indemnity where there is a material conflict between the interests of the Grantee and King County.

9. VACATION

If at any time King County vacates any County road rights-of-way covered by this franchise, King County will not be held liable for any damages or loss to the Grantee by reason of such vacation. King County may, after giving thirty (30) days written notice to the Grantee, terminate this franchise with respect to any County road rights-of-way vacated.

10. REPAIR, REMOVAL OR RELOCATION

The Grantee hereby covenants, at its own expense, to repair, remove, or relocate existing facilities

including all appurtenant facilities and service lines connecting its system to users, within King County road rights-of-way if such repair, removal, or relocation is required by King County for any County road purpose. Such repair, removal, or relocation shall not be unreasonably required.

The grantee shall, at no expense to the County, adjust, remove or relocate existing facilities within County road rights-of-way, including all appurtenant facilities and service lines connecting its system to users, if the County determines such adjustment, removal or relocation is reasonably necessary to allow for an improvement or alteration planned by the County in such road right-of-way. The County shall give the Grantee written notice of such requirement as soon as practicable, at the beginning of the pre-design stage for projects that are part of the County's capital improvement program, including such available information as is reasonably necessary for the Grantee to plan for such adjustment, removal or relocation.

For projects that are a part of the County's capital improvement program, in addition to any other notice given to the Grantee, the County shall provide a vertical and horizontal profile of the roadway and drainage facilities within it, both existing and as proposed by the County, and the proposed construction schedule; notwithstanding any permit conditions that may later be applied to the County project, this initial design information shall be given at least 180 days before construction is scheduled to begin, except in cases of urgent construction or emergencies. The Grantee shall respond to this notice, and to any later notices of revised designs based on permit conditions, within no more than thirty (30) days by providing to the County the best available information as to the location of all of the Grantee's facilities, including all appurtenant facilities and service lines connecting its system to users and all facilities that it has abandoned, within the area proposed for the public works project.

The County shall offer the Grantee the opportunity to participate in the preparation of bid documents for the selection of a contractor to perform the public works project as well as all required adjustments, removals or relocations of the Grantee's facilities. Such bid documents shall provide for an appropriate cost allocation between the parties. The County shall have sole authority to choose the contractor to perform such work. The Grantee and the County may negotiate an agreement for the Grantee to pay the County for its allocation of costs, but neither party shall be bound to enter into such an agreement. Under such an agreement, in addition to the Grantee's allocation of contractor costs, the Grantee shall reimburse the County for cost, such as for inspections or soils testing, related to the Grantee's work and reasonably incurred by the County in the administration of such joint construction contracts. Such costs shall be calculated as the direct salary cost of the time of County professional and technical personnel spent productively engaged in such work, plus overhead costs at the standard rate charged by the County on other similar projects, including joint projects with other County agencies.

11. REQUIREMENT OF CONSTRUCTION PERMITS

The Grantee, its successors or assigns, has the right, privilege, and authority to enter the County road rights-of-way for the purpose of operating, maintaining, repairing or construction its transmission and service lines and appurtenances on the condition that it obtains permits approved

by the Director and Property Services Division and, when applicable, by the Department of Development and Environmental Services. Applications for work permits shall be presented to the Property Services Division which may require copies of plans, blueprints, cross-sections, or further detailing of work to be done. In the event of an emergency, the Grantee may immediately commence the necessary work and shall apply the next business day for the work permit. Any work done, whether by Grantee, its contractors, or third parties will include necessary paving, patching, grading and any other reasonably necessary repair or restoration to the County road rights-of-way. All work shall be done to the satisfaction of the Director.

All equipment, lines and appurtenances which are used in the operation, maintenance, repair or construction of the Grantee's service and which are located within the County road rights-of-way shall be considered to be part of the Grantee's system and shall be the responsibility of the Grantee.

All permits for the operation, maintenance, repair or construction of said system shall be applied for and given in the name of the Grantee, who will be responsible for all work done under the permit. The Grantee remains responsible whether the work is done by the Grantee, its contractors, or by third parties.

The Grantee shall, at no expense to the County, assume the following obligations with respect to the facilities connected to its system that are within County road rights-of-way and which it does not own, including appurtenant facilities and service lines connecting its system to users:

- (a) The Grantee shall apply for, upon request and on behalf of the owner of the facilities, a County right-of-way construction permit for any repairs required for such facilities; provided such owner agrees to reimburse the Grantee for all costs incurred by the Grantee and any other reasonable conditions the Grantee requires as a precondition to applying for the permit. All work to be performed in the County right-of-way shall comply with all conditions of the County permit and all applicable County requirements. The Grantee may at its option perform any part of the repair with its own forces or require the owner to employ a contractor for that purpose, provided such contractor is approved by the County;
- (b) In the event that the County determines emergency repair of such facilities is necessary to halt or prevent significant damage to County road rights-of-way or significant threats to the health, safety and welfare of parties other than the owner or the occupants of the building served by such facilities, the Grantee shall take prompt remedial action to correct the emergency to the County's approval, which the County shall not unreasonably withhold;
- (c) When the County or its contractor provides notice to the Grantee, pursuant to RCW 19.122, of its intent to excavate within County road rights-of-way, the Grantee shall provide to the County or its contractor the best information available from the Grantee's records or, where reasonable, from the use of locating equipment as to the location of such facilities, including surface markings where these would reasonably be of use in the excavation. If the Grantee fails to make good faith efforts to

provide the above information within the deadlines provided by RCW 19.122, the Grantee shall hold the County harmless for all reasonable costs that result from damage to such facilities if such damage occurs as a result of the failure to provide such information. Nothing in this subsection is intended or shall be construed to create any rights in any third party or to form the basis for any obligation or liability on the part of the County or the Grantee toward any third party, nor is anything in this subsection intended to be construed to alter the rights and responsibilities of the parties under RCW 19.122, as amended.

12. RESTORATION OF COUNTY ROAD RIGHTS-OF-WAY

After work on, under or adjacent to County road rights-of-way, the Grantee is responsible for and will leave all County road rights-of-way in as good a condition as they were in before any work was done. In the event that the Grantee, its contractors, or third parties working under permit should fail to restore County road rights-of-way to the satisfaction of the Director, King County may make such repairs or restorations as are necessary to return the County road rights-of-way to its pre-work condition. Upon presentation of an itemized bill for repairs or restorations, including the costs of labor and equipment, the Grantee will pay the bill within thirty (30) days. If suit is brought upon the Grantee's failure to pay for repair and restoration, and if judgment in such a suit is entered in favor of King County, then the Grantee shall pay all of the actual costs, including interest from the date the bill was presented, disbursements, and attorney's fees and litigation related costs incurred.

13. PERFORMANCE OF WORK

The Grantee covenants that in consideration for the rights and privileges granted by this franchise, all work performed by the Grantee on County road rights-of-way shall conform to all County requirements including, but not limited to, the requirements of the current edition of the County Road Standards in force when the work is performed and all traffic control shall also conform to the current edition of the Manual of Uniform Traffic Control Devices in force when the work is performed.

14. BLASTING REQUIREMENTS

The right to operate, maintain, repair and construct Grantee's distribution and service lines and appurtenances granted by this franchise does not preclude King County, its agents or contractors from blasting, grading, or doing other road work to the Grantee's lines and appurtenances. Except in the case of an emergency, the Grantee will be given ten (10) business days written notice of any blasting so that the Grantee may protect its lines and appurtenances. If the Grantee notifies the County within ten (10) business days that the facilities will have to be relocated to protect them from blasting, the County will defer the blasting for up to ninety (90) days from the date of the original notice. In no event will the Grantee be given less than two (2) business days written notice of any blasting. Notification of any excavation shall be provided through the One-Call System as provided by RCW 19.122, as hereinafter amended.

15. SURVEY MARKERS AND MONUMENTS

It shall be the responsibility of the Grantee performing any construction work in the County road rights-of-way to restore any survey markers or monuments disturbed by such construction in accordance with RCW 58.09.130, and as hereinafter amended.

16. ASSIGNMENT

The Grantee shall not have the right to assign this franchise without the consent of the Metropolitan King County Council given by Ordinance. No assignment shall be effective unless an acceptance by the assignee of all rights, conditions, terms, provisions, and responsibilities contained within the franchise, as well as surety bonds which the Council deems necessary to be posted are received. Council approval of the assignment may be made subject to the assignee's acceptance of new or modified terms of the franchise.

17. EXPIRATION AND RENEWAL

To the extent described in Exhibit "A", all rights granted by this franchise to County road rights-of-way outside incorporated Towns and Cities apply to all existing County road rights-of-Way improved and unimproved and to all County road rights-of-way acquired by King County during the term of this franchise.

If the Grantee has initiated a renewal of this franchise before it expires, the County may, at its sole discretion, extend the term of the franchise on a month to month basis for up to one year. Should the County elect to extend the franchise, written notice shall be provided to the Grantee before the franchise expiration date.

If the Grantee has not applied for a renewal of this franchise before it expires, King County has the right to remove or relocate any lines and appurtenances of the Grantee as is reasonably necessary for the public's health, welfare, safety, or convenience including, but not limited to, the safe operation of County roads, franchise holders, or for the construction, renewing, altering, or improving of any County road right-of-way, or for the installation of lines and/or facilities of other franchise holders. Grantee shall be liable for the costs incurred in any removal or relocation of its lines and appurtenances under this section. Costs include the expense of labor and equipment.

Upon expiration of this franchise, the Grantee shall continue to be responsible for the operation and maintenance of existing facilities in the County road rights-of-way until removed, assigned to another franchised utility or abandoned; however, the Grantee shall not have the right to provide additional services or construct new facilities. King County will issue permits required for the repair and maintenance of the existing facilities in accordance with K.C.C. 14.44.055 as amended and Section 11 of this franchise. This section and sections 8, 10-13 and 15 of this franchise shall continue in force until such time as the lines are removed from County road rights-of-way, assigned to another franchised utility, or abandoned in place with the approval of the Manager of the

18. RESERVATION OF RIGHTS

King County specifically reserves for itself the right to impose a utility tax on the Grantee if such taxing authority is granted by State of Washington and the local option is exercised by the King County Council.

King County also specifically reserves the right to exercise authority it has or may acquire in the future to secure and receive fair market compensation for the use of its property, pursuant to an ordinance. If King County elects to exercise such authority, the fair market compensation requirement for Grantee shall be imposed by ordinance not less than one hundred eighty (180) days after written notice ("Compensation Notice") is delivered to the Grantee, said Compensation Notice identifying with specificity the definition, terms and/or formula to be used in determining such fair market compensation. Acceptance of King County's definition terms and/or formula identified in the Compensation Notice will occur if the Grantee accepts in writing within thirty (30) days of receipt of the Compensation Notice; or, if Grantee takes no action in writing within thirty (30) days of receipt of the Compensation Notice; in which case the applicable ordinance that the King County Council passes will be determinative.

Nothing in this section shall be construed as an agreement by the Grantee of King County's right to exercise authority it has or may acquire in the future to secure and receive fair market compensation for the use of property. Nothing in this section shall be construed to prohibit the Grantee from challenging, in King County Superior Court or a court of competent jurisdiction, the legality of such right.

Grantee's rejection of the definition, terms, and/or formula identified in the Compensation Notice will only occur if such rejection is in written form, identifying with specificity the grounds for such rejection, and delivered to King County within thirty (30) days after receipt of the Compensation Notice, in which case the below identified arbitration terms will apply:

- (a) The Grantee and King County will select one arbitrator each, and the two selected arbitrators will select a third arbitrator. If the two arbitrators have not selected a third arbitrator within thirty (30) days after the selection of the last selection of the two, either the Grantee or King County may apply to the presiding judge of the King County Superior Court for the appointment of a third arbitrator. The three arbitrators will determine the method for determining the fair market compensation for the County property used by the Grantee. The arbitration procedure employed shall be consistent with the rules and procedures of the American Arbitration Association. The decision of a majority of the arbitrators will bind both the Grantee and King County. At the conclusion of the arbitration, the arbitrators will submit written reports to the Grantee and King County which shall contain all pertinent evidence that led to their conclusion together with an explanation of their reasoning for such conclusion.

- (b) The fees of the arbitrators selected by each party shall be paid by that party, and the fees of the third arbitrator shall be paid one-half by the County and the Grantee. The other costs of the proceeding shall be shared equally by the County and the Grantee.
- (c) In event that the question of fair market compensation is not resolved prior to the effective date specified by the ordinance authorizing said compensation, the arbitration decision will be applied retroactively to the effective date in the ordinance. The Grantee will pay the retroactive sum plus interest in the amount of twelve percent (12%) per annum.

Nothing in this franchise may be construed to limit the exercise of authority now or later possessed by the County or any other governing body having competent jurisdiction to fix just, reasonable and compensatory rates or other requirements for services under this franchise. Nothing in this section shall be construed to prohibit the Grantee from challenging, in King County Superior Court or a court of competent jurisdiction, the authority of the County or any other governing body to fix rates or other requirements for services.

19. COMPLIANCE WITH LAWS

Grantee shall conform to all applicable federal, state and local laws and regulations including, but not limited to, the State Environmental Policy Act and King County environmental standards and ordinances.

20. NON-DISCRIMINATION CLAUSE

In all hiring or employment made possible or resulting from this franchise agreement, there shall be no discrimination against any employee or applicant for employment because of sex, sexual orientation, age, race, color, creed, national origin, marital status or the presence of any sensory, mental, or physical handicap, unless based upon a bona fide occupational qualification, and this requirement shall apply to but not be limited to the following: employment, advertising, lay-off or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

No person shall be denied, or subjected to discrimination in receipt of the benefit of any services or activities made possible by or resulting from this agreement on the grounds of sex, sexual orientation, race, color, creed, national origin, age except minimum age and retirement provisions, marital status, or the presence of any sensory, mental or physical handicap.

Any violation of this provision shall be considered a violation of a material provision of this agreement and shall be grounds for cancellation, termination or suspension in whole or in part, of the agreement by the County and may result in ineligibility for further County agreements.

The Grantee shall make the best efforts to make opportunities for employment and/or contracting services available to women and minority persons. The Grantee recognizes that King County has a policy of promoting affirmative action, equal opportunity and has resources available to assist Grantee in these efforts.

21. PENALTY FOR VIOLATION OF CONDITIONS

If the Grantee shall violate or fail to comply with any of the material terms, conditions, or responsibilities of this franchise through neglect or failure to obey or comply with any notice given the Grantee under the provisions of this franchise or if the Grantee abandons its franchise, the Council may revoke this franchise. King County shall give written notice of its intent to revoke this franchise. A public hearing shall be scheduled within forty-five (45) days following the notification. The decision to revoke this franchise will become effective ninety (90) days following the public hearing if the County, by ordinance, finds:

- A. That the Grantee has not substantially cured the violation or failure to comply which was the basis of the notice; or
- B. that the violation or failure to comply which was the basis of the notice is incapable of cure; or
- C. that the Grantee has repeatedly violated or failed to comply with any of the material terms, conditions, or responsibilities of the franchise, even though the individual violations have been cured; and
- D. that the revocation of the franchise is in the public interest.

During the forty-five (45) days following the notification, the Grantee shall have the opportunity to remedy the failure to comply.

22. RIGHT OF APPEAL

Decisions, requirements, or approvals of the Director are binding on the parties to this document. Appeals from the Director's determinations will be made by filing a complaint with the King County Superior Court.

23. SEVERANCE

This franchise gives effect to purposes and uses which are consistent with economical and efficient services rendered in the public interest. If any provision of this franchise, or its application is determined to be invalid by a court of law, then the remaining provisions of this franchise shall continue and remain valid unless the dominant purpose of the franchise would be prevented or the public interest is no longer served.

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TOWNSHIP 22 NOR

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Tug Harbor



APPENDIX E

**WATER QUALITY SAMPLING,
DATA, REPORTS, LETTERS**

WATER DISTRICT 19 Coliform Monitoring Plan

A. System Information

Plan Date: June 1, 2022

Water System Name <u>Water District 19</u>	County <u>KING</u>	System I.D. Number <u>38900</u>	
Name of Plan Preparer <u>Armin Wahanik</u>	Position <u>Operations Lead</u>	Daytime Phone <u>206-463-9007</u>	
Sources: DOH Source Number, Source Name, Well Depth, Pumping Capacity		<u>Source 01, Beall Creek, Surface, 400 gpm</u> <u>Source 02, Ellis Creek, Surface, 200 gpm</u> <u>Source 03, Well #1, 670 ft., 110 gpm</u> <u>Source 04, Well #2, 689 ft., 50 gpm</u> <u>Source 05, Beall/Ellis, Surface (WTP), 600 gpm</u> <u>Source 06, Well #3 (Morgan Hill), 363 ft., 35 gpm</u> <u>Source 07, 32300L/Heights Intertie</u> <u>Source 08, Well #4, 704 ft., 250 gpm</u> <u>Source 09, Wells 1,2,&4 (wellfield), 689 ft., 250 gpm</u> <u>Source 10, Beall Well, 599 ft., 80 gpm</u> <u>Source 11, Vashon Meadows Well, 200 ft., 11 gpm</u>	
Storage: List and Describe		<u>1 Million gallon tank, Steel, 46 ft. diameter, 80 ft. height, provides system pressure</u> <u>625,000 gallon tank, Steel, 46 ft. diameter, 50 ft. height, stores treated S09 (wellfield), transfers to 1 MG tank</u> <u>100,000 gallon tank, Steel, 30 ft. diameter, 20 ft. height, filled from treated S06 (Morgan Hill), pumped into distribution system</u>	
Treatment: Source Number & Process		<u>S05: Coagulation, Filtration, Chlorination</u> <u>S06: Chlorination</u> <u>S09: Chlorination</u> <u>S10: Chlorination</u> <u>S11: Chlorination</u>	

Pressure Zones: Number and name	<u>494' Zone</u> <u>350' Zone</u> <u>305' Zone</u> <u>240' Zone</u> <u>200' Zone</u>
Population by Pressure Zone	n/a
Number of Routine Samples Required Monthly by Regulation:	4
Number of Sample Sites Needed to Represent the Distribution System:	12
*Request DOH Approval of Triggered Source Monitoring Plan?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

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

B. Laboratory Information

Laboratory Name AmTest Laboratories	Office Phone 425-885-1664 After Hours Phone 425-770-7073 (Kathy Fugiel)
Address 13600 NE 126 th PL, STE 200, Kirkland, WA, 98034	Cell Phone 425-770-7073 (Kathy Fugiel) Email: customerservice@amtestlab.com Website: amtestlab.com
Hours of Operation Monday-Friday 7am-5pm	
Contact Name Kathy Fugiel	
Emergency Laboratory Name	Office Phone - - After Hours Phone - -
Address _____	Cell Phone - - Email _____
Hours of Operation _____	
Contact Name _____	

C. 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. 16401 Vashon Hwy	1-1 16401 Vashon Highway	S 06 Morgan Hill
Sample Station	1-2 16333 Vashon Highway	S 09 Wellfield
	1-3 16415 Vashon Highway	S 11 Vashon Meadows
<hr/>		
X2. 17520 115th Ave SW	2-1. 17520 115th Ave SW	S 06 Morgan Hill
Hose bib off temporary tank, SW corner of property	2-2. 17428 115th Ave SW	S 09 Wellfield
	2-3. 17620 115th Ave SW	S 11 Vashon Meadows
<hr/>		
X3. 17305 96th PL SW	3-1 17305 96th PL SW	S 06 Morgan Hill
Hose bib SE corner of Apts. Attached to building	3-2 17300 96th PL SW	S 09 Wellfield
	3-3 17311 96th PL SW	S 11 Vashon Meadows
<hr/>		
X4. 18000 McLean Rd SW	4-1 18000 McLean Rd SW	S 06 Morgan Hill
Sample Station	4-2 17920 Vashon Highway	S 09 Wellfield
	4-3 18006 Vashon Highway	S 11 Vashon Meadows
<hr/>		
X5. 20112 Ridge Rd SW	5-1 20112 Ridge Rd SW	S 06 Morgan Hill
Yard hose bib btwn meter box and house	5-2 20102 Ridge Rd SW	S 09 Wellfield
	5-3 20126 Ridge Rd SW	S 11 Vashon Meadows
<hr/>		
X6. 8130 SW 201st St.	6-1 8130 SW 201st St.	S 06 Morgan Hill
Yard hose bib after meter box	6-2 8122 SW 201st St.	S 09 Wellfield
	6-3 8136 SW 201st St.	S 11 Vashon Meadows
<hr/>		

X7. 9204 SW 204th St.	7-1 9204 SW 204th St.	S 06 Morgan Hill
Hose bib after meter box	7-2 9335 SW 204th St.	S 09 Wellfield
	7-3 20515 Monument RD SW	S 11 Vashon Meadows
X8. 87th Ave SW & SW Ellisport Rd	8-1 87th & Ellisport Sample Station	S 06 Morgan Hill
Sample station near PRV enclosure	8-2 8518 SW Ellisport Rd	S 09 Wellfield
	8-3 20818 87th Ave SW	S 11 Vashon Meadows
X9. 10411 SW Cemetery Rd	9-1 10411 SW Cemetery Rd	S 06 Morgan Hill
Yard hose bib after meter box	9-2 10402 SW Cemetery Rd	S 09 Wellfield
	9-3 10418 SW Cemetery Rd	S 11 Vashon Meadows
X10. 10010 SW 210th St	10-1 10010 SW 210th St	S 06 Morgan Hill
Hose bib at entrance	10-2 9908 SW 210th St	S 09 Wellfield
	10-3 10030 SW 210th St	S 11 Vashon Meadows
X11. 23429 Kingsbury Rd SW	11-1 23429 Kingsbury Rd SW	S 06 Morgan Hill
Yard hose bib after meter box	11-2 23417 Kingsbury Rd SW	S 09 Wellfield
	11-3 23515 Kingsbury Rd SW	S 11 Vashon Meadows
X12. 22604 Deppman Rd SW	12-1. 22604 Deppman Rd. SW	S 06 Morgan Hill
Yard hose bib after meter box	12-2. 22519 Deppman Rd. SW	S 09 Wellfield
	12-3. 22618 Deppman Rd SW	S 11 Vashon Meadows

*NOTE: If you need more than three routine samples to cover the distribution system, attach additional sheets as needed.

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

D. Routine Sample Rotation Schedule

Month	Routine Site(s)	Month	Routine Site(s)
January	X1, X2, X3, X4	July	X1, X2, X3, X4
February	X5, X6, X7, X8	August	X5, X6, X7, X8
March	X9, X10, X11, X12	September	X9, X10, X11, X12
April	X1, X2, X3, X4	October	X1, X2, X3, X4
May	X5, X6, X7, X8	November	X5, X6, X7, X8
June	X9, X10, X11, X12	December	X9, X10, X11, X12

Important Notes for Sample Collector:

Water District 19 Coliform Sampling Procedure

1. If sampling the distribution system for Total Coliform Rule compliance, use a sampling station or physical address identified in the Coliform Monitoring Plan. The District has a minimum number of routine distribution samples it must collect each month as described in WAC 246-290-300. In some unusual circumstances (frozen tap, tap in disrepair) another site may be used to represent the distribution system. The following criteria must be followed if a physical address tap is used:
 - Tap is free of aerators, strainers, hose attachments, mixing type faucets, and purification devices.
 - Only a designated cold-water line is used.
 - It is preferable to use outside hose bib.
2. Clean hands and/or use disposable gloves, which should be cleaned as well.
3. Fill in the sampling form completely - see WD19 Bact_slip Template
4. Ensure that bottle is labeled with sample identification, date and time collected. This can be done before or after the sample is gathered.

Prepare Sample Site

5. Immediate maintenance should be initiated on a sample tap if the sampler observes any of the following:
 - Evidence of insects, dirt, or other debris. Clean tap with weak bleach solution and clean rag, flush tap for a minimum of 5 minutes, then flame tap prior to sampling.
 - Sample Station leaks shall be reported the same day to the Operations Lead.
6. Allow the tap to run for 3–5 minutes prior to sampling. Adequate flushing is necessary to ensure that water representing the water main is sampled.
7. Measure the free chlorine residual of the water using a chlorine field analyzer and record value on the sample form.

8. Turn off flow and flame sample tap with a propane torch.
9. Adjust the flow rate from the tap so that the jet of water breaks sharply away without lapping the outside lip of the tap or splashing.

Collect the sample

- Keep the sample bottle closed until it is to be filled
 - Hold the sample bottle at or near the bottom and loosen the cap.
 - Carefully remove the lid and hold the bottle under the flow. Be careful not to touch the neck or inside of the bottle or cap.
 - Hold the cap in hand during sampling to avoid contamination.
 - Fill the bottle to the shoulder of the bottle. DO NOT OVERFILL THE BOTTLE.
 - Replace the lid.
 - If the bottle is suspected of being contaminated during the sample grab – discard bottle and start over.
10. Be alert for any unusual conditions surrounding the sampling event. Examples of such conditions could include unusual smells, the presence of turbidity, a level of free chlorine residual that is unusual for the area, or the presence of air in the lines. These conditions may indicate a problem with the water main or an intentional contamination event. As such, observation of any of the following should be communicated immediately to the Operations Lead or General Manager.
 11. Review the sampling forms including date, time, initials of sampler, sample location, the sample type including the residual chlorine value, and any comments.
 12. Prepare the shipping packaging with ice when sent to the laboratory. Samples can be shipped in a single container and may include other water quality samples.
 13. Follow the guidelines for sample holding times—30 hours for treated water.

E. Level 1 and Level 2 Assessment Contact Information

Name: Operations Lead (Armin Wahanik)	Office Phone: 206-463-9007 After Hours Phone: 206-437-7314
Address: PO Box T 17630 100 th Ave SW Vashon WA 98070	Email: awahanik@water19.com water19@water19.com
Name: General Manager (John Martinak)	Office Phone: 206-463-9007 After Hours Phone: 206-305-7658
Address: PO Box T 17630 100 th Ave SW Vashon WA 98070	Email: jmartinak@water19.com

F. *E. coli*-Present Sample Response

Distribution System <i>E. coli</i> 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.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We document all water main breaks, construction & repair activities, and low pressure and outage incidents.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We can easily access and review documentation on water main breaks, construction & repair activities, and low pressure and outage incidents.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our Cross-Connection Control Program is up-to-date.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We test all cross-connection control devices annually as required, with easy access to the proper documentation.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We routinely inspect all treatment facilities for proper operation.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We identified one or more qualified individuals who are able to conduct a Level 2 assessment of our water system.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We have procedures in place for disinfecting and flushing the water system if it becomes necessary.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We can activate an emergency intertie with an adjacent water system in an emergency.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We have a map of our service area boundaries.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We have consumers who may not have access to bottled or boiled water.	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>
There is a sufficient supply of bottled water immediately available to our customers who are unable to boil their water.	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>
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.	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>
We have messages prepared and translated into different languages to ensure our consumers will understand them.	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>
We have the capacity to print and distribute the required number of notices in a short time period.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Policy Direction	Yes	No	N/A	To Do List
We have discussed the issue of <i>E. coli</i> -present sample results with our policy makers.	<input type="checkbox"/>	X	<input type="checkbox"/>	X
If we find <i>E. coli</i> in a routine distribution sample, the policy makers want to wait until repeat test results are available before issuing advice to water system customers.	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>

(Cont.)

Distribution System <i>E. coli</i> 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.	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>
We have a list of all of our customers' addresses.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We have a list of customer telephone numbers or access to a Reverse 9-1-1 system.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We have a list of customer email addresses.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We encourage our customers to remain in contact with us using social media.	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>
We have an active website we can quickly update to include important messages.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Our customers drive by a single location where we could post an advisory and expect everyone to see it.	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>
We need a news release to supplement our public notification process.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Distribution System <i>E. coli</i> Response Plan
If we have <i>E. coli</i> in our distribution system we will immediately:
<ol style="list-style-type: none"> 1. Call DOH. 2. Collect repeat and triggered source samples per Part D. Collect additional investigative samples as necessary. 3. Inspect our water system facilities, including the water treatment plant for proper operation. 4. Interview staff to determine whether anything unusual was happening in the water system service area, especially since the previous month's samples. 5. Review new construction activities, water main breaks, and pressure outages that may have occurred prior the incident. 6. Review Cross-Connection Control Program status. 7. Discuss with DOH whether to issue a Health Advisory based on the findings of steps 3-6.

***E. coli*-Present Triggered Source Sample Response Checklist – Groundwater 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.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We address any significant deficiencies identified during a sanitary survey.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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.	<input type="checkbox"/> <input type="checkbox"/>	X <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
We routinely inspect our well site(s).	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We have a good raw water sample tap installed at each source.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
After we complete work on a source, we disinfect the source, flush, and collect an investigative sample.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public Notice	Yes	No	N/A	To Do List
We discussed the requirement for immediate public notice of an <i>E. coli</i> -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.	<input type="checkbox"/>	X	<input type="checkbox"/>	X
We discussed the requirement for immediate public notice of an <i>E. coli</i> -present source sample result with our wholesale customers and encouraged them to develop a response plan.	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>
We have prepared templates and a communications plan that will help us quickly distribute our messages.	<input type="checkbox"/>	X	<input type="checkbox"/>	X

E. coli-Present Triggered Source Sample Response Checklist – Groundwater 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.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We have an emergency intertie with a neighboring water system that we can use until corrective action is complete (perhaps for several months).	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We can provide bottled water to all or part of the distribution system for an indefinite period.	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>
We can quickly replace our existing source of supply with a more protected new source.	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>
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.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If yes, at what concentration? <u>1.20 mg/L</u>				
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.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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.	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

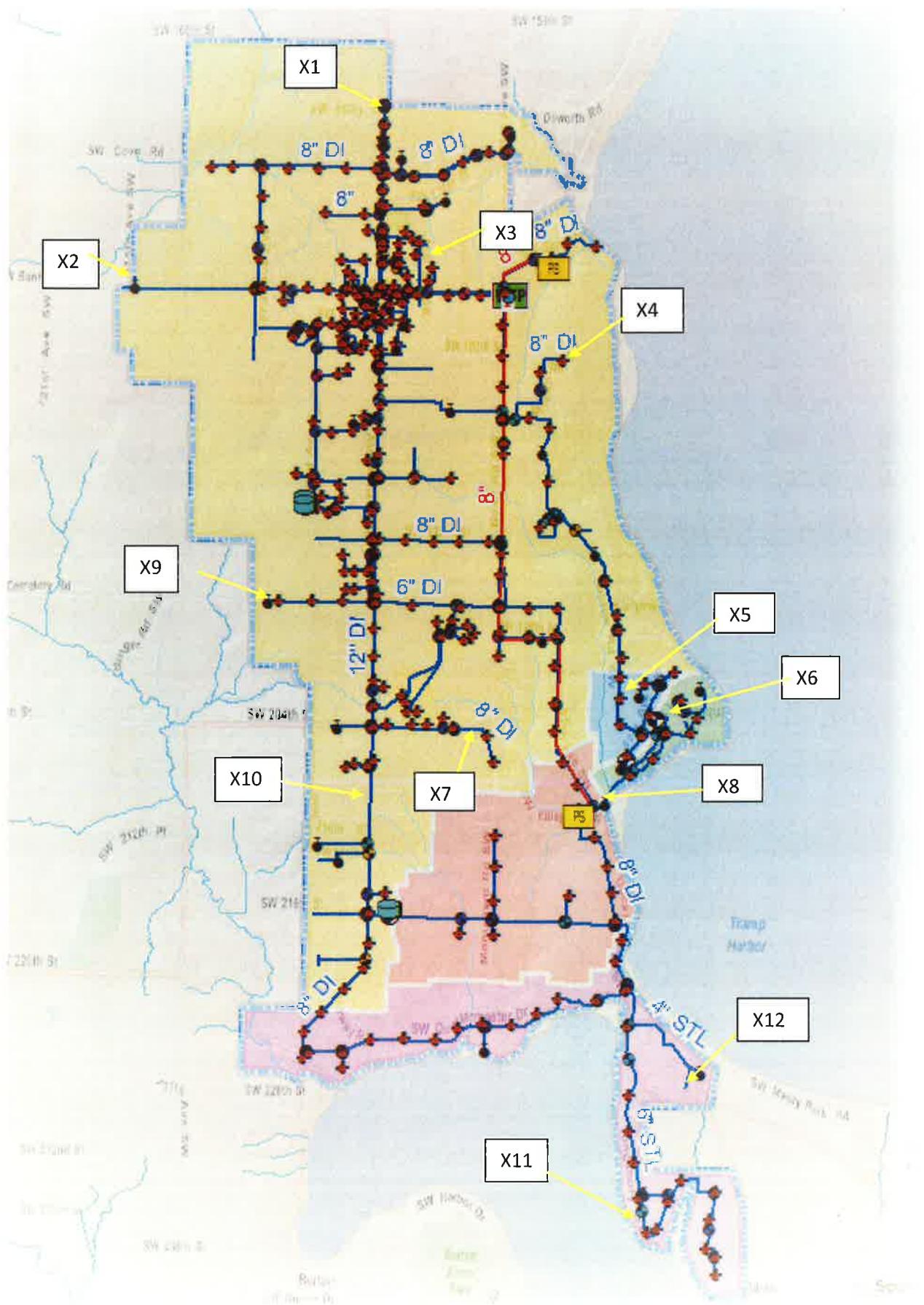
*NOTE: If your system has multiple sources, you may want to complete a separate checklist for each source.

E. coli-Present Triggered Source Sample Response Plan – Groundwater Sources

If we have E. coli in one of our Source waters' we will immediately:

1. Call DOH.
2. If a source is E. coli positive, the source shall be shut down immediately.
3. Collect repeat source sample and additional investigative samples as necessary.
4. Interview staff to determine if any repairs or problems have occurred at the source recently.
5. Inspect and repair any problems at the source.
6. Discuss finding with WA DOH and begin work on a corrective action plan.

Water District 19 System Map Coliform Monitoring Plan Sample Sites





RTCR Level 1 Assessment

Guidance Template

331-569, March 2016

Eastern Region	16201 East Indiana Avenue, Suite 1500 Spokane Valley, WA 99216	Phone: 509.329.2100 Fax: 509.329.2104 Email: mark.steward@doh.wa.gov
Northwest Region	20425 72nd Ave. South, Suite 310 Kent, WA 98032-2358	Phone: 253.395.7570 Fax: 253.395.6760 Email: dw.nwro@doh.wa.gov
Southwest Region	PO Box 47823 Olympia, WA 98504-7823	Phone: 360-626-3030 Fax: 360-624-8058 Email: swro.coli@doh.wa.gov

Water System Name: Water District 19	County: King	Water System ID #: 38900
Operator in Responsible Charge (ORC): Armin Wahanik	ORC Phone: 206-463-9007	Water System Mailing Address:
ORC Address, City, State: 17630 100 th Ave SW, Vashon, WA		Water District 19 PO Box T Vashon, WA 98070
Assessor(s) Name: Armin Wahanik, John Martinak		
Assessor Address, City, State, Zip: 17630 100 th Ave SW, Vashon, WA, 98070		
Date(s) Assessment Completed:		

Your water system exceeded a treatment technique trigger for the Revised Total Coliform Rule. Assess the water system's condition and operation using this *Level 1 Assessment Template* as a guide.

Part A: Respond to each item below. Identify corrective actions taken to address the issue(s) found.

Part B: Summarize your findings and include an action plan with timetable for corrective actions not yet taken.

For parts A and B, include additional information (photos or other documentation) as needed to depict assessment findings and corrective actions that have been completed. All assessment elements listed in this template must be addressed in your assessment. Systems with multiple facilities such as wells or storage tanks may need to provide additional pages.

Within 30 days of learning of the treatment technique trigger, submit completed assessment documentation to your regional office and keep a copy in your water system files.

Part A: Assessment	Corrective action needed?	Corrective action(s) taken & date taken
1. Site and Sampling Protocol		
1a. Do you have a written <u>coliform monitoring plan & sampling procedure</u> that ensures samples are representative of the distribution system?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
1b. Have there been any changes in sampling conditions or procedures that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
1c. Inspect the sampling sites:		
- Are the sampling locations free of potential sources of contamination? - Are the sampling taps in good condition? - Other: (describe)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No

	Corrective action needed?	Corrective action(s) taken & date taken
2. Distribution		
2a. Do you have procedures in place to ensure proper maintenance of the distribution system, including:		
- Appropriate pipe replacement and repair procedures	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Replacement and repair of other distribution system components	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Regular flushing program	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Routine vault inspections	<input type="checkbox"/> Yes	<input type="checkbox"/> N/A
- Fully implemented <u>cross connection control</u> program	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
- Maintain positive pressure in all parts of the distribution system	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2b. Has there been any recently reported low pressure (<20 PSI) or complete loss of pressure in the distribution system?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2c. Have there been any changes in distribution conditions or operations that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2d. Inspect the distribution system:		
- Are there any visible line breaks or leaks?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Are there any observed unprotected cross connections?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Is there any evidence of <u>vandalism or other security breaches</u> ?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Other: (describe) _____	<input type="checkbox"/> Yes	<input type="checkbox"/> N/A
3. Storage Facilities		
3a. Does your water system have a water storage tank? <i>If no, skip to Section 4.</i>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
3b. Do you have procedures in place for periodic inspection and maintenance of the exterior and interior of each storage facility?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
3c. Have there been any changes in storage conditions or operations that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
3d. Inspect the storage facilities:		
- Does the tank have any cracks or other openings?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Is the reservoir roof free of any unprotected openings?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Is the access hatch constructed and sealed to keep contaminants out?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- If there is an air vent on the storage tank, is it constructed to prevent the entry of contaminants?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Is the overflow line constructed to prevent contaminants from entering the tank?	<input type="checkbox"/> Yes	<input type="checkbox"/> N/A
- If the overflow line discharges into a storm drain, to surface water, or directly into a sanitary sewer, is it protected by a proper air gap?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Is there any evidence of vandalism or other security breaches?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
- Other: (describe) _____	<input type="checkbox"/> Yes	<input type="checkbox"/> N/A

Part A: Assessment	Corrective action needed?	Corrective action(s) taken & date taken
4. Source--Groundwater		
4a. Does your water system have a well or spring? If no, skip to Section 6.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
4b. Do you comply with <u>Sanitary Control Area</u> requirements (WAC 246-290-135(2)?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
4c. Have there been any changes in source conditions or operations that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
4d. Inspect the source facilities:		
- Is the sanitary control area free of all potential sources of contamination?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
- Is the wellhead or spring box above grade with no potential for flooding?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
- Is the pressure tank water logged?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No
- Is the well cap sealed and watertight, and the well casing free of unprotected openings?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No
- (For springs) Is the spring box (structure, hatch, and overflow) free of any unprotected openings?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No
- Other: (describe)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No
5. Treatment--Groundwater		
5a. Is any source continuously treated with a disinfectant? If no, skip to Section 6.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
5b. Do you have procedures in place for proper operation and maintenance of disinfection treatment facilities?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
5c. Have there been any changes in treatment equipment or process that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
5d. Inspect the treatment facilities:		
- Is the treatment system operating properly?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No
- Is there any evidence of vandalism or other security breaches?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No
- Other: (describe)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No
6. Source—Surface Water Supply (watershed)		
6a. Does your water system have a surface water supply? If no, skip to Section 8.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6b. Do you comply with Watershed Control Program requirements (WAC 246-290-135(4)?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
6c. Have there been any changes within the watershed or in raw water conditions that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Part A: Assessment	Corrective action needed?	Corrective action(s) taken & date taken
6d. Inspect the surface water intake/headworks: <ul style="list-style-type: none"> - Is there evidence of problems at the intake? - Is there evidence of vandalism or other security breaches at the intake? - Other: (describe) _____ 	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No/N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No
7. Treatment—Surface Water		
7a. Do you have procedures in place for proper operation and maintenance of surface water treatment facilities?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
7b. Have there been any changes in treatment equipment or process that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
7c. Inspect the treatment facilities: <ul style="list-style-type: none"> - Is the treatment system operating properly? - Is there any evidence of vandalism or other security breaches? - Other: (describe) _____ 	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No
8. Other assessment activities (describe):		

Part B. Assessment Summary and Action Plan with Timetable for corrective actions not yet taken

ASSESSOR: CHECK HERE if you did not identify any issues that may have directly or indirectly caused or contributed to entry of coliform bacteria into the system.

Corrective Actions Completed: ASSESSOR: Summarize the issues found and the corrective actions that have been completed and date completed

Describe issue found	Describe corrective action taken and date completed

Corrective Actions Not Completed: ASSESSOR: Describe the issues for which corrective actions have not yet been completed. Provide an action plan with timetable for completion.

Describe issue found	Describe planned corrective action and timetable for completion.

Print Name of Assessor: _____

Signature of Assessor: _____

Date: _____

OFFICE OF DRINKING WATER USE ONLY

Regional Office Reviewer: _____

Date of Review: _____

Assessment sufficient? Yes No

Likely cause determined? Yes No

Sanitary defect(s) identified? Yes No

Corrective actions completed? Yes No

Corrective action plan included? Yes No

Corrective action plan approved? Yes No

Comments: _____



RTCR Level 2 Assessment Guidance Template

33-1-570, March 2016

Send your
assessment to:

Eastern Region	16201 East Indiana Avenue, Suite 1500 Spokane Valley, WA 99216	Phone: 509.329.2100 Fax: 509.329.2104 Email: mark.steward@doh.wa.gov
Northwest Region	20425 72nd Ave. South, Suite 310 Kent, WA 98032-2358	Phone: 253.395.6750 Fax: 253.395.6760 Email: dw.nwro@doh.wa.gov
Southwest Region	PO Box 47823 Olympia, WA 98504-7823	Phone: 360-236-3030 Fax: 360-654-8058 Email: swro.coli@doh.wa.gov

Water System Name: Water District 19	County: King	Water System ID #: 38900
Operator in Responsible Charge (ORC): Armin Wahaniak	ORC Phone: 206-463-9007	Water System Mailing Address:
ORC Address, City, State: 17630 100th Ave SW, Vashon, WA		Water District 19 PO Box T Vashon, WA 98070
Assessor Name(s) : Armin Wahaniak, John Martinak	Assessor is: WDM-2, 3, or 4	
Assessor Address, City, State, Zip: 17630 100th Ave SW, Vashon, WA, 98070		
Date(s) Assessment Completed:		

Your water system exceeded a treatment technique trigger for the Revised Total Coliform Rule. Assess the water system's condition and operation using this *Level 2 Assessment Template* as a guide.

Part A: Respond to each item below. Identify corrective actions taken to address the issue(s) found.
Part B: Summarize your findings and include an action plan with timetable for corrective actions not yet taken.

For parts A and B, include additional information (photos or other documentation) as needed to depict assessment findings and corrective actions that have been completed. All assessment elements listed in this template must be addressed in your assessment. Systems with multiple facilities such as wells or storage tanks may need to provide additional pages.

Within 30 days of learning of the treatment technique trigger, submit completed assessment documentation to your regional office and keep a copy in your water system files.

Part A: Assessment		Corrective action needed?	Corrective action(s) taken & date taken
1. Site and Sampling Protocol			
1a. Do you have a written <u>coliform monitoring plan & sampling procedure</u> that ensures samples are representative of the distribution system?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
1b. Do you have a program in place that ensures that all sample collectors are trained before being allowed to collect compliance samples?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
1c. Do you regularly monitor the condition of each routine and repeat sample site to ensure that no site will contaminate the sample?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
1d. Was the sample collected by a trained, qualified person?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
1e. Did the sampler follow your monitoring plan and sampling procedure?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Part A: Assessment	Corrective action needed?	Corrective action(s) taken & date taken
1f. Was the sample collected representative of the water in the distribution system?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
1g. Have there been any changes in sampling conditions or procedures that may have contributed to the treatment technique trigger? Describe:		
1h. Inspect the sampling sites: <ul style="list-style-type: none"> - Are the sampling locations free of potential sources of contamination? - Are the sampling taps in good condition? - Other: (describe) _____ 	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No
2. Distribution		
2a. Do you have procedures in place to ensure proper maintenance of the distribution system, including: <ul style="list-style-type: none"> - Appropriate pipe replacement and repair procedures - Replacement and repair of other distribution system components - Regular flushing program - Routine vault inspections - Fully implemented cross connection control program - Maintain positive pressure in all parts of the distribution system 	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No
2b. Following work done on the water system and following any pressure loss event, do you collect investigative coliform samples?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
2b. Has there been any recently reported low pressure (<20 PSI) or complete loss of pressure in the distribution system?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
2c. Have there been any recent repairs or new construction in the distribution system?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
2d. Are there any known pipe leaks that have not yet been repaired?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
2e. Has there been any recent use of fire hydrants such as hydrant maintenance or utility/FD flushing?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No
2f. If there are any air-vacuum relief valve vaults in the distribution system, are any flooded?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No
2g. Has there been any recent report of a cross connection incident?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
2h. Have there been any off-normal events, such as discolored water, odd taste, or smell?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
2i. Have there been any other changes in distribution conditions or operations that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Part A: Assessment	Corrective action needed?	Corrective action(s) taken & date taken
2j. Inspect the distribution system: <ul style="list-style-type: none"> - Are there any visible line breaks or leaks? - Are there any observed unprotected cross connections? - Is there any evidence of vandalism or other security breaches? - Other: (describe) _____ 	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No
3. Storage Facilities 3a. Does your water system have a water storage tank? If no, skip to Section 4.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
3b. Do you have procedures in place for periodic inspection and cleaning of the interior of each storage facility including vent, roof hatch, and overflow?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3c. Has there been any recent work done on a storage facility?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3d. Are all storage facilities secured from unauthorized entry and vandalism?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3e. Have there been any other changes in storage conditions or operations that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3f. Inspect the storage facilities: <ul style="list-style-type: none"> - Does the tank have any cracks or other openings? - Is the reservoir roof free of any unprotected openings? - Is the access hatch constructed and sealed to keep contaminants out? - If there is an <u>air vent on the storage tank</u>, is it constructed to prevent the entry of contaminants? <ul style="list-style-type: none"> - Is the overflow line constructed to prevent contaminants from entering the tank? - If the overflow line discharges into a storm drain, to surface water, or directly into a sanitary sewer, is it protected by a proper air gap? - Is there any evidence of vandalism or other security breaches? - Other: (describe) _____ 	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No
4. Source--Groundwater		
4a. Does your water system have a well or spring? If no, skip to Section 6.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
4b. Do you comply with Sanitary Control Area requirements (WAC 246-290-135(2)?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
4c. Are all sources protected from fecal contamination by appropriate placement and construction?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
4d. Have any unapproved sources recently been used?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Part A: Assessment

		Corrective action needed?	Corrective action(s) taken & date taken
5f. Have there been any other changes in treatment equipment or process that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
5g. Inspect the treatment facilities: - Is the treatment system operating properly? - Is there any evidence of vandalism or other security breaches? - Other: (describe)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No	
6. Source—Surface Water Supply (watershed)			
6a. Does your water system have a surface water supply? If no, skip to Section 8.	<input type="checkbox"/> Yes <input type="checkbox"/> No		
6b. Do you comply with Watershed Control Program requirements (WAC 246-290-135(4))?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6c. Has there been any recent spikes in raw water turbidity?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6d. Have there been any land use changes within the watershed, such as logging, construction, or different farming practices in the past month?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6e. Have there been any other changes within the watershed or in raw water conditions that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6f. Inspect the surface water intake/headworks: - Is there evidence of problems at the intake? - Is there evidence of vandalism or other security breaches at the intake? - Other: (describe)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No	
7. Treatment—Surface Water			
7a. Do you have procedures in place for proper operation and maintenance of surface water treatment facilities?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
7b. Have there been any recent interruptions in any part of the filtration or disinfection treatment process?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
7c. Are filtration and disinfection treatment facilities properly operated and maintained?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
7d. Has there been any maintenance performed on any treatment component in the past month?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
7e. Have there been any problems with a treatment process in the past month, such as high finished water turbidity, disinfection inactivation ratio <1, or changes in coagulation practices or filtration rate?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Part A: Assessment	Corrective action needed?	Corrective action(s) taken & date taken		
7f. Have there been any other changes in treatment equipment or process that may have contributed to the treatment technique trigger? Describe:	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No		
7g. Inspect the treatment facilities: - Is the treatment system operating properly? - Is there any evidence of vandalism or other security breaches? - Other: (describe)	<input type="checkbox"/> Yes <input type="checkbox"/> Yes <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> Yes <input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> No <input type="checkbox"/> No
8. Other assessment activities (describe):				

Part B. Assessment Summary and Action Plan with Timetable for corrective actions not yet taken

ASSESSOR: CHECK HERE if you did not identify any issues that may have directly or indirectly caused or contributed to entry of coliform bacteria into the system.

Corrective Actions Completed: ASSESSOR: Summarize the issues found and the corrective actions that have been completed and date completed

Describe issue found	Describe corrective action taken and date completed

Corrective Actions Not Completed: ASSESSOR: Describe the issues for which corrective actions have not yet been completed. Provide an action plan with timetable for completion.

Describe issue found	Describe planned corrective action and timetable for completion.

Print Name of Assessor: _____

Signature of Assessor: _____

Date: _____

OFFICE OF DRINKING WATER USE ONLY

Regional Office Reviewer: _____	Date of Review: _____
Assessment sufficient? <input type="checkbox"/> Yes <input type="checkbox"/> No	Likely cause determined? <input type="checkbox"/> Yes <input type="checkbox"/> No
Corrective actions completed? <input type="checkbox"/> Yes <input type="checkbox"/> No	Sanitary defect(s) identified? <input type="checkbox"/> Yes <input type="checkbox"/> No
Comments:	Corrective action plan included? <input type="checkbox"/> Yes <input type="checkbox"/> No
	Corrective action plan approved? <input type="checkbox"/> Yes <input type="checkbox"/> No



DBP Monitoring Plan (Quarterly Schedule)

This template should be used by:

- * Surface water systems who serve more than 500 population and are not on reduced monitoring
- * Surface water systems who serve more than 10,000 population on reduced monitoring
- * Groundwater systems who serve more than 10,000 population and are not on reduced monitoring
- * Any system that is on increased quarterly monitoring

For more information, refer to the Reference Sheets on the separate tabs

System Name: WATER DISTRICT 19
PWSID#: 38900
Population: 3723
Type of Source Water: SURFACE AND GROUNDWATER
Completed by: ARMIN WAHANIK
Date: 6/20/2022

Routine Monitoring Requirements

Monitoring Frequency (Routine Monitoring):

Quarterly

Number of TTHM Samples Required:

2

Number of HAA5 Samples Required:

2

See Routine Monitoring Reference tab to determine number of samples required

Monitoring Locations and Month Assigned

Monitoring Location (Name of Site)	Assigned Sampling Month			
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
10411 SW Cemetery Rd	MARCH	JUNE	SEPTEMBER	DECEMBER
22604 Deppman Rd SW	MARCH	JUNE	SEPTEMBER	DECEMBER

Determining Compliance for TTHM and HAAs

Our system is required to monitor quarterly. Each quarter we will calculate a locational running annual average (LRAA) for TTHM and HAA5 at each monitoring location. Compliance will be achieved if the TTHM and the Because compliance is based on a locational running annual average, the same location(s) must be used each quarter.

Operational Evaluation Level (OEL)

Calculated each quarter using the most recent 3 quarters of sample results, with Q3 being the most recent (multiplied by 2) and Q1 being the first of the 3 quarters.

$$OEL = \frac{[Q1 + Q2 + 2 \times (Q3)]}{4}$$

If the calculated OEL exceeds the MCLs for TTHM (0.080 mg/L) or HAA5 (0.060 mg/L) then the system has an OEL exceedance and is required to conduct an operational evaluation and submit a report within 90 days.

To qualify for reduced monitoring:

The TTHM LRAA must be less than or equal to 0.040 mg/L AND the HAA LRAA must be less than or equal to 0.030 mg/L at each monitoring location.

AND for systems that use surface water the source water annual average TOC level, before any treatment, must be less than or equal to 4.0 mg/L (based on routine monthly samples or reduced quarterly samples). Please note, if you are a wholesale customer, you will need to get this data from your supplying system.

Disinfectant Residual Monitoring

Chlorine residuals must be measured at the same time and place as routine or repeat coliform samples MRDL for chlorine and chloramines = 4.0 mg/l as Cl₂

Determining Compliance for disinfectant residuals

Compliance is based on the running annual average (RAA) of 12 consecutive months. Daily residual measurements will / will not be included in the compliance calculations (circle one)

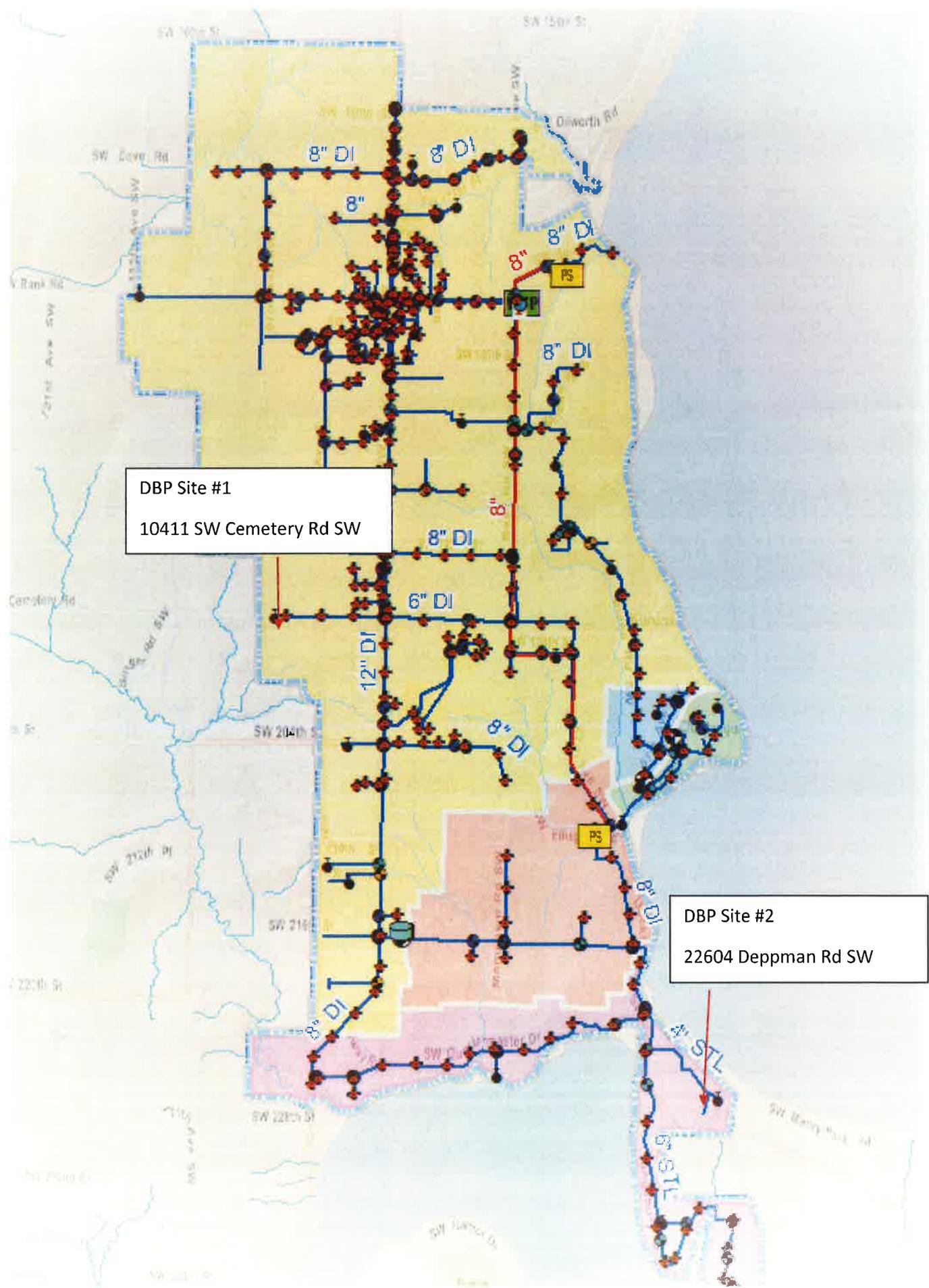
(Attach a distribution map with sample locations. You will need to print a hard copy for your records and make it available upon request. You do not need to submit a copy to DOH. If you need this publication in an alternate

Stage 2 DBP Routine Monitoring Requirements

(reduced monitoring is on the next tab)

Source Water Type	Population Range	Routine Monitoring Frequency	Number of Samples	Notes
Surface Water	3,301 - 9,999	Quarterly	2 Sample Sets; Two sets of TTHM and HAA5 samples (two locations, monitor both TTHM/HAA5 at every location)	<ul style="list-style-type: none"> Two locations are required. Both locations must be monitored for TTHM and HAA5.
Groundwater	500 - 9,999	Annual	2 Sample Sets; Two sets of TTHM and HAA5 samples (two locations, monitor both TTHM/HAA5 at every location)	<ul style="list-style-type: none"> Two locations are required. Both locations must be monitored for TTHM and HAA5.

Water District 19 System Map Disinfectant By-Product Sample Sites





Water Quality Monitoring Schedule

System: WATER DISTRICT 19

Contact: John J Martinak

SMA ID: 130

PWS ID: 38900 R

Group: A - Comm

Region: NORTHWEST

County: KING

SMA Name: WATER DISTRICT 19

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

	Jul 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022	Jan 2023	Feb 2023	Mar 2023	Apr 2023	May 2023	Jun 2023
Coliform Monitoring Population	3723	3723	3723	3723	3723	3723	3723	3723	3723	3723	3723	3723
Number of Routine Samples Required	4	4	4	4	4	4	4	4	4	4	4	4

- 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

Water Quality Monitoring Schedule

<u>Test Panel/Analyte</u>	<u># Samples Required</u>	<u>Compliance Period</u>	<u>Frequency</u>	<u>Last Sample Date</u>	<u>Next Sample Due</u>	
Lead and Copper	20	Jan 2022 - Dec 2024	standard - 3 year	09/29/2021	Sep 2024	
Asbestos	1	Jan 2020 - Dec 2028	standard - 9 year	10/17/2018	Oct 2027	
Total Trihalomethane (THM)	2	Jan 2022 - Mar 2022	standard - quarterly	03/16/2022		
Total Trihalomethane (THM)	2	Apr 2022 - Jun 2022	standard - quarterly	03/16/2022	Apr 2022	Due Date
Total Trihalomethane (THM)	2	Jul 2022 - Sep 2022	standard - quarterly	03/16/2022	Jul 2022	
Total Trihalomethane (THM)	2	Oct 2022 - Dec 2022	standard - quarterly	03/16/2022	Oct 2022	
Halo-Acetic Acids (HAA5)	2	Jan 2022 - Mar 2022	standard - quarterly	03/16/2022		
Halo-Acetic Acids (HAA5)	2	Apr 2022 - Jun 2022	standard - quarterly	03/16/2022	Apr 2022	Due Date
Halo-Acetic Acids (HAA5)	2	Jul 2022 - Sep 2022	standard - quarterly	03/16/2022	Jul 2022	
Halo-Acetic Acids (HAA5)	2	Oct 2022 - Dec 2022	standard - quarterly	03/16/2022	Oct 2022	

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.

For *Disinfection Byproducts (HAA5 and THM)*: Collect the samples at the locations identified in your Disinfection Byproducts (DBP) monitoring plan.

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 S05	Beall/Ellis	Surface	Use - Permanent	Susceptibility - High	
<u>Test Panel/Analyte</u>	<u># Samples Required</u>	<u>Compliance Period</u>	<u>Frequency</u>	<u>Last Sample Date</u>	<u>Next Sample Due</u>
Nitrate	1	Jan 2022 - Dec 2022	standard - 1 year	10/11/2021	Oct 2022

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 S05	Beall/Ellis	Surface	Use - Permanent	Susceptibility - High	
Test Panel/Analyte	# Samples Required	Compliance Period	Frequency	Last Sample Date	Next Sample Due
Complete Inorganic (IOC)	1	Jan 2020 - Dec 2028	waiver - 9 year	10/11/2021	
Manganese	1	Jan 2020 - Dec 2022	standard - 3 year	10/11/2021	
Volatile Organics (VOC)	1	Jan 2020 - Dec 2025	waiver - 6 year	07/22/2020	
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	10/25/2016	
Pesticides	0	Jan 2020 - Dec 2022	waiver - 3 year	06/11/2007	
Soil Fumigants	0	Jan 2020 - Dec 2022	waiver - 3 year		
Gross Alpha	1	Jan 2020 - Dec 2025	standard - 6 year	10/11/2021	
Radium 228	1	Jan 2020 - Dec 2025	standard - 6 year	10/11/2021	
Source S06	Well #3 (100 K Tank Site)	Well	Use - Permanent	Susceptibility - Low	
Test Panel/Analyte	# Samples Required	Compliance Period	Frequency	Last Sample Date	Next Sample Due
Nitrate	1	Jan 2022 - Dec 2022	standard - 1 year	10/07/2020	Mar 2022 Past Due
Complete Inorganic (IOC)	1	Jan 2020 - Dec 2028	waiver - 9 year	10/08/2019	Oct 2028
Manganese	1	Jan 2020 - Dec 2022	standard - 3 year	10/08/2019	Oct 2022
Volatile Organics (VOC)	1	Jan 2020 - Dec 2025	waiver - 6 year	10/08/2019	Oct 2025
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	06/12/2019	
Pesticides	0	Jan 2020 - Dec 2022	waiver - 3 year	05/20/2010	
Soil Fumigants	0	Jan 2020 - Dec 2022	waiver - 3 year		
Gross Alpha	1	Jan 2020 - Dec 2025	standard - 6 year	08/08/2018	Aug 2024
Radium 228	1	Jan 2020 - Dec 2025	standard - 6 year	08/08/2018	Aug 2024

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 S09	Wells 1, 2 & 4	Well Field	Use - Permanent	Susceptibility - Low	
Test Panel/Analyte	# Samples Required	Compliance Period	Frequency	Last Sample Date	Next Sample Due
Nitrate	1	Jan 2022 - Dec 2022	standard - 1 year	07/27/2021	Jul 2022
Complete Inorganic (IOC)	1	Jan 2020 - Dec 2028	waiver - 9 year	06/12/2019	Jun 2028
Arsenic	1	Jan 2020 - Dec 2022	standard - 3 year	06/12/2019	Jun 2022
Iron	1	Jan 2020 - Dec 2022	standard - 3 year	06/12/2019	Jun 2022
Manganese	1	Jan 2020 - Dec 2022	standard - 3 year	06/12/2019	Jun 2022
Volatile Organics (VOC)	1	Jan 2020 - Dec 2025	waiver - 6 year	06/12/2019	Jun 2025
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	08/04/2021	
Pesticides	0	Jan 2020 - Dec 2022	waiver - 3 year	08/22/2012	
Soil Fumigants	0	Jan 2020 - Dec 2022	waiver - 3 year		
Gross Alpha	1	Jan 2020 - Dec 2025	standard - 6 year	10/11/2021	
Radium 228	1	Jan 2020 - Dec 2025	standard - 6 year	10/11/2021	
Source S10	Beall Well APP677	Well	Use - Permanent	Susceptibility - Low	
Test Panel/Analyte	# Samples Required	Compliance Period	Frequency	Last Sample Date	Next Sample Due
Nitrate	1	Jan 2022 - Dec 2022	standard - 1 year	09/01/2021	Sep 2022
Complete Inorganic (IOC)	1	Jan 2020 - Dec 2028	waiver - 9 year	04/06/2017	Apr 2026
Arsenic	1	Jan 2022 - Mar 2022	increased - quarterly	10/07/2020	Mar 2022
Arsenic	1	Apr 2022 - Jun 2022	increased - quarterly	10/07/2020	Jun 2022
Arsenic	1	Jul 2022 - Sep 2022	increased - quarterly	10/07/2020	Sep 2022
Arsenic	1	Oct 2022 - Dec 2022	increased - quarterly	10/07/2020	Oct 2022
Manganese	1	Jan 2020 - Dec 2022	standard - 3 year	04/06/2017	May 2021

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 S10	Beall Well APP677	Well	Use - Permanent	Susceptility - Low	
Test Panel/Analyte	# Samples Required	Compliance Period	Frequency	Last Sample Date	Next Sample Due
Volatile Organics (VOC)	1	Jan 2020 - Dec 2022	standard - 3 year	06/13/2018	Jun 2022
Herbicides	1	Jan 2017 - Dec 2025	waiver - 9 year	06/13/2018	
Pesticides	0	Jan 2020 - Dec 2022	waiver - 3 year	06/19/2019	
Soil Fumigants	0	Jan 2020 - Dec 2022	waiver - 3 year		
Gross Alpha	1	Jan 2020 - Dec 2025	standard - 6 year	03/15/2018	Apr 2023
Radium 228	1	Jan 2020 - Dec 2025	standard - 6 year	04/06/2017	Apr 2023

Source S11	Vashon Meadow AFA518	Well	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	07/27/2021	Jul 2022
Complete Inorganic (IOC)	1	Jan 2020 - Dec 2028	waiver - 9 year	07/09/2019	Jul 2028
Iron	1	Jan 2020 - Dec 2022	standard - 3 year	07/09/2019	Jul 2022
Manganese	1	Jan 2020 - Dec 2022	standard - 3 year	07/09/2019	Jul 2022
Volatile Organics (VOC)	1	Jan 2020 - Dec 2025	waiver - 6 year	12/17/2019	Oct 2025
Herbicides	1	Jan 2020 - Dec 2028	waiver - 9 year	12/17/2019	Oct 2028
Pesticides	0	Jan 2020 - Dec 2022	waiver - 3 year	12/17/2019	
Soil Fumigants	0	Jan 2020 - Dec 2022	waiver - 3 year	12/17/2019	
Gross Alpha	1	Jan 2020 - Dec 2025	standard - 6 year	12/17/2019	Dec 2025
Radium 228	1	Jan 2020 - Dec 2025	standard - 6 year	12/17/2019	Dec 2025



Water Quality Monitoring Schedule

Other Information

<i>Other Reporting Schedules</i>	<i>Due Date</i>
Measure chlorine residuals and submit monthly reports if your system uses continuous chlorination:	monthly
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

Because source S10 has treatment to remove arsenic, you must collect a sample EVERY MONTH from that source after treatment and have an accredited lab analyze it for arsenic.

Northwest Regional Water Quality Monitoring Contacts

For questions regarding chemical monitoring:	Steve Hulsman: (253) 395-6777 or Steve.Hulsman@doh.wa.gov
For questions regarding DBPs:	Steve Hulsman: (253) 395-6777 or Steve.Hulsman@doh.wa.gov
For questions regarding coliform bacteria and microbial issues:	Brandon Katz: (253) 395-6775 or Brandon.Katz@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.

Example Letter 1 *To local jurisdictions / agencies*

Dear (Agency/Local Government):

We are writing to let you know that businesses or facilities you regulate are in our public water system wellhead protection area. Please take all reasonable steps to ensure that land use activities within this area do not contaminate our drinking water sources.

Our water company has 1,325 service connections, and serves about 2,736 people. The Washington State Department of Health rated some wells in our system as “highly susceptible.”

The enclosed map shows the 6-month and 1-, 5- and 10-year time-of-travel boundaries for our wellhead protection area. We’re also sending you a list of the facilities or activities of concern. Any groundwater contamination that occurs within this wellhead protection area has a high potential to reach our well.

Thank you for your support in protecting our drinking water.

Sincerely,

Example Letter 2 *To potential source owners/operators*

Dear (Owner/Operator):

To protect the drinking water supply for the customers of King County Water District 19, 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. The nature of your business and its location within our wellhead protection area means that your activities have the potential to affect our customers' drinking water supply.

We have notified the agency or agencies that regulate(s) your type of business/facility that you are in our wellhead protection area. You should contact them to request technical assistance to help manage your business in a way that will best prevent groundwater contamination. We realize you are already careful to protect the environment as you conduct your business. 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

28 January 2016

1218 Third Avenue
Suite 1412
Seattle, WA 98101
(425) 462-8591
(425) 455-3573 (fax)

Mr. Dale Myers
Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, Washington 98008-5452



Re: Response to Opinion on Site Characterization Report for K2 Facility (VCP #NW2894)
Vashon, Washington

Dear Mr. Myers:

ERM-West, Inc. (ERM) prepared this letter on behalf of K2 in response to the Washington State Department of Ecology (Ecology) opinion letter dated 23 November 2015 for the Site Characterization Report for the K2 facility at 19215 Vashon Highway Southwest, Vashon, Washington (the "Site"). K2 and ERM appreciate your review, comments, and opinion on the Site Characterization Report. We understand that the only material data gap in the Site Characterization Report identified by Ecology in its opinion letter is the vertical extent of trichloroethene (TCE) in groundwater at the Site. The specific comment in the opinion letter is presented below:

From analysis of Site ground water for TCE and Cross Section A-A' (Figure 9), it is apparent that the vertical extent of TCE in ground water has not been defined. The Site is within the 5-year travel time of Vashon Island Wellhead Protection Zones for Water District 19 (WD19). Ground water intakes for WD19's wells 1, 2, and 4 are at roughly 567, 640, and 598 feet below ground surface, respectively. Therefore Ecology is requiring that the vertical extent of the TCE plume be fully characterized. Additionally, Ecology is requiring that all data from this investigation be forwarded to WD19.

This letter presents the proposed approach to address the characterization of the vertical extent of the TCE plume in groundwater at the Site, and a summary of the pertinent background information from which the rationale for the plan was developed.

PROPOSED APPROACH

K2 proposes to characterize the vertical extent of the TCE plume in groundwater at the Site by installing a deep monitoring well downgradient of the known extent of the TCE plume in shallow groundwater at the Site and constructing the well with a screen set across water-bearing intervals in the lower reaches of the Vashon glacial till unit (Qvt). The proposed location of the deep monitoring well and the horizontal extent of the TCE plume in shallow groundwater at the Site are shown in the attached Figure 1. The depth of the water-bearing intervals in the Qvt is currently unknown, but based on available regional geologic data we anticipate encountering them at approximately 35 to 60 feet below ground surface (bgs). The depth of the water-bearing intervals and the well screen will be determined from observations during the drilling completed for well installation.

A groundwater sample will be collected from the deep well and analyzed for TCE. If the TCE concentration is less than the Model Toxics Control Act regulation (MTCA) Method A groundwater cleanup standard of 5 micrograms per liter in groundwater from the well, no further evaluation of vertical extent of TCE would be recommended, as the susceptibility of the groundwater extraction aquifer will be appropriately evaluated. If TCE is detected in the deep well at concentrations greater than the applicable MTCA Method A groundwater cleanup standard, additional characterization will be needed.

The monitoring well will be installed and constructed using procedures described in Section 4.2 of the Site Characterization Work Plan and Sampling and Analysis Plan by ERM dated December 2014 (Work Plan). The only exception from the Work Plan will be that the well screen will be installed fully submerged in groundwater rather than in a manner that intersects that water table surface. Well development, well surveying, water level measurement, groundwater sample collection will also be conducted as indicated in the Work Plan.

RATIONALE

Hydrostratigraphy and Groundwater Flow

The description of the hydrostratigraphy and groundwater flow in the vicinity of the Site presented herein is based on:

- Conditions observed in the shallow aquifer during the Site characterization;
- Well logs for the WD19 wells and others in the area; and
- Information in the *Vashon-Maury Island Hydrologic Modeling Technical Report* prepared for King County by DHI Water and Environment, October 2009 (Vashon Model).

The uppermost groundwater at the Site is encountered in the Vashon glacial till unit (Qvt) at a depth of 2 to 10 bgs. As documented in the Site Characterization Report and indicated on the well logs for the WD19 production wells, the Qvt is approximately 60 feet to greater than 100 feet thick in the Site vicinity. A representative WD19 well log from the well field northwest of the Site is included in Attachment A.

Groundwater flow in the Qvt at the Site is toward the south to southeast at a horizontal rate of 0.2 to 9 feet per year. Vertical groundwater flow rates are expected to be at least an order of magnitude slower due to aquifer anisotropy. The Vashon Model indicates a Qvt horizontal hydraulic conductivity (2.5 feet per day) that is 500 times greater than the vertical conductivity (0.005 feet per day).

The next water-bearing unit beneath the Qvt in the Site vicinity is the uppermost sand unit of the Vashon advance outwash (Qva). Based on well logs for the WD19 production wells, the sand unit of the Qva is approximately 70 feet thick in the Site vicinity. Groundwater flow in the Qva is toward the southeast at the Site. Information from the Vashon Model indicates that pumping at the WD19 wells near the Site is not affecting groundwater flow conditions in the Qvt and Qva groundwater units.

An aquitard consisting of approximately 400 feet of silty and clayey glacial and interglacial sediments (Qpff) is present between the bottom of the sand unit of the Qva and pre-Vashon glacial sediments below a depth of approximately 570 feet below ground surface, which is the next

significant water-bearing unit. In the Vashon Model, the Qpff is represented as having a horizontal hydraulic conductivity of 0.01 feet per day, and vertical hydraulic conductivity of 0.001 feet per day.

The pre-Vashon glacial sediments form the aquifer from which the shallowest WD19 wells extract groundwater. The Vashon Model indicates that groundwater flow in the pre-Vashon glacial sediments near the Site is normally toward the east to southeast, but is locally affected by the pumping from the WD19 wells. To consider conditions under a “worst-case” scenario, it is assumed in this evaluation that groundwater in the pre-Vashon glacial sediments aquifer beneath the Site flows northwesterly toward the WD19 wells.

Conceptual Contaminant Transport Model

ERM developed a conceptual contaminant transport model for the Site based on the hydrogeologic and groundwater flow conditions described above and the physical and chemical properties of TCE (see Figure 2). As discussed in Section 4.5.2 of the Site Characterization Report, the results of the Site investigation do not indicate that TCE is present as a dense non-aqueous-phase liquid (DNAPL) at the Site. However, to evaluate a worst case scenario, the contaminant transport conceptual model includes the assumption of the presence and downward migration of TCE DNAPL (see Figure 2). As indicated on the conceptual contaminant transport model, the hypothetical TCE plume would migrate both deeper and downgradient with time. The known area of the TCE plume exceeding the MTCA Method A cleanup standard in the Qvt water-bearing unit is generally limited to the footprint of the former K2 manufacturing building; however, if the TCE plume has migrated downward to the underlying Qva water-bearing unit, it would have passed through the lower Qvt unit and migrated downgradient beyond the footprint of the former K2 manufacturing building.

Consideration of Potential for Creation of Preferential Migration Pathways

Installing a deep groundwater monitoring well within the footprint of an existing shallow TCE plume has the potential to create a preferential vertical migration pathway to deeper groundwater. This is of particular concern for contaminants that can migrate as DNAPL, such as TCE, because they have a density greater than water. Although procedures are available to limit the potential for introducing preferential pathways

for shallow water to flow to deeper groundwater, there is risk that such cross-contamination may occur with even the best-executed drilling program. Therefore, the recommended location of the deep monitoring well is a short distance downgradient of the known footprint of the shallow TCE plume.

CLOSING

K2 requests that Ecology review this proposed plan for characterizing the vertical extent of the TCE groundwater plume, obtain input from WD19, as needed, and provide approval and/or comments regarding the plan at your earliest convenience. If you have questions regarding this plan, please contact Mr. Mike Arnold at (425) 761-2603.

Sincerely,



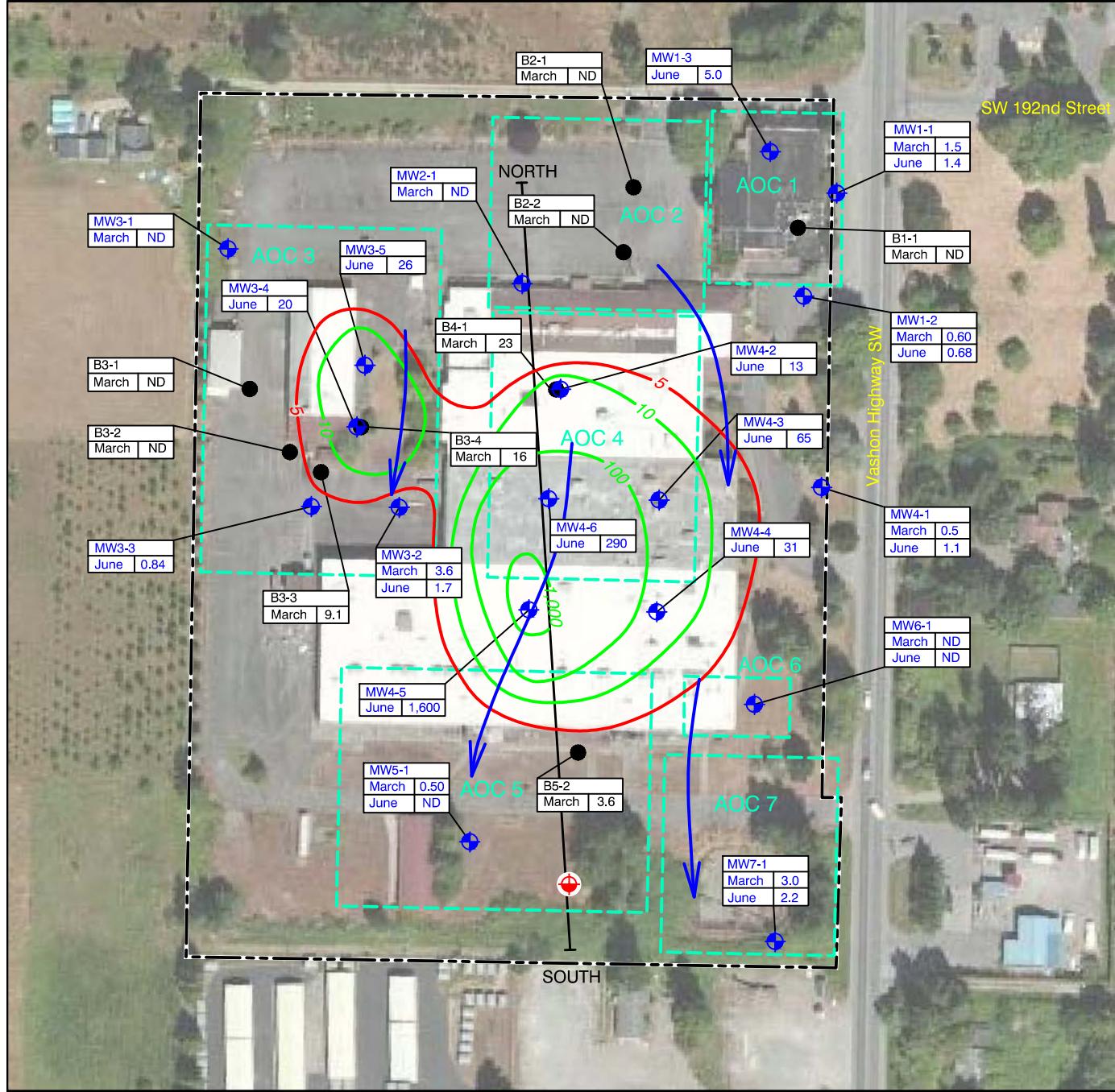
A. Michael Arnold
Program Director



David P. Edwards
Partner

Attachments

Figures



LEGEND

- MW1-1 Proposed Deep Well
- MW2-1 Monitoring Well
- B1-1 Soil Boring (Grab Groundwater Sample)
- March 1.5 Trichloroethene Concentration in micrograms per liter ($\mu\text{g}/\text{L}$); Sample collected in March 2015
- June 1.4 Trichloroethene Concentration in micrograms per liter ($\mu\text{g}/\text{L}$); Sample collected in June 2015
- ND Not Detected
- 5 Trichloroethene Preliminary Screening Goal Isoconcentration Contour based on June 2015 Sample Data; $\mu\text{g}/\text{L}$
- 100 Trichloroethene Isoconcentration Contour based on June 2015 Sample Data; $\mu\text{g}/\text{L}$
- Inferred Groundwater Flow Direction - 3 June 2015
- General Schematic Cross Section (Figure 2)
- Area of Concern
- Property Boundary

Aerial Photo Source: Bing Maps © 2015 Microsoft Corporation

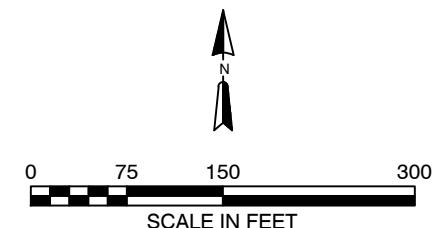
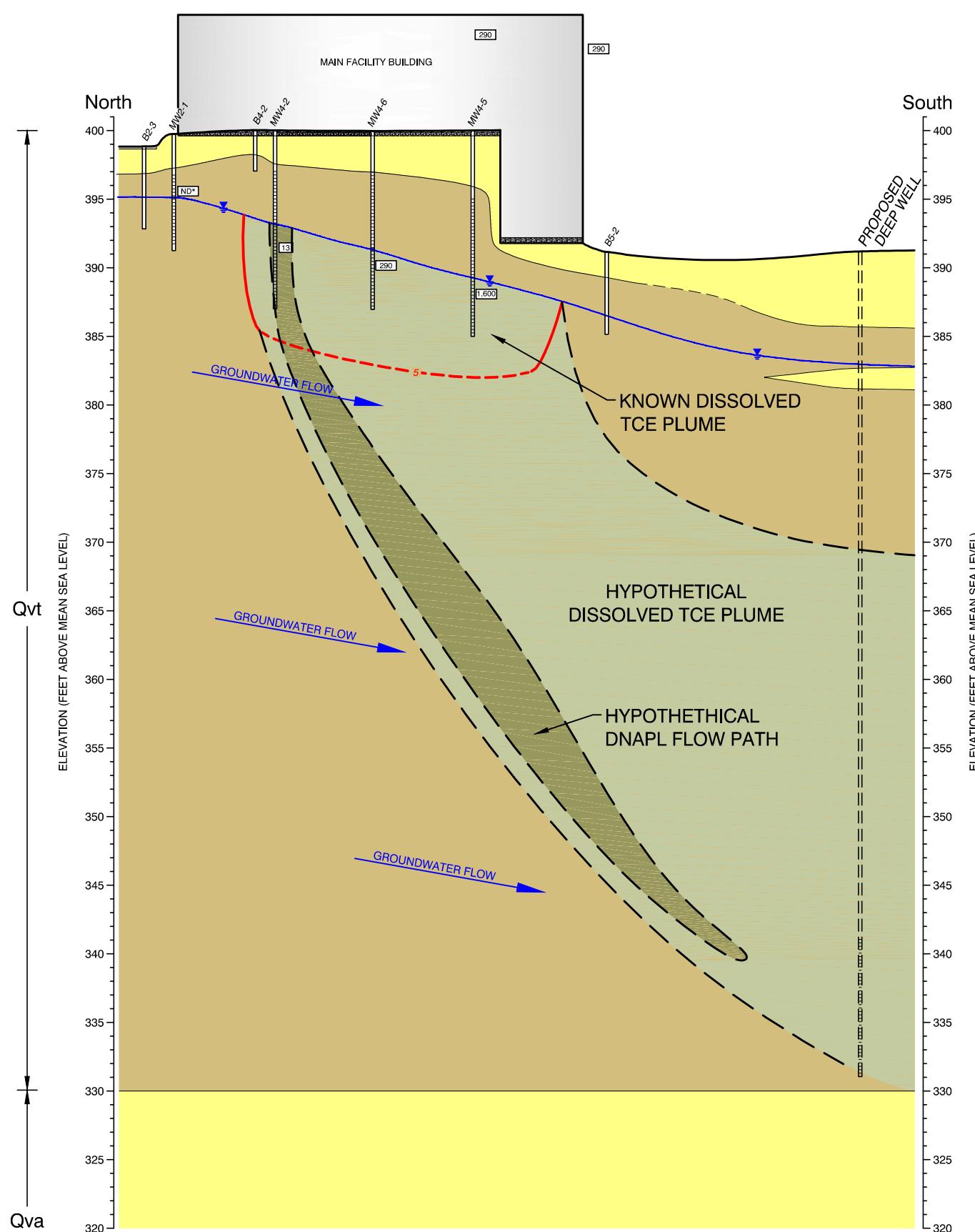


Figure 1
Trichloroethene in Shallow Groundwater
K2 Facility
Vashon, Washington



LEGEND
Geological Contact; Dashed Where Inferred

Well Screen Interval

Groundwater Elevation; Measured on 3 June 2015

Note: Presence and distribution of LNAPL and dissolved TCE at depth are assumed, and are not supported by available information.

5 — Trichloroethene Preliminary Screening Goal
Isoconcentration Contour Based on June 2015
Sample Data; $\mu\text{g/L}$

290 Trichloroethene Concentration in Groundwater;
June 2015; $\mu\text{g/L}$ (micrograms per liter)

ND* Not Detected; March 2015

Figure 2
Schematic Hydrogeologic Cross Section
K2 Facility
Vashon, Washington

Attachment A
Water District 19 Well Log

File Original with
Department of Ecology

Second Copy - Owner's Copy

Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

1/2 JUL 15 2005

Notice of Intent W166285

UNIQUE WELL I.D. # AKM948

Water Right Permit No. 61-23519C

(1) OWNER: Name Water District No 19 DEPT OF ECOLOGY Address 17630-100th Ave SW, Vashon Island, WA

(2) LOCATION OF WELL: County King SW 1/4 SE 1/4 Sec 31 T 23 N.R. 3E WM

(2a) STREET ADDRESS OF WELL: (or nearest address) 1/8 mile south - intersection 103 Ave SW & 188th St & SW

TAX PARCEL NO.: 3123039154 23-3E-31Q

(3) PROPOSED USE: Domestic Industrial Municipal Other

(4) TYPE OF WORK: Owner's number of well (if more than one) 4

New Well Method:
 Deepened Dug Bored
 Reconditioned Cable Driven
 Decommission Rotary Jetted

(5) DIMENSIONS: Diameter of well 12 inches
Drilled 704 feet. Depth of completed well 704 ft.

(6) CONSTRUCTION DETAILS

Casing Installed:
 Welded 16 Diam. from 0 ft. to 395 ft.
 Liner installed 12 Diam. from +2 ft. to 616 ft.
 Threaded Diam. from ft. to ft.

RECEIVED

Perforations: Yes No

Type of perforator used

SIZE of perforations in. by in.
perforations from ft. to ft.

APR 17 2006

DEPT. OF ECOLOGY

Screens: Yes No K-Pac Location

Manufacturer's Name

Type Model No.

Diam. Slot Size from ft. to ft.

Diam. Slot Size from ft. to ft.

Gravel/Filter packed: Yes No Size of gravel/sand

Material 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 418 ft.

Static level 412.5 ft. below top of well Date 5/24/05

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? P661 Holt+

Yield: 260 gal./min. with 85.4 ft. drawdown after 24 hrs.

Yield: gal./min. with ft. drawdown after hrs.

Yield: gal./min. with ft. drawdown after hrs.

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

Time	Water Level	Time	Water Level	Time	Water Level
1.0	466.85	15	449.14	55	443.96
5.0	452.58	20	448.16	110	440.56
10	450.45	30	446.5	187	437.49

Date of test

Bailer test gal./min. with ft. drawdown after hrs.

Airstest gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? Yes No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
Brown sandy gravelly silt	0	23
Gray sandy gravelly Silt	23	94
Brown silty sand Gravel + Cobbles	94	109
Brown Sand + Gravel	109	171
Gray Sand + Gravel	171	176
Gray Silt + Clay	176	470
Gray silty clay w/ small gravel	470	490
Gray silty sand w/mineral gravel	490	530
Gray sticky clay	530	535
Gray sandy Silt w/mineral gravel	535	576
Gray silty f-Sand w/mineral gravel	576	582
Gray f-c Sand	582	589
Gray f-m Sand w/silt interbeds and wood	589	601
Gray fine sand w/silt interbeds and wood	601	611
Gray very silty gravelly sand	611	614
Gray slightly gravelly f-c sand	614	630
Gray Sand + Gravel	630	635
Gray very silty sand + gravel	635	640
Gray silty sand + gravel	640	651
Gray Silt w/mineral gravel	651	657
Gray gravelly f-c sand w/ cobbles and wood	657	670
Gray f-c Sand	670	680
Gray f-m Sand	680	691
Gray Silt	691	704

Work Started 3/3/05 completed 5/20/05

WELL CONSTRUCTION CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Type or Print Name Randy Holt License No. 1099
(Licensed Driller/Engineer)

Trainee Name License No.

Drilling Company Holt Drilling / Board Longyear
(Signed) Randy Holt License No. 1099
(Licensed Driller/Engineer)

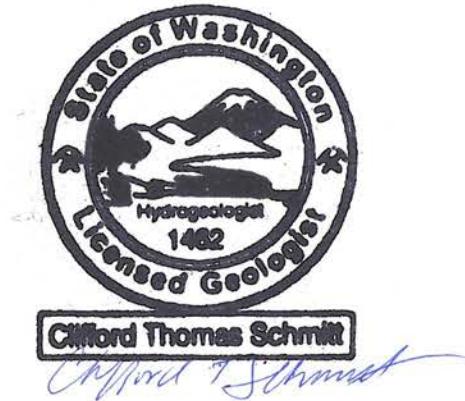
Address Po Box 1890 Milton Wa 98354

Contractor's Registration No. BOARTLC055PZ Date 6/20/05

(USE ADDITIONAL SHEETS IF NECESSARY)

TECHNICAL MEMORANDUM

TO: Bill Moyer, Executive Director—Backbone Campaign
FROM: Clifford T. Schmitt, L.G., L.H.G., Principal
DATE: December 15, 2015
RE: SITE CHARACTERIZATION REPORT
 FORMER K2 FACILITY
 19215 VASHON HIGHWAY SOUTHWEST
 VASHON, WASHINGTON
 FARALLON PN: 1271-001



Farallon Consulting, L.L.C. (Farallon) has prepared this technical memorandum to present the results of a preliminary review of the *Site Characterization Report, Former K2 Facility, 19215 Vashon Highway SW, Vashon, Washington* dated September 2015, prepared by Environmental Resources Management (Site Characterization Report) for the Former K2 Facility at 19215 Vashon Highway Southwest in Vashon, Washington (herein referred to as the Site). Farallon's review focused on releases of trichloroethene (TCE), a chlorinated solvent typically used as a degreaser, and to a lesser extent on releases of petroleum hydrocarbons at various areas of concern (AOCs) identified from prior investigations at the Site. Overall, the subsurface investigation documented in the Site Characterization Report confirmed that there were multiple releases to soil and groundwater at the Site; however, substantial additional investigation will be necessary to more fully characterize the source and extent of contamination prior to consideration of potential cleanup actions.

Provided below are comments regarding information presented in specific sections of the Site Characterization Report and the work performed at or analytical results from each AOC.

Section 2.1.1 Geology and Hydrogeology. Soil at the Site was described in the Site Characterization Report as very dense silt (SM) with sand and gravel. Farallon's review of the boring logs indicated that sand (SP) intervals were encountered at nearly all of the boring locations. Some of these sand intervals were present in the shallow water-bearing zone, particularly at monitoring wells MW3-2, MW4-1, MW4-4, and MW6-1. These more transmissive sand intervals below the water table likely act as preferential migration pathways for contaminated groundwater at the Site.

Section 2.5.1 Soil and Groundwater Cleanup Levels and Table 3. Although this section stated that the process for establishing Preliminary Screening Goals (PSGs) was "designed to generate the lowest, most protective regulatory values expected to be applicable to contaminants at the Site," Table 3 often cited a Washington State Model Toxics Control Act Regulation



(MTCA) Method A cleanup level when there may have been a more stringent MTCA Method B cleanup level for a constituent of concern. It is not clear why MTCA Method B cleanup levels were not considered as a primary criterion for selection of PSGs. For example, there is no MTCA Method A cleanup level for cis-1,2-dichloroethene (cis-1,2-DCE); therefore, the MTCA Method B cleanup level of 16 micrograms per liter (ug/l) is selected as the screening or cleanup level at most chlorinated solvent-contaminated sites in Washington, rather than the less conservative U.S. Environmental Protection Agency (EPA) Maximum Contaminant Level of 70 ug/l. Table 3 should be revised to include MTCA Method B cleanup levels, when available, for all constituents of concern in soil and groundwater.

AOC 1 – Machine Shop. Insufficient details were provided regarding the construction of the sump (e.g., the presence or lack of a soil bottom or associated piping). The maps presented in the Site Characterization Report were not sufficiently detailed to evaluate the proximity of borings and monitoring wells to specific features where releases likely would have occurred (e.g., the proximity of monitoring well MW1-3 to the sump in AOC 1).

Concentrations of petroleum hydrocarbons as diesel- and oil-range organics (DRO and ORO, respectively) exceeded their respective MTCA Method A cleanup levels in the single soil sample collected in AOC 1 from boring HA1-1 at a depth of 4.5 feet below ground surface (bgs). The lateral and vertical extent of petroleum contamination at AOC 1 was not defined. The soil analytical results for this contaminated soil sample were flagged with “NJ” on Table 6. The meaning of this flag is not defined on the table.

Groundwater samples were only collected from monitoring well MW1-3 during one monitoring event. Although DRO and ORO contamination was confirmed in soil at 4.5 feet bgs and groundwater was present at less than 6 feet below the top of the well casing, the groundwater sample collected from monitoring well MW1-3 was not analyzed for petroleum hydrocarbons. No explanation was provided in the Site Characterization Report as to why groundwater was not analyzed for petroleum hydrocarbons. Further assessment of groundwater quality in this AOC should be performed to confirm whether groundwater is contaminated, and if contaminated, to define the extent of contamination with additional monitoring wells. In addition, TCE was detected at a concentration equal to the MTCA Method A cleanup level in the single groundwater sample collected from monitoring well MW1-3. The source of TCE contamination was not specifically identified in the Site Characterization Report. Given that TCE was detected in groundwater samples collected from the other two monitoring wells at AOC 1, it is not known if the extent of TCE-contaminated groundwater has been fully characterized at AOC 1.

AOC 2 – Decommissioned UST and North Lot. It is not clear from review of Figure 10 that the lateral or potentially vertical extent of petroleum-contaminated soil has been defined in the vicinity of the former underground storage tank at AOC 2. A more detailed map at a scale of approximately 10 feet per 1 inch should be provided and include the boring HA2-1 and surrounding features. Based on review of Figure 10, it does not appear that the vertical extent of petroleum-contaminated soil at sample location Southwall-4' or the lateral extent to the south and southeast has been defined.



AOC 3 – Still, Centrifuge Room, and Chemical, Equipment, and Hazardous Waste Storage Area. A figure should be provided that shows specific features at AOC 3 at a scale of 10 to 20 feet per 1 inch. The former locations of the solvent still, hazardous waste shed, and areas used for storage of hazardous substances should be depicted on this figure along with boring and monitoring well locations. TCE was detected at low concentrations in soil samples collected from four borings at AOC 3. In addition, TCE was detected at concentrations exceeding the MTCA Method A cleanup level in groundwater samples collected from monitoring wells MW3-4 and MW3-5.

The source(s) causing groundwater contamination at AOC 3 were not identified in the Site Characterization Report. The northern, western, and vertical extent of groundwater contamination at AOC 3 needs to be defined using analytical data collected from additional monitoring wells. The analytical results for reconnaissance groundwater samples collected from borings B3-1 and B3-2 suggest that groundwater contamination does not extend off the Site to the west.

AOC 4 – Former Drain Field and Vapor Degreasers. A figure should be provided that shows specific features at AOC 4 at a scale of 10 to 20 feet per 1 inch. The former locations of vapor degreasers and other features where hazardous substances were used and stored inside the building should be depicted on this figure along with boring and monitoring well locations.

Based on the distribution of TCE in groundwater, it is likely that there are several sources at AOC 4. Substantial additional characterization of soil and groundwater conditions is necessary at AOC 4 in order to identify the sources and define the lateral and vertical extent of contamination at and down-gradient of AOC 4. While Figure 13 appeared to correctly depict the extent of groundwater contamination based on the available data, that data set is insufficient. When a more thorough characterization of groundwater conditions is performed, the lateral and vertical extent of the plume likely will be much larger than this limited data set suggests. The basis for this opinion is as follows:

- The locations of the sources of TCE in soil that are contaminating groundwater have not been identified. Therefore, it is highly likely that the current monitoring well network is not positioned to monitor areas where groundwater contamination is highest (i.e., at each source area).
- There is a moderate gradient of the shallow groundwater table of approximately 1.5 percent. This means that groundwater is flowing generally toward the south. No information regarding the vertical gradient for the shallow water-bearing zone was provided in the Site Characterization Report. To assess the vertical gradient would require installation of monitoring wells screened at successively deeper intervals. At a minimum, monitoring wells screened at deeper intervals should be installed adjacent to existing monitoring wells MW4-5, MW5-1, and MW7-1. The intervals screened at these locations would be dependent on the soil types and water-saturated intervals encountered during drilling. Monitoring well(s) also should be installed west of monitoring well



MW5-1 and between monitoring wells MW5-1 and MW7-1, and screened at shallow and deeper intervals to more thoroughly define the extent of groundwater contamination.

- The TCE plume extending down-gradient (south) of monitoring well MW4-5 was shown as being limited to a distance of approximately 100 feet. Based on the high concentration of TCE but relatively low concentrations of TCE degradation products cis-1,2-DCE and vinyl chloride in the plume and the probable long time frame that TCE was released at the facility, the plume likely extends further south than depicted.
- Based on experiences at other chlorinated solvent-contaminated sites, it is expected that upon further subsurface investigation, the plume of TCE will be found to be migrating vertically downward as it travels south. Therefore, the position of the plume will be deeper than the shallow screened interval of monitoring wells MW5-1 and MW7-1.

AOC 5 – Former Resin Tank and Grinding Process Area; AOC 6 – Boiler Room; and AOC 7 – Stormwater Retention Pond. These AOCs are located down-gradient of the sources and contaminated groundwater at AOCs 3 and 4. As discussed under AOC 4, the down-gradient extent of TCE in groundwater likely has not been defined.

Section 4.4 Vapor Intrusion Screening. During recent discussions with Farallon personnel, Ecology indicated that the *Draft Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action* dated October 2009 is no longer applicable. The vapor intrusion pathway is now to be assessed using the more recent *Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Investigation Vapor Sources to Indoor Air* dated June 2015, prepared by the EPA.

Section 4.5 Discussion of Results. The source areas contributing TCE to groundwater at AOCs 3 and 4, and potentially at AOC 1, have not been identified or characterized. TCE should be considered a contaminant of concern for soil and indoor air until more thorough characterization of the source and extent of contamination has been completed.

The points of release of TCE to soil at the Site were not identified. In order for future cleanup actions to address contamination by TCE and its degradation products cis-1,2-DCE and vinyl chloride to be successful, all sources (i.e., areas where soil contamination is present) must be identified and addressed during the cleanup. Based on this preliminary review of the Site Characterization Report, the consultant discounted that soil contamination exists and did not include TCE in soil as a contaminant of concern. Based on the configuration of contamination in groundwater and known size of the TCE plume in groundwater (i.e., approximately 4 acres), multiple TCE sources are present at the Site.

Section 5.0 Conclusions. Insufficient data was collected to support the statement that “it is likely that any residual TCE source areas in soil are either very small in area, or have naturally attenuated.” Substantial additional characterization is necessary, particularly at AOCs 3 and 4, to locate the continuing sources of TCE to groundwater. Multiple source areas likely are present at each AOC. As a first step, soil gas surveys could be performed on a grid pattern not to exceed



25 feet across each AOC. The soil gas analytical results could then be used to better target features and areas for further soil and groundwater sampling. Results for each area should be depicted on significantly more detailed maps showing historical use and features, including the locations of chemical storage and use areas, vapor degreasers, and the sanitary sewer and storm drain lines.

The statement that characterization of the Site “under Chapter 173-340-350 WAC [Washington Administrative Code] is sufficient to perform a feasibility study and complete a draft cleanup action plan” is incorrect. Substantial additional investigation is necessary to identify the locations of sources that are causing long-term contamination of groundwater, and the extent of TCE, cis-1,2-DCE, vinyl chloride, and petroleum hydrocarbons in groundwater needs to be defined in order to complete the remedial investigation in accordance with WAC 173-340-350(7). After the sources and extent of contamination have been more fully defined, potential feasible remediation technologies for cleanup can be evaluated for the Site.

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APPENDIX F

HYDRAULIC MODEL RESULTS

2016 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-1	2.97	395	489.35	40.8
J-2	2.97	330	489.35	68.91
J-3	2.97	300	489.37	81.89
J-4	2.97	325	489.35	71.07
J-5	2.97	320	489.35	73.23
J-6	2.97	185	489.35	131.61
J-7	2.97	330	489.35	68.91
J-8	2.97	275	489.05	92.56
J-10	2.97	325	489.24	71.02
J-11	2.97	350	489.33	60.25
J-12	2.97	330	489.34	68.91
J-13	2.97	325	489.34	71.07
J-14	2.97	325	489.35	71.07
J-15	2.97	325	489.35	71.07
J-16	2.97	325	489.35	71.07
J-17	2.97	355	489.35	58.1
J-18	2.97	360	489.35	55.94
J-19	2.97	360	489.36	55.94
J-21	2.97	360	489.34	55.93
J-22	2.97	330	489.35	68.91
J-23	2.97	325	489.24	71.02
J-24	2.97	370	489.35	51.61
J-25	2.97	380	489.38	47.3
J-26	2.97	380	489.39	47.31
J-27	2.97	385	489.48	45.18
J-28	2.97	375	489.48	49.5
J-29	2.97	360	489.33	55.93
J-30	2.97	375	489.36	49.45
J-31	2.97	385	489.49	45.19
J-32	2.97	380	489.51	47.36
J-33	2.97	380	489.52	47.36
J-34	2.97	380	489.56	47.38
J-35	2.97	375	489.49	49.51
J-37	2.97	375	489.36	49.45
J-39	2.97	375	489.49	49.51
J-40	2.97	375	489.48	49.51
J-41	2.97	370	489.48	51.67
J-42	2.97	375	489.48	49.5
J-43	2.97	350	489.48	60.32
J-44	2.97	350	489.48	60.32
J-45	2.97	350	489.49	60.32
J-46	2.97	350	489.48	60.32
J-47	2.97	362	489.47	55.12
J-48	2.97	380	489.47	47.34
J-49	2.97	390	489.47	43.01
J-50	2.97	395	489.46	40.85

2016 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-51	2.97	395	489.46	40.85
J-52	2.97	400	488.51	38.27
J-53	2.97	285	489.39	88.39
J-54	2.97	275	489.39	92.71
J-55	2.97	380	489.49	47.35
J-56	2.97	380	489.49	47.35
J-57	2.97	385	489.49	45.18
J-58	2.97	385	489.52	45.2
J-59	2.97	385	489.52	45.2
J-60	2.97	380	489.66	47.42
J-61	2.97	380	489.66	47.42
J-62	2.97	375	489.48	49.5
J-63	2.97	375	489.48	49.5
J-64	2.97	380	489.48	47.34
J-65	2.97	380	489.52	47.36
J-66	2.97	380	489.54	47.37
J-67	2.97	385	489.49	45.19
J-68	2.97	375	489.48	49.5
J-69	2.97	375	489.47	49.5
J-71	2.97	380	489.39	47.31
J-72	2.97	320	488.73	72.96
J-73	2.97	325	489.24	71.02
J-74	2.97	375	489.51	49.52
J-75	2.97	360	489.39	55.95
J-76	2.97	350	489.36	60.26
J-77	2.97	375	489.56	49.54
J-78	2.97	325	489.55	71.16
J-79	2.97	375	488.69	49.16
J-80	2.97	315	489.55	75.48
J-83	2.97	375	489.56	49.54
J-84	2.97	400	489.55	38.72
J-85	2.97	405	489.92	36.72
J-86	2.97	405	489.93	36.73
J-87	2.97	400	489.93	38.89
J-88	2.97	310	488.68	77.27
J-89	2.97	320	488.68	72.94
J-90	2.97	310	488.65	77.25
J-91	2.97	330	488.6	68.59
J-92	2.97	315	488.6	75.07
J-93	2.97	335	488.59	66.42
J-94	2.97	330	488.52	68.55
J-95	2.97	285	488.45	87.98
J-96	2.97	280	488.35	90.1
J-97	2.97	280	488.33	90.09
J-99	2.97	290	488.45	85.82
J-100	2.97	300	488.45	81.49

2016 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-101	2.97	385	489.56	45.22
J-102	2.97	385	489.62	45.24
J-103	2.97	395	489.82	41
J-104	2.97	405	490.01	36.76
J-105	2.97	400	489.81	38.84
J-106	2.97	400	489.81	38.84
J-107	2.97	390	489.39	42.98
J-108	2.97	355	489.28	58.07
J-109	2.97	320	489.24	73.19
J-110	2.97	382	489.35	46.42
J-111	2.97	375	489.31	49.43
J-112	2.97	365	489.24	53.73
J-113	2.97	350	489.11	60.16
J-114	2.97	320	489.03	73.09
J-115	2.97	375	489.31	49.43
J-116	2.97	360	489.31	55.92
J-117	2.97	330	489.31	68.89
J-118	2.97	310	488.95	77.38
J-119	2.97	305	488.88	79.51
J-120	2.97	285	488.82	88.14
J-121	2.97	292	488.94	85.16
J-122	2.97	300	489	81.73
J-123	2.97	275	488.61	92.37
J-124	2.97	235	488.35	109.55
J-125	2.97	200	488.08	124.57
J-126	2.97	180	323.29	61.96
J-127	2.97	70	323.15	109.47
J-128	2.97	25	323.12	128.92
J-129	2.97	50	216	71.79
J-130	2.97	47	323.09	119.39
J-131	2.97	100	323	96.43
J-132	2.97	145	322.88	76.92
J-133	2.97	150	322.88	74.76
J-134	2.97	110	322.76	92.01
J-135	2.97	110	322.76	92.01
J-136	2.97	150	322.76	74.71
J-137	2.97	165	322.76	68.22
J-138	2.97	165	322.76	68.22
J-139	2.97	50	207.76	68.22
J-140	2.97	17	207.76	82.49
J-141	2.97	60	207.82	63.92
J-142	2.97	15	207.91	83.42
J-143	2.97	10	207.9	85.58
J-144	2.97	22	207.66	80.29
J-145	2.97	90	207.62	50.86
J-146	2.97	80	207.61	55.18

2016 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-147	2.97	75	208.1	57.56
J-148	2.97	75	208.14	57.58
J-150	2.97	155	208.61	23.18
J-151	2.97	235	486.01	108.55
J-152	2.97	210	485.68	119.21
J-153	2.97	50	208.14	68.39
J-154	2.97	50	208.14	68.39
J-155	2.97	50	207.47	68.09
J-156	2.97	30	207.46	76.74
J-157	2.97	35	207.46	74.58
J-158	2.97	30	207.46	76.74
J-159	2.97	75	207.46	57.28
J-160	2.97	60	207.46	63.77
J-161	2.97	60	216	67.46
J-162	2.97	79	216.01	59.25
J-163	2.97	110	299.05	81.75
J-164	2.97	110	299.06	81.76
J-165	2.97	70	216	63.14
J-166	2.97	80	216.01	58.81
J-167	2.97	22	216	83.89
J-168	2.97	55	216	69.62
J-169	2.97	50	216	71.78
J-170	2.97	50	216	71.78
J-171	2.97	75	216	60.97
J-172	2.97	100	299.04	86.07
J-173	2.97	120	299.04	77.42
J-174	2.97	120	299.04	77.42
J-175	2.97	175	299.04	53.64
J-176	2.97	180	299.1	51.5
J-177	2.97	211	299.15	38.12
J-178	2.97	217	299.16	35.53
J-179	2.97	260	487.99	98.59
J-180	2.97	270	488.21	94.36
J-181	2.97	270	486.15	93.47
J-182	2.97	260	486.22	97.83
J-183	2.97	295	486.96	83.01
J-184	2.97	305	487.15	78.77
J-185	2.97	375	488.91	49.26
J-186	2.97	375	488.91	49.26
J-187	2.97	305	487.13	78.76
J-188	2.97	305	486.55	78.51
J-189	2.97	200	482.32	122.08
J-190	2.97	317	489.15	74.44
J-191	2.97	321	489.15	72.71
J-192	2.97	268	489.15	95.63
J-193	2.97	275	489.15	92.61

2016 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-194	2.97	266	489.15	96.5
J-195	2.97	250	489.15	103.42
J-196	2.97	310	488.86	77.34
J-197	2.97	308	489.17	78.35
J-198	2.97	305	489.21	79.66
J-199	2.97	125	322.75	85.52
J-200	2.97	260	322.75	27.14
J-201	2.97	125	322.75	85.52
J-202	2.97	250	486.22	102.15
J-203	2.97	275	486.14	91.31
J-205	2.97	275	486.14	91.31
J-216	2.97	255	489.22	101.28
J-217	2.97	100	489.21	168.31
J-218	2.97	45	489.21	192.09
J-219	2.97	200	489.22	125.07
J-220	2.97	325	489.12	70.97
J-221	2.97	325	488.99	70.92
J-222	2.97	17	207.77	82.49
J-223	2.97	325	550	97.3
J-224	2.97	325	489.21	71.01
J-225	2.97	245	487.92	105.05
J-226	2.97	228	299.18	30.78
J-227	2.97	400	489.42	38.67
J-228	2.97	335	489.15	66.66
J-229	2.97	320	489.03	73.09
J-230	2.97	300	489	81.73
J-231	2.97	310	489.17	77.48
J-232	2.97	330	489.17	68.83
J-233	2.97	340	489.17	64.51
J-234	2.97	330	489.17	68.83
J-235	2.97	375	489.57	49.54
J-295	2.97	315	489.35	75.4
J-292	2.97	367	489.32	52.9
J-237	2.97	350	489.32	60.25
J-238	2.97	348	489.34	61.12
J-239	2.97	347	489.34	61.55
J-240	2.97	350	489.35	60.26
J-291	2.97	345	489.3	62.4
J-290	2.97	400	489.38	38.65
J-289	2.97	400	489.38	38.65
J-288	2.97	390	489.38	42.98
J-272	2.97	400	489.38	38.65
J-287	2.97	405	489.38	36.49
J-286	2.97	385	489.33	45.12
J-285	2.97	397	489.33	39.93
J-284	2.97	335	489.35	66.75

2016 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-283	2.97	345	489.22	62.37
J-282	2.97	415	487.72	31.44
J-281	2.97	385	489.56	45.21
J-293	2.97	387	489.78	44.45
J-279	2.97	375	489.24	49.4
J-278	2.97	392	489.47	42.15
J-277	2.97	380	489.47	47.34
J-276	2.97	385	489.57	45.22
J-236	2.97	385	489.57	45.22
J-271	2.97	390	489.57	43.06
J-270	2.97	392	489.57	42.19
J-269	2.97	390	489.57	43.06
J-268	2.97	390	489.57	43.06
J-267	2.97	368	489.35	52.47
J-266	2.97	367	489.29	52.88
J-265	2.97	383	489.35	45.99
J-264	2.97	377	489.35	48.58
J-263	2.97	377	489.34	48.58
J-262	2.97	385	489.36	45.13
J-261	2.97	383	489.35	45.99
J-260	2.97	385	489.35	45.13
J-259	2.97	387	489.39	44.28
J-258	2.97	387	489.38	44.27
J-257	2.97	385	489.36	45.13
J-256	2.97	386	489.32	44.68
J-255	2.97	387	489.38	44.27
J-254	2.97	380	489.35	47.29
J-253	2.97	386	489.36	44.7
J-252	2.97	385	489.6	45.23
J-251	2.97	387	489.54	44.34
J-250	2.97	387	489.54	44.34
J-249	2.97	390	489.54	43.04
J-248	2.97	405	489.62	36.59
J-247	2.97	325	489.17	70.99
J-246	2.97	325	489.17	70.99
J-245	2.97	325	489.17	70.99
J-244	2.97	412	489.94	33.71
J-243	2.97	406	489.94	36.3
J-242	2.97	407	489.94	35.87
J-241	2.97	405	489.81	36.68
J-298	2.97	410	489.94	34.57
J-297	2.97	345	489.03	62.28
J-299	2.97	40	207.76	72.54
J-296	2.97	55	207.53	65.96
J-302	2.97	110	299.06	81.76
J-303	2.97	170	323.04	66.18

2022 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-1	3.18	395	488.27	40.34
J-2	3.18	330	488.28	68.44
J-3	3.18	300	488.3	81.43
J-4	3.18	325	488.27	70.61
J-5	3.18	320	488.27	72.77
J-6	3.18	185	488.27	131.14
J-7	3.18	330	488.27	68.44
J-8	3.18	275	487.94	92.08
J-10	3.18	325	488.15	70.55
J-11	3.18	350	488.25	59.79
J-12	3.18	330	488.26	68.44
J-13	3.18	325	488.27	70.6
J-14	3.18	325	488.27	70.6
J-15	3.18	325	488.27	70.6
J-16	3.18	325	488.28	70.61
J-17	3.18	355	488.28	57.63
J-18	3.18	360	488.28	55.47
J-19	3.18	360	488.28	55.47
J-21	3.18	360	488.27	55.47
J-22	3.18	330	488.27	68.44
J-23	3.18	325	488.15	70.55
J-24	3.18	370	488.27	51.14
J-25	3.18	380	488.31	46.84
J-26	3.18	380	488.32	46.84
J-27	3.18	385	488.42	44.72
J-28	3.18	375	488.42	49.05
J-29	3.18	360	488.25	55.46
J-30	3.18	375	488.28	48.99
J-31	3.18	385	488.43	44.73
J-32	3.18	380	488.46	46.9
J-33	3.18	380	488.47	46.9
J-34	3.18	380	488.51	46.92
J-35	3.18	375	488.43	49.05
J-37	3.18	375	488.28	48.99
J-39	3.18	375	488.43	49.05
J-40	3.18	375	488.42	49.05
J-41	3.18	370	488.42	51.21
J-42	3.18	375	488.42	49.05
J-43	3.18	350	488.42	59.86
J-44	3.18	350	488.42	59.86
J-45	3.18	350	488.42	59.86
J-46	3.18	350	488.42	59.86
J-47	3.18	362	488.41	54.67
J-48	3.18	380	488.41	46.88
J-49	3.18	390	488.4	42.55
J-50	3.18	395	488.4	40.39

2022 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-51	3.18	395	488.4	40.39
J-52	3.18	400	487.32	37.76
J-53	3.18	285	488.32	87.92
J-54	3.18	275	488.32	92.25
J-55	3.18	380	488.43	46.89
J-56	3.18	380	488.43	46.89
J-57	3.18	385	488.43	44.73
J-58	3.18	385	488.47	44.74
J-59	3.18	385	488.47	44.74
J-60	3.18	380	488.62	46.97
J-61	3.18	380	488.62	46.97
J-62	3.18	375	488.42	49.05
J-63	3.18	375	488.42	49.05
J-64	3.18	380	488.42	46.88
J-65	3.18	380	488.47	46.91
J-66	3.18	380	488.49	46.91
J-67	3.18	385	488.43	44.73
J-68	3.18	375	488.42	49.05
J-69	3.18	375	488.4	49.04
J-71	3.18	380	488.32	46.84
J-72	3.18	320	487.57	72.46
J-73	3.18	325	488.15	70.55
J-74	3.18	375	488.45	49.06
J-75	3.18	360	488.32	55.49
J-76	3.18	350	488.29	59.8
J-77	3.18	375	488.51	49.08
J-78	3.18	325	488.5	70.7
J-79	3.18	375	487.52	48.66
J-80	3.18	315	488.5	75.03
J-83	3.18	375	488.51	49.08
J-84	3.18	400	488.5	38.27
J-85	3.18	405	488.92	36.29
J-86	3.18	405	488.92	36.29
J-87	3.18	400	488.92	38.45
J-88	3.18	310	487.51	76.76
J-89	3.18	320	487.52	72.44
J-90	3.18	310	487.48	76.75
J-91	3.18	330	487.43	68.08
J-92	3.18	315	487.43	74.56
J-93	3.18	335	487.42	65.91
J-94	3.18	330	487.33	68.04
J-95	3.18	285	487.26	87.46
J-96	3.18	280	487.14	89.57
J-97	3.18	280	487.12	89.57
J-99	3.18	290	487.25	85.3
J-100	3.18	300	487.25	80.97

2022 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-101	3.18	385	488.51	44.76
J-102	3.18	385	488.58	44.79
J-103	3.18	395	488.8	40.56
J-104	3.18	405	489.02	36.33
J-105	3.18	400	488.8	38.4
J-106	3.18	400	488.8	38.4
J-107	3.18	390	488.31	42.51
J-108	3.18	355	488.19	57.6
J-109	3.18	320	488.15	72.71
J-110	3.18	382	488.27	45.95
J-111	3.18	375	488.23	48.96
J-112	3.18	365	488.15	53.26
J-113	3.18	350	488	59.68
J-114	3.18	320	487.91	72.61
J-115	3.18	375	488.23	48.96
J-116	3.18	360	488.22	55.45
J-117	3.18	330	488.22	68.42
J-118	3.18	310	487.82	76.89
J-119	3.18	305	487.74	79.02
J-120	3.18	285	487.67	87.64
J-121	3.18	292	487.81	84.67
J-122	3.18	300	487.88	81.24
J-123	3.18	275	487.44	91.87
J-124	3.18	235	487.14	109.03
J-125	3.18	200	486.84	124.04
J-126	3.18	180	320.01	60.54
J-127	3.18	70	319.84	108.04
J-128	3.18	25	319.81	127.49
J-129	3.18	50	215.56	71.59
J-130	3.18	47	319.78	117.96
J-131	3.18	100	319.67	94.99
J-132	3.18	145	319.54	75.48
J-133	3.18	150	319.54	73.31
J-134	3.18	110	319.41	90.55
J-135	3.18	110	319.41	90.55
J-136	3.18	150	319.41	73.26
J-137	3.18	165	319.41	66.77
J-138	3.18	165	319.41	66.77
J-139	3.18	50	205.32	67.17
J-140	3.18	17	205.32	81.44
J-141	3.18	60	205.4	62.87
J-142	3.18	15	205.49	82.37
J-143	3.18	10	205.48	84.53
J-144	3.18	22	205.21	79.23
J-145	3.18	90	205.16	49.8
J-146	3.18	80	205.15	54.12

2022 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-147	3.18	75	205.71	56.52
J-148	3.18	75	205.75	56.54
J-150	3.18	155	206.29	22.18
J-151	3.18	235	484.5	107.89
J-152	3.18	210	484.13	118.54
J-153	3.18	50	205.75	67.35
J-154	3.18	50	205.75	67.35
J-155	3.18	50	204.99	67.02
J-156	3.18	30	204.99	75.67
J-157	3.18	35	204.99	73.51
J-158	3.18	30	204.98	75.67
J-159	3.18	75	204.98	56.21
J-160	3.18	60	204.98	62.69
J-161	3.18	60	215.56	67.27
J-162	3.18	79	215.56	59.05
J-163	3.18	110	297.38	81.03
J-164	3.18	110	297.39	81.03
J-165	3.18	70	215.56	62.95
J-166	3.18	80	215.57	58.62
J-167	3.18	22	215.56	83.7
J-168	3.18	55	215.56	69.43
J-169	3.18	50	215.55	71.59
J-170	3.18	50	215.55	71.59
J-171	3.18	75	215.55	60.78
J-172	3.18	100	297.36	85.35
J-173	3.18	120	297.36	76.7
J-174	3.18	120	297.36	76.7
J-175	3.18	175	297.36	52.91
J-176	3.18	180	297.44	50.78
J-177	3.18	211	297.48	37.4
J-178	3.18	217	297.5	34.81
J-179	3.18	260	486.73	98.05
J-180	3.18	270	486.99	93.83
J-181	3.18	270	484.66	92.82
J-182	3.18	260	484.74	97.19
J-183	3.18	295	485.57	82.41
J-184	3.18	305	485.78	78.18
J-185	3.18	375	487.77	48.77
J-186	3.18	375	487.77	48.77
J-187	3.18	305	485.77	78.17
J-188	3.18	305	485.11	77.89
J-189	3.18	200	480.34	121.23
J-190	3.18	317	488.05	73.97
J-191	3.18	321	488.05	72.24
J-192	3.18	268	488.05	95.16
J-193	3.18	275	488.05	92.13

2022 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-194	3.18	266	488.05	96.02
J-195	3.18	250	488.05	102.94
J-196	3.18	310	487.72	76.85
J-197	3.18	308	488.07	77.87
J-198	3.18	305	488.11	79.18
J-199	3.18	125	319.4	84.06
J-200	3.18	260	319.4	25.69
J-201	3.18	125	319.4	84.06
J-202	3.18	250	484.74	101.51
J-203	3.18	275	484.65	90.66
J-205	3.18	275	484.65	90.66
J-216	3.18	255	488.12	100.81
J-217	3.18	100	488.12	167.84
J-218	3.18	45	488.12	191.62
J-219	3.18	200	488.12	124.59
J-220	3.18	325	488.01	70.49
J-221	3.18	325	487.87	70.43
J-222	3.18	17	205.33	81.44
J-223	3.18	325	550	97.3
J-224	3.18	325	488.11	70.54
J-225	3.18	245	486.66	104.5
J-226	3.18	228	297.52	30.06
J-227	3.18	400	488.35	38.21
J-228	3.18	335	488.05	66.18
J-229	3.18	320	487.91	72.61
J-230	3.18	300	487.88	81.24
J-231	3.18	310	488.07	77
J-232	3.18	330	488.07	68.36
J-233	3.18	340	488.07	64.03
J-234	3.18	330	488.07	68.36
J-235	3.18	375	488.52	49.09
J-295	3.18	315	488.27	74.93
J-292	3.18	367	488.24	52.43
J-237	3.18	350	488.24	59.78
J-238	3.18	348	488.26	60.66
J-239	3.18	347	488.26	61.09
J-240	3.18	350	488.27	59.79
J-291	3.18	345	488.22	61.93
J-290	3.18	400	488.31	38.19
J-289	3.18	400	488.31	38.19
J-288	3.18	390	488.31	42.51
J-272	3.18	400	488.31	38.19
J-287	3.18	405	488.31	36.03
J-286	3.18	385	488.25	44.65
J-285	3.18	397	488.25	39.46
J-284	3.18	335	488.27	66.28

2022 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-283	3.18	345	488.13	61.89
J-282	3.18	415	486.43	30.89
J-281	3.18	385	488.51	44.76
J-293	3.18	387	488.76	44
J-279	3.18	375	488.14	48.93
J-278	3.18	392	488.4	41.69
J-277	3.18	380	488.4	46.88
J-276	3.18	385	488.52	44.77
J-236	3.18	385	488.52	44.77
J-271	3.18	390	488.52	42.6
J-270	3.18	392	488.52	41.74
J-269	3.18	390	488.52	42.6
J-268	3.18	390	488.52	42.6
J-267	3.18	368	488.27	52.01
J-266	3.18	367	488.2	52.41
J-265	3.18	383	488.27	45.52
J-264	3.18	377	488.27	48.12
J-263	3.18	377	488.26	48.11
J-262	3.18	385	488.28	44.66
J-261	3.18	383	488.28	45.53
J-260	3.18	385	488.28	44.66
J-259	3.18	387	488.32	43.81
J-258	3.18	387	488.31	43.81
J-257	3.18	385	488.29	44.66
J-256	3.18	386	488.24	44.21
J-255	3.18	387	488.31	43.81
J-254	3.18	380	488.28	46.82
J-253	3.18	386	488.28	44.23
J-252	3.18	385	488.55	44.78
J-251	3.18	387	488.48	43.88
J-250	3.18	387	488.49	43.89
J-249	3.18	390	488.49	42.59
J-248	3.18	405	488.58	36.14
J-247	3.18	325	488.07	70.52
J-246	3.18	325	488.07	70.52
J-245	3.18	325	488.07	70.52
J-244	3.18	412	488.94	33.27
J-243	3.18	406	488.94	35.87
J-242	3.18	407	488.94	35.43
J-241	3.18	405	488.8	36.24
J-298	3.18	410	488.94	34.14
J-297	3.18	345	487.91	61.8
J-299	3.18	40	205.32	71.49
J-296	3.18	55	205.06	64.89
J-302	3.18	110	297.39	81.03
J-303	3.18	170	319.72	64.74

2026 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-1	3.26	395	487.85	40.15
J-2	3.26	330	487.85	68.26
J-3	3.26	300	487.87	81.24
J-4	3.26	325	487.85	70.42
J-5	3.26	320	487.84	72.58
J-6	3.26	185	487.84	130.96
J-7	3.26	330	487.85	68.26
J-8	3.26	275	487.49	91.89
J-10	3.26	325	487.71	70.36
J-11	3.26	350	487.82	59.6
J-12	3.26	330	487.83	68.25
J-13	3.26	325	487.84	70.42
J-14	3.26	325	487.84	70.42
J-15	3.26	325	487.84	70.42
J-16	3.26	325	487.85	70.42
J-17	3.26	355	487.85	57.45
J-18	3.26	360	487.85	55.29
J-19	3.26	360	487.85	55.29
J-21	3.26	360	487.84	55.28
J-22	3.26	330	487.84	68.26
J-23	3.26	325	487.71	70.36
J-24	3.26	370	487.84	50.96
J-25	3.26	380	487.88	46.65
J-26	3.26	380	487.89	46.66
J-27	3.26	385	487.99	44.54
J-28	3.26	375	487.99	48.86
J-29	3.26	360	487.82	55.27
J-30	3.26	375	487.85	48.8
J-31	3.26	385	488.01	44.54
J-32	3.26	380	488.04	46.72
J-33	3.26	380	488.05	46.72
J-34	3.26	380	488.09	46.74
J-35	3.26	375	488	48.87
J-37	3.26	375	487.85	48.8
J-39	3.26	375	488	48.87
J-40	3.26	375	488	48.86
J-41	3.26	370	488	51.03
J-42	3.26	375	488	48.86
J-43	3.26	350	488	59.67
J-44	3.26	350	488	59.68
J-45	3.26	350	488	59.68
J-46	3.26	350	488	59.68
J-47	3.26	362	487.99	54.48
J-48	3.26	380	487.98	46.7
J-49	3.26	390	487.98	42.37
J-50	3.26	395	487.97	40.21

2026 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-51	3.26	395	487.97	40.21
J-52	3.26	400	486.84	37.55
J-53	3.26	285	487.89	87.74
J-54	3.26	275	487.89	92.06
J-55	3.26	380	488.01	46.71
J-56	3.26	380	488.01	46.71
J-57	3.26	385	488.01	44.54
J-58	3.26	385	488.05	44.56
J-59	3.26	385	488.05	44.56
J-60	3.26	380	488.21	46.79
J-61	3.26	380	488.21	46.79
J-62	3.26	375	488	48.86
J-63	3.26	375	487.99	48.86
J-64	3.26	380	487.99	46.7
J-65	3.26	380	488.05	46.72
J-66	3.26	380	488.07	46.73
J-67	3.26	385	488.01	44.54
J-68	3.26	375	488	48.86
J-69	3.26	375	487.98	48.86
J-71	3.26	380	487.89	46.66
J-72	3.26	320	487.1	72.26
J-73	3.26	325	487.71	70.36
J-74	3.26	375	488.03	48.88
J-75	3.26	360	487.89	55.3
J-76	3.26	350	487.86	59.61
J-77	3.26	375	488.09	48.9
J-78	3.26	325	488.09	70.52
J-79	3.26	375	487.06	48.46
J-80	3.26	315	488.09	74.85
J-83	3.26	375	488.09	48.9
J-84	3.26	400	488.08	38.09
J-85	3.26	405	488.52	36.12
J-86	3.26	405	488.53	36.12
J-87	3.26	400	488.53	38.28
J-88	3.26	310	487.04	76.56
J-89	3.26	320	487.05	72.24
J-90	3.26	310	487.01	76.55
J-91	3.26	330	486.96	67.87
J-92	3.26	315	486.96	74.36
J-93	3.26	335	486.94	65.71
J-94	3.26	330	486.85	67.83
J-95	3.26	285	486.77	87.25
J-96	3.26	280	486.65	89.36
J-97	3.26	280	486.63	89.35
J-99	3.26	290	486.77	85.09
J-100	3.26	300	486.77	80.77

2026 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-101	3.26	385	488.09	44.58
J-102	3.26	385	488.17	44.61
J-103	3.26	395	488.4	40.39
J-104	3.26	405	488.63	36.16
J-105	3.26	400	488.39	38.22
J-106	3.26	400	488.39	38.22
J-107	3.26	390	487.89	42.33
J-108	3.26	355	487.76	57.41
J-109	3.26	320	487.71	72.52
J-110	3.26	382	487.84	45.77
J-111	3.26	375	487.8	48.78
J-112	3.26	365	487.72	53.07
J-113	3.26	350	487.56	59.48
J-114	3.26	320	487.46	72.42
J-115	3.26	375	487.79	48.78
J-116	3.26	360	487.79	55.26
J-117	3.26	330	487.79	68.23
J-118	3.26	310	487.36	76.7
J-119	3.26	305	487.28	78.82
J-120	3.26	285	487.21	87.44
J-121	3.26	292	487.35	84.48
J-122	3.26	300	487.43	81.05
J-123	3.26	275	486.97	91.66
J-124	3.26	235	486.65	108.82
J-125	3.26	200	486.33	123.82
J-126	3.26	180	318.49	59.89
J-127	3.26	70	318.32	107.38
J-128	3.26	25	318.29	126.83
J-129	3.26	50	215.36	71.51
J-130	3.26	47	318.25	117.3
J-131	3.26	100	318.14	94.33
J-132	3.26	145	318	74.81
J-133	3.26	150	318	72.65
J-134	3.26	110	317.86	89.89
J-135	3.26	110	317.86	89.89
J-136	3.26	150	317.86	72.59
J-137	3.26	165	317.86	66.1
J-138	3.26	165	317.86	66.1
J-139	3.26	50	204.2	66.68
J-140	3.26	17	204.2	80.95
J-141	3.26	60	204.28	62.39
J-142	3.26	15	204.38	81.89
J-143	3.26	10	204.37	84.05
J-144	3.26	22	204.09	78.74
J-145	3.26	90	204.03	49.31
J-146	3.26	80	204.02	53.63

2026 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-147	3.26	75	204.61	56.05
J-148	3.26	75	204.65	56.07
J-150	3.26	155	205.22	21.72
J-151	3.26	235	483.88	107.62
J-152	3.26	210	483.49	118.26
J-153	3.26	50	204.65	66.88
J-154	3.26	50	204.65	66.88
J-155	3.26	50	203.85	66.53
J-156	3.26	30	203.85	75.18
J-157	3.26	35	203.85	73.02
J-158	3.26	30	203.84	75.18
J-159	3.26	75	203.84	55.71
J-160	3.26	60	203.84	62.2
J-161	3.26	60	215.36	67.18
J-162	3.26	79	215.36	58.97
J-163	3.26	110	296.61	80.7
J-164	3.26	110	296.62	80.7
J-165	3.26	70	215.36	62.86
J-166	3.26	80	215.36	58.54
J-167	3.26	22	215.35	83.61
J-168	3.26	55	215.35	69.34
J-169	3.26	50	215.35	71.5
J-170	3.26	50	215.35	71.5
J-171	3.26	75	215.35	60.69
J-172	3.26	100	296.59	85.01
J-173	3.26	120	296.59	76.36
J-174	3.26	120	296.59	76.36
J-175	3.26	175	296.59	52.58
J-176	3.26	180	296.67	50.45
J-177	3.26	211	296.72	37.07
J-178	3.26	217	296.73	34.48
J-179	3.26	260	486.22	97.83
J-180	3.26	270	486.49	93.62
J-181	3.26	270	484.04	92.56
J-182	3.26	260	484.13	96.92
J-183	3.26	295	485	82.16
J-184	3.26	305	485.22	77.93
J-185	3.26	375	487.32	48.57
J-186	3.26	375	487.32	48.57
J-187	3.26	305	485.21	77.93
J-188	3.26	305	484.52	77.63
J-189	3.26	200	479.49	120.86
J-190	3.26	317	487.61	73.78
J-191	3.26	321	487.61	72.05
J-192	3.26	268	487.6	94.96
J-193	3.26	275	487.6	91.94

2026 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-194	3.26	266	487.6	95.83
J-195	3.26	250	487.6	102.75
J-196	3.26	310	487.26	76.65
J-197	3.26	308	487.63	77.68
J-198	3.26	305	487.67	78.99
J-199	3.26	125	317.85	83.4
J-200	3.26	260	317.85	25.02
J-201	3.26	125	317.85	83.4
J-202	3.26	250	484.13	101.25
J-203	3.26	275	484.03	90.39
J-205	3.26	275	484.03	90.39
J-216	3.26	255	487.68	100.62
J-217	3.26	100	487.68	167.65
J-218	3.26	45	487.68	191.43
J-219	3.26	200	487.68	124.4
J-220	3.26	325	487.57	70.3
J-221	3.26	325	487.42	70.24
J-222	3.26	17	204.21	80.96
J-223	3.26	325	550	97.3
J-224	3.26	325	487.67	70.35
J-225	3.26	245	486.15	104.28
J-226	3.26	228	296.76	29.73
J-227	3.26	400	487.93	38.02
J-228	3.26	335	487.61	65.99
J-229	3.26	320	487.46	72.42
J-230	3.26	300	487.42	81.05
J-231	3.26	310	487.63	76.81
J-232	3.26	330	487.63	68.16
J-233	3.26	340	487.63	63.84
J-234	3.26	330	487.63	68.16
J-235	3.26	375	488.1	48.91
J-295	3.26	315	487.84	74.74
J-292	3.26	367	487.81	52.24
J-237	3.26	350	487.81	59.59
J-238	3.26	348	487.83	60.47
J-239	3.26	347	487.83	60.9
J-240	3.26	350	487.84	59.61
J-291	3.26	345	487.78	61.74
J-290	3.26	400	487.88	38
J-289	3.26	400	487.88	38
J-288	3.26	390	487.88	42.33
J-272	3.26	400	487.88	38
J-287	3.26	405	487.88	35.84
J-286	3.26	385	487.82	44.46
J-285	3.26	397	487.82	39.27
J-284	3.26	335	487.84	66.09

2026 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-283	3.26	345	487.69	61.7
J-282	3.26	415	485.9	30.66
J-281	3.26	385	488.09	44.58
J-293	3.26	387	488.35	43.83
J-279	3.26	375	487.71	48.74
J-278	3.26	392	487.98	41.51
J-277	3.26	380	487.98	46.69
J-276	3.26	385	488.11	44.59
J-236	3.26	385	488.11	44.59
J-271	3.26	390	488.11	42.42
J-270	3.26	392	488.1	41.56
J-269	3.26	390	488.11	42.42
J-268	3.26	390	488.11	42.42
J-267	3.26	368	487.84	51.82
J-266	3.26	367	487.77	52.23
J-265	3.26	383	487.84	45.34
J-264	3.26	377	487.84	47.93
J-263	3.26	377	487.83	47.93
J-262	3.26	385	487.85	44.48
J-261	3.26	383	487.85	45.34
J-260	3.26	385	487.85	44.47
J-259	3.26	387	487.89	43.63
J-258	3.26	387	487.88	43.62
J-257	3.26	385	487.86	44.48
J-256	3.26	386	487.81	44.02
J-255	3.26	387	487.88	43.62
J-254	3.26	380	487.85	46.64
J-253	3.26	386	487.85	44.04
J-252	3.26	385	488.13	44.6
J-251	3.26	387	488.06	43.7
J-250	3.26	387	488.07	43.71
J-249	3.26	390	488.07	42.41
J-248	3.26	405	488.17	35.96
J-247	3.26	325	487.63	70.33
J-246	3.26	325	487.63	70.33
J-245	3.26	325	487.63	70.33
J-244	3.26	412	488.55	33.1
J-243	3.26	406	488.55	35.7
J-242	3.26	407	488.55	35.26
J-241	3.26	405	488.39	36.06
J-298	3.26	410	488.55	33.97
J-297	3.26	345	487.46	61.6
J-299	3.26	40	204.2	71
J-296	3.26	55	203.92	64.4
J-302	3.26	110	296.62	80.7
J-303	3.26	170	318.19	64.08

2036 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-1	3.47	395	486.85	39.72
J-2	3.47	330	486.85	67.83
J-3	3.47	300	486.87	80.81
J-4	3.47	325	486.85	69.99
J-5	3.47	320	486.85	72.15
J-6	3.47	185	486.84	130.53
J-7	3.47	330	486.85	67.83
J-8	3.47	275	486.45	91.44
J-10	3.47	325	486.7	69.92
J-11	3.47	350	486.82	59.17
J-12	3.47	330	486.84	67.82
J-13	3.47	325	486.84	69.98
J-14	3.47	325	486.84	69.99
J-15	3.47	325	486.84	69.99
J-16	3.47	325	486.85	69.99
J-17	3.47	355	486.85	57.02
J-18	3.47	360	486.85	54.86
J-19	3.47	360	486.85	54.86
J-21	3.47	360	486.84	54.85
J-22	3.47	330	486.85	67.83
J-23	3.47	325	486.7	69.92
J-24	3.47	370	486.84	50.53
J-25	3.47	380	486.89	46.22
J-26	3.47	380	486.9	46.23
J-27	3.47	385	487.02	44.11
J-28	3.47	375	487.02	48.44
J-29	3.47	360	486.82	54.84
J-30	3.47	375	486.85	48.37
J-31	3.47	385	487.03	44.12
J-32	3.47	380	487.06	46.3
J-33	3.47	380	487.08	46.3
J-34	3.47	380	487.13	46.33
J-35	3.47	375	487.03	48.44
J-37	3.47	375	486.85	48.37
J-39	3.47	375	487.03	48.44
J-40	3.47	375	487.02	48.44
J-41	3.47	370	487.02	50.6
J-42	3.47	375	487.02	48.44
J-43	3.47	350	487.02	59.25
J-44	3.47	350	487.02	59.25
J-45	3.47	350	487.03	59.25
J-46	3.47	350	487.03	59.25
J-47	3.47	362	487.01	54.06
J-48	3.47	380	487.01	46.27
J-49	3.47	390	487	41.95
J-50	3.47	395	486.99	39.78

2036 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-51	3.47	395	486.99	39.78
J-52	3.47	400	485.72	37.07
J-53	3.47	285	486.9	87.31
J-54	3.47	275	486.9	91.63
J-55	3.47	380	487.03	46.28
J-56	3.47	380	487.03	46.28
J-57	3.47	385	487.03	44.12
J-58	3.47	385	487.08	44.14
J-59	3.47	385	487.08	44.14
J-60	3.47	380	487.25	46.38
J-61	3.47	380	487.25	46.38
J-62	3.47	375	487.02	48.44
J-63	3.47	375	487.02	48.44
J-64	3.47	380	487.02	46.28
J-65	3.47	380	487.08	46.3
J-66	3.47	380	487.1	46.31
J-67	3.47	385	487.03	44.12
J-68	3.47	375	487.02	48.44
J-69	3.47	375	487	48.43
J-71	3.47	380	486.9	46.23
J-72	3.47	320	486.01	71.79
J-73	3.47	325	486.7	69.92
J-74	3.47	375	487.06	48.46
J-75	3.47	360	486.9	54.88
J-76	3.47	350	486.86	59.18
J-77	3.47	375	487.12	48.49
J-78	3.47	325	487.12	70.11
J-79	3.47	375	485.96	47.98
J-80	3.47	315	487.12	74.43
J-83	3.47	375	487.12	48.49
J-84	3.47	400	487.11	37.67
J-85	3.47	405	487.61	35.72
J-86	3.47	405	487.62	35.73
J-87	3.47	400	487.61	37.89
J-88	3.47	310	485.95	76.09
J-89	3.47	320	485.95	71.76
J-90	3.47	310	485.91	76.07
J-91	3.47	330	485.85	67.4
J-92	3.47	315	485.85	73.88
J-93	3.47	335	485.84	65.23
J-94	3.47	330	485.74	67.35
J-95	3.47	285	485.65	86.77
J-96	3.47	280	485.51	88.87
J-97	3.47	280	485.49	88.86
J-99	3.47	290	485.64	84.6
J-100	3.47	300	485.64	80.28

2036 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-101	3.47	385	487.13	44.16
J-102	3.47	385	487.21	44.2
J-103	3.47	395	487.47	39.99
J-104	3.47	405	487.73	35.77
J-105	3.47	400	487.46	37.82
J-106	3.47	400	487.46	37.82
J-107	3.47	390	486.9	41.9
J-108	3.47	355	486.75	56.97
J-109	3.47	320	486.7	72.09
J-110	3.47	382	486.84	45.34
J-111	3.47	375	486.79	48.34
J-112	3.47	365	486.71	52.63
J-113	3.47	350	486.53	59.04
J-114	3.47	320	486.42	71.97
J-115	3.47	375	486.79	48.34
J-116	3.47	360	486.79	54.83
J-117	3.47	330	486.79	67.8
J-118	3.47	310	486.31	76.24
J-119	3.47	305	486.22	78.36
J-120	3.47	285	486.14	86.98
J-121	3.47	292	486.3	84.02
J-122	3.47	300	486.38	80.6
J-123	3.47	275	485.87	91.19
J-124	3.47	235	485.51	108.33
J-125	3.47	200	485.15	123.31
J-126	3.47	180	314.82	58.3
J-127	3.47	70	314.63	105.78
J-128	3.47	25	314.59	125.23
J-129	3.47	50	214.86	71.29
J-130	3.47	47	314.55	115.7
J-131	3.47	100	314.43	92.72
J-132	3.47	145	314.27	73.2
J-133	3.47	150	314.27	71.03
J-134	3.47	110	314.11	88.27
J-135	3.47	110	314.11	88.26
J-136	3.47	150	314.11	70.97
J-137	3.47	165	314.11	64.48
J-138	3.47	165	314.11	64.48
J-139	3.47	50	201.47	65.5
J-140	3.47	17	201.47	79.77
J-141	3.47	60	201.56	61.22
J-142	3.47	15	201.67	80.72
J-143	3.47	10	201.66	82.88
J-144	3.47	22	201.35	77.56
J-145	3.47	90	201.29	48.12
J-146	3.47	80	201.27	52.44

2036 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-147	3.47	75	201.93	54.89
J-148	3.47	75	201.98	54.91
J-150	3.47	155	202.61	20.59
J-151	3.47	235	482.4	106.98
J-152	3.47	210	481.96	117.61
J-153	3.47	50	201.98	65.72
J-154	3.47	50	201.98	65.72
J-155	3.47	50	201.09	65.34
J-156	3.47	30	201.08	73.98
J-157	3.47	35	201.08	71.82
J-158	3.47	30	201.07	73.98
J-159	3.47	75	201.07	54.52
J-160	3.47	60	201.07	61
J-161	3.47	60	214.86	66.97
J-162	3.47	79	214.87	58.75
J-163	3.47	110	294.73	79.89
J-164	3.47	110	294.75	79.89
J-165	3.47	70	214.86	62.64
J-166	3.47	80	214.87	58.32
J-167	3.47	22	214.86	83.4
J-168	3.47	55	214.86	69.13
J-169	3.47	50	214.85	71.29
J-170	3.47	50	214.85	71.29
J-171	3.47	75	214.86	60.48
J-172	3.47	100	294.71	84.2
J-173	3.47	120	294.71	75.55
J-174	3.47	120	294.71	75.55
J-175	3.47	175	294.71	51.77
J-176	3.47	180	294.8	49.64
J-177	3.47	211	294.86	36.26
J-178	3.47	217	294.87	33.68
J-179	3.47	260	485.03	97.31
J-180	3.47	270	485.33	93.12
J-181	3.47	270	482.58	91.93
J-182	3.47	260	482.68	96.3
J-183	3.47	295	483.66	81.58
J-184	3.47	305	483.91	77.37
J-185	3.47	375	486.26	48.11
J-186	3.47	375	486.26	48.11
J-187	3.47	305	483.89	77.36
J-188	3.47	305	483.12	77.02
J-189	3.47	200	477.48	119.99
J-190	3.47	317	486.58	73.33
J-191	3.47	321	486.58	71.6
J-192	3.47	268	486.58	94.52
J-193	3.47	275	486.58	91.49

2036 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-194	3.47	266	486.58	95.39
J-195	3.47	250	486.58	102.3
J-196	3.47	310	486.19	76.19
J-197	3.47	308	486.61	77.24
J-198	3.47	305	486.66	78.55
J-199	3.47	125	314.1	81.77
J-200	3.47	260	314.1	23.39
J-201	3.47	125	314.1	81.77
J-202	3.47	250	482.68	100.62
J-203	3.47	275	482.58	89.76
J-205	3.47	275	482.58	89.76
J-216	3.47	255	486.67	100.18
J-217	3.47	100	486.67	167.21
J-218	3.47	45	486.66	190.99
J-219	3.47	200	486.67	123.96
J-220	3.47	325	486.54	69.86
J-221	3.47	325	486.37	69.78
J-222	3.47	17	201.48	79.78
J-223	3.47	325	550	97.3
J-224	3.47	325	486.66	69.91
J-225	3.47	245	484.95	103.76
J-226	3.47	228	294.91	28.93
J-227	3.47	400	486.94	37.6
J-228	3.47	335	486.59	65.55
J-229	3.47	320	486.42	71.97
J-230	3.47	300	486.38	80.6
J-231	3.47	310	486.61	76.37
J-232	3.47	330	486.61	67.72
J-233	3.47	340	486.61	63.4
J-234	3.47	330	486.61	67.72
J-235	3.47	375	487.14	48.49
J-295	3.47	315	486.85	74.31
J-292	3.47	367	486.8	51.81
J-237	3.47	350	486.8	59.16
J-238	3.47	348	486.84	60.04
J-239	3.47	347	486.84	60.47
J-240	3.47	350	486.84	59.17
J-291	3.47	345	486.78	61.31
J-290	3.47	400	486.89	37.57
J-289	3.47	400	486.89	37.57
J-288	3.47	390	486.89	41.9
J-272	3.47	400	486.89	37.57
J-287	3.47	405	486.89	35.41
J-286	3.47	385	486.82	44.03
J-285	3.47	397	486.82	38.84
J-284	3.47	335	486.85	65.66

2036 Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-283	3.47	345	486.68	61.27
J-282	3.47	415	484.67	30.13
J-281	3.47	385	487.12	44.16
J-293	3.47	387	487.42	43.42
J-279	3.47	375	486.69	48.3
J-278	3.47	392	487	41.08
J-277	3.47	380	487	46.27
J-276	3.47	385	487.14	44.17
J-236	3.47	385	487.14	44.17
J-271	3.47	390	487.14	42.01
J-270	3.47	392	487.14	41.14
J-269	3.47	390	487.14	42.01
J-268	3.47	390	487.14	42.01
J-267	3.47	368	486.84	51.39
J-266	3.47	367	486.77	51.79
J-265	3.47	383	486.85	44.91
J-264	3.47	377	486.85	47.5
J-263	3.47	377	486.84	47.5
J-262	3.47	385	486.85	44.04
J-261	3.47	383	486.85	44.91
J-260	3.47	385	486.85	44.04
J-259	3.47	387	486.9	43.2
J-258	3.47	387	486.89	43.19
J-257	3.47	385	486.86	44.05
J-256	3.47	386	486.81	43.59
J-255	3.47	387	486.89	43.19
J-254	3.47	380	486.85	46.21
J-253	3.47	386	486.86	43.61
J-252	3.47	385	487.17	44.18
J-251	3.47	387	487.09	43.28
J-250	3.47	387	487.1	43.29
J-249	3.47	390	487.1	41.99
J-248	3.47	405	487.21	35.55
J-247	3.47	325	486.61	69.89
J-246	3.47	325	486.61	69.89
J-245	3.47	325	486.61	69.89
J-244	3.47	412	487.64	32.71
J-243	3.47	406	487.64	35.3
J-242	3.47	407	487.64	34.87
J-241	3.47	405	487.46	35.66
J-298	3.47	410	487.64	33.57
J-297	3.47	345	486.42	61.15
J-299	3.47	40	201.47	69.83
J-296	3.47	55	201.16	63.21
J-302	3.47	110	294.75	79.89
J-303	3.47	170	314.48	62.48

2015 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-1	1,001.86	1,641.41	J-1	20	441.25	1,641.40	20.00	19.98
J-10	1,001.86	3,589.59	J-282	12.98	445.01	2,013.12	20.00	47.66
J-100	1,001.86	1,487.43	J-100	20	346.25	1,487.43	20.00	19.97
J-101	2,001.86	3,293.55	J-282	6.72	430.54	1,446.43	20.00	33.22
J-102	2,001.86	3,410.23	J-282	6.82	430.76	1,502.81	20.00	33.22
J-103	2,001.86	3,339.73	J-282	11.19	440.88	1,743.01	20.00	28.90
J-104	1,001.86	3,475.93	J-282	15.26	450.29	2,257.36	20.00	24.69
J-105	2,001.86	1,882.63	J-241	17.84	446.25	1,668.96	20.00	22.12
J-106	2,001.86	1,427.28	J-106	20	446.25	1,427.28	20.00	19.96
J-108	1,001.86	3,044.61	J-282	5.11	426.81	1,267.72	20.00	43.77
J-109	1,001.86	3,615.14	J-282	-1.5	411.52	1,270.21	20.00	58.20
J-11	2,001.86	3,423.00	J-282	14.15	447.73	2,050.87	20.00	39.29
J-110	2,001.86	1,905.93	J-282	15.68	451.26	1,265.22	20.00	29.64
J-111	2,001.86	1,682.13	J-282	17.36	455.14	1,269.34	20.00	28.58
J-112	1,001.86	1,374.80	J-282	19.44	459.95	1,279.57	20.00	23.17
J-113	1,001.86	1,382.27	J-282	19.52	460.14	1,299.32	20.00	23.46
J-114	1,001.86	2,082.16	J-282	14.91	449.48	1,317.84	20.00	45.34
J-115	2,001.86	1,298.03	J-282	19.83	460.86	1,269.35	20.00	20.82
J-116	2,001.86	1,244.78	J-116	20	406.25	1,244.78	20.00	19.96
J-117	1,001.86	1,267.76	J-116	19.04	404.03	1,244.78	20.00	21.32
J-118	1,001.86	1,640.18	J-282	18.13	456.92	1,327.10	20.00	35.78
J-119	1,001.86	1,616.10	J-282	18.36	457.46	1,337.52	20.00	34.99
J-12	2,001.86	2,455.58	J-282	18.54	457.87	2,061.82	20.00	31.11
J-120	1,001.86	1,931.03	J-282	16.4	452.93	1,351.76	20.00	48.60
J-121	1,001.86	1,864.80	J-282	16.64	453.48	1,329.30	20.00	46.25
J-122	1,001.86	2,034.12	J-282	15.32	450.43	1,321.31	20.00	49.13
J-123	1,001.86	1,747.99	J-282	17.9	456.40	1,383.87	20.00	42.20
J-124	1,001.86	1,827.08	J-282	17.73	456.01	1,423.62	20.00	49.64
J-125	1,001.86	1,994.12	J-282	17.05	454.44	1,465.26	20.00	61.20
J-126	1,001.86	2,152.94	J-282	16.26	452.59	1,486.37	20.00	71.11
J-127	1,001.86	2,894.15	J-282	11.51	441.61	1,519.54	20.00	124.25
J-128	1,001.86	3,184.12	J-282	9.38	436.69	1,527.23	20.00	145.53
J-129	1,001.86	2,906.95	J-282	12.24	443.31	1,575.49	20.00	127.46
J-13	2,001.86	2,831.23	J-282	16.99	454.28	2,061.90	20.00	38.79
J-131	1,001.86	2,400.18	J-282	14.62	448.81	1,485.50	20.00	100.03
J-133	1,001.86	1,418.75	J-133	20	196.25	1,418.75	20.00	19.97
J-135	1,001.86	1,655.80	J-200	-1.3	256.99	1,428.21	20.00	51.60
J-136	1,001.86	1,523.78	J-200	11.37	286.28	1,428.21	20	32.97
J-137	1,001.86	1,397.93	J-138	20	211.25	1,397.93	20.00	19.97
J-138	1,001.86	1,334.04	J-138	20	211.25	1,334.04	20	19.97
J-139	1,001.86	2,360.34	J-282	14.79	449.20	1,476.81	20.00	111.52
J-14	2,001.86	4,099.79	J-282	10.64	439.60	2,062.05	20.00	50.39
J-140	1,001.86	2,362.62	J-282	14.73	449.05	1,472.38	20.00	120.18
J-141	1,001.86	2,132.56	J-282	16.22	452.50	1,468.40	20	96.45
J-142	1,001.86	2,210.22	J-282	15.68	451.27	1,465.82	20.00	111.91
J-143	1,001.86	1,063.98	J-143	20	56.25	1,063.98	20	20.28
J-144	1,001.86	1,704.75	J-282	18.79	458.46	1,472.38	20	60.22
J-145	1,001.86	653.03	J-145	20	136.25	653.03	20	19.96

2015 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-146	1,001.86	458.92	J-146	20	126.25	458.92	20	19.97
J-147	1,001.86	1,984.88	J-282	17.09	454.53	1,462.77	20	83.41
J-148	1,001.86	1,985.65	J-282	17.08	454.50	1,461.78	20	83.58
J-15	2,001.86	2,386.22	J-282	18.81	458.50	2,062.05	20.00	30.04
J-150	1,001.86	1,816.96	J-282	17.99	456.60	1,448.30	20	58.67
J-151	1,001.86	1,582.31	J-282	19.26	459.53	1,440.24	20	32.51
J-152	1,001.86	98.05	J-152	20	256.25	98.05	20.00	19.84
J-153	1,001.86	1,995.76	J-282	17.02	454.35	1,461.78	20	89.08
J-155	1,001.86	916.88	J-159	9.19	96.24	882.49	20	30.75
J-156	1,001.86	920.56	J-159	0.54	76.25	860.93	20	39.38
J-157	1,001.86	909.02	J-159	8.09	93.72	871.67	20	32.25
J-158	1,001.86	899.67	J-159	0.54	76.25	841.42	20	39.38
J-159	1,001.86	814.72	J-159	20	121.25	814.72	20.00	19.96
J-16	2,001.86	4,612.15	J-282	7.61	432.59	2,062.77	20	52.68
J-160	1,001.86	821.33	J-159	17.77	116.10	814.72	20.00	22.25
J-161	1,001.86	2,386.10	J-282	15.71	451.32	1,579.59	20	102.39
J-162	1,001.86	2,738.13	J-282	13.56	446.35	1,587.96	20.00	112.73
J-163	1,001.86	2,083.63	J-282	17.7	455.93	1,612.54	20.00	70.18
J-164	1,001.86	2,595.20	J-282	14.76	449.13	1,612.54	20.00	97.77
J-165	1,001.86	2,672.20	J-282	13.9	447.13	1,579.59	20.00	113.24
J-166	1,001.86	2,750.07	J-282	13.51	446.24	1,590.47	20.00	112.74
J-167	1,001.86	2,660.90	J-282	14.07	447.53	1,587.96	20	124.95
J-168	1,001.86	2,401.38	J-282	15.69	451.29	1,587.96	20.00	103.64
J-169	1,001.86	2,073.05	J-282	17.58	455.65	1,587.96	20.00	81.78
J-17	2,001.86	3,882.61	J-282	11.85	442.39	2,062.31	20.00	40.23
J-170	1,001.86	1,979.10	J-282	18.08	456.81	1,587.96	20.00	73.11
J-171	1,001.86	1,774.14	J-282	19.12	459.22	1,587.96	20.00	47.45
J-172	1,001.86	1,592.07	J-175	-12.43	146.25	1,377.26	20.00	52.33
J-173	1,001.86	1,522.25	J-175	-1.46	171.62	1,377.26	20.00	41.78
J-174	1,001.86	1,497.46	J-175	2.33	180.40	1,377.26	20.00	38.47
J-175	1,001.86	1,316.26	J-175	20	221.25	1,316.26	20.00	19.96
J-176	1,001.86	2,256.39	J-282	16.86	454.00	1,625.59	20.00	66.77
J-177	1,001.86	2,097.41	J-282	17.8	456.17	1,637.92	20.00	52.89
J-178	1,001.86	2,066.40	J-282	17.98	456.59	1,640.92	20	50.22
J-179	1,001.86	1,890.26	J-282	19.1	459.17	1,685.98	20	33.1
J-18	2,001.86	3,794.94	J-282	12.32	443.48	2,062.11	20.00	38.39
J-180	1,001.86	1,965.99	J-282	18.98	458.90	1,730.25	20.00	33.60
J-181	1,001.86	1,474.78	J-282	19.8	460.78	1,435.01	20.00	23.10
J-185	1,001.86	1,514.99	J-282	18.71	458.26	1,298.70	20	25.16
J-186	1,001.86	747.42	J-186	20	421.25	747.42	20.00	19.96
J-187	1,001.86	397.26	J-187	20	351.25	397.26	20.00	19.96
J-188	1,001.86	63.78	J-188	20	351.25	63.78	20.00	19.88
J-189	1,001.86	26.84	J-189	20	246.25	26.84	20.00	19.96
J-19	2,001.86	3,819.28	J-282	12.19	443.18	2,062.06	20.00	38.49
J-190	1,001.86	3,240.21	J-282	3.11	422.20	1,276.44	20.00	57.68
J-191	1,001.86	3,111.60	J-282	4.55	425.52	1,276.44	20.00	55.66
J-192	1,001.86	3,204.30	J-282	3.52	423.13	1,276.44	20.00	74.80
J-193	1,001.86	3,113.58	J-282	4.53	425.47	1,276.44	20.00	71.70

2015 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-194	1,001.86	2,998.83	J-282	5.77	428.35	1,276.44	20.00	73.92
J-195	1,001.86	2,543.88	J-282	10.35	438.94	1,276.44	20.00	73.98
J-196	1,001.86	75.30	J-196	20	356.25	75.30	20.00	19.96
J-197	1,001.86	3,518.07	J-282	-0.2	414.53	1,274.46	20.00	62.15
J-198	1,001.86	3,723.13	J-282	-2.81	408.51	1,272.34	20.00	64.07
J-2	1,001.86	3,762.30	J-1	-8.11	376.25	1,971.10	20.00	48.01
J-201	1,001.86	1,615.84	J-200	-4.92	248.63	1,364.51	20.00	53.77
J-202	1,001.86	1,502.96	J-282	19.63	460.39	1,431.06	20.00	26.23
J-203	1,001.86	1,317.89	J-203	20	321.25	1,317.89	20.00	19.97
J-205	1,001.86	1,312.26	J-205	20	321.25	1,312.26	20.00	19.97
J-21	2,001.86	2,313.48	J-282	19.08	459.12	2,060.44	20.00	25.26
J-216	1,001.86	1,311.22	J-216	20	301.25	1,311.22	20.00	19.96
J-217	1,001.86	1,739.14	J-216	-30.02	185.58	1,311.22	20.00	76.79
J-218	1,001.86	1,795.92	J-216	-37.54	168.20	1,311.22	20.00	92.04
J-219	1,001.86	1,490.76	J-216	0.45	256.04	1,311.22	20.00	40.36
J-22	2,001.86	4,374.96	J-282	9.04	435.90	2,062.10	20.00	50.09
J-220	1,001.86	2,838.46	J-282	16.35	452.80	1,961.84	20.00	40.79
J-221	1,001.86	2,436.93	J-282	17.91	456.41	1,919.40	20.00	34.94
J-222	1,001.86	2,345.67	J-282	14.83	449.30	1,471.67	20.00	119.28
J-223	1,001.86	31,522.96	J-223	20	371.25	31,523.43	20.00	19.96
J-224	1,001.86	3,341.89	J-282	14.14	447.71	1,997.89	20.00	45.83
J-225	1,001.86	1,956.45	J-282	18.74	458.33	1,675.63	20.00	38.72
J-226	1,001.86	2,009.20	J-282	18.31	457.33	1,646.52	20.00	45.37
J-227	2,001.86	2,198.11	J-282	13.2	445.54	1,256.14	20.00	26.74
J-228	1,001.86	2,001.69	J-282	15.35	450.49	1,302.93	20.00	40.92
J-229	1,001.86	2,054.00	J-282	15.13	450.00	1,318.38	20.00	44.84
J-23	1,001.86	3,506.68	J-282	13.42	446.03	2,013.12	20.00	47.02
J-230	1,001.86	1,820.16	J-282	16.87	454.02	1,321.31	20.00	43.70
J-232	1,001.86	3,176.74	J-282	4.08	424.43	1,283.70	20.00	52.71
J-233	1,001.86	2,955.15	J-282	6.47	429.95	1,283.89	20.00	48.26
J-234	1,001.86	2,733.98	J-282	8.71	435.13	1,283.85	20.00	50.35
J-235	1,001.86	1,464.80	J-235	20	421.25	1,464.80	20.00	19.96
J-236	1,001.86	2,784.80	J-282	17.4	455.24	2,102.83	20.00	26.79
J-237	2,001.86	2,202.56	J-282	19.44	459.95	2,046.24	20.00	24.01
J-238	2,001.86	2,371.34	J-282	18.87	458.63	2,061.88	20.00	27.39
J-239	2,001.86	2,169.74	J-282	19.62	460.36	2,061.88	20.00	22.94
J-24	2,001.86	3,425.08	J-282	14.21	447.85	2,059.32	20.00	33.97
J-240	2,001.86	2,953.23	J-282	16.45	453.04	2,061.98	20.00	35.32
J-241	2,001.86	1,430.56	J-241	20	451.25	1,430.56	20.00	19.96
J-242	2,001.86	1,151.06	J-242	20	453.25	1,151.06	20.00	19.96
J-243	2,001.86	1,218.32	J-242	19.57	452.25	1,184.65	20.00	20.40
J-244	1,001.86	2,549.84	J-282	18.83	458.55	2,215.63	20.00	21.24
J-245	2,001.86	2,347.53	J-282	12.27	443.37	1,281.86	20.00	48.62
J-246	1,001.86	2,500.70	J-282	10.89	440.19	1,281.85	20.00	50.15
J-247	1,001.86	3,475.25	J-282	0.61	416.40	1,281.66	20.00	55.68
J-248	2,001.86	1,397.99	J-248	20	451.25	1,397.99	20.00	19.96
J-249	2,001.86	1,963.77	J-249	20	436.25	1,963.77	20.00	19.96
J-25	2,001.86	3,201.63	J-282	15.34	450.46	2,065.95	20.00	30.36

2015 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-250	2,001.86	2,458.27	J-282	18.7	458.24	2,100.90	20.00	24.00
J-251	2,001.86	2,774.61	J-282	17.43	455.31	2,100.17	20.00	26.39
J-252	1,001.86	3,657.09	J-282	13.39	445.97	2,106.99	20.00	30.68
J-253	2,001.86	2,396.99	J-282	18.78	458.42	2,064.25	20.00	23.89
J-255	2,001.86	1,897.19	J-255	20	433.25	1,897.19	20.00	19.96
J-257	2,001.86	2,457.34	J-282	18.55	457.89	2,064.91	20.00	24.55
J-258	2,001.86	2,615.63	J-282	17.92	456.44	2,066.89	20.00	25.54
J-259	2,001.86	2,958.08	J-282	16.46	453.07	2,067.88	20.00	27.59
J-26	2,001.86	3,265.41	J-282	15.05	449.8	2,068.21	20.00	30.65
J-260	2,001.86	1,354.26	J-260	20	431.25	1,354.26	20.00	19.96
J-261	2,001.86	1,919.85	J-260	19.14	429.25	1,868.64	20.00	20.82
J-262	2,001.86	2,423.38	J-282	18.67	458.18	2,063.71	20.00	24.25
J-263	2,001.86	3,130.13	J-282	15.61	451.10	2,056.75	20.00	30.75
J-264	2,001.86	2,402.22	J-282	18.74	458.33	2,059.79	20.00	24.94
J-265	2,001.86	2,945.87	J-282	16.47	453.09	2,059.79	20.00	28.40
J-267	2,001.86	2,369.04	J-282	18.87	458.65	2,061.53	20.00	25.40
J-268	1,001.86	2,697.66	J-282	17.76	456.07	2,102.83	20.00	25.39
J-269	1,001.86	3,335.33	J-282	14.94	449.56	2,102.83	20.00	28.36
J-27	2,001.86	3,392.18	J-282	14.53	448.61	2,082.90	20.00	29.88
J-270	1,001.86	2,100.18	J-270	20	438.25	2,100.19	20.00	19.96
J-271	1,001.86	2,222.07	J-282	19.58	460.28	2,102.83	20.00	21.40
J-272	2,001.86	1,423.00	J-287	17.84	446.25	1,258.34	20.00	22.13
J-276	1,001.86	2,265.58	J-282	19.42	459.92	2,102.83	20.00	22.14
J-277	1,001.86	1,787.62	J-277	20	426.25	1,787.62	20.00	19.97
J-278	1,001.86	2,220.52	J-52	16.48	438.10	1,892.72	20.00	23.51
J-28	2,001.86	3,497.94	J-282	13.89	447.13	2,068.97	20.00	33.02
J-281	1,001.86	2,735.73	J-282	16.62	453.45	1,940.14	20.00	27.96
J-283	1,001.86	97.06	J-283	20	391.25	97.06	20.00	20.00
J-284	1,001.86	2,615.40	J-1	12.01	422.76	1,996.72	20.00	34.97
J-285	2,001.86	1,024.93	J-285	20.00	443.25	1,024.93	20.00	19.97
J-286	2,001.86	1,644.72	J-282	17.60	455.71	1,267.19	20.00	26.45
J-287	2,001.86	1,165.30	J-287	20	451.25	1,165.30	20.00	19.97
J-288	2,001.86	2,002.11	J-282	14.88	449.41	1,259.95	20.00	28.48
J-291	2,001.86	169.17	J-291	20	391.25	169.17	20.00	19.91
J-292	2,001.86	3,250.12	J-282	14.97	449.61	2,046.24	20.00	33.89
J-293	1,001.86	4,088.03	J-282	11.41	441.39	2,144.36	20.00	31.15
J-295	1,001.86	2,072.06	J-282	19.97	461.18	2,063.67	20.00	20.32
J-296	1,001.86	1,055.36	J-159	11.34	101.22	1,023.29	20.00	28.76
J-297	1,001.86	1,445.72	J-282	19.27	459.55	1,318.38	20.00	25.27
J-298	1,001.86	2,102.12	J-298	20	456.25	2,102.13	20.00	19.96
J-299	1,001.86	2,388.97	J-282	14.59	448.74	1,476.56	20.00	115.53
J-3	1,001.86	2,943.62	J-282	16.56	453.30	2,073.76	20.00	45.39
J-30	2,001.86	3,311.31	J-282	14.78	449.19	2,062.04	20.00	32.12
J-302	1,001.86	1,869.09	J-282	18.8	458.47	1,612.54	20.00	51.82
J-303	1,001.86	2,195.07	J-282	16.12	452.28	1,499.86	20.00	73.70
J-304	1,000.00	1,639.43	J-93	22.2	386.34	1,693.92	20.00	17.60
J-307	1,000.00	975.17	J-159	10.91	100.23	944.10	20.00	29.03
J-309	2,000.00	7,634.60	J-282	-15.01	380.30	2,085.44	20.00	185.96

2015 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-31	2,001.86	3,438.25	J-282	14.34	448.16	2,087.49	20.00	30.02
J-311	1,000.00	4,148.47	J-282	10.37	438.98	2,062.08	20.00	49.07
J-312	1,000.00	4,782.64	J-282	6.54	430.12	2,062.08	20.00	164.01
J-319	1,000.00	4,065.02	J-282	10.84	440.07	2,062.08	20.00	48.66
J-32	2,251.86	3,723.70	J-282	12.93	444.91	2,091.69	20.00	32.32
J-321	1,000.00	3,860.40	J-282	11.85	442.39	2,048.47	20.00	41.70
J-322	1,000.00	2,809.79	J-282	7.73	432.87	1,274.58	20.00	53.93
J-323	1,000.00	3,058.95	J-282	10.26	438.74	1,519.98	20.00	139.68
J-324	1,000.00	2,687.15	J-282	12.87	444.76	1,506.58	20.00	115.23
J-325	1,000.00	829.60	J-159	17.84	116.25	823.09	20.00	22.12
J-326	1,000.00	850.05	J-159	14.38	108.25	833.02	20.00	25.57
J-33	2,251.86	3,746.34	J-282	12.83	444.67	2,093.68	20.00	32.38
J-34	1,001.86	3,820.08	J-282	12.5	443.91	2,100.58	20.00	32.59
J-35	2,001.86	3,700.89	J-282	13.02	445.10	2,087.23	20.00	33.66
J-39	2,001.86	3,696.77	J-282	13.04	445.15	2,087.23	20.00	33.64
J-4	1,001.86	3,920.80	J-1	-10.2	371.40	1,996.72	20.00	50.15
J-40	2,001.86	3,512.62	J-282	13.97	447.31	2,087.04	20.00	32.93
J-41	2,001.86	3,294.10	J-282	15.04	449.77	2,087.04	20.00	33.17
J-42	2,001.86	3,338.55	J-282	14.82	449.28	2,086.86	20.00	32.15
J-43	2,001.86	2,531.60	J-282	18.35	457.44	2,086.86	20.00	29.55
J-44	2,001.86	2,767.11	J-282	17.39	455.22	2,087.04	20.00	32.92
J-45	2,001.86	2,256.27	J-282	19.4	459.86	2,087.23	20.00	24.25
J-46	2,001.86	1,781.02	J-46	20	396.25	1,781.02	20.00	19.96
J-47	2,001.86	3,566.10	J-282	13.7	446.68	2,086.62	20.00	36.67
J-48	1,001.86	2,750.36	J-52	11.37	426.29	1,971.69	20.00	28.66
J-49	1,001.86	2,247.74	J-52	15.6	436.06	1,852.89	20.00	24.38
J-5	1,001.86	1,988.42	J-5	20	366.25	1,988.42	20.00	19.97
J-50	1,001.86	1,967.40	J-52	17.68	440.89	1,763.40	20.00	22.28
J-51	1,001.86	1,948.17	J-52	17.67	440.85	1,745.08	20.00	22.29
J-52	1,001.86	15.20	J-52	20	446.25	17.91	20.00	19.96
J-53	1,001.86	2,926.11	J-282	16.66	453.54	2,078.03	20.00	48.03
J-54	1,001.86	2,071.82	J-54	20	321.25	2,071.82	20.00	19.97
J-55	2,001.86	3,547.99	J-282	13.8	446.90	2,087.30	20.00	31.73
J-56	2,001.86	2,572.99	J-282	18.19	457.06	2,087.30	20.00	26.05
J-57	2,001.86	1,905.93	J-57	20	431.25	1,905.93	20.00	19.96
J-58	2,251.86	2,719.83	J-282	17.62	455.76	2,093.68	20.00	26.42
J-59	2,251.86	2,299.79	J-282	19.26	459.55	2,093.68	20.00	22.66
J-6	1,001.86	1,960.81	J-6	20	231.25	1,960.81	20.00	19.97
J-60	1,001.86	4,059.77	J-282	11.36	441.26	2,117.59	20.00	33.22
J-61	1,001.86	2,407.53	J-282	18.96	458.84	2,117.59	20.00	24.01
J-62	2,001.86	3,398.59	J-282	14.35	448.18	2,064.32	20.00	32.62
J-63	2,001.86	3,165.83	J-282	15.47	450.78	2,064.32	20.00	31.47
J-65	2,001.86	3,620.57	J-282	13.49	446.19	2,094.85	20.00	31.97
J-66	2,001.86	2,964.36	J-282	16.63	453.45	2,101.54	20.00	28.90
J-67	2,001.86	2,066.16	J-67	20	431.25	2,066.16	20.00	19.96
J-68	1,001.86	3,322.20	J-282	14.69	448.98	2,060.57	20.00	32.31
J-69	1,001.86	267.25	J-69	20	421.25	267.25	20.00	19.96
J-7	1,001.86	4,155.93	J-282	10.34	438.90	2,063.92	20.00	49.10

2015 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-71	1,001.86	100.93	J-71	20	426.25	100.93	20.00	19.94
J-72	1,001.86	2,105.96	J-282	18.97	458.87	1,849.95	20.00	29.31
J-73	1,001.86	3,620.59	J-282	12.81	444.63	2,013.12	20	47.88
J-74	1,001.86	2,927.29	J-282	16.03	452.07	1,984.60	20	30.85
J-75	1,001.86	1,067.38	J-75	20	406.25	1,067.38	20.00	19.96
J-76	1,001.86	1,050.85	J-76	20	396.25	1,050.84	20.00	20.01
J-77	2,001.86	2,642.02	J-282	14.66	448.91	1,635.30	20	32.53
J-78	1,001.86	2,241.71	J-79	-1.78	370.89	1,531.99	20	41.7
J-79	1,001.86	26.99	J-79	20	421.25	26.99	20.00	19.96
J-80	1,001.86	1,794.63	J-79	12.73	404.44	1,531.99	20.00	32.00
J-82	1,000.00	2,807.76	J-282	7.75	432.92	1,274.58	20	51.93
J-83	2,001.86	2,665.57	J-282	14.41	448.32	1,624.75	20	32.78
J-85	1,001.86	3,169.75	J-282	16.3	452.68	2,204.75	20.00	24.13
J-86	1,001.86	3,184.58	J-282	16.25	452.57	2,207.22	20.00	24.16
J-87	1,001.86	1,696.73	J-87	20	446.25	1,696.74	20.00	19.97
J-88	1,001.86	1,645.91	J-88	20	356.25	1,645.91	20.00	19.98
J-89	1,001.86	2,050.36	J-282	19.16	459.30	1,840.94	20.00	27.88
J-90	1,001.86	2,040.36	J-93	10.53	359.34	1,805.52	20	29.72
J-91	1,001.86	353.76	J-91	20	376.25	353.76	20	19.96
J-92	1,001.86	376.57	J-91	14.99	364.66	353.76	20	25.13
J-93	1,001.86	1,654.22	J-93	20	381.25	1,654.22	20	19.98
J-94	1,001.86	1,649.64	J-94	20	376.25	1,649.64	20	19.98
J-95	1,001.86	2,092.65	J-282	18.72	458.28	1,787.97	20	34.75
J-96	1,001.86	2,018.53	J-282	18.91	458.74	1,762.49	20	33.42
J-97	1,001.86	401.13	J-97	20	326.25	401.13	20	19.96
J-99	1,001.86	1,747.81	J-100	15.68	336.25	1,674.47	20	24.3

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2022 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-1	1,001.99	1,603.76	J-1	20	441.25	1,603.75	20.00	19.98
J-10	1,001.99	3,557.26	J-282	12.53	443.98	1,856.30	20.00	49.15
J-100	1,001.99	1,476.89	J-100	20	346.25	1,476.89	20.00	19.97
J-101	2,001.99	3,228.55	J-282	6.68	430.44	1,337.84	20.00	33.27
J-102	2,001.99	3,343.44	J-282	6.77	430.65	1,390.26	20.00	33.26
J-103	2,001.99	3,258.08	J-282	11.13	440.74	1,615.14	20.00	28.96
J-104	1,001.99	3,358.65	J-282	15.21	450.17	2,092.00	20.00	24.74
J-105	2,001.99	1,835.32	J-282	19.06	459.08	1,615.14	20.00	22.16
J-106	2,001.99	1,393.57	J-106	20	446.25	1,393.57	20.00	19.96
J-108	1,001.99	3,007.59	J-282	4.85	426.23	1,172.21	20.00	44.09
J-109	1,001.99	3,583.90	J-282	-1.8	410.83	1,174.70	20.00	58.59
J-11	2,001.99	3,384.39	J-282	13.74	446.76	1,892.02	20.00	40.47
J-110	2,001.99	1,873.49	J-282	15.34	450.48	1,170.13	20.00	30.31
J-111	2,001.99	1,658.14	J-282	16.96	454.22	1,174.32	20.00	29.78
J-112	1,001.99	1,359.07	J-282	18.99	458.91	1,184.29	20.00	25.63
J-113	1,001.99	1,369.09	J-282	19.05	459.06	1,202.72	20.00	26.69
J-114	1,001.99	2,065.43	J-282	14.45	448.42	1,219.73	20.00	47.37
J-115	2,001.99	1,280.59	J-282	19.39	459.85	1,174.32	20.00	23.05
J-116	2,001.99	1,232.05	J-282	19.67	460.50	1,174.32	20.00	22.28
J-117	1,001.99	1,258.88	J-282	19.52	460.14	1,174.32	20.00	24.86
J-118	1,001.99	1,628.81	J-282	17.64	455.80	1,228.28	20.00	39.66
J-119	1,001.99	1,605.20	J-282	17.87	456.33	1,237.85	20.00	39.25
J-12	2,001.99	2,436.03	J-282	18.05	456.74	1,902.48	20.00	34.61
J-120	1,001.99	1,918.86	J-282	15.91	451.80	1,250.86	20.00	52.16
J-121	1,001.99	1,853.15	J-282	16.15	452.34	1,230.31	20.00	49.76
J-122	1,001.99	2,020.40	J-282	14.84	449.32	1,222.90	20.00	51.80
J-123	1,001.99	1,737.42	J-282	17.4	455.25	1,280.23	20.00	47.11
J-124	1,001.99	1,817.51	J-282	17.22	454.83	1,316.47	20.00	55.80
J-125	1,001.99	1,984.14	J-282	16.54	453.25	1,354.36	20.00	67.76
J-126	1,001.99	2,142.17	J-282	15.74	451.40	1,373.46	20.00	77.44
J-127	1,001.99	2,881.64	J-282	10.98	440.39	1,403.52	20.00	129.74
J-128	1,001.99	3,171.02	J-282	8.84	435.45	1,410.47	20.00	150.74
J-129	1,001.99	2,894.95	J-282	11.71	442.07	1,454.05	20.00	133.73
J-13	2,001.99	2,808.88	J-282	16.5	453.16	1,902.56	20.00	41.53
J-130	1,001.99	2,921.39	J-282	10.64	439.60	1,401.00	20.00	137.97
J-131	1,001.99	2,388.47	J-282	14.1	447.61	1,372.51	20.00	106.84
J-132	1,001.99	1,741.77	J-282	18.01	456.65	1,358.41	20.00	62.87
J-133	1,001.99	1,412.37	J-282	19.74	460.65	1,358.41	20	27.93
J-134	1,001.99	1,693.28	J-282	18.24	457.19	1,353.22	20.00	64.57
J-135	1,001.99	1,648.62	J-282	18.49	457.76	1,353.22	20	60.19
J-136	1,001.99	1,516.49	J-282	19.19	459.38	1,353.22	20.00	41.68
J-137	1,001.99	1,391.13	J-282	19.82	460.83	1,353.22	20.00	25.34
J-138	1,001.99	1,327.71	J-138	20	211.25	1,327.71	20.00	19.97
J-139	1,001.99	2,350.13	J-282	14.26	447.99	1,364.62	20	119.68
J-14	2,001.99	4,063.25	J-282	10.21	438.60	1,902.71	20.00	51.53
J-140	1,001.99	2,353.02	J-282	14.19	447.83	1,360.59	20	129.05
J-141	1,001.99	2,123.42	J-282	15.69	451.29	1,356.97	20	106.02
J-142	1,001.99	2,201.65	J-282	15.15	450.04	1,354.62	20	122.02

2022 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-143	1,001.99	1,061.16	J-143	20	56.25	1,061.16	20	20.28
J-144	1,001.99	1,698.38	J-282	18.27	457.24	1,360.59	20	76.79
J-145	1,001.99	651.04	J-145	20.00	136.25	651.04	20	19.97
J-146	1,001.99	457.72	J-146	20.00	126.25	457.72	20.00	19.97
J-147	1,001.99	1,976.43	J-282	16.57	453.32	1,351.87	20	93.88
J-148	1,001.99	1,977.21	J-282	16.56	453.29	1,350.97	20	94.03
J-15	2,001.99	2,368.52	J-282	18.31	457.35	1,902.70	20.00	34.00
J-150	1,001.99	1,807.72	J-282	17.48	455.41	1,338.75	20	67.86
J-151	1,001.99	1,571.70	J-282	18.76	458.39	1,331.43	20	40.58
J-152	1,001.99	97.76	J-152	20.00	256.25	97.76	20	19.81
J-153	1,001.99	1,987.83	J-282	16.49	453.14	1,350.97	20	100.24
J-154	1,001.99	1,446.49	J-282	19.53	460.17	1,350.97	20	38.69
J-155	1,001.99	913.69	J-159	9.19	96.24	879.26	20.00	30.75
J-156	1,001.99	917.49	J-159	0.54	76.25	857.79	20	39.38
J-157	1,001.99	905.98	J-159	8.06	93.63	868.48	20.00	32.29
J-158	1,001.99	896.70	J-159	0.54	76.25	838.37	20	39.38
J-159	1,001.99	811.81	J-159	20	121.25	811.81	20.00	19.96
J-16	2,001.99	4,569.31	J-282	7.21	431.68	1,903.37	20.00	53.50
J-160	1,001.99	818.51	J-159	17.75	116.04	811.81	20.00	22.28
J-161	1,001.99	2,377.00	J-282	15.17	450.07	1,457.76	20.00	111.53
J-162	1,001.99	2,726.27	J-282	13.02	445.12	1,465.35	20.00	119.32
J-163	1,001.99	2,075.02	J-282	17.17	454.71	1,487.50	20	80.84
J-164	1,001.99	2,583.44	J-282	14.23	447.90	1,487.50	20.00	104.63
J-165	1,001.99	2,661.06	J-282	13.36	445.89	1,457.76	20.00	120.29
J-166	1,001.99	2,738.12	J-282	12.97	445.00	1,467.63	20.00	119.27
J-167	1,001.99	2,651.10	J-282	13.52	446.27	1,465.35	20.00	133.24
J-168	1,001.99	2,392.21	J-282	15.15	450.04	1,465.35	20.00	112.90
J-169	1,001.99	2,065.79	J-282	17.04	454.41	1,465.35	20.00	94.35
J-17	2,001.99	3,833.84	J-282	11.48	441.56	1,902.94	20.00	40.99
J-170	1,001.99	1,972.33	J-282	17.55	455.58	1,465.35	20.00	86.88
J-171	1,001.99	1,768.00	J-282	18.59	458.00	1,465.35	20.00	63.28
J-172	1,001.99	1,586.31	J-175	-12.43	146.25	1,371.16	20.00	52.33
J-173	1,001.99	1,516.49	J-175	-1.48	171.58	1,371.16	20.00	41.79
J-174	1,001.99	1,491.84	J-175	2.29	180.30	1,371.16	20	38.52
J-175	1,001.99	1,310.55	J-175	20	221.25	1,310.55	20	19.96
J-176	1,001.99	2,244.28	J-282	16.34	452.80	1,499.34	20.00	73.77
J-177	1,001.99	2,085.15	J-282	17.29	454.98	1,510.54	20.00	59.99
J-178	1,001.99	2,054.10	J-282	17.47	455.40	1,513.27	20.00	57.33
J-179	1,001.99	1,877.57	J-282	18.59	458.00	1,554.31	20	40.12
J-18	2,001.99	3,744.00	J-282	11.97	442.67	1,902.75	20.00	39.10
J-180	1,001.99	1,952.65	J-282	18.48	457.73	1,594.68	20.00	40.05
J-181	1,001.99	1,463.13	J-282	19.31	459.66	1,326.68	20.00	30.41
J-182	1,001.99	1,518.93	J-282	18.99	458.92	1,323.15	20.00	35.15
J-183	1,001.99	1,390.52	J-282	19.5	460.08	1,292.78	20.00	26.67
J-184	1,001.99	1,356.27	J-282	19.64	460.41	1,285.61	20.00	24.58
J-185	1,001.99	1,491.49	J-282	18.3	457.33	1,201.82	20.00	26.70
J-186	1,001.99	737.65	J-186	20	421.25	737.65	20.00	19.96
J-187	1,001.99	394.92	J-187	20	351.25	394.92	20.00	19.97

2022 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-188	1,001.99	63.47	J-188	20.00	351.25	63.47	20.00	19.96
J-189	1,001.99	26.77	J-189	20.00	246.25	26.77	20.00	19.96
J-19	2,001.99	3,767.93	J-282	11.84	442.38	1,902.70	20.00	39.19
J-190	1,001.99	3,213.25	J-282	2.75	421.37	1,180.80	20.00	58.30
J-191	1,001.99	3,085.08	J-282	4.19	424.68	1,180.80	20.00	56.31
J-192	1,001.99	3,186.10	J-282	3.06	422.08	1,180.80	20.00	75.95
J-193	1,001.99	3,095.25	J-282	4.07	424.42	1,180.80	20.00	72.86
J-194	1,001.99	2,982.41	J-282	5.3	427.25	1,180.80	20.00	75.30
J-195	1,001.99	2,531.95	J-282	9.84	437.76	1,180.80	20.00	76.28
J-196	1,001.99	74.96	J-196	20	356.25	74.96	20.00	19.96
J-197	1,001.99	3,490.54	J-282	-0.55	413.73	1,178.89	20.00	62.70
J-198	1,001.99	3,694.43	J-282	-3.14	407.75	1,176.81	20.00	64.54
J-199	1,001.99	1,654.13	J-282	18.44	457.64	1,350.30	20.00	59.11
J-2	1,001.99	3,728.19	J-282	12.08	442.94	1,905.95	20.00	48.22
J-200	1,001.99	1,247.09	J-200	20	306.25	1,247.09	20.00	19.97
J-201	1,001.99	1,608.63	J-282	18.69	458.21	1,350.30	20.00	54.57
J-202	1,001.99	1,492.54	J-282	19.14	459.25	1,323.15	20.00	34.30
J-203	1,001.99	1,307.48	J-203	20	321.25	1,307.48	20.00	19.97
J-205	1,001.99	1,301.91	J-205	20	321.25	1,301.91	20.00	19.97
J-21	2,001.99	2,287.12	J-282	18.62	458.06	1,901.15	20.00	27.79
J-216	1,001.99	1,305.72	J-216	20	301.25	1,305.72	20.00	19.96
J-217	1,001.99	1,735.03	J-216	-30.09	185.41	1,305.72	20.00	76.86
J-218	1,001.99	1,792.25	J-216	-37.66	167.91	1,305.72	20.00	92.18
J-219	1,001.99	1,485.87	J-216	0.43	255.99	1,305.72	20.00	40.39
J-22	2,001.99	4,332.91	J-282	8.64	434.98	1,902.75	20.00	50.98
J-220	1,001.99	2,813.48	J-282	15.87	451.70	1,808.28	20.00	43.20
J-221	1,001.99	2,415.42	J-282	17.42	455.29	1,768.79	20.00	38.14
J-222	1,001.99	2,336.18	J-282	14.3	448.08	1,359.95	20.00	128.28
J-223	1,001.99	31,522.96	J-223	20	371.25	31,523.43	20.00	19.96
J-224	1,001.99	3,312.06	J-282	13.68	446.64	1,841.99	20.00	47.56
J-225	1,001.99	1,944.01	J-282	18.23	457.15	1,544.75	20.00	45.84
J-226	1,001.99	1,996.83	J-282	17.8	456.16	1,518.35	20.00	52.51
J-227	2,001.99	2,131.96	J-282	13.16	445.44	1,160.72	20.00	26.78
J-228	1,001.99	1,984.05	J-282	14.9	449.46	1,206.04	20.00	42.69
J-229	1,001.99	2,037.54	J-282	14.67	448.93	1,220.23	20.00	46.93
J-23	1,001.99	3,475.38	J-282	12.96	444.98	1,856.30	20.00	48.61
J-230	1,001.99	1,808.33	J-282	16.39	452.89	1,222.90	20.00	47.11
J-231	1,001.99	3,655.36	J-282	-2.24	409.81	1,185.26	20.00	62.37
J-232	1,001.99	3,146.68	J-282	3.75	423.68	1,186.44	20.00	53.25
J-233	1,001.99	2,924.63	J-282	6.14	429.2	1,186.57	20.00	48.81
J-234	1,001.99	2,709.53	J-282	8.31	434.23	1,186.54	20.00	51.20
J-235	1,001.99	1,446.40	J-235	20	421.25	1,446.40	20.00	19.96
J-236	1,001.99	2,733.56	J-282	17.04	454.4	1,942.41	20.00	27.65
J-237	2,001.99	2,180.92	J-282	18.96	458.85	1,887.62	20.00	27.31
J-238	2,001.99	2,348.16	J-282	18.39	457.53	1,902.54	20.00	30.33
J-239	2,001.99	2,149.35	J-282	19.14	459.25	1,902.54	20.00	26.56
J-24	2,001.99	3,372.28	J-282	13.86	447.05	1,900.07	20.00	34.70
J-240	2,001.99	2,921.61	J-282	16	452.01	1,902.65	20.00	37.05

2022 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-241	2,001.99	1,388.38	J-241	20	451.25	1,388.39	20.00	19.96
J-242	2,001.99	1,116.45	J-242	20	453.25	1,116.45	20.00	19.96
J-243	2,001.99	1,183.24	J-242	19.57	452.25	1,148.87	20.00	20.40
J-244	1,001.99	2,424.14	J-282	18.74	458.33	2,051.64	20.00	21.34
J-245	2,001.99	2,328.63	J-282	11.83	442.35	1,184.75	20.00	50.01
J-246	1,001.99	2,480.13	J-282	10.46	439.19	1,184.75	20.00	51.33
J-247	1,001.99	3,443.04	J-282	0.31	415.72	1,184.55	20.00	56.11
J-248	2,001.99	1,354.85	J-248	20	451.25	1,354.86	20.00	19.97
J-249	2,001.99	1,926.14	J-249	20	436.25	1,926.14	20.00	19.96
J-25	2,001.99	3,143.10	J-282	15.01	449.72	1,906.44	20.00	31.00
J-250	2,001.99	2,412.28	J-282	18.31	457.35	1,940.46	20.00	25.13
J-251	2,001.99	2,720.76	J-282	17.08	454.50	1,939.75	20.00	27.20
J-252	1,001.99	3,584.21	J-282	13.15	445.41	1,946.56	20.00	31.02
J-253	2,001.99	2,350.53	J-282	18.39	457.54	1,904.78	20.00	25.06
J-255	2,001.99	1,862.22	J-255	20	433.25	1,862.22	20.00	19.96
J-257	2,001.99	2,410.66	J-282	18.16	457.00	1,905.43	20.00	25.69
J-258	2,001.99	2,562.45	J-282	17.57	455.62	1,907.35	20.00	26.43
J-259	2,001.99	2,895.60	J-282	16.15	452.36	1,908.34	20.00	28.20
J-26	2,001.99	3,205.65	J-282	14.73	449.07	1,908.67	20.00	31.25
J-260	2,001.99	1,332.10	J-260	20	431.25	1,332.10	20.00	19.96
J-261	2,001.99	1,887.43	J-260	19.13	429.25	1,835.71	20.00	20.82
J-262	2,001.99	2,377.41	J-282	18.29	457.29	1,904.27	20.00	25.43
J-263	2,001.99	3,076.09	J-282	15.27	450.30	1,897.63	20.00	31.51
J-264	2,001.99	2,364.52	J-282	18.32	457.37	1,900.52	20.00	26.51
J-265	2,001.99	2,888.86	J-282	16.14	452.32	1,900.52	20.00	29.12
J-267	2,001.99	2,337.90	J-282	18.43	457.62	1,902.20	20.00	27.44
J-268	1,001.99	2,641.24	J-282	17.42	455.28	1,942.41	20.00	26.15
J-269	1,001.99	3,260.76	J-282	14.7	448.99	1,942.41	20.00	28.72
J-27	2,001.99	3,323.70	J-282	14.26	447.99	1,923.08	20.00	30.31
J-270	1,001.99	2,056.63	J-282	19.61	460.36	1,942.41	20.00	21.32
J-271	1,001.99	2,178.04	J-282	19.19	459.37	1,942.41	20.00	22.70
J-272	2,001.99	1,384.65	J-282	18.7	458.25	1,164.37	20.00	22.75
J-276	1,001.99	2,226.25	J-282	19.02	458.97	1,942.41	20.00	23.64
J-277	1,001.99	1,760.92	J-277	20	426.25	1,760.92	20.00	19.98
J-278	1,001.99	2,172.20	J-52	16.45	438.04	1,837.11	20.00	23.53
J-28	2,001.99	3,441.72	J-282	13.57	446.38	1,910.42	20.00	33.61
J-281	1,001.99	2,687.38	J-282	16.27	452.63	1,792.42	20.00	28.70
J-283	1,001.99	96.44	J-283	20	391.25	96.44	20.00	19.99
J-284	1,001.99	2,593.05	J-282	17.43	455.31	1,905.76	20.00	36.35
J-285	2,001.99	1,001.73	J-285	20	443.25	1,001.73	20.00	19.97
J-286	2,001.99	1,615.63	J-282	17.24	454.86	1,172.14	20.00	27.36
J-287	2,001.99	1,127.90	J-287	20	451.25	1,127.90	20.00	19.97
J-288	2,001.99	1,960.17	J-282	14.62	448.82	1,164.37	20.00	28.85
J-291	2,001.99	168.06	J-291	20	391.25	168.06	20.00	19.96
J-292	2,001.99	3,202.78	J-282	14.59	448.75	1,887.62	20.00	34.81
J-293	1,001.99	4,004.84	J-282	11.24	440.99	1,984.20	20.00	31.34
J-295	1,001.99	2,058.68	J-282	19.47	460.02	1,904.24	20.00	26.22
J-296	1,001.99	1,051.56	J-159	11.34	101.22	1,019.44	20.00	28.74

2022 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-297	1,001.99	1,432.01	J-282	18.8	458.48	1,220.23	20.00	28.54
J-298	1,001.99	2,017.14	J-298	20	456.25	2,017.15	20.00	19.96
J-299	1,001.99	2,378.83	J-282	14.06	447.52	1,364.40	20.00	123.73
J-3	1,001.99	2,925.37	J-282	16.06	452.13	1,913.90	20.00	48.72
J-30	2,001.99	3,255.83	J-282	14.45	448.42	1,902.68	20.00	32.81
J-302	1,001.99	1,861.92	J-282	18.27	457.25	1,487.50	20.00	65.06
J-303	1,001.99	2,182.50	J-282	15.61	451.11	1,385.57	20.00	80.06
J-304	1,000.00	1,623.46	J-282	20.19	461.69	1,674.33	20.00	17.75
J-31	2,001.99	3,368.88	J-282	14.08	447.55	1,927.48	20.00	30.44
J-32	2,251.99	3,655.83	J-282	12.67	444.3	1,931.56	20.00	32.72
J-33	2,251.99	3,678.14	J-282	12.57	444.07	1,933.49	20.00	32.78
J-34	1,001.99	3,750.92	J-282	12.25	443.32	1,940.20	20.00	32.96
J-35	2,001.99	3,639.92	J-282	12.72	444.41	1,927.20	20.00	34.16
J-39	2,001.99	3,635.89	J-282	12.74	444.46	1,927.19	20.00	34.15
J-4	1,001.99	3,886.54	J-282	11.22	440.96	1,905.76	20.00	50.64
J-40	2,001.99	3,455.65	J-282	13.65	446.56	1,927.00	20.00	33.53
J-41	2,001.99	3,246.80	J-282	14.66	448.90	1,927.00	20.00	34.03
J-42	2,001.99	3,285.23	J-282	14.48	448.48	1,926.81	20.00	32.86
J-43	2,001.99	2,507.21	J-282	17.88	456.35	1,926.81	20.00	32.10
J-44	2,001.99	2,739.82	J-282	16.93	454.16	1,927.00	20.00	35.01
J-45	2,001.99	2,235.19	J-282	18.92	458.76	1,927.19	20.00	27.53
J-46	2,001.99	1,765.29	J-46	20	396.25	1,765.29	20.00	19.96
J-47	2,001.99	3,520.11	J-282	13.32	445.81	1,926.56	20.00	37.52
J-48	1,001.99	2,704.11	J-52	11.34	426.23	1,913.19	20.00	28.69
J-49	1,001.99	2,201.52	J-52	15.57	436.00	1,798.75	20.00	24.41
J-5	1,001.99	1,974.91	J-282	19.77	460.71	1,905.76	20.00	22.80
J-50	1,001.99	1,921.67	J-52	17.66	440.83	1,712.50	20.00	22.30
J-51	1,001.99	1,903.00	J-52	17.64	440.80	1,694.84	20.00	22.31
J-52	1,001.99	14.81	J-52	20	446.25	17.56	20.00	19.96
J-53	1,001.99	2,910.07	J-282	16.15	452.35	1,918.04	20.00	51.88
J-54	1,001.99	2,062.18	J-282	19.51	460.11	1,918.04	20.00	27.99
J-55	2,001.99	3,483.81	J-282	13.51	446.24	1,927.27	20.00	32.21
J-56	2,001.99	2,531.15	J-282	17.79	456.14	1,927.27	20.00	27.30
J-57	2,001.99	1,873.72	J-57	20	431.25	1,873.72	20.00	19.96
J-58	2,251.99	2,669.62	J-282	17.26	454.91	1,933.49	20.00	27.34
J-59	2,251.99	2,259.39	J-282	18.86	458.61	1,933.49	20.00	24.09
J-6	1,001.99	1,955.04	J-282	19.83	460.86	1,905.76	20.00	24.72
J-60	1,001.99	3,987.05	J-282	11.13	440.74	1,957.15	20.00	33.52
J-61	1,001.99	2,370.93	J-282	18.54	457.87	1,957.16	20.00	25.56
J-62	2,001.99	3,344.57	J-282	14.01	447.41	1,906.14	20.00	33.28
J-63	2,001.99	3,116.70	J-282	15.11	449.94	1,906.14	20.00	32.28
J-65	2,001.99	3,555.62	J-282	13.21	445.54	1,934.60	20.00	32.42
J-66	2,001.99	2,915.16	J-282	16.26	452.60	1,941.08	20.00	29.77
J-67	2,001.99	2,030.65	J-282	19.65	460.44	1,927.48	20.00	21.48
J-68	1,001.99	3,269.93	J-282	14.35	448.18	1,902.98	20.00	33.00
J-69	1,001.99	264.46	J-69	20	421.25	264.46	20.00	19.96
J-7	1,001.99	4,116.81	J-282	9.92	437.94	1,904.47	20.00	50.12
J-71	1,001.99	99.80	J-71	20	426.25	99.80	20.00	19.93

2022 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-72	1,001.99	2,087.37	J-282	18.48	457.74	1,704.57	20.00	33.50
J-73	1,001.99	3,587.89	J-282	12.37	443.60	1,856.30	20.00	49.34
J-74	1,001.99	2,884.59	J-282	15.65	451.18	1,832.83	20	31.77
J-75	1,001.99	1,057.28	J-75	20	406.25	1,057.28	20	19.96
J-76	1,001.99	1,042.20	J-76	20	396.25	1,042.20	20.00	20.01
J-77	2,001.99	2,604.36	J-282	14.3	448.06	1,510.12	20.00	33.26
J-78	1,001.99	2,226.41	J-282	16.5	453.15	1,510.12	20	41.76
J-79	1,001.99	26.72	J-79	20	421.25	26.72	20	19.96
J-8	1,001.99	85.23	J-8	20	321.25	85.23	20.00	19.96
J-80	1,001.99	1,784.07	J-282	18.77	458.4	1,510.12	20.00	32.42
J-83	2,001.99	2,627.45	J-282	14.04	447.48	1,500.45	20	33.47
J-85	1,001.99	3,060.59	J-282	16.19	452.45	2,041.23	20	24.24
J-86	1,001.99	3,075.05	J-282	16.15	452.34	2,043.57	20.00	24.27
J-87	1,001.99	1,657.18	J-87	20	446.25	1,657.18	20.00	19.97
J-88	1,001.99	1,633.63	J-88	20	356.25	1,633.63	20.00	19.98
J-89	1,001.99	2,032.18	J-282	18.67	458.18	1,696.25	20.00	32.26
J-90	1,001.99	2,023.73	J-282	18.68	458.19	1,690.90	20.00	33.41
J-91	1,001.99	351.31	J-91	20	376.25	351.31	20	19.96
J-92	1,001.99	374.30	J-91	14.97	364.62	351.31	20	25.14
J-93	1,001.99	1,637.97	J-93	20	381.25	1,637.97	20	19.98
J-94	1,001.99	1,633.98	J-94	20	376.25	1,633.98	20	19.98
J-95	1,001.99	2,077.64	J-282	18.22	457.12	1,647.51	20	40.22
J-96	1,001.99	2,004.31	J-282	18.41	457.58	1,624.15	20	39.34
J-97	1,001.99	399.31	J-97	20	326.25	399.31	20	19.96
J-99	1,001.99	1,735.67	J-282	19.66	460.45	1,647.51	20	25.12

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2026 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-1	1,002.04	1,589.05	J-1	20	441.25	1,589.04	20.00	19.98
J-10	1,002.04	3,544.35	J-282	12.35	443.57	1,794.00	20.00	49.71
J-100	1,002.04	1,472.67	J-100	20	346.25	1,472.67	20.00	19.97
J-101	2,002.04	3,202.91	J-282	6.66	430.40	1,294.62	20.00	33.29
J-102	2,002.04	3,317.12	J-282	6.75	430.60	1,345.60	20.00	33.28
J-103	2,002.04	3,226.12	J-282	11.1	440.67	1,564.60	20.00	28.97
J-104	1,002.04	3,313.02	J-282	15.18	450.11	2,026.28	20.00	24.77
J-105	2,002.04	1,817.02	J-282	18.93	458.78	1,564.60	20.00	22.43
J-106	2,002.04	1,380.59	J-106	20	446.25	1,380.59	20.00	19.96
J-108	1,002.04	2,992.89	J-282	4.75	425.99	1,134.24	20.00	44.21
J-109	1,002.04	3,571.41	J-282	-1.92	410.55	1,136.75	20.00	58.75
J-11	2,002.04	3,369.05	J-282	13.57	446.38	1,828.94	20.00	40.92
J-110	2,002.04	1,860.78	J-282	15.21	450.18	1,132.36	20.00	30.56
J-111	2,002.04	1,648.76	J-282	16.8	453.86	1,136.58	20.00	30.23
J-112	1,002.04	1,352.93	J-282	18.81	458.51	1,146.45	20.00	26.56
J-113	1,002.04	1,363.93	J-282	18.87	458.64	1,164.35	20.00	27.91
J-114	1,002.04	2,058.77	J-282	14.27	448.01	1,180.77	20.00	48.12
J-115	2,002.04	1,273.81	J-282	19.22	459.45	1,136.58	20.00	23.90
J-116	2,002.04	1,227.09	J-282	19.49	460.08	1,136.58	20.00	23.55
J-117	1,002.04	1,255.43	J-282	19.33	459.70	1,136.58	20.00	26.73
J-118	1,002.04	1,624.31	J-282	17.45	455.36	1,189.03	20.00	41.11
J-119	1,002.04	1,600.87	J-282	17.68	455.89	1,198.27	20.00	40.83
J-12	2,002.04	2,428.34	J-282	17.86	456.30	1,839.22	20.00	35.94
J-120	1,002.04	1,914.00	J-282	15.72	451.35	1,210.79	20.00	53.49
J-121	1,002.04	1,848.51	J-282	15.96	451.90	1,191.00	20.00	51.07
J-122	1,002.04	2,014.93	J-282	14.65	448.88	1,183.81	20.00	52.80
J-123	1,002.04	1,733.18	J-282	17.21	454.80	1,239.05	20.00	49.02
J-124	1,002.04	1,813.64	J-282	17.03	454.37	1,273.91	20.00	58.13
J-125	1,002.04	1,980.07	J-282	16.34	452.78	1,310.30	20.00	70.24
J-126	1,002.04	2,137.76	J-282	15.54	450.93	1,328.62	20.00	79.84
J-127	1,002.04	2,876.46	J-282	10.77	439.91	1,357.43	20.00	131.81
J-128	1,002.04	3,165.57	J-282	8.63	434.96	1,364.09	20.00	152.72
J-129	1,002.04	2,889.96	J-282	11.49	441.58	1,405.80	20.00	136.10
J-13	2,002.04	2,800.04	J-282	16.31	452.72	1,839.30	20.00	42.57
J-130	1,002.04	2,916.16	J-282	10.43	439.12	1,354.99	20.00	140.12
J-131	1,002.04	2,383.60	J-282	13.9	447.14	1,327.62	20.00	109.42
J-132	1,002.04	1,738.22	J-282	17.81	456.19	1,314.09	20.00	66.89
J-133	1,002.04	1,409.76	J-282	19.54	460.19	1,314.09	20	33.9
J-134	1,002.04	1,690.19	J-282	18.04	456.72	1,309.10	20.00	69.37
J-135	1,002.04	1,645.66	J-282	18.29	457.29	1,309.10	20	65.25
J-136	1,002.04	1,513.49	J-282	18.99	458.92	1,309.10	20.00	46.82
J-137	1,002.04	1,388.34	J-282	19.62	460.37	1,309.10	20.00	31.06
J-138	1,002.04	1,325.11	J-282	19.92	461.08	1,309.10	20.00	22.36
J-139	1,002.04	2,345.88	J-282	14.06	447.51	1,320.06	20	122.77
J-14	2,002.04	4,048.66	J-282	10.04	438.21	1,839.44	20.00	51.96
J-140	1,002.04	2,349.03	J-282	13.99	447.35	1,316.18	20	132.41
J-141	1,002.04	2,119.62	J-282	15.49	450.81	1,312.70	20	109.65
J-142	1,002.04	2,198.09	J-282	14.94	449.56	1,310.44	20	125.85

2026 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-143	1,002.04	1,060.02	J-143	20	56.25	1,060.02	20	20.28
J-144	1,002.04	1,695.74	J-282	18.06	456.77	1,316.18	20	83.07
J-145	1,002.04	650.23	J-145	20.00	136.25	650.23	20	19.97
J-146	1,002.04	457.24	J-146	20.00	126.25	457.24	20.00	19.97
J-147	1,002.04	1,972.93	J-282	16.37	452.85	1,307.81	20	97.84
J-148	1,002.04	1,973.72	J-282	16.35	452.82	1,306.95	20	97.98
J-15	2,002.04	2,361.56	J-282	18.12	456.91	1,839.44	20.00	35.50
J-150	1,002.04	1,803.90	J-282	17.28	454.95	1,295.24	20	71.34
J-151	1,002.04	1,567.35	J-282	18.57	457.94	1,288.21	20	43.63
J-152	1,002.04	97.65	J-152	20.00	256.25	97.65	20	19.79
J-153	1,002.04	1,984.55	J-282	16.29	452.66	1,306.95	20	104.47
J-154	1,002.04	1,444.48	J-282	19.33	459.70	1,306.95	20	46.58
J-155	1,002.04	912.37	J-159	9.19	96.24	877.93	20.00	30.75
J-156	1,002.04	916.23	J-159	0.54	76.25	856.50	20	39.38
J-157	1,002.04	904.73	J-159	8.04	93.60	867.16	20.00	32.30
J-158	1,002.04	895.47	J-159	0.54	76.25	837.12	20	39.38
J-159	1,002.04	810.61	J-159	20	121.25	810.61	20.00	19.96
J-16	2,002.04	4,552.15	J-282	7.06	431.33	1,840.09	20.00	53.82
J-160	1,002.04	817.35	J-159	17.73	116.01	810.61	20.00	22.29
J-161	1,002.04	2,373.25	J-282	14.96	449.59	1,409.37	20.00	114.99
J-162	1,002.04	2,721.36	J-282	12.81	444.63	1,416.64	20.00	121.81
J-163	1,002.04	2,071.48	J-282	16.96	454.23	1,437.82	20	84.87
J-164	1,002.04	2,578.58	J-282	14.02	447.42	1,437.82	20.00	107.22
J-165	1,002.04	2,656.44	J-282	13.15	445.41	1,409.37	20.00	122.95
J-166	1,002.04	2,733.17	J-282	12.76	444.52	1,418.82	20.00	121.74
J-167	1,002.04	2,647.04	J-282	13.31	445.77	1,416.64	20.00	136.37
J-168	1,002.04	2,388.42	J-282	14.94	449.55	1,416.64	20.00	116.40
J-169	1,002.04	2,062.80	J-282	16.83	453.92	1,416.64	20.00	99.11
J-17	2,002.04	3,814.42	J-282	11.34	441.23	1,839.66	20.00	41.28
J-170	1,002.04	1,969.54	J-282	17.34	455.09	1,416.64	20.00	92.09
J-171	1,002.04	1,765.48	J-282	18.39	457.52	1,416.64	20.00	69.27
J-172	1,002.04	1,583.96	J-175	-12.43	146.25	1,368.67	20.00	52.33
J-173	1,002.04	1,514.14	J-175	-1.49	171.57	1,368.67	20.00	41.80
J-174	1,002.04	1,489.55	J-175	2.27	180.26	1,368.67	20	38.53
J-175	1,002.04	1,308.23	J-175	20	221.25	1,308.23	20	19.96
J-176	1,002.04	2,239.31	J-282	16.14	452.33	1,449.19	20.00	76.41
J-177	1,002.04	2,080.12	J-282	17.09	454.52	1,459.93	20.00	62.67
J-178	1,002.04	2,049.06	J-282	17.27	454.94	1,462.55	20.00	60.03
J-179	1,002.04	1,872.41	J-282	18.4	457.55	1,502.01	20	42.77
J-18	2,002.04	3,723.73	J-282	11.83	442.35	1,839.47	20.00	39.38
J-180	1,002.04	1,947.24	J-282	18.28	457.28	1,540.82	20.00	42.48
J-181	1,002.04	1,458.36	J-282	19.12	459.22	1,283.64	20.00	33.18
J-182	1,002.04	1,514.27	J-282	18.81	458.49	1,280.28	20.00	37.90
J-183	1,002.04	1,385.88	J-282	19.31	459.65	1,251.11	20.00	29.17
J-184	1,002.04	1,351.55	J-282	19.45	459.98	1,244.21	20.00	26.96
J-185	1,002.04	1,482.22	J-282	18.15	456.96	1,163.32	20.00	27.29
J-186	1,002.04	733.85	J-186	20	421.25	733.85	20.00	19.96
J-187	1,002.04	393.99	J-187	20	351.25	393.99	20.00	19.97

2026 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-188	1,002.04	63.34	J-188	20.00	351.25	63.34	20.00	19.96
J-189	1,002.04	26.75	J-189	20.00	246.25	26.75	20.00	19.96
J-19	2,002.04	3,747.48	J-282	11.7	442.06	1,839.43	20.00	39.46
J-190	1,002.04	3,202.47	J-282	2.61	421.04	1,142.81	20.00	58.53
J-191	1,002.04	3,074.49	J-282	4.04	424.34	1,142.81	20.00	56.57
J-192	1,002.04	3,178.82	J-282	2.88	421.66	1,142.81	20.00	76.39
J-193	1,002.04	3,087.93	J-282	3.89	424.00	1,142.81	20.00	73.30
J-194	1,002.04	2,975.86	J-282	5.11	426.82	1,142.81	20.00	75.82
J-195	1,002.04	2,527.22	J-282	9.64	437.30	1,142.81	20.00	77.15
J-196	1,002.04	74.83	J-196	20	356.25	74.83	20.00	19.96
J-197	1,002.04	3,479.51	J-282	-0.69	413.41	1,140.91	20.00	62.91
J-198	1,002.04	3,682.93	J-282	-3.27	407.44	1,138.85	20.00	64.72
J-199	1,002.04	1,651.02	J-282	18.24	457.18	1,306.31	20.00	63.85
J-2	1,002.04	3,714.61	J-282	11.91	442.54	1,842.61	20.00	48.72
J-200	1,002.04	1,243.43	J-200	20	306.25	1,243.43	20.00	19.97
J-201	1,002.04	1,605.66	J-282	18.49	457.75	1,306.31	20.00	59.58
J-202	1,002.04	1,488.28	J-282	18.94	458.81	1,280.28	20.00	37.36
J-203	1,002.04	1,303.23	J-282	19.94	461.11	1,290.26	20.00	21.07
J-205	1,002.04	1,297.68	J-282	19.97	461.17	1,290.59	20.00	20.57
J-21	2,002.04	2,276.77	J-282	18.44	457.64	1,837.90	20.00	28.75
J-216	1,002.04	1,303.56	J-216	20	301.25	1,303.56	20.00	19.96
J-217	1,002.04	1,733.40	J-216	-30.12	185.35	1,303.56	20.00	76.89
J-218	1,002.04	1,790.80	J-216	-37.71	167.80	1,303.56	20.00	92.23
J-219	1,002.04	1,483.95	J-216	0.42	255.97	1,303.56	20.00	40.40
J-22	2,002.04	4,316.10	J-282	8.48	434.62	1,839.48	20.00	51.32
J-220	1,002.04	2,803.50	J-282	15.68	451.27	1,747.27	20.00	44.12
J-221	1,002.04	2,406.83	J-282	17.23	454.85	1,708.95	20.00	39.35
J-222	1,002.04	2,332.23	J-282	14.1	447.60	1,315.56	20.00	131.68
J-223	1,002.04	31,522.96	J-223	20	371.25	31,523.43	20.00	19.96
J-224	1,002.04	3,300.14	J-282	13.5	446.22	1,780.05	20.00	48.22
J-225	1,002.04	1,938.94	J-282	18.03	456.69	1,492.75	20.00	48.53
J-226	1,002.04	1,991.77	J-282	17.6	455.7	1,467.43	20.00	55.22
J-227	2,002.04	2,105.95	J-282	13.15	445.4	1,122.72	20.00	26.80
J-228	1,002.04	1,977.08	J-282	14.72	449.05	1,167.56	20.00	43.36
J-229	1,002.04	2,030.99	J-282	14.49	448.52	1,181.25	20.00	47.71
J-23	1,002.04	3,462.89	J-282	12.78	444.56	1,794.00	20.00	49.21
J-230	1,002.04	1,803.63	J-282	16.19	452.45	1,183.81	20.00	48.38
J-231	1,002.04	3,643.20	J-282	-2.37	409.52	1,146.60	20.00	62.54
J-232	1,002.04	3,134.68	J-282	3.62	423.38	1,147.73	20.00	53.45
J-233	1,002.04	2,912.45	J-282	6.01	428.9	1,147.89	20.00	49.02
J-234	1,002.04	2,699.81	J-282	8.16	433.87	1,147.85	20.00	51.53
J-235	1,002.04	1,439.28	J-235	20	421.25	1,439.28	20.00	19.96
J-236	1,002.04	2,713.46	J-282	16.9	454.08	1,878.80	20.00	27.98
J-237	2,002.04	2,172.43	J-282	18.77	458.42	1,824.63	20.00	28.57
J-238	2,002.04	2,339.05	J-282	18.21	457.11	1,839.28	20.00	31.45
J-239	2,002.04	2,141.35	J-282	18.95	458.82	1,839.28	20.00	27.93
J-24	2,002.04	3,351.32	J-282	13.72	446.74	1,836.84	20.00	34.98
J-240	2,002.04	2,909.11	J-282	15.83	451.61	1,839.38	20.00	37.71

2026 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-241	2,002.04	1,372.12	J-241	20	451.25	1,372.12	20.00	19.96
J-242	2,002.04	1,103.19	J-242	20	453.25	1,103.19	20.00	19.97
J-243	2,002.04	1,169.80	J-242	19.57	452.25	1,135.16	20.00	20.40
J-244	1,002.04	2,375.29	J-282	18.7	458.24	1,986.47	20.00	21.38
J-245	2,002.04	2,321.14	J-282	11.65	441.94	1,146.10	20.00	50.53
J-246	1,002.04	2,471.97	J-282	10.29	438.80	1,146.10	20.00	51.77
J-247	1,002.04	3,430.13	J-282	0.2	415.45	1,145.92	20.00	56.28
J-248	2,002.04	1,338.17	J-248	20	451.25	1,338.17	20.00	19.97
J-249	2,002.04	1,911.49	J-282	19.89	460.99	1,876.83	20.00	20.44
J-25	2,002.04	3,119.95	J-282	14.89	449.43	1,843.12	20.00	31.25
J-250	2,002.04	2,394.29	J-282	18.16	457.00	1,876.83	20.00	25.56
J-251	2,002.04	2,699.64	J-282	16.94	454.18	1,876.13	20.00	27.50
J-252	1,002.04	3,555.45	J-282	13.06	445.19	1,882.97	20.00	31.15
J-253	2,002.04	2,332.25	J-282	18.24	457.19	1,841.47	20.00	25.51
J-255	2,002.04	1,848.54	J-282	19.99	461.22	1,844.01	20.00	20.03
J-257	2,002.04	2,392.30	J-282	18.01	456.66	1,842.10	20.00	26.13
J-258	2,002.04	2,541.51	J-282	17.43	455.30	1,844.01	20.00	26.77
J-259	2,002.04	2,870.92	J-282	16.03	452.08	1,845.00	20.00	28.43
J-26	2,002.04	3,181.99	J-282	14.61	448.78	1,845.33	20.00	31.48
J-260	2,002.04	1,323.49	J-260	20	431.25	1,323.49	20.00	19.96
J-261	2,002.04	1,874.75	J-260	19.13	429.25	1,822.83	20.00	20.82
J-262	2,002.04	2,359.33	J-282	18.14	456.94	1,840.96	20.00	25.88
J-263	2,002.04	3,054.69	J-282	15.13	449.99	1,834.45	20.00	31.80
J-264	2,002.04	2,349.69	J-282	18.16	456.99	1,837.28	20.00	27.10
J-265	2,002.04	2,866.32	J-282	16.01	452.02	1,837.28	20.00	29.40
J-267	2,002.04	2,325.65	J-282	18.26	457.22	1,838.93	20.00	28.21
J-268	1,002.04	2,619.11	J-282	17.29	454.97	1,878.80	20.00	26.44
J-269	1,002.04	3,231.38	J-282	14.6	448.77	1,878.80	20.00	28.85
J-27	2,002.04	3,296.65	J-282	14.16	447.74	1,859.68	20.00	30.48
J-270	1,002.04	2,039.64	J-282	19.46	460.00	1,878.80	20.00	21.84
J-271	1,002.04	2,160.85	J-282	19.04	459.02	1,878.80	20.00	23.20
J-272	2,002.04	1,369.72	J-282	18.58	457.97	1,126.37	20.00	23.00
J-276	1,002.04	2,210.90	J-282	18.86	458.60	1,878.80	20.00	24.21
J-277	1,002.04	1,750.52	J-277	20	426.25	1,750.52	20.00	19.98
J-278	1,002.04	2,153.28	J-52	16.44	438.01	1,815.22	20.00	23.54
J-28	2,002.04	3,419.52	J-282	13.44	446.08	1,847.55	20.00	33.84
J-281	1,002.04	2,668.48	J-282	16.13	452.31	1,733.70	20.00	28.99
J-283	1,002.04	96.20	J-283	20	391.25	96.20	20.00	19.98
J-284	1,002.04	2,584.24	J-282	17.25	454.88	1,842.43	20.00	37.44
J-285	2,002.04	992.73	J-285	20	443.25	992.73	20.00	19.97
J-286	2,002.04	1,604.26	J-282	17.09	454.53	1,134.40	20.00	27.71
J-287	2,002.04	1,113.35	J-287	20	451.25	1,113.35	20.00	19.96
J-288	2,002.04	1,943.71	J-282	14.52	448.58	1,126.37	20.00	29.00
J-291	2,002.04	167.64	J-291	20	391.25	167.64	20.00	19.96
J-292	2,002.04	3,183.99	J-282	14.45	448.41	1,824.63	20.00	35.15
J-293	1,002.04	3,972.10	J-282	11.17	440.83	1,920.59	20.00	31.41
J-295	1,002.04	2,053.44	J-282	19.27	459.57	1,840.94	20.00	28.45
J-296	1,002.04	1,049.99	J-159	11.34	101.21	1,017.86	20.00	28.73

2026 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-297	1,002.04	1,426.61	J-282	18.62	458.06	1,181.25	20.00	29.77
J-298	1,002.04	1,984.25	J-298	20	456.25	1,984.24	20.00	19.96
J-299	1,002.04	2,374.61	J-282	13.86	447.04	1,319.84	20.00	126.83
J-3	1,002.04	2,918.17	J-282	15.86	451.67	1,850.44	20.00	49.98
J-30	2,002.04	3,233.84	J-282	14.32	448.11	1,839.40	20.00	33.08
J-302	1,002.04	1,858.98	J-282	18.06	456.77	1,437.82	20.00	70.06
J-303	1,002.04	2,177.31	J-282	15.42	450.65	1,340.16	20.00	82.47
J-304	1,000.00	1,617.07	J-282	20	461.25	1,617.44	20.00	19.95
J-31	2,002.04	3,341.48	J-282	13.97	447.31	1,864.01	20.00	30.60
J-32	2,252.04	3,628.98	J-282	12.57	444.06	1,868.05	20.00	32.88
J-33	2,252.04	3,651.16	J-282	12.47	443.83	1,869.96	20.00	32.93
J-34	1,002.04	3,723.59	J-282	12.15	443.09	1,876.60	20.00	33.10
J-35	2,002.04	3,615.79	J-282	12.6	444.13	1,863.70	20.00	34.36
J-39	2,002.04	3,611.79	J-282	12.62	444.18	1,863.70	20.00	34.35
J-4	1,002.04	3,872.88	J-282	11.05	440.55	1,842.43	20.00	51.12
J-40	2,002.04	3,433.13	J-282	13.52	446.27	1,863.50	20.00	33.77
J-41	2,002.04	3,228.13	J-282	14.51	448.57	1,863.50	20.00	34.36
J-42	2,002.04	3,264.17	J-282	14.34	448.17	1,863.30	20.00	33.13
J-43	2,002.04	2,497.66	J-282	17.7	455.93	1,863.30	20.00	33.07
J-44	2,002.04	2,729.10	J-282	16.75	453.74	1,863.50	20.00	35.80
J-45	2,002.04	2,226.96	J-282	18.74	458.33	1,863.70	20.00	28.77
J-46	2,002.04	1,759.18	J-46	20	396.25	1,759.18	20.00	19.96
J-47	2,002.04	3,501.91	J-282	13.17	445.47	1,863.05	20.00	37.85
J-48	1,002.04	2,685.93	J-282	16.93	454.15	1,862.75	20.00	28.96
J-49	1,002.04	2,183.42	J-52	15.56	435.98	1,777.43	20.00	24.42
J-5	1,002.04	1,969.63	J-282	19.57	460.26	1,842.43	20.00	25.10
J-50	1,002.04	1,903.79	J-52	17.65	440.81	1,692.47	20.00	22.31
J-51	1,002.04	1,885.34	J-52	17.63	440.78	1,675.08	20.00	22.32
J-52	1,002.04	14.66	J-52	20	446.25	17.43	20.00	19.96
J-53	1,002.04	2,903.75	J-282	15.95	451.88	1,854.53	20.00	53.34
J-54	1,002.04	2,058.42	J-282	19.31	459.65	1,854.53	20.00	31.15
J-55	2,002.04	3,458.44	J-282	13.4	445.98	1,863.78	20.00	32.39
J-56	2,002.04	2,514.74	J-282	17.63	455.77	1,863.78	20.00	27.78
J-57	2,002.04	1,861.17	J-57	20	431.25	1,861.17	20.00	19.96
J-58	2,252.04	2,649.92	J-282	17.12	454.58	1,869.96	20.00	27.69
J-59	2,252.04	2,243.60	J-282	18.70	458.24	1,869.96	20.00	24.64
J-6	1,002.04	1,952.79	J-282	19.63	460.39	1,842.43	20.00	30.44
J-60	1,002.04	3,958.33	J-282	11.04	440.53	1,893.61	20.00	33.63
J-61	1,002.04	2,356.66	J-282	18.38	457.50	1,893.61	20.00	26.14
J-62	2,002.04	3,323.24	J-282	13.88	447.10	1,843.44	20.00	33.53
J-63	2,002.04	3,097.34	J-282	14.97	449.61	1,843.44	20.00	32.59
J-65	2,002.04	3,529.96	J-282	13.09	445.28	1,871.05	20.00	32.59
J-66	2,002.04	2,895.84	J-282	16.12	452.27	1,877.45	20.00	30.10
J-67	2,002.04	2,016.79	J-282	19.49	460.06	1,864.01	20.00	22.18
J-68	1,002.04	3,249.31	J-282	14.21	447.86	1,840.50	20.00	33.27
J-69	1,002.04	263.41	J-69	20	421.25	263.41	20.00	19.96
J-7	1,002.04	4,101.20	J-282	9.76	437.57	1,841.17	20.00	50.51
J-71	1,002.04	99.37	J-71	20	426.25	99.37	20.00	19.92

2026 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm)	Critical Node ID	Critical Node Pressure (psi)	Critical Node Head (ft)	Design Flow (gpm)	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-72	1,002.04	2,079.92	J-282	18.29	457.30	1,646.82	20.00	35.09
J-73	1,002.04	3,574.81	J-282	12.19	443.19	1,794.00	20.00	49.90
J-74	1,002.04	2,867.85	J-282	15.49	450.83	1,772.64	20	32.13
J-75	1,002.04	1,053.39	J-75	20	406.25	1,053.39	20	19.96
J-76	1,002.04	1,038.86	J-76	20	396.25	1,038.86	20.00	20.01
J-77	2,002.04	2,589.63	J-282	14.15	447.72	1,460.47	20.00	33.54
J-78	1,002.04	2,220.45	J-282	16.3	452.70	1,460.47	20	42.82
J-79	1,002.04	26.62	J-79	20	421.25	26.62	20	19.96
J-8	1,002.04	85.12	J-8	20	321.25	85.12	20.00	19.96
J-80	1,002.04	1,779.98	J-282	18.57	457.94	1,460.47	20.00	34.30
J-83	2,002.04	2,612.54	J-282	13.90	447.14	1,451.15	20	33.73
J-85	1,002.04	3,018.09	J-282	16.15	452.35	1,976.22	20	24.29
J-86	1,002.04	3,032.41	J-282	16.11	452.24	1,978.52	20.00	24.31
J-87	1,002.04	1,641.98	J-87	20	446.25	1,641.98	20.00	19.97
J-88	1,002.04	1,628.73	J-88	20	356.25	1,628.73	20.00	19.98
J-89	1,002.04	2,024.88	J-282	18.48	457.74	1,638.77	20.00	33.92
J-90	1,002.04	2,017.05	J-282	18.49	457.75	1,633.67	20.00	35.26
J-91	1,002.04	350.36	J-91	20	376.25	350.36	20	19.97
J-92	1,002.04	373.42	J-91	14.97	364.61	350.36	20	25.15
J-93	1,002.04	1,631.48	J-282	19.98	461.20	1,625.49	20	20.21
J-94	1,002.04	1,627.71	J-282	19.93	461.09	1,609.60	20	20.76
J-95	1,002.04	2,071.58	J-282	18.02	456.67	1,591.72	20	42.28
J-96	1,002.04	1,998.55	J-282	18.22	457.12	1,569.20	20	41.57
J-97	1,002.04	398.60	J-97	20	326.25	398.60	20	19.96
J-99	1,002.04	1,730.79	J-282	19.46	460.00	1,591.72	20	27.98

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2036 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Max Flow at hydrant to Maintain Minimum System Pressure at 20 psi	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-1	1,002.17	1,554.05	J-1	20	441.25	1,554.04	20.00	19.98
J-10	1,002.17	3,513.78	J-282	11.94	442.60	1,643.75	20.00	51.02
J-100	1,002.17	1,462.67	J-282	19.98	461.20	1,457.18	20.00	20.32
J-101	2,002.17	3,142.16	J-282	6.61	430.30	1,190.48	20.00	33.34
J-102	2,002.17	3,254.74	J-282	6.69	430.48	1,238.01	20.00	33.34
J-103	2,002.17	3,150.36	J-282	11.04	440.52	1,442.88	20.00	29.02
J-104	1,002.17	3,204.63	J-282	15.13	449.98	1,867.08	20.00	24.83
J-105	2,002.17	1,773.53	J-282	18.63	458.08	1,442.88	20.00	23.09
J-106	2,002.17	1,349.69	J-106	20	446.25	1,349.69	20.00	19.96
J-108	1,002.17	2,958.09	J-282	4.51	425.44	1,042.41	20.00	44.50
J-109	1,002.17	3,541.86	J-282	-2.21	409.89	1,044.95	20.00	59.11
J-11	2,002.17	3,332.75	J-282	13.19	445.49	1,676.81	20.00	41.97
J-110	2,002.17	1,830.64	J-282	14.9	449.46	1,041.08	20.00	31.15
J-111	2,002.17	1,626.49	J-282	16.43	453.00	1,045.35	20.00	31.28
J-112	1,002.17	1,338.37	J-282	18.4	457.55	1,054.92	20.00	28.72
J-113	1,002.17	1,351.68	J-282	18.44	457.65	1,071.55	20.00	30.75
J-114	1,002.17	2,043.00	J-282	13.85	447.03	1,086.53	20.00	49.88
J-115	2,002.17	1,257.69	J-282	18.82	458.51	1,045.35	20.00	25.85
J-116	2,002.17	1,215.35	J-282	19.06	459.08	1,045.35	20.00	26.48
J-117	1,002.17	1,247.25	J-282	18.88	458.66	1,045.35	20.00	31.05
J-118	1,002.17	1,613.64	J-282	17	454.32	1,094.11	20.00	44.45
J-119	1,002.17	1,590.61	J-282	17.23	454.85	1,102.55	20.00	44.50
J-12	2,002.17	2,410.11	J-282	17.41	455.25	1,686.65	20.00	39.01
J-120	1,002.17	1,902.47	J-282	15.27	450.30	1,113.90	20.00	56.56
J-121	1,002.17	1,837.54	J-282	15.5	450.85	1,095.92	20.00	54.10
J-122	1,002.17	2,002.00	J-282	14.21	447.85	1,089.28	20.00	55.11
J-123	1,002.17	1,723.15	J-282	16.75	453.74	1,139.53	20.00	53.28
J-124	1,002.17	1,804.48	J-282	16.56	453.29	1,171.03	20.00	63.56
J-125	1,002.17	1,970.43	J-282	15.86	451.69	1,203.87	20.00	76.04
J-126	1,002.17	2,127.31	J-282	15.06	449.83	1,220.28	20.00	85.45
J-127	1,002.17	2,864.19	J-282	10.28	438.77	1,246.13	20.00	136.62
J-128	1,002.17	3,152.68	J-282	8.14	433.81	1,252.08	20.00	157.29
J-129	1,002.17	2,878.18	J-282	10.99	440.42	1,289.35	20.00	141.59
J-13	2,002.17	2,779.12	J-282	15.86	451.68	1,686.74	20.00	44.97
J-131	1,002.17	2,372.10	J-282	13.42	446.03	1,219.19	20.00	115.47
J-133	1,002.17	1,403.57	J-282	19.07	459.10	1,207.02	20.00	47.82
J-135	1,002.17	1,638.66	J-282	17.81	456.19	1,202.50	20.00	77.04
J-136	1,002.17	1,506.39	J-282	18.52	457.83	1,202.50	20	58.78
J-137	1,002.17	1,381.74	J-282	19.15	459.29	1,202.50	20.00	44.38
J-138	1,002.17	1,318.96	J-282	19.46	460.00	1,202.50	20	36.96
J-139	1,002.17	2,335.84	J-282	13.57	446.38	1,212.39	20.00	129.99

2036 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Max Flow at hydrant to Maintain Minimum System Pressure at 20 psi	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-14	2,002.17	4,014.15	J-282	9.64	437.29	1,686.88	20.00	52.97
J-140	1,002.17	2,339.58	J-282	13.5	446.21	1,208.90	20.00	140.26
J-141	1,002.17	2,110.64	J-282	15	449.69	1,205.77	20	118.11
J-142	1,002.17	2,189.67	J-282	14.45	448.42	1,203.72	20.00	134.78
J-143	1,002.17	1,057.30	J-143	20	56.25	1,057.30	20	19.96
J-144	1,002.17	1,689.49	J-282	17.58	455.65	1,208.90	20	97.69
J-145	1,002.17	648.31	J-145	20	136.25	648.31	20	19.97
J-146	1,002.17	456.10	J-146	20	126.25	456.10	20	19.97
J-147	1,002.17	1,964.65	J-282	15.88	451.73	1,201.37	20	107.09
J-148	1,002.17	1,965.45	J-282	15.87	451.70	1,200.61	20	107.21
J-15	2,002.17	2,345.09	J-282	17.66	455.85	1,686.88	20.00	38.96
J-150	1,002.17	1,794.88	J-282	16.81	453.86	1,190.10	20	79.46
J-151	1,002.17	1,557.04	J-282	18.12	456.89	1,183.76	20	50.76
J-152	1,002.17	97.39	J-152	20	256.25	97.39	20.00	19.96
J-153	1,002.17	1,976.77	J-282	15.8	451.53	1,200.61	20	114.33
J-155	1,002.17	909.26	J-159	9.19	96.24	874.77	20	30.75
J-156	1,002.17	913.24	J-159	0.54	76.25	853.44	20	39.38
J-157	1,002.17	901.76	J-159	8.01	93.51	864.05	20	32.34
J-158	1,002.17	892.57	J-159	0.54	76.25	834.16	20	39.38
J-159	1,002.17	807.78	J-159	20	121.25	807.78	20.00	19.96
J-16	2,002.17	4,511.59	J-282	6.69	430.48	1,687.48	20	54.56
J-160	1,002.17	814.61	J-159	17.71	115.95	807.78	20.00	22.32
J-161	1,002.17	2,364.36	J-282	14.46	448.43	1,292.56	20	122.96
J-162	1,002.17	2,709.73	J-282	12.32	443.48	1,299.08	20.00	127.57
J-163	1,002.17	2,063.11	J-282	16.47	453.09	1,317.96	20.00	94.15
J-164	1,002.17	2,567.07	J-282	13.53	446.28	1,317.96	20.00	113.21
J-165	1,002.17	2,645.53	J-282	12.65	444.25	1,292.56	20.00	129.11
J-166	1,002.17	2,721.46	J-282	12.27	443.37	1,301.04	20.00	127.45
J-167	1,002.17	2,637.43	J-282	12.8	444.60	1,299.08	20	143.6
J-168	1,002.17	2,379.46	J-282	14.44	448.40	1,299.08	20.00	124.47
J-169	1,002.17	2,055.73	J-282	16.33	452.77	1,299.08	20.00	110.05
J-17	2,002.17	3,768.47	J-282	11.01	440.45	1,687.08	20.00	41.96
J-170	1,002.17	1,962.95	J-282	16.84	453.94	1,299.08	20.00	104.08
J-171	1,002.17	1,759.52	J-282	17.9	456.39	1,299.08	20.00	83.05
J-172	1,002.17	1,578.38	J-282	18.88	458.66	1,317.96	20.00	58.57
J-173	1,002.17	1,508.58	J-282	19.19	459.38	1,317.96	20.00	48.16
J-174	1,002.17	1,484.11	J-282	19.3	459.63	1,317.96	20.00	45.11
J-175	1,002.17	1,302.72	J-175	20	221.25	1,302.72	20.00	19.97
J-176	1,002.17	2,227.53	J-282	15.66	451.22	1,328.17	20.00	82.52
J-177	1,002.17	2,068.23	J-282	16.62	453.43	1,337.82	20.00	68.86
J-178	1,002.17	2,037.14	J-282	16.8	453.85	1,340.18	20	66.23

2036 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Max Flow at hydrant to Maintain Minimum System Pressure at 20 psi	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-179	1,002.17	1,860.19	J-282	17.93	456.47	1,375.84	20	48.89
J-18	2,002.17	3,675.76	J-282	11.5	441.60	1,686.89	20.00	40.02
J-180	1,002.17	1,934.44	J-282	17.82	456.20	1,410.96	20.00	48.09
J-181	1,002.17	1,447.08	J-282	18.68	458.19	1,179.64	20.00	39.64
J-185	1,002.17	1,460.20	J-282	17.77	456.10	1,070.21	20	28.65
J-186	1,002.17	724.80	J-186	20	421.25	724.80	20.00	19.96
J-187	1,002.17	391.80	J-187	20	351.25	391.80	20.00	19.97
J-188	1,002.17	63.05	J-188	20	351.25	63.05	20.00	19.96
J-189	1,002.17	26.68	J-189	20	246.25	26.68	20.00	19.96
J-19	2,002.17	3,699.11	J-282	11.38	441.31	1,686.85	20.00	40.09
J-190	1,002.17	3,176.98	J-282	2.28	420.26	1,050.91	20.00	59.08
J-191	1,002.17	3,049.43	J-282	3.7	423.55	1,050.91	20.00	57.15
J-192	1,002.17	3,161.60	J-282	2.45	420.67	1,050.91	20.00	77.41
J-193	1,002.17	3,070.60	J-282	3.47	423.02	1,050.91	20.00	74.33
J-194	1,002.17	2,960.35	J-282	4.67	425.79	1,050.91	20.00	77.04
J-195	1,002.17	2,516.01	J-282	9.17	436.20	1,050.91	20.00	79.17
J-196	1,002.17	74.52	J-196	20	356.25	74.52	20.00	19.96
J-197	1,002.17	3,453.44	J-282	-1.01	412.65	1,049.07	20.00	63.39
J-198	1,002.17	3,655.74	J-282	-3.58	406.72	1,047.04	20.00	65.14
J-2	1,002.17	3,682.48	J-282	11.5	441.59	1,689.89	20.00	49.88
J-201	1,002.17	1,598.63	J-282	18.01	456.65	1,200.03	20.00	71.27
J-202	1,002.17	1,478.20	J-282	18.49	457.76	1,176.62	20.00	44.49
J-203	1,002.17	1,293.17	J-282	19.49	460.08	1,185.63	20.00	28.96
J-205	1,002.17	1,287.67	J-282	19.52	460.14	1,185.93	20.00	28.53
J-21	2,002.17	2,252.24	J-282	18.01	456.66	1,685.38	20.00	30.98
J-216	1,002.17	1,298.45	J-216	20	301.25	1,298.45	20.00	19.96
J-217	1,002.17	1,729.56	J-216	-30.19	185.19	1,298.45	20.00	76.96
J-218	1,002.17	1,787.38	J-216	-37.82	167.54	1,298.45	20.00	92.36
J-219	1,002.17	1,479.40	J-216	0.4	255.91	1,298.45	20.00	40.42
J-22	2,002.17	4,276.34	J-282	8.11	433.76	1,686.92	20.00	52.11
J-220	1,002.17	2,779.89	J-282	15.24	450.25	1,600.14	20.00	46.23
J-221	1,002.17	2,386.49	J-282	16.79	453.82	1,564.67	20.00	42.13
J-222	1,002.17	2,322.89	J-282	13.6	446.46	1,208.34	20.00	139.64
J-223	1,002.17	31,522.96	J-223	20	371.25	31,523.43	20.00	19.96
J-224	1,002.17	3,271.94	J-282	13.08	445.24	1,630.69	20.00	49.75
J-225	1,002.17	1,926.95	J-282	17.56	455.61	1,367.36	20.00	54.73
J-226	1,002.17	1,979.79	J-282	17.13	454.61	1,344.57	20.00	61.44
J-227	2,002.17	2,044.13	J-282	13.1	445.30	1,030.62	20.00	26.84
J-228	1,002.17	1,960.55	J-282	14.31	448.09	1,074.48	20.00	44.92
J-229	1,002.17	2,015.48	J-282	14.07	447.53	1,086.97	20.00	49.53
J-23	1,002.17	3,433.32	J-282	12.36	443.59	1,643.75	20.00	50.59

2036 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Max Flow at hydrant to Maintain Minimum System Pressure at 20 psi	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-230	1,002.17	1,792.51	J-282	15.74	451.40	1,089.28	20.00	51.32
J-232	1,002.17	3,106.26	J-282	3.31	422.67	1,054.25	20.00	53.93
J-233	1,002.17	2,883.64	J-282	5.7	428.19	1,054.49	20.00	49.52
J-234	1,002.17	2,676.78	J-282	7.79	433.02	1,054.44	20.00	52.28
J-235	1,002.17	1,422.36	J-235	20	421.25	1,422.36	20.00	19.96
J-236	1,002.17	2,665.78	J-282	16.56	453.31	1,725.59	20.00	28.74
J-237	2,002.17	2,152.29	J-282	18.33	457.4	1,672.71	20.00	31.46
J-238	2,002.17	2,317.45	J-282	17.77	456.09	1,686.71	20.00	34.03
J-239	2,002.17	2,122.38	J-282	18.51	457.8	1,686.71	20.00	31.10
J-24	2,002.17	3,301.71	J-282	13.4	446	1,684.36	20.00	35.63
J-240	2,002.17	2,879.49	J-282	15.42	450.65	1,686.83	20.00	39.23
J-241	2,002.17	1,333.32	J-241	20	451.25	1,333.32	20.00	19.97
J-242	2,002.17	1,071.50	J-242	20	453.25	1,071.50	20.00	19.97
J-243	2,002.17	1,137.69	J-242	19.57	452.25	1,102.38	20.00	20.40
J-244	1,002.17	2,258.77	J-282	18.61	458.03	1,828.82	20.00	21.48
J-245	2,002.17	2,303.40	J-282	11.24	440.98	1,052.62	20.00	51.76
J-246	1,002.17	2,452.64	J-282	9.89	437.87	1,052.62	20.00	52.81
J-247	1,002.17	3,399.60	J-282	-0.08	414.81	1,052.50	20.00	56.66
J-248	2,002.17	1,298.43	J-282	19.73	460.62	1,238.01	20.00	20.61
J-249	2,002.17	1,876.65	J-282	19.51	460.11	1,723.56	20.00	21.99
J-25	2,002.17	3,065.05	J-282	14.59	448.74	1,690.43	20.00	31.82
J-250	2,002.17	2,351.59	J-282	17.81	456.18	1,723.56	20.00	26.56
J-251	2,002.17	2,649.52	J-282	16.62	453.43	1,722.86	20.00	28.21
J-252	1,002.17	3,487.33	J-282	12.83	444.67	1,729.83	20.00	31.45
J-253	2,002.17	2,288.90	J-282	17.89	456.37	1,688.79	20.00	26.54
J-255	2,002.17	1,816.06	J-282	19.59	460.31	1,691.29	20.00	21.83
J-257	2,002.17	2,348.74	J-282	17.66	455.84	1,689.41	20.00	27.14
J-258	2,002.17	2,491.84	J-282	17.1	454.54	1,691.29	20.00	27.56
J-259	2,002.17	2,812.46	J-282	15.75	451.42	1,692.30	20.00	28.98
J-26	2,002.17	3,125.93	J-282	14.32	448.11	1,692.62	20.00	32.03
J-260	2,002.17	1,303.00	J-260	20	431.25	1,303.00	20.00	19.97
J-261	2,002.17	1,844.62	J-282	19.49	460.07	1,688.30	20.00	22.50
J-262	2,002.17	2,316.43	J-282	17.78	456.12	1,688.30	20.00	26.93
J-263	2,002.17	3,004.00	J-282	14.81	449.26	1,682.08	20.00	32.47
J-264	2,002.17	2,314.52	J-282	17.77	456.10	1,684.78	20.00	28.48
J-265	2,002.17	2,812.93	J-282	15.7	451.30	1,684.78	20.00	30.05
J-267	2,002.17	2,296.62	J-282	17.85	456.28	1,686.38	20.00	30.00
J-268	1,002.17	2,566.61	J-282	16.97	454.25	1,725.59	20.00	27.11
J-269	1,002.17	3,161.75	J-282	14.38	448.24	1,725.59	20.00	29.17
J-27	2,002.17	3,232.59	J-282	13.91	447.16	1,706.89	20.00	30.87
J-270	1,002.17	1,999.25	J-282	19.1	459.16	1,725.59	20.00	23.05

2036 Fire Flow Scenario

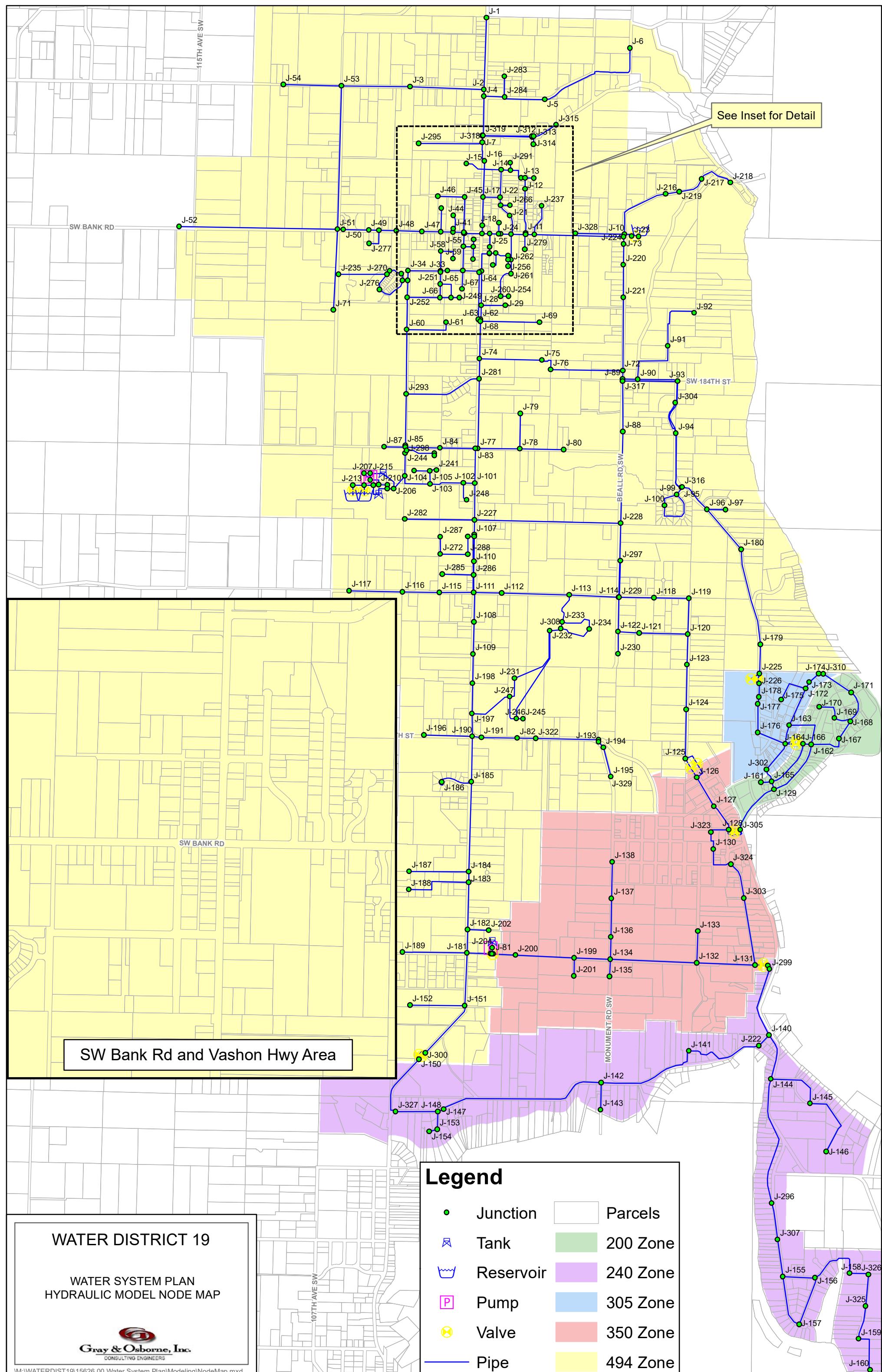
ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Max Flow at hydrant to Maintain Minimum System Pressure at 20 psi	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-271	1,002.17	2,120.01	J-282	18.67	458.18	1,725.59	20.00	24.34
J-272	2,002.17	1,334.19	J-282	18.29	457.29	1,034.44	20.00	23.59
J-276	1,002.17	2,174.45	J-282	18.48	457.73	1,725.59	20.00	25.52
J-277	1,002.17	1,725.83	J-282	19.95	461.13	1,709.50	20.00	20.28
J-278	1,002.17	2,108.34	J-282	18.65	458.13	1,709.50	20.00	24.09
J-28	2,002.17	3,366.93	J-282	13.14	445.38	1,696.11	20.00	34.38
J-281	1,002.17	2,623.65	J-282	15.81	451.55	1,591.71	20.00	29.65
J-283	1,002.17	95.64	J-283	20	391.25	95.64	20.00	19.98
J-284	1,002.17	2,563.37	J-282	16.8	453.85	1,689.71	20.00	39.95
J-285	2,002.17	971.28	J-285	20.00	443.25	971.28	20.00	19.98
J-286	2,002.17	1,577.27	J-282	16.76	453.75	1,043.16	20.00	28.51
J-287	2,002.17	1,078.62	J-282	19.77	460.71	1,034.44	20.00	20.52
J-288	2,002.17	1,904.60	J-282	14.28	448.02	1,034.44	20.00	29.34
J-291	2,002.17	166.64	J-291	20	391.25	166.64	20.00	19.96
J-292	2,002.17	3,139.51	J-282	14.1	447.61	1,672.71	20.00	35.97
J-293	1,002.17	3,894.56	J-282	11.01	440.46	1,766.42	20.00	31.59
J-295	1,002.17	2,041.03	J-282	18.81	458.49	1,688.28	20.00	33.58
J-296	1,002.17	1,046.28	J-159	11.33	101.21	1,014.11	20.00	28.71
J-297	1,002.17	1,413.81	J-282	18.19	457.07	1,086.97	20.00	32.60
J-298	1,002.17	1,905.69	J-282	19.76	460.71	1,828.82	20.00	20.37
J-299	1,002.17	2,364.62	J-282	13.37	445.91	1,212.20	20.00	134.09
J-3	1,002.17	2,901.13	J-282	15.39	450.59	1,697.42	20.00	52.87
J-30	2,002.17	3,181.76	J-282	14.01	447.4	1,686.83	20.00	33.69
J-302	1,002.17	1,852.03	J-282	17.57	455.64	1,317.96	20.00	81.58
J-303	1,002.17	2,165.01	J-282	14.95	449.57	1,230.51	20.00	88.04
J-304	1,000.00	1,601.93	J-282	19.55	460.22	1,480.28	20.00	25.00
J-307	1,000.00	966.60	J-159	10.91	100.23	935.43	20.00	29.03
J-309	2,000.00	7,590.26	J-282	-16.42	377.03	1,708.61	20.00	190.06
J-31	2,002.17	3,276.58	J-282	13.73	446.74	1,711.05	20.00	30.97
J-311	1,000.00	4,056.67	J-282	9.4	436.74	1,686.35	20.00	51.39
J-312	1,000.00	4,758.37	J-282	5.14	426.88	1,686.35	20.00	174.87
J-319	1,000.00	3,975.82	J-282	9.86	437.81	1,686.35	20.00	51.11
J-32	2,252.17	3,565.42	J-282	12.32	443.49	1,715.00	20.00	33.23
J-321	1,000.00	3,753.13	J-282	10.97	440.36	1,674.16	20.00	43.62
J-322	1,000.00	2,755.31	J-282	6.79	430.70	1,048.74	20.00	55.94
J-323	1,000.00	3,027.95	J-282	9.03	435.87	1,245.66	20.00	151.99
J-324	1,000.00	2,657.31	J-282	11.65	441.95	1,235.10	20.00	128.83
J-325	1,000.00	822.24	J-159	17.84	116.25	815.72	20.00	22.12
J-326	1,000.00	842.60	J-159	14.38	108.25	825.53	20.00	25.57
J-33	2,252.17	3,587.29	J-282	12.22	443.27	1,716.88	20.00	33.27
J-34	1,002.17	3,658.86	J-282	11.91	442.54	1,723.40	20.00	33.43

2036 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Max Flow at hydrant to Maintain Minimum System Pressure at 20 psi	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-35	2,002.17	3,558.66	J-282	12.32	443.49	1,710.70	20.00	34.81
J-39	2,002.17	3,554.74	J-282	12.34	443.53	1,710.69	20.00	34.80
J-4	1,002.17	3,840.58	J-282	10.64	439.60	1,689.71	20.00	52.25
J-40	2,002.17	3,379.80	J-282	13.22	445.57	1,710.47	20.00	34.30
J-41	2,002.17	3,183.93	J-282	14.17	447.76	1,710.47	20.00	35.13
J-42	2,002.17	3,214.29	J-282	14.02	447.43	1,710.27	20.00	33.76
J-43	2,002.17	2,475.02	J-282	17.26	454.92	1,710.27	20.00	35.30
J-44	2,002.17	2,703.72	J-282	16.32	452.75	1,710.47	20.00	37.63
J-45	2,002.17	2,207.45	J-282	18.29	457.31	1,710.69	20.00	31.64
J-46	2,002.17	1,744.69	J-282	19.89	461.00	1,710.69	20.00	21.11
J-47	2,002.17	3,458.83	J-282	12.82	444.65	1,710.00	20.00	38.61
J-48	1,002.17	2,642.81	J-282	16.58	453.33	1,709.69	20.00	29.88
J-49	1,002.17	2,140.43	J-282	18.54	457.86	1,709.40	20.00	24.62
J-5	1,002.17	1,957.09	J-282	19.11	459.19	1,689.71	20.00	30.39
J-50	1,002.17	1,861.29	J-52	17.62	440.75	1,644.66	20.00	22.34
J-51	1,002.17	1,843.37	J-52	17.61	440.72	1,627.88	20.00	22.35
J-52	1,002.17	14.33	J-52	20	446.25	17.11	20.00	19.96
J-53	1,002.17	2,888.78	J-282	15.47	450.77	1,701.42	20.00	56.70
J-54	1,002.17	2,049.51	J-282	18.83	458.55	1,701.42	20.00	38.42
J-55	2,002.17	3,398.35	J-282	13.13	445.36	1,710.78	20.00	32.82
J-56	2,002.17	2,475.82	J-282	17.26	454.92	1,710.78	20.00	28.89
J-57	2,002.17	1,831.35	J-282	19.61	460.35	1,710.78	20.00	21.87
J-58	2,252.17	2,603.19	J-282	16.78	453.80	1,716.88	20.00	28.48
J-59	2,252.17	2,206.12	J-282	18.33	457.38	1,716.88	20.00	25.87
J-6	1,002.17	1,947.45	J-282	19.14	459.27	1,689.71	20.00	43.56
J-60	1,002.17	3,890.32	J-282	10.82	440.03	1,740.70	20.00	33.89
J-61	1,002.17	2,322.79	J-282	17.99	456.60	1,740.70	20.00	27.48
J-62	2,002.17	3,272.73	J-282	13.57	446.37	1,692.47	20.00	34.11
J-63	2,002.17	3,051.47	J-282	14.63	448.83	1,692.47	20.00	33.31
J-65	2,002.17	3,469.19	J-282	12.83	444.67	1,717.92	20.00	33.00
J-66	2,002.17	2,850.03	J-282	15.77	451.48	1,724.17	20.00	30.87
J-67	2,002.17	1,983.89	J-282	19.1	459.16	1,711.05	20.00	23.79
J-68	1,002.17	3,200.45	J-282	13.89	447.12	1,689.99	20.00	33.88
J-69	1,002.17	260.90	J-69	20	421.25	260.90	20.00	19.96
J-7	1,002.17	4,064.27	J-282	9.37	436.67	1,688.50	20.00	51.41
J-71	1,002.17	98.35	J-71	20	426.25	98.35	20.00	19.96
J-72	1,002.17	2,062.26	J-282	17.84	456.26	1,507.58	20.00	38.75
J-73	1,002.17	3,543.88	J-282	11.77	442.23	1,643.75	20	51.18
J-74	1,002.17	2,828.18	J-282	15.14	450	1,627.52	20	32.94
J-75	1,002.17	1,044.13	J-75	20	406.25	1,044.13	20.00	19.96
J-76	1,002.17	1,030.94	J-76	20	396.25	1,030.94	20.00	20.00

2036 Fire Flow Scenario

ID	Total Demand (gpm)	Available Flow at Hydrant (gpm); maintains 20 psi in water main adjacent to hydrant	Critical Node ID	Critical Node Pressure (psi) at Available Fire Flow	Critical Node Head (ft)	Design Flow (gpm); Max Flow at hydrant to Maintain Minimum System Pressure at 20 psi	Design Pressure (psi)	Design Fire Node Pressure (psi)
J-77	2,002.17	2,554.71	J-282	13.8	446.92	1,340.77	20	34.18
J-78	1,002.17	2,206.36	J-282	15.84	451.63	1,340.77	20	45.26
J-79	1,002.17	26.38	J-79	20	421.25	26.38	20.00	19.96
J-80	1,002.17	1,770.30	J-282	18.1	456.86	1,340.76	20.00	38.62
J-82	1,000.00	2,749.98	J-282	6.84	430.83	1,048.74	20	53.76
J-83	2,002.17	2,577.17	J-282	13.56	446.35	1,332.31	20	34.35
J-85	1,002.17	2,917.18	J-282	16.05	452.11	1,818.88	20.00	24.40
J-86	1,002.17	2,931.16	J-282	16	452.01	1,821.10	20.00	24.42
J-87	1,002.17	1,605.79	J-87	20	446.25	1,605.79	20.00	19.97
J-88	1,002.17	1,617.12	J-282	19.57	460.26	1,499.24	20.00	26.13
J-89	1,002.17	2,007.60	J-282	18.03	456.70	1,500.19	20.00	37.74
J-90	1,002.17	2,001.23	J-282	18.03	456.69	1,495.71	20	39.51
J-91	1,002.17	348.09	J-91	20	376.25	348.09	20	19.97
J-92	1,002.17	371.32	J-91	14.95	364.57	348.09	20	25.17
J-93	1,002.17	1,616.09	J-282	19.53	460.17	1,487.97	20	25.1
J-94	1,002.17	1,612.85	J-282	19.48	460.06	1,473.42	20	25.87
J-95	1,002.17	2,057.23	J-282	17.56	455.60	1,457.19	20	47.04
J-96	1,002.17	1,984.94	J-282	17.75	456.05	1,436.71	20	46.72
J-97	1,002.17	396.91	J-97	20	326.25	396.91	20	19.96
J-99	1,002.17	1,719.22	J-282	19	458.93	1,457.19	20	34.57



APPENDIX G

SEPA CHECKLIST

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. Background

1. Name of proposed project, if applicable:

Comprehensive Water System Plan

2. Name of applicant:

King County Water District 19

3. Address and phone number of applicant and contact person:

John Martinak, General Manager
17630 100th Avenue SW
Vashon Island, WA 98070
(206) 463-9007

4. Date checklist prepared:

June 15, 2022

5. Agency requesting checklist:

King County Water District 19

6. Proposed timing or schedule (including phasing, if applicable):

A capital improvement project plan and schedule is included in the Comprehensive Water System Plan which includes a ten-year and 20-year planning schedule. The project schedule is tentative and schedules are subject to revisions on a project-by-project basis. Timing of projects will depend on funding availability, developer extension scheduling, and water system demand requirements.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

The Comprehensive Water System Plan may be amended as additional needs are identified to meet the water system requirements. The Plan will be updated every ten years in accordance with State Department of Health requirements.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

Environmental review may be required for individual capital projects proposed in the Plan. The environmental information pertinent to each individual project will be evaluated at the time that each project is developed.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

None are known at this time.

10. List any government approvals or permits that will be needed for your proposal, if known.

The Comprehensive Water System Plan must be approved by the State Departments of Health and Ecology and King County.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The proposal concerns the adoption of a new Comprehensive Water System Plan for Water District 19 addressing current and projected water system demands and service area growth. The Plan includes a capital improvements schedule identifying potential

projects to improve capacity and service capability. The Plan meets the requirements of WAC 246-290.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

Water District 19's service area includes approximately 6.2 square miles in the vicinity of the Town of Vashon on Vashon Island and Maury Island in unincorporated King County, Washington. The service area is bounded on the north by SW 160th Street, on the east by Puget Sound, on the west by 115th Avenue SW and 103rd Avenue SW and on the south by Maury Island.

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site:

(circle one): **Flat, rolling, hilly, steep slopes, mountainous, other _____**

Water District 19's service area is predominantly flat with shallow to moderate slopes in areas. Steep slopes of up to 55% exist in the vicinity of Puget Sound and along the banks of some of the waterways in the service area.

b. What is the steepest slope on the site (approximate percent slope)?

Slopes along the banks of Puget Sound are up to 55%.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Soils within the service area consist mostly of glacial till covered by gravelly sandy silt loam, including Alderwood and Everett series, according to the USDA Web Soil Survey.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

None known

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

Pipeline capital projects may require imported backfill, though no significant grading changes are proposed. Grading, backfill, and excavation will be determined on a project-specific basis.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Minor amounts of erosion could occur during excavation for capital projects, so erosion control plans and measures will be evaluated and implemented on a project-by-project basis.

- g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

The capital projects do not propose additions of impervious area, though landcover changes will be evaluated on a project-specific basis.

- h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Erosion control measures will be designed and employed wherever necessary during construction of capital projects on a project-specific basis. Disturbed areas will be restored following construction.

2. Air

- a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

Minor amounts of exhaust from construction equipment may occur during construction of capital projects. This will be evaluated on a project-specific basis.

- b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None known

- c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Construction vehicles and equipment will be properly maintained to minimize emissions to air. No burning of cleared vegetation is anticipated. Measures will be developed and implemented on a project-specific basis.

3. Water

- a. Surface Water:

- 1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Two surface water sources, Beall and Ellis Creeks, flow through the District to Puget Sound. Preservation of water quality within these water bodies and other incidental surface water bodies will be considered on a project-specific basis.

- 2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Project SO-4 (Intake Improvements) will require work adjacent to the surface waters. None of the planning or design for this project has been initiated at this time, and the project will require its own SEPA process at a future time when

design begins. Environmental and permitting requirements will be considered if required on a project-specific basis.

- 3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Not applicable

- 4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

Not applicable

- 5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

Not applicable

- 6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

Not applicable

b. Ground Water:

- 1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

The District operates three groundwater wells. Additional wells may be required in the future to meet future needs of the district.

- 2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

The District operates three groundwater wells. Additional wells may be required in the future to meet future demands, though none are planned at this time.

c. Water runoff (including stormwater):

- 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Runoff rates will be evaluated and mitigation measures will be considered on a project-specific basis.

- 2) Could waste materials enter ground or surface waters? If so, generally describe.

Best management practices will be employed during construction of capital projects on a project-specific basis to prevent groundwater and surface water contamination.

- 3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

Drainage patterns will be evaluated on a project-specific basis.

- d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

Drainage best management practices will be developed and employed on a project-specific basis.

4. Plants

- a. Check the types of vegetation found on the site:

deciduous tree: alder, maple, aspen, other

evergreen tree: fir, cedar, pine, other

shrubs

grass

pasture

crop or grain

Orchards, vineyards or other permanent crops.

wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other

water plants: water lily, eelgrass, milfoil, other

other types of vegetation

- b. What kind and amount of vegetation will be removed or altered?

Most proposed capital projects will occur within developed rights-of-way. Vegetation removal and management will be considered on a project-specific basis.

- c. List threatened and endangered species known to be on or near the site.

None known.

- d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Vegetation preservation and enhancement will be considered on a project-specific basis.

- e. List all noxious weeds and invasive species known to be on or near the site.

Not applicable.

5. Animals

- a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

Examples include:

birds: **hawk, heron, eagle, songbirds, other:**

mammals: **deer, bear, elk, beaver, other:**

fish: bass, **salmon**, trout, herring, shellfish, other _____

- b. List any threatened and endangered species known to be on or near the site.

None known.

- c. Is the site part of a migration route? If so, explain.

Not applicable.

- d. Proposed measures to preserve or enhance wildlife, if any:

Capital improvements projects will be conducted in such a manner to minimize impacts to wildlife.

- e. List any invasive animal species known to be on or near the site.

None known.

6. Energy and Natural Resources

- a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

The District's system components require the use of water, electricity, and fuel.

- b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No.

- c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Not applicable.

7. Environmental Health

- a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

Not applicable.

- 1) Describe any known or possible contamination at the site from present or past uses.

Not applicable.

- 2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

Not applicable.

- 3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

Not applicable.

- 4) Describe special emergency services that might be required.

Not applicable.

- 5) Proposed measures to reduce or control environmental health hazards, if any:

Not applicable – environmental health hazards will be evaluated addressed as required on a project-specific basis.

b. Noise

- 1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Not applicable

- 2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Construction activities may cause temporary increases in noise levels during approved work hours, though no long-term noise impacts are anticipated from any capital projects.

- 3) Proposed measures to reduce or control noise impacts, if any:

Noise reduction methods, such as approved work hours and equipment mufflers, will be implemented as necessary on a project-specific basis.

8. **Land and Shoreline Use**

- a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

Land use within the district is primarily rural residential with some commercial and limited industrial areas. Land use will not be affected.

- b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

Not applicable.

- 1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides,

tilling, and harvesting? If so, how:

Not applicable.

c. Describe any structures on the site.

Not applicable

d. Will any structures be demolished? If so, what?

Not applicable

e. What is the current zoning classification of the site?

Not applicable

f. What is the current comprehensive plan designation of the site?

Rural

g. If applicable, what is the current shoreline master program designation of the site?

Not applicable

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

Some of the District's service area includes steep slope and erosion hazard areas. The capital projects do not propose work in these areas.

i. Approximately how many people would reside or work in the completed project?

Not applicable

j. Approximately how many people would the completed project displace?

None

k. Proposed measures to avoid or reduce displacement impacts, if any:

Not applicable

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The Comprehensive Water System Plan was developed to guide further development of the District's water system in the context of the projected growth and land use dictated by the Town of Vashon and King County ordinances and planning documents.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

Not applicable

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

None

- b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None

- c. Proposed measures to reduce or control housing impacts, if any:

Not applicable

10. Aesthetics

- a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Not applicable – most capital projects will involve only underground pipeline improvements.

- b. What views in the immediate vicinity would be altered or obstructed?

Not applicable

- c. Proposed measures to reduce or control aesthetic impacts, if any:

Not applicable

11. Light and Glare

- a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

None

- b. Could light or glare from the finished project be a safety hazard or interfere with views?

Not applicable

- c. What existing off-site sources of light or glare may affect your proposal?

None

- d. Proposed measures to reduce or control light and glare impacts, if any:

Not applicable

12. Recreation

- a. What designated and informal recreational opportunities are in the immediate vicinity?

Not applicable

- b. Would the proposed project displace any existing recreational uses? If so, describe.

Not applicable

- c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Not applicable

13. Historic and cultural preservation

- a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe.

Not applicable – the historic preservation registers will be consulted on a project-specific basis.

- b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

This will be determined on a project-specific basis.

- c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

The historic preservation registers will be consulted on a project-specific basis during planning.

- d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

Disturbance minimization methods will be employed on a project-specific basis when necessary.

14. Transportation

- a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

Most capital projects are located within Town or County rights-of-way.

- b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

Areas of the District are served by King County Metro.

- c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

None.

- d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private). _____

No.

- e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No.

- f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

None.

- g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

Not applicable.

- h. Proposed measures to reduce or control transportation impacts, if any:

Not applicable.

15. Public Services

- a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

No.

- b. Proposed measures to reduce or control direct impacts on public services, if any.

The proposed capital projects will serve to increase transmission capacity of the District's water system.

16. Utilities

- a. Circle utilities currently available at the site:

electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other _____

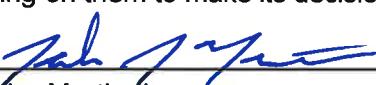
Not applicable.

- b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Not applicable.

C. Signature

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: 

Name of signee John Martinák

Position and Agency/Organization General Manager/Water District 19

Date Submitted: 06/24/2022

D. Supplemental Sheet for Nonproject Actions

(IT IS NOT NECESSARY to use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Water District 19's Comprehensive Water System Plan recommends capital improvements, primarily including replacement of existing piping. All proposed projects will be completed in compliance with all county, state and federal regulations and District Standards. It is anticipated that these capital improvements will cause no discharge to water, emissions to air, or long-term noise impacts. Production, storage, or release of toxic or hazardous substances is not anticipated.

Proposed measures to avoid or reduce such increases are:

Noise reduction during construction will be employed. Additionally, any other impacts to water or air will be evaluated on a project-specific basis.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

No work will be performed in streams, lakes, or marine waters, and no impacts are anticipated on marine life. Any urban runoff or erosion will be controlled using best management practices developed on a project-specific basis. The capital improvements developed in the Plan will be implemented mainly within developed rights-of-way and will not replace natural habitat areas.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

Protection methods will be considered and developed on a project-specific basis. For any project, individual SEPA documentation will be developed to determine potential impacts and identify mitigation measures. Native vegetation will be restored wherever possible following construction and lower impact construction techniques, such as trenchless construction, may be considered.

3. How would the proposal be likely to deplete energy or natural resources?

The capital projects are not anticipated to deplete energy or natural resources, as most projects include replacement of existing facilities.

Proposed measures to protect or conserve energy and natural resources are:

Conservation methods will be considered and developed on a project-specific basis, such as energy-efficient pumps.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

The siting of public facilities such as transmission and distribution piping will take into account environmentally sensitive areas. Most capital projects are located within existing rights-of-way, so environmental impacts will be limited. A SEPA document will be prepared for each project.

Proposed measures to protect such resources or to avoid or reduce impacts are:
Resource protection and impact mitigation methods will be developed and implemented on a project-specific basis.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Effects to land use will be determined on a project-specific basis. Most projects will occur within existing rights-of-way, limiting impact to undeveloped areas. Projects are not proposed to occur within shoreline areas. Projects will be completed in compliance with state, town, county, and federal regulations, including District resolutions.

Proposed measures to avoid or reduce shoreline and land use impacts are:
Land use and shoreline impact reduction will be evaluated on a project-specific basis.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

The proposed capital projects will may cause minor short-term traffic disruption during construction but will not change traffic patterns or volumes long-term.

Proposed measures to reduce or respond to such demand(s) are:
Traffic disruption will be evaluated and mitigated on a project-specific basis.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

All capital projects will be completed in compliance with state and federal regulations and Town ordinances. SEPA documentation will be completed for each project.

APPENDIX H

WATER USE EFFICIENCY DOCUMENTATION



Date Submitted: 4/18/2019

Water Use Efficiency Annual Performance Report - 2018

WS Name: WATER DISTRICT 19

Water System ID# : 38900

WS County: KING

Report submitted by: Jamie Hatton

Meter Installation Information:

Estimate the percentage of metered connections: 100%

If not fully metered - Current status of meter installation:

Production, Authorized Consumption, and Distribution System Leakage Information:

12-Month WUE Reporting Period: 01/01/2018 To 12/31/2018

Incomplete or missing data for the year? No

If yes, explain:

Distribution System Leakage Summary:

Total Water Produced and Purchased (TP) – Annual Volume	118,315,704 gallons
Authorized Consumption (AC) – Annual Volume	102,538,775 gallons
Distribution System Leakage – Annual Volume TP – AC	15,776,929 gallons
Distribution System Leakage – Percent DSL = [(TP – AC) / TP] x 100	13.3 %
3-year annual average	12.7 %

Goal-Setting Information:

Date of Most Recent Public Forum: _____ Has goal been changed since last performance report? No

Note: Customer goal must be re-established every 6 years through a public process

WUE Goals:

Customer Goal (Demand Side):

Describe Progress in Reaching Goals:

Customer (Demand Side) Goal Progress:

The District has implemented a new and steeper stepped rate structure for water consumption that is year round that went into effect February 2019. The District continues to see water consumption increase during dry years, and is considering the implementation in the future, of EPA Water Sense rebates for replacing old and inefficient irrigation systems and controllers.

Additional Information Regarding Supply and Demand Side WUE Efforts

Include any other information that describes how you and your customers use water efficiently:

Our upcoming comprehensive plan includes the replacement of aging and deteriorating infrastructure that have shown a history of leakage and brown water incidences. The upcoming main replacement will add additional hydrants to a half mile of main road that does not currently include hydrants for fire protection. We will also be replacing a similar length of main that has been the source of 7 leaks in the last 2 years.

Do not mail, fax, or email this report to DOH



King County

Water Reclamation Evaluation Checklist For Systems with 1,000 or more Connections

The County and State recognize that changing conditions could initiate a need to respond in new ways to future water quality standards, wastewater discharge requirements, take advantage of advances in treatment technologies and/or allow our region to be positioned to respond to changes associated with climate change and population growth.

In 2003, Chapter 90.46 of the Revised Code of Washington (RCW) was amended to require public water systems serving 1,000 or more connections to evaluate opportunities for reclaimed water when completing their water system plans. Please use this checklist to meet King County consistency requirements in responding to this legislation.

Water System Name: King County Water District #19

Date: December 2016

PWS ID# 38900R

Contact: Jeffrey Lakin

Please use this checklist, including the inventory template, to ensure that your water system plan includes sufficient information about opportunities for reclaimed water and your system's efforts to develop those opportunities. If a question is not applicable or the information is unavailable, then answer, "unknown" or "n/a." King County will consider the checklist completed if each answer is filled in with the best available information, even if the utility states that it is not aware of any reclaimed water opportunities within its service area.

1. Identifying Potential Future Demand for Reclaimed Water: King County maintains a database and map of potential reclaimed water users for evaluating future projects. Please use the template below, or similar table, to provide information to assist King County in further researching these potential uses.

• **Large Utility Water Users** (choose one):

- Attached is an inventory of twenty large (above 20,000 gallons/month on average), non single-family residential, water users served by our utility that have a potential for reclaimed water use, or
- Attached is an inventory of our utility's top twenty water users, or
- The information requested is unknown or not available.

Additional Comments: _____

• **Large Self Suppliers** (choose one):

- Attached is an inventory of large, self-supplied water users within our water utility's service boundaries - especially those near wastewater treatment plants, mainlines, outfalls, and pump stations or similar reclaimed water facilities), or
- The information requested is unknown or not available.

Additional Comments: _____

• **Other** (choose one):

- Attached is an inventory of other water users (such as those that are clustered near one another and could be served by a single system) that may be likely candidates for reclaimed water use, or
- The information requested is unknown or not available.

Additional Comments: _____

2. **Environmental Commitment:** Are you a city/town, or providing water service to a city/town, that has made commitments within resource management plans, salmon recovery plans, or other environmental initiatives for which there is a potential opportunity for using reclaimed water to assist in meeting commitments? (choose one)

Yes, here are plans that have potential for reclaimed water use in our service area to meet the above commitments:

The information requested is unknown, not available.

Additional Comments: _____

3. **Identifying Areas of Potential Use of Reclaimed Water for Environmental Benefit:**

Below are *examples* of uses of reclaimed water ***that comply with State, Federal and other reclaimed water environmental, health and safety standards***. All of these uses are currently in effect somewhere in Washington State. To the best of your knowledge, are any of these potential uses for reclaimed water applicable to your area?

River Augmentation (choose one):

Yes, our water rights are limited by instream flows. For more information, King County may contact:

The information requested is unknown, or not available.

Additional Comments: _____

Groundwater Recharge (choose one):

Yes, we withdraw water from an aquifer that is in a groundwater management area, or from a declining aquifer, where water levels may need to be replenished or to maintain aquifer storage. For more information, King County may contact:

The information requested is unknown, or not available.

Additional Comments: _____

Water Rights Mitigation (choose one):

Yes, our area is pursuing, or planning to pursue, new or additional water rights, and there may be an opportunity to use reclaimed water for mitigation of those new water rights. For more information, King County may contact:

The information requested is unknown, or not available.

Additional Comments: _____

Potential Areas of Environmental Need (choose one):

Yes, parts of our service area include potential environmental enhancement locations, such as wetlands enhancement, aquifer recharge, stream flow augmentation, that might be candidates for reclaimed water use. For more information, King County may contact:

The information requested is unknown, or not available.

Additional Comments: _____

4. **Local Reclaimed Water Legislation:** If water reclamation is mandated for this water system through local government agreement, contract, local regulations, ordinances, or other mechanisms, please provide a copy of the governing mechanism (choose one).

Yes, local legislation exists in our area in support of reclaimed water use. The following relevant legislation is attached (please list titles of documents):

No water reclamation legislation exists, or is known to exist, at a local level in our service area.

5. **Coordination with Local Wastewater Utility:** Include a brief description of your interactions with any wastewater or reclaimed water utility (King County or other) adjacent to your service area to evaluate any potential opportunities to develop reclaimed water (choose one).

Describe if applicable:

None. Additional Comments: _____

**Template for
Inventory of Water Users and Identification of Potential Reclaimed Water Users**

Site Owner or Site Name	Site Address (for general mapping purposes)	Estimated Annual Water Use	Water uses not requiring potable water ¹	Is this a Potential Reclaimed Water Customer?
Vashon School Dist 402	9329 SW Cemetery Rd	665,900 gal		
Mathews Company	9740 SW Bank Rd	245,100 gal		
Island Spring	18846 103rd Ave SW	183,500 gal		
Mark Leonard	19120 Vashon Hwy SW	151,900 gal		
Evergreen Village	17200 97th Pl SW	112,800 gal		
Dan Baty	9005 SW Quartermaster Dr	90,800 gal		
	18025 Vashon Hwy SW	81,000 gal		
Vashon Terrace	17206 97th Pl SW	80,300 gal		
Vashon Household	17305 96th Pl SW	73,400 gal		
Mary Jo Barrentine	17601 Vashon Hwy SW	70,800 gal		
Vashon Household - RB	103rd Ave SW & SW 178th St	69,700 gal		
LID Enterprises	9914 SW 188th St	67,400 gal		
Stretch Technology Inc	17639 100th Ave SW	65,500 gal		
Vashon Household - JG Commons	17300 96th Pl SW	65,200 gal		
Vashon Allied Arts	19704 Vashon Hwy SW	63,400 gal		
Karen Chachkes	21720 Monument Rd SW	60,300 gal		
Redside Partners	10106 SW Bank Rd	57,900 gal		
Pacific Research	10221 SW 188th St	54,200 gal		
Homeport Condos	17320 97th Pl SW	51,500 gal		
Vashon Park District - Pool	9526 SW 204th St	50,000 gal		

¹ See Washington State Reclamation and Reuse Standards, September 1997, Section 1, Articles 1-5 for allowable uses of reclaimed water.
<http://www.ecy.wa.gov/PROGRAMS/WQ/reclaim/standards.html>



AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

American Water Works Association.
Copyright © 2014, All Rights Reserved.

[?] Click to access definition
[+] Click to add a comment

Water Audit Report for: King County Water District 19 (38900R)
Reporting Year: 2015 1/2015 - 12/2015

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED

<----- Enter grading in column 'E' and 'J' ----->				Master Meter and Supply Error Adjustments			
Volume from own sources:	[+]	[?]	7	114.869	MG/Yr	Pcnt:	Value:
Water imported:	[+]	[?]	n/a		MG/Yr	[+]	[?]
Water exported:	[+]	[?]	n/a		MG/Yr	[+]	[?]

WATER SUPPLIED: 114.869 MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Billed metered:	[+]	[?]	8	99.820	MG/Yr	Pcnt:	Value:
Billed unmetered:	[+]	[?]	n/a		MG/Yr	[+]	[?]
Unbilled metered:	[+]	[?]	n/a		MG/Yr	[+]	[?]
Unbilled unmetered:	[+]	[?]	4	1.140	MG/Yr	[+]	[?]

AUTHORIZED CONSUMPTION: 100.960 MG/Yr

Click here: [?] for help using option buttons below

Pcnt: Value: 1.140 MG/Yr

Use buttons to select percentage of water supplied
OR
value

Pcnt: Value: 0.25% MG/Yr

0.50% MG/Yr
0.25% MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

13.909 MG/Yr

Apparent Losses

Unauthorized consumption: [+] [?]

0.287 MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies: [+] [?]

0.502 MG/Yr

Systematic data handling errors: [+] [?]

0.250 MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: [?]

1.038 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: [?]

12.871 MG/Yr

WATER LOSSES: 13.909 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: [?]

15.049 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains: [+] [?]

37.4 miles

Number of active AND inactive service connections: [+] [?]

1,465

Service connection density: [?]

39 conn./mile main

Are customer meters typically located at the curbstop or property line?

Yes

(length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: [+] [?]

67.8 psi

COST DATA

Total annual cost of operating water system: [+] [?]

\$265,831 \$/Year

Customer retail unit cost (applied to Apparent Losses): [+] [?]

\$2.78 \$/100 cubic feet (ccf)

Variable production cost (applied to Real Losses): [+] [?]

\$2,314.00 \$/Million gallons

Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 68 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

- 1: Volume from own sources
- 2: Customer metering inaccuracies
- 3: Unauthorized consumption

APPENDIX I

WATERSHED REPORT

**Watershed Control Plan
Water District 19
Vashon Island, Washington**

June 10, 2008

Prepared for
King County Water District 19

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1	Water Quality Monitoring Frequency

1.0 INTRODUCTION

This Watershed Control Program has been prepared for King County Water District 19 (the District) to supplement their 2007 Comprehensive Plan, prepared by PACE Engineers. This report is intended to meet the watershed control program requirements outlined in WAC 462-290.

1.1 WATERSHED CONTROL PROGRAM

The District currently uses surface water from Beall and Ellis creeks within their district as a source for drinking water. Control over these creeks and their associated drainage basins helps protect the land over which the water travels and thus protects the water supply. Land development and the actions of residents can affect the watershed by changing its physical structures, altering vegetation, and by impairing the water quality. Implementing controls on the land within the watershed helps protect the area that water travels over and through and regulates the movement of sediment, nutrients, pathogens and toxins within the system.

A water control program is designed to evaluate the watershed and implement controls on the system to protect the source water for the communities that utilize it. As specified in WAC 462-290, a watershed control program should address:

- Watershed Description and Characteristics
- Identification of Activities and Land Uses Detrimental to Water Quality
- Watershed Management and Control Measures
- Monitoring Program
- System Operations.

2.0 WATERSHED CONTROL PROGRAMS

2.1 AREA CHARACTERISTICS

The District is Vashon Island's largest water provider and encompasses a service area of over six square miles. For purposes of water quality planning, Beall and Ellis Creeks are both in the state Water Resource Inventory Area (WRIA) number 15, known as the Kitsap Peninsula and Islands watershed. These creeks are located 2 miles apart on the eastern side of Vashon Island and their basins drain directly into the Puget Sound. For use in this report, the term "watershed" refers to the hydrologic drainage basin up gradient of the District's surface water intake. Specific watershed descriptions are described further in this report. Site locations for the Beall and Ellis Creeks are shown in Figure 1.

2.2 BEALL CREEK WATERSHED

The Beall Creek watershed is located in the SW ¼ - SE ¼ of Sec 29 T23N and R03E, one half mile east from the Vashon downtown area. The watershed encompasses a drainage area approximately 174 acres (King County, 2005). It consists of one main channel with no named or distinguishable tributaries or water bodies. A map of the watershed's location and drainage basin delineation is shown on Figure 2.

Beall Creek is predominantly spring fed from the Island's primary aquifer which has a static water table of approximately Elevation 190 ft (MSL) in the watershed area (PACE, 2007). The creek flows in a north-east direction through a steep canyon and drains directly into the Puget Sound. The area is mostly forested, dominated by Douglas-fir with hemlock, alder, maples and some madrone. Understory vegetation consists mainly of sword ferns, salmonberry, and blackberry. This area of Vashon Island receives approximately 40 inches of rain per year with cool dry summers and mild wet winters (PACE, 2007).

The zoning within this area is either rural area or urban reserve, with only one dwelling unit per five acres. The steep canyon slopes restrict development, leaving most of the area in its natural wooded condition. There is currently no industrial or commercial use, golf courses, logging, or agricultural practices within the watershed. Figure 3 shows the identified land use zoning within the watershed.

2.2.1 IDENTIFICATION OF ACTIVITIES AND LAND USES DETRIMENTAL TO WATER QUALITY

Properties not owned by the District are private residences with homes or undeveloped lots off of 91st Avenue Southwest or Southwest Soper Road which follows the canyon to the northeast. Activities

that have the potential to affect water quality within this watershed are those derived from rural private residences. Activities affecting the watershed may include:

- Land alteration: Includes vegetation removal, construction and parcel development, new roads, increases in impervious surfaces, and roadway improvement.
- Stormwater runoff: Consists of water entering the streams over compacted soil or impervious surfaces, mostly due to roads, driveways, and parking lots.
- Septic tank leakage: Occurs when tanks are not maintained and sewage is released into the drain field. Sewage can seep into the groundwater or to the surface.
- Pets and livestock: There is no documented agriculture within the area; however, homeowners may have pets and livestock.
- Fertilizers, herbicides and pesticides: Use of chemicals in landscaping, particularly lawns. Chemicals have the potential to enter the system through storm water runoff, especially if the chemical application is not within the recommended guidelines.

These types of activities can result in the following environmental problems:

- Bacterial contamination (including E. coli)
- Temperature elevation
- Reduced dissolved oxygen
- Nutrient overloading
- Increase in suspended sediments
- Increase in phosphorous loading.

2.2.2 BEALL CREEK WATERSHED MANAGEMENT AND CONTROL MEASURES

The primary land owner in the Beall Creek watershed is the District. Property under District control is protected to ensure water quality and prevent development and land alterations. Access to the District's property and the surface water intake is restricted and gated at both the north and south ends. The District continues to acquire additional land parcels within the watershed as they become available to increase the amount of protected land. The District also visually monitors the watershed, walking through and observing its condition and any changes.

The zoning designation allowing one dwelling unit per five acres greatly restricts the amount of homes and the development that can occur on land not controlled by the District. Additionally, the steep canyon slopes prevent land development and alterations and maintain a heavily vegetated riparian buffer

between the creek channel and dwellings at higher elevations. Figure 3 shows land zoning and property ownership within this area.

Despite the canyon's steep slopes the District has had no known landslide events within the watershed. Most of this area is under the District's ownership which prevents land alterations and vegetation removal that can increase erosion. It also allows them to directly respond to any major landslide event within this area and to evaluate its impact on water quality.

Private property owners may have pets and livestock; however, animals are regulated under King County Code, 21A.30.010 through 21A.30.60. The code regulates livestock to minimize the impact on the environment, partially in regards on water quality. These regulations set allowed animal densities and require the implementation of best management practices for minimizing water pollution from livestock.

2.3 ELLIS CREEK WATERSHED

The Ellis Creek watershed is located in the NW ¼ of Sec 27 T23N and R3E near the Ellsport community on the east side of the island. Ellis Creek has a drainage area of 508 acres (King County 2005) and consists of several small channels with no named tributaries or distinguishable water bodies. A map of the watershed's location and drainage basin delineation is shown in Figure 4.

The headwaters of Ellis Creek start in a wooded area near Vashon Island School District property and flows in a south-east direction to Tramp Harbor in Puget Sound. A small tributary creek from the south joins the main channel near the harbor. The watershed is primarily spring fed from Vashon Island's sole source aquifer which in this area is estimated at about Elevation 25 ft, MSL (PACE, 2007). The area is mostly forested, dominated by Douglas-fir with hemlock, alder, maples and some madrone. Understory vegetation consists mainly of sword ferns, salmonberry, and blackberry. This area of Vashon Island receives approximately 40 inches of rain per year with cool dry summers and mild wet winters (PACE, 2007).

The zoning designations within this area are rural, allowing only one dwelling unit per five or ten acres. Most of the area is in its natural wooded condition. There are currently no industrial uses, golf courses, logging, or agricultural practices within the watershed. The northwestern section of the Ellis Creek drainage area, near the creek's headwaters, contains several public schools with sports fields.

2.3.1 IDENTIFICATION OF ACTIVITIES AND LAND USES DETERIMENTAL TO WATER QUALITY

Properties not owned by the District are primarily private residences with homes, undeveloped lots, or public areas with schools. Activities that have the potential to affect water quality within this

watershed are those derived from rural private residences and from the schools, especially sports fields. Activities affecting the watershed may include;

- Land alteration: Includes vegetation removal, construction and parcel development, new roads, increases in impervious surfaces, and roadway improvement.
- Stormwater runoff: Consists of water entering the streams over compacted soil or impervious surfaces, mostly due to roads, driveways, and parking lots.
- Septic tank leakage: Occurs when tanks are not maintained and sewage is released into the drain field. Sewage can seep into the groundwater or to the surface.
- Pets and livestock: There is no documented agriculture within the area; however, homeowners may have pets and livestock.
- Fertilizers, herbicides and pesticides: Use of chemicals in landscaping, particularly lawns. Chemicals have the potential to enter the system through storm water runoff, especially if the chemical application is not within the recommended guidelines.

These types of activities can result in the following environmental problems:

- Bacterial contamination (including E. coli)
- Temperature elevation
- Reduced dissolved oxygen
- Nutrient overloading
- Increase in suspended sediments
- Elevated phosphorus loading.

2.3.2 ELLIS CREEK WATERSHED MANAGEMENT AND CONTROL MEASURES

The District owns most of the property at the lower section of the basin, where the creek drains into Tramp Harbor. This area is protected to ensure watershed integrity and prevent development and land alterations. Access to the District's property and the surface water intake is restricted and gated at both the east and west ends. The District continues to acquire additional land parcels within the watershed as they become available to increase the amount of protected land. The District also visually monitors the watershed, walking through and observing its condition and any changes.

The zoning of one dwelling unit per five and ten acres greatly restricts the amount of homes and the development that can occur on land not controlled by the District. Much of the area remains densely wooded, especially around the creek's channels, which create a vegetated buffer between the creek,

schools, and many of the homes and cleared areas near the basin's borders. Figure 5 shows land zoning and property ownership within this area.

There are some areas within the upper reaches of the main channel with steep slopes where landslides can potentially occur, however, the District has had no known landslide events within the watershed. Most of this area is heavily forested, undeveloped, or under the District's ownership which restricts vegetation removal or land alteration.

Private property owners may have pets and livestock; however, they are regulated under King County Code, 21A.30.010 through 21A.30.60. The code is designed to regulate livestock in a manner that minimizes their impact on the environment, partially in regards to water quality. The regulations set densities and require the implementation of best management practices for minimizing non-point pollution source from livestock.

3.0 WATERSHED MONITORING AND SYSTEM OPERATIONS

3.1 WATERSHED MONITORING

Water flow and precipitation levels for Beall and Ellis Creeks are monitored daily at their respective pumping stations. From the pumping stations, raw water is pumped to the water treatment plant where it is combined and included with backwash water from the recycle pond. This combined raw water, listed as Washington State Department of Health (WDOH) Source # S05, is monitored prior to treatment in accordance with WDOH specifications. The water quality monitoring requirements from the District's WDOH water quality monitoring report for the year 2008 is shown in Table 1.

The District has an established coliform monitoring plan on file at the District office; it includes testing sites and information regarding their public notification process. In addition to their current water monitoring requirements, the District will begin testing for *E. coli* and *cryptosporidium* under the Long Term 2 Enhanced Surface Water Treatment Rule (LT2 rule).

3.2 SYSTEM OPERATIONS

Both the Beall and Ellis Creek pump stations pump raw water from the creeks to a 13,000 gallon tank through two pumps located at the water treatment plant. The pump stations are linked through a telemetry line to the treatment plant which controls the water pumps. This provides the operator with access to the on/off control at both pump stations (PACE, 2007). The District inspects the pumping stations on a daily basis and routinely conducts preventive maintenance such as servicing pumps and motors. System readings and stream conditions are documented daily such as stream flow and the amount of precipitation. The pump station's daily maintenance checks are documented and include:

- Indicator lights, gauges, and switches
- Motor vibration, temperature, oil and packing
- Piping, stream and basin condition
- Pump operation (i.e., which pump is on), amperage, and pumping rate.

In addition to daily checks, the pump stations are also inspected every Friday for safety equipment such as eyewash stations, heaters, fans and vents, and overall cleanliness and organization.

4.0 WATERSHED WATER QUALITY PROGRAM IMPLEMENTATION

As stated in the District's *Water System Plan* (Water System Plan) under its Environmental Policy (E-1): "The District will steward the 104 acres of natural watershed area it currently owns using the best available science and advice to manage the surface water sources and the habitat within these watershed." In addition to the property already under their stewardship, the District is currently working on purchasing additional land parcels, and plans will continue to purchase properties in the watershed as they become available. This puts land and the water that flows over and through it, under the District's control.

The *Vashon-Maury Island Watershed Plan* (Watershed Plan), written in 2005 by King County Department of Natural Resources and Parks, makes recommendations in the water quality section for protecting the island's water resources. The report recommends that the highest priority in protecting water quality is an education program. Although the report focuses on the Vashon and Maury Islands, recommendations that protect the Beall and Ellis Creek watersheds should be implemented. Educational topics from the Watershed Plan which help protect the Beall and Ellis Creek watersheds include:

- Septic Systems: Increase awareness regarding septic system maintenance in order to reduce the likelihood of pollution from malfunctioning systems.
- Livestock and Pets: Maintaining control of pets and livestock and their waste as well as the importance of keeping pets and livestock out of wetlands, riparian and aquatic areas.
- Pesticide, Fertilizer and Herbicide Use: The proper use of organic, nontoxic, and short-lived pesticides, herbicides and fertilizers.
- Storm Water Runoff: Education on the importance of maintaining natural vegetation and using erosion control best management practices.

Currently, the District issues annual consumer confidence reports. These reports include information on the system's water quality, water treatment, and water quality standards. These reports, in addition to other information such as the District's water plan, are provided on their website. The District also allows public participation at their regular Board of Commissioners meetings, every second Tuesday of every month. Educational material for protecting the watersheds can be incorporated into these meetings. Invitations to the Commissioners meetings can be directed to residents within and nearby the Beall and Ellis Creek watersheds so the residents can participate in the meetings and receive information regarding their direct impact to their water supply. The consumer confidence report can be expanded to include additional material about protecting the water supply or additional information pamphlets can be sent to target residences, including the school grounds maintenance staff.

5.0 SUMMARY

The two watersheds have water quality protections and controls in place. District ownership of the watersheds provides control over the development in the area, prevents use of the riparian area by livestock and ultimately protects water quality. The District continues to purchase property surrounding Beall and Ellis Creeks when it is available, to enhance their protection and control of water quality. They also visually monitor and check on the watershed's physical condition. Additionally, the current land use zoning designations assist in providing controls, including regulating the number of livestock allowed on properties on Vashon Island.

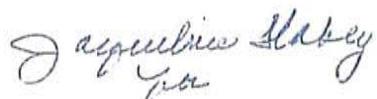
The District continues to monitor water quality based upon the DOH requirements and will begin testing for E coli and cryptosporidium under the LT2 rule. The District also provides opportunities for public input at the monthly Board of Commissioners meeting and also provides additional education through annual consumer confidence reports, which are available on their website.

Additional outreach opportunities could be sought to further education on septic systems and proper use of pesticides, targeting the property owners in the vicinity of the watersheds.

The District takes the responsibility of being good stewards of their watersheds very seriously, and pursues opportunities to increase ownership of the watersheds. They will continue to monitor and maintain their water sources and take the steps necessary to ensure the public within their service area a safe and secure water supply.

This report has been prepared for the exclusive use of King County Water District 19 for specific application to the Watershed Control Plan. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of Landau Associates. Further, the reuse of information, conclusions and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

LANDAU ASSOCIATES, INC.



Jessica C. Stone
Staff Scientist



Eric F. Weber, L.G.
Principal

EFW/JCS/jas

6.0 REFERENCES

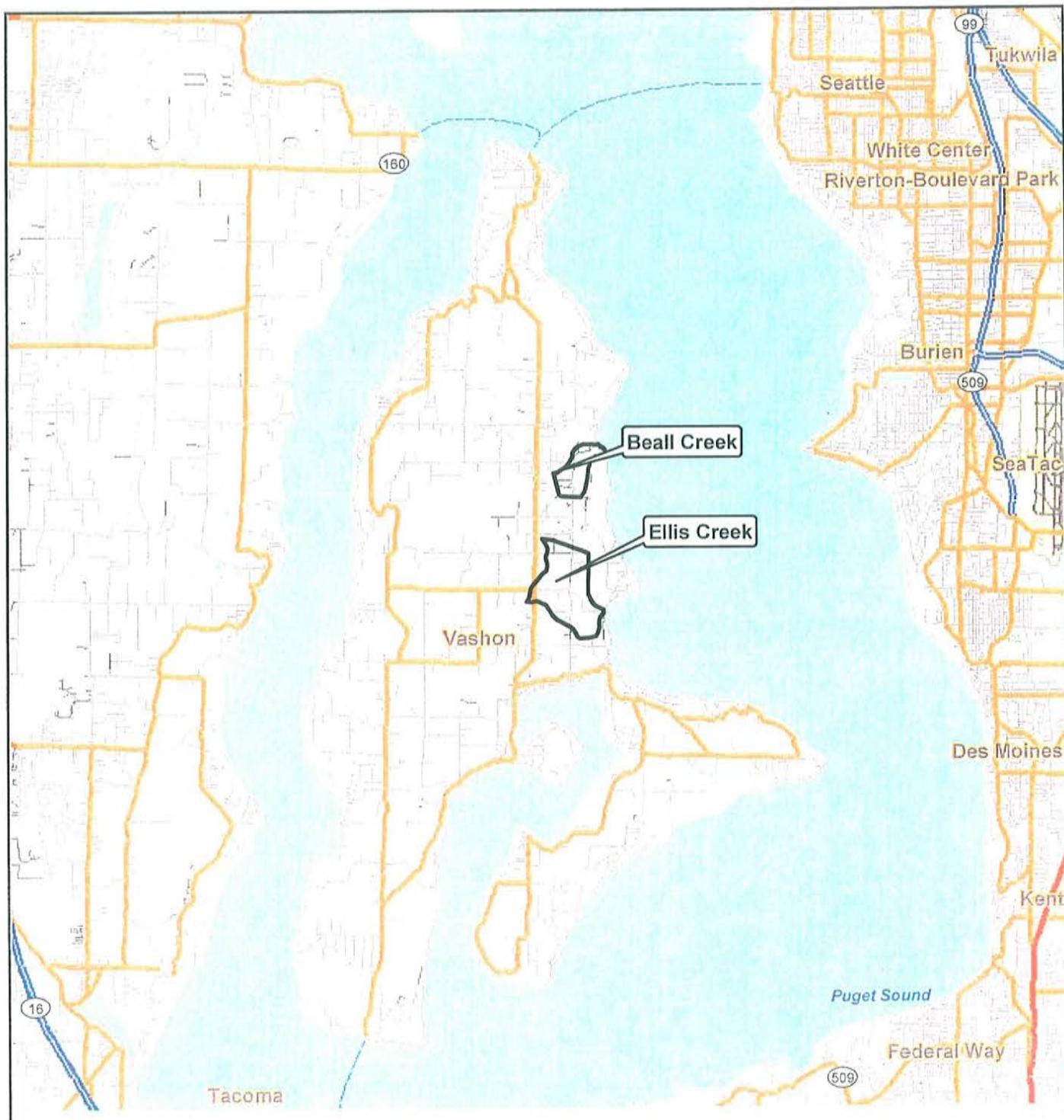
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King County Department of Natural Resources and Parks. 2008. *Vashon-Maury Island Watershed Plan.* June 6.

King County Code. Passed December 17, 2007. *Section 21A.30 Development Standards – Animals, Home Occupation, Home Industry.*

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PACE Engineers. 2007. *Water District 19, 2007 Comprehensive Plan. Draft.*



Data Source: ESRI 2006

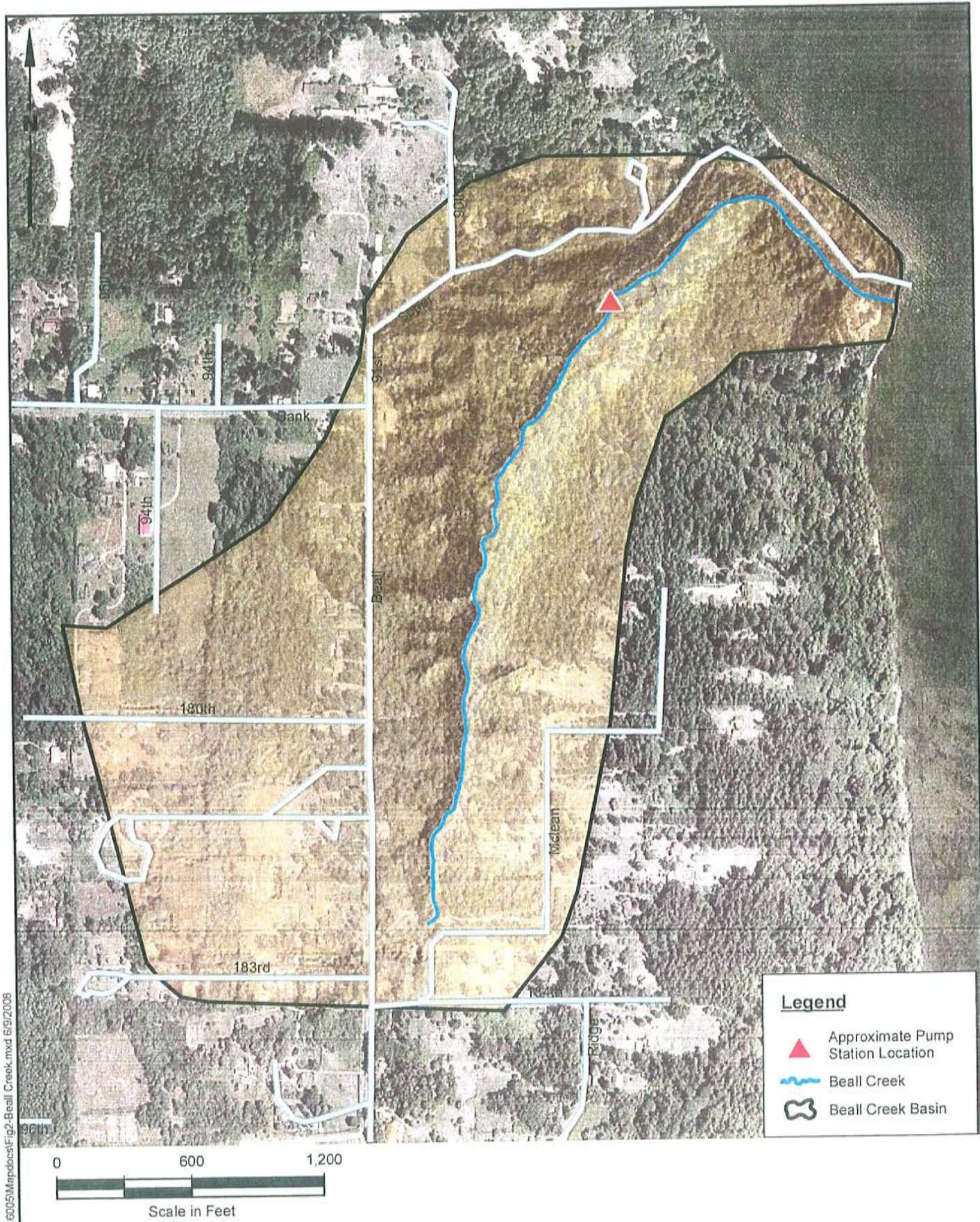
Water District 19
Watershed Control Plan
Vashon Island, Washington

Vicinity Map

Figure 1



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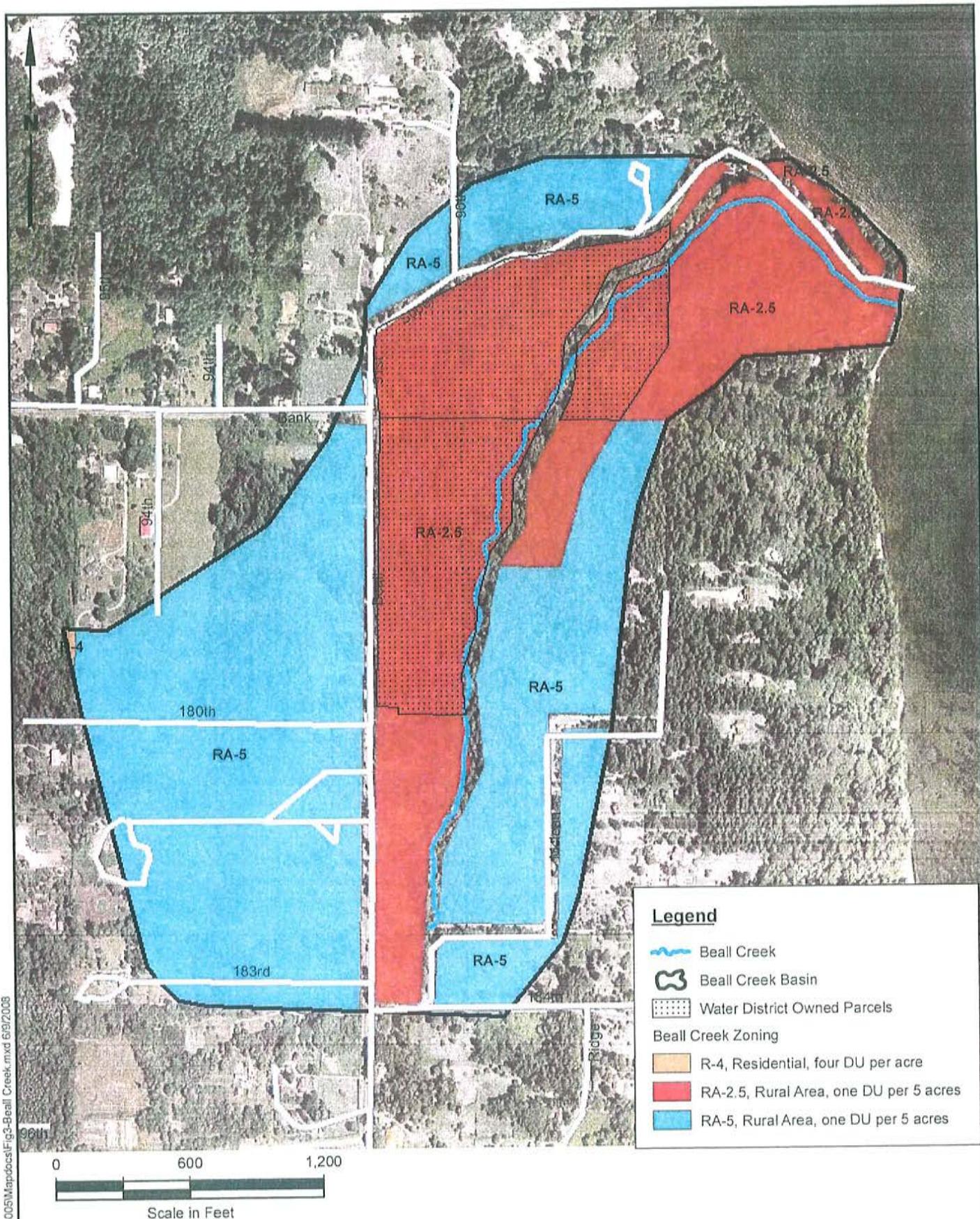


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Water District 19
Watershed Control Plan
Vashon Island, Washington

Beall Creek Basin
Topography and Pump Station
Location

Figure
2

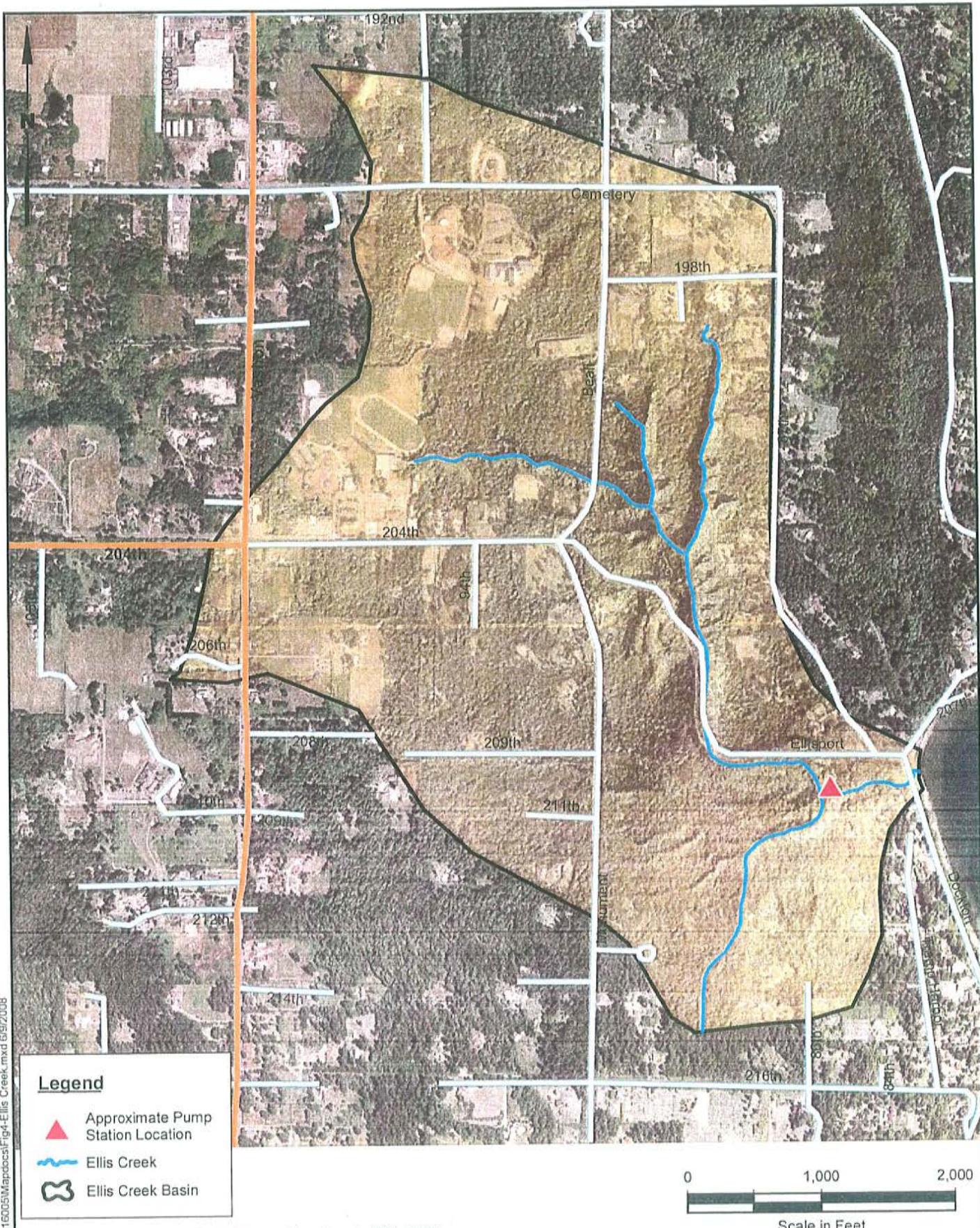


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Water District 19
Watershed Control Plan
Vashon Island, Washington

**Beall Creek Basin
Zoning and Parcel Ownership**

Figure
3



Data Source: King County GIS; ESRI

A horizontal scale bar with tick marks at 0, 1,000, and 2,000.

Scale in Feet

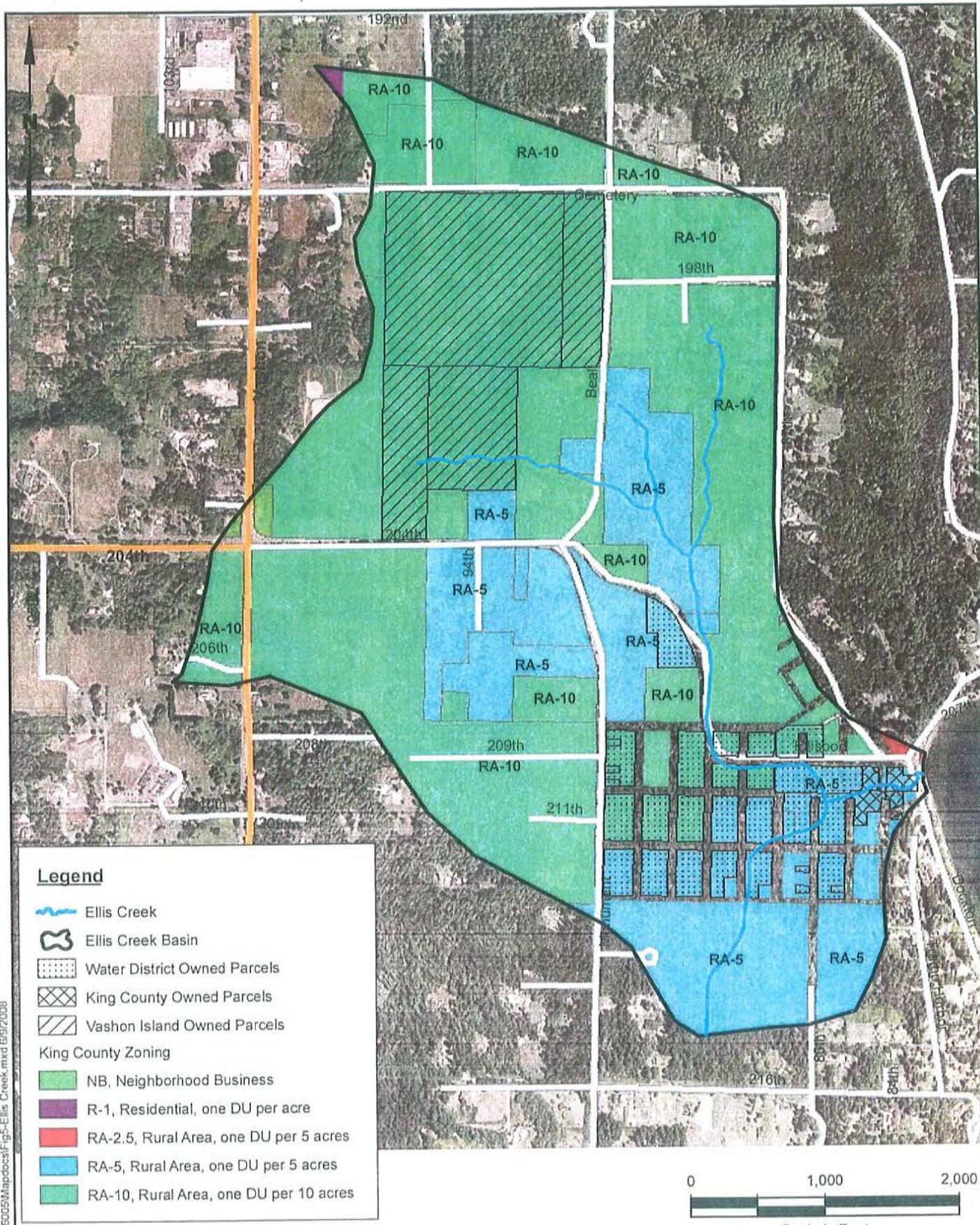
Water District 19
Watershed Control Plan
Vashon Island, Washington

Ellis Creek Basin
Topography and Pump Station
Location

Figure
4



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Data Source: King County GIS; ESRI

Water District 19
Watershed Control Plan
Vashon Island, Washington

**Ellis Creek Basin
Zoning and Parcel Ownership**

Figure
5



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TABLE 1
WATER QUALITY MONITORING FREQUENCY
KING COUNTY WATER DISTRICT 19

Monitoring Group	Test Panel	Sample Location	Schedule/Status
Asbestos	ASB	Distribution	Collect 1 Asbestos sample in 2009
Bacteriological	Coli	Distribution	Collect monthly from representative points within the distribution system
Dioxin	Dioxin	All Sources	State Waver Thru Dec 2010
Endothall	Endo	All Sources	State Waver Thru Dec 2010
EDB and other soil fumigants	Fumigant	DOH Source S05	State Waiver Thru Dec 2010
Glyphosphate	Glyphs	All Sources	State Waiver Thru Dec 2010
Herbicides	Herbs	DOH Source S05	1 Sample between Jan 2008 - Dec 2010
Insecticides	Insect	DOH Source S05	1 Sample between Jan 2008 - Dec 2010
Inorganic contaminants	IOC	DOH Source S05	1 Sample every year
Lead/Copper	LCR	Distribution	LCR 1 set of 10 samples between Jan 2007 - Dec 2009
Nitrate	NIT	DOH Source S05	Collect 1 Nitrate sample in 2008
General Pesticides	Pest1	DOH Source S05	1 Sample between Jan 2008 - Dec 2010
Disquat	Disquat	All Sources	State Waiver Thru Dec 2010
Volatile Organic Contaminants	VOC	DOH Source S05	1 Sample every 1 year

APPENDIX J

CONSUMER CONFIDENCE REPORT

2019 Consumer Confidence Report

Mission:

To provide a sufficient quantity of good quality water at a reasonable cost to our customers, in perpetuity.

Inside this report:

Sources	2
Treatment Process	2
Chlorination	2
Water Quality	3
Test Results 2019	3
Definitions	3
Water Use Efficiency	4
Notable Events 2019	4

For more information:

Water District 19
(206) 463-9007
water19@water19.com

Or

U.S. Environmental Protection Agency
Safe Drinking Water Hotline **1-800-426-4719**
www.epa.gov/safewater

Or

Washington State Department of Health Regional Office **(253) 395-6750**
www.doh.wa.gov/ehp/dw

This Consumer Confidence Report is designed to give you, our customer, an overview of Water District 19's operation and water quality test results for 2019. Now as in previous years you will discover where your water comes from, where it goes and what steps are taken to provide water that is safe to drink every time you turn on the tap. We also highlight some of our accomplishments from 2019 and our direction for 2020.

At Water District 19 we strive to provide our customers with drinking water that meets or exceeds the stringent standards set by the state and federal government. To this end we constantly monitor the water from the water's source all the way to the tap. We have adopted voluntary state health department goals that go well beyond the basic requirements.

The water quality in our distribution system—the pipes that carry the water from our tanks and treatment plant to your home—are regularly monitored for quality control. Monthly samples are taken for analysis and sent to a state certified laboratory to test for coliform bacteria. Additional yearly sampling is done on a schedule dictated by the Washington Department of Health. We are pleased to report that our results indicate a water quality that consistently exceeds US EPA standards. (results of recent analyses are on pages 2 and 3 of this report)

All water quality information is available to the public during office hours (M - F, 8 a.m. to 4 p.m.). This includes all test results from either in-house analysis or from state certified labs. Additionally, the Washington State Department of Health Office of Drinking Water maintains a comprehensive database of every water system in the state. Called Sentry Internet, can be accessed at: <https://fortress.wa.gov/doh/eh/portal/odw/si/Intro.aspx>

Water District 19's system I.D. is **38900**. Enter this I.D. number to access all of our records.

If you have any concerns regarding the quality of your water, contact the District office and we will investigate it immediately.

Water Usage and Conservation

There are two aspects of water conservation: the supply side and the demand side. We provide the water, you the customer consume it. On the supply side we are primarily concerned with leaking pipes. Leaks are a result of aging infrastructure. The table below shows our system leakage (supply side). Though we are below the Statewide goal of 10%, we actively survey our system for leaks throughout the year. If you see or suspect a water leak please call our office.

Distribution System Leakage Summary 2019		
Total Water Produced (TP) - Annual Volume	112,747,561	Gallons
Authorized Consumption (AC) - Annual Volume	100,651,287	Gallons
Distribution System Leakage (DSL) - Annual Volume TP - AC	12,096,274	Gallons
Distribution System Leakage - Percent DSL	10.7	%
3 year Annual Average - Percent	10.8	%

Sources for Water District 19

Water District 19 utilizes surface water and groundwater sources. Our surface water comes from Beall and Ellis Creeks and our groundwater comes from our main well field on 103rd Ave. SW, the Morgan Hill Well on SW 216th St. and the Vashon Meadows Well. Water from the creeks is pumped to our Treatment Plant. There the water is filtered and chlorinated before being pumped into the distribution system and the million gallon

storage tank located at our wellfield.

The wellfield on 103rd Ave consists of three wells and two tanks. Pumped groundwater is chlorinated before entering a 625,000 gallon storage tank. This water is transferred to the million gallon tank, where it is blended with surface water. This tank sets the system pressure for our entire distribution system.

Morgan Hill well water is chlorinated and stored in a 100,000 gallon tank on site before

being pumped into the distribution system.. Vashon Meadows water is chlorinated and pumped directly into the system at 196th Avenue SW. Beall Well is blended with surface water and is only used if it is absolutely required to meet high seasonal demand, and then it is blended with treated water.

Creeks supply 60% of annual water consumption and wells provide 40%.

Surface Water Treatment Process

Surface water enters the treatment plant and is treated with National Science Foundation (NSF) certified chemicals which aid filtration. The water then passes through the filtration process. Post filtration, the water is chlorinated and stored in the clear well. Once in the clear well, the water flows through a series of baffles and chambers to provide adequate contact time for disinfection. This contact time ensures the chlorine will be effective against bacteria, viruses and pathogens. Water is then pumped from the clear well into the distribution system.

Water quality is monitored continuously throughout this process. We consistently produce water which meets the Department of Health's Treatment Optimization Program (TOP). TOP goals are more stringent than the treatment requirements set forth by the EPA.



Water District 19 Water Treatment Plant

Chlorination and Disinfection

Liquid sodium hypochlorite is used as our disinfectant. Chlorine is very effective in killing disease-causing pathogens, such as bacteria, viruses, and protozoans. We are required to assure minimum chlorine residuals entering into the distribution system and a measurable chlorine residual throughout. We monitor chlorine concentrations daily as water enters the distribution system and throughout the system. The table below shows the range chlorine concentrations in our system

Chlorine Monitoring Point	Unit	Minimum	MRDL	Average	Range
Entry Into Distribution System	Mg/L	0.20	4.00	0.86	.20 - 1.98
Distribution System Samples	Mg/L	detectable	4.00	0.34	.01 - 1.44



While disinfection helps to maintain the safety of our water, chlorine can react with natural materials to form "Disinfection Byproducts" (DBPs) that may pose a health risk. We have been collecting data on DBPs every year since 2005 and we sample for them quarterly. Though our results are typically below the EPA MCL's*, we continue to investigate ways to reduce their formation.

2019 Disinfectant By-Products Results					
DBP's	Units	MCL	Avg	Max	Min
Total HAA's *	µg/L*	60	34.8	70.0	5.8
Total TTHM*	µg/L	80	55.6	93.0	12.4

* see Definition of Terms page 3

Water Quality Standards

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care pro-

viders. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

In order to ensure that tap water is safe to drink, the Washington State Department of Health (WA DOH) and EPA prescribe regulations which limit the amount of certain contaminants in water provided by public water systems. The Food and Drug Administration regulates contaminants in bottled water.

Contaminants that may be present in source water before treatment include:

Microbial contaminants

Inorganic contaminants

Pesticides and herbicides

Organic chemical contaminants

Radioactive contaminants

WA DOH prescribes the water quality monitoring requirements yearly. See Table below for the most recent results.

Water Quality Test Results 2019

This table shows the most recent data concerning the quality of our drinking water. Sampling is done at the entry point to the distribution system, post treatment. Of the 135 regulated chemicals tested for, we provide data on the chemicals detected. The table does not include the regulated chemicals we tested for but did not detect, including synthetic and volatile organic chemicals such as oils, solvents herbicides and pesticides. If you have any questions regarding Water Quality please give us a call, 206-463-9007.

Contaminant	Units	MCL	Test Result				In Compliance	Typical Source of Contamination
EPA Regulated (Primary)			Well field 103rd	Morgan Hill Well	Beall Well ¹	Surface Water		
Arsenic	mg/L	0.01	0.007	0.0016	0.0026	ND	yes	Erosion of Natural Deposits
Nitrate	mg/L	10	ND	ND	1.3	0.66	yes	Erosion of Natural Deposits, leaching from septic systems
Radium 228	pCi/L	5	<0.9	<.209	0.940	ND	yes	Erosion of Natural Deposits
EPA Regulated (Secondary)								
Hardness (CaCO ₃)	mg/L	-	64	85	76	76	n/a	Erosion of Natural Deposits
Manganese	mg/L	0.05	0.084	0.093	ND	ND	n/a	Erosion of Natural Deposits

¹ Due to arsenic levels in Beall Well (33 ug/L), it is blended with surface water at the plant to well below the MCL. **Results in Table are post treatment.** Beall Well was not operated in 2019 and will only be operated in the future if absolutely necessary to meet system demand.

Coliform bacteria: An indicator for potential disease causing bacteria in water. All samples taken for 2019 were satisfactory.

Arsenic: Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.

Lead and Copper: Lead and copper are typically a result of corrosion of household plumbing systems. The action levels* for lead and copper are 0.015 mg/L and 1.3 mg/L, respectively. We sampled 10 homes and the Vashon School District in 2019. The 90th percentile concentration level for lead was 0.0024 mg/L. One sample was measured above this at 0.0052 mg/L. The 90th percentile concentration level for copper was 0.16 mg/L. Two samples were above this at 0.17 mg/L. Lead and Copper in drinking water is primarily from materials and components associated with service lines and home plumbing. Water District 19 is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at <http://www.epa.gov/safewater/lead>

* Definition of Terms

Maximum Contaminant Level Goal or MCLG: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Maximum Contaminant Level or MCL: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available technology.

Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants (e.g. chlorine, chloramines, chlorine dioxide).

90th Percentile value: The 90th percentile is the value for which 90% of the data points are smaller.

mg/L: Milligrams per liter = parts per million.

µg/L: Micrograms per liter, equal to parts per billion.

pCi/L: PicoCuries per Liter

THM: Trihalomethane, a regulated disinfection by-product.

HAA: Haloacetic Acids, regulated disinfection by-product.

DOH: Washington State Department of Health.

Public Participation Opportunities

Regular Board of Commissioners meetings occur on the second Tuesday of every month at 6:00 p.m. at the District office and are always open to the public. Other special meetings, as scheduled by the Board, are advertised and posted on our website.

Board of Commissioners

Bob Powell, President
Seth Zuckerman, Secretary

Mike Weller

General Manager

Jim McRae

Lead Operator

Helen Westphal

Administrative Offices

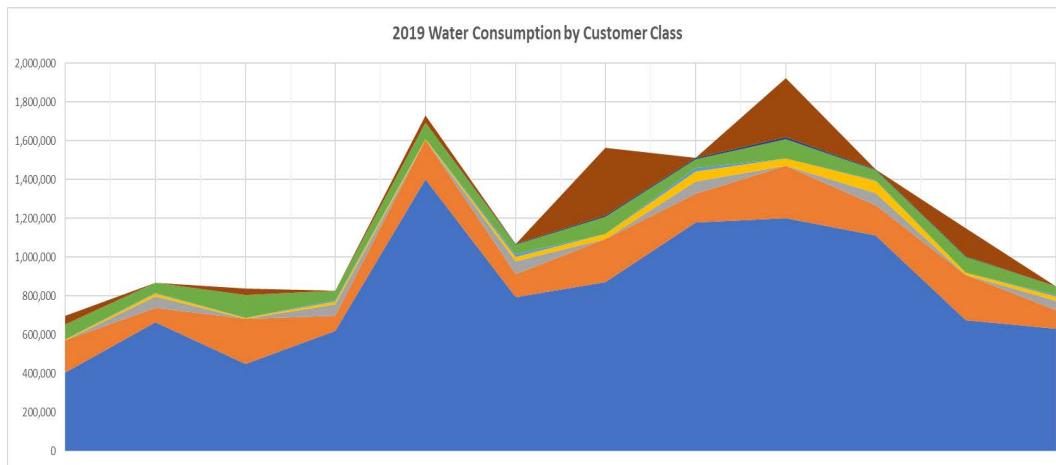
17630 100th Ave. S.W.
P.O. Box T
Vashon, WA 98070

Phone: 206-463-9007
Fax: 206-463-1262

<http://water19.com>

Water Use Efficiency

The demand side is solely a function of the customer's usage. Demand in 2019 increased by 2.6% from last year with each Equivalent Residential Unit (ERU) sold representing 158 gallons per day. Lawn and garden irrigation continue to be the primary source of increased summer demand. Overall use increased by 18 gallons per day throughout the year or 1,080 gallons per billing cycle per ERU sold. Your personal use may be much different than the average, due to your water use patterns. Weather patterns also effect irrigation; during the summer of 2019 we only had 5.45 inches of rain from April through September but got a whopping 11.31 inches in October and experienced higher humidity than normal throughout the summer. However, as a community we used 5,702,000 fewer gallons than the summer of 2018. We thank you, our customers for your continued efforts to conserve water; you have made a difference. Call or stop by our office for more information, as we want to work with you to continue to reduce summer irrigation. With better conservation, we can defer future capital costs to develop new sources and comply with state guidelines by continuing this encouraging trend of summer



Residential Commercial Industrial Public Entity Fire Apartment Non-ERU School



Notable events 2019—What's planned for 2020

In 2019: the District began rehabilitating its water wells, beginning with Well #4 at the main well site. Plans are to continue this practice on each of the three main wells on a three to four-year cycle, depending on each well's specific needs. The District hopes to continue to meet customer demands without having to develop additional water sources, unless island growth requires more water. Demand will ultimately be dependent on island population's growth, plus the success of conservation programs. The District hopes that water conservation will continue to

improve on the island and slow the need for more water sources. In 2019, the Vashon Meadows Class B system customers were connected to the District's water mains and the small community well was connected to supply additional water to the distribution system.

In 2021& 2022, the District plans to replace mains along 216th & Vashon Highway. In 2023, plans are to replace water main on Bank Road. The District will continue replacing old meters with

electronically read meters. Pulling this all together will require that all water sources be integrated into the District's Supervisory Control and Data Acquisition System (SCADA). The District will continue to upgrade and automate its systems. The Commissioners are in the process of submitting its Comprehensive Water System Plan to regulators and our customers in the coming months.

APPENDIX K

SANITARY SURVEY



STATE OF WASHINGTON
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310, Kent Washington 98032-2388

December 12, 2016

JEFF LAKIN
GENERAL MANAGER
WATER DISTRICT 19
17630 100TH AVE SW
VASHON WA 98070

Subject: Water District 19, ID# 38900R
King County
Routine Sanitary Survey 2016

Dear Mr. Lakin:

This letter is in follow up to our routine sanitary survey of the water system on October 21, 2016. The purpose of the sanitary survey is to inspect water system facilities, to review operations & maintenance programs, and to reinforce our long-term relationships. Thank you to Armin (in his last few days employed by the District) and Helen for showing me the system.

I understand the District is motivated to improving water system design and operations in order to provide safe and reliable drinking water. Furthermore, I understand the challenges the District faces in Armin's absence.

The enclosed survey report includes specific action items and key issues we discussed during our visit. Please respond to all items within **30 days**. The response may include a photo, a written response with schedule, or both. Please prioritize identifying a permanent operator in responsible charge. In addition, prioritize protecting any direct openings to the system from contamination.

The Drinking Water Regulations require that all Group A public water systems have a sanitary survey every 3 to 5 years. In order to receive credit for the survey, a sanitary survey fee must be paid. Enclosed is an invoice for \$1,224.00. Please remit your complete payment in the form of a check or money order within thirty days of the date of this letter in the enclosed envelope or send payment to: **DOH, Revenue Section, P.O. Box 1099, Olympia, WA 98507-1099**.

Thank you for all that you do to provide safe and reliable drinking water. Please contact me at (253) 395-6770 if I can be of any assistance to you in answering any questions or in addressing any of these issues and recommendations.

Sincerely,

Brietta Carter, P.E.
NW Drinking Water Operations

RECEIVED

DEC 19 2016

Enclosures

cc: Public Health – Seattle & King County

WATER DISTRICT 19





Office of Drinking Water INVOICE

Engineering, Planning, and Sanitary Survey Review Form

TO: JEFFREY LAKIN
WATER DISTRICT 19
PO BOX T
VASHON WA 98070

ATTN: ACCOUNTS PAYABLE DEPT

Invoice Number	N02500	
Invoice Date	December 12, 2016	
Billing Period	30 days	NW

DATE	DESCRIPTION	QTY	COST	AMOUNT
December 12, 2016	SURVEY FEE WATER DISTRICT 19 KING COUNTY PWS ID 38900 DATE OF SURVEY: 10/21/2016 NWRO Survey	1	1	\$1,224.00
	Total			\$1,224.00
	Payment due within 30 days. Interest shall accrue at 1% per month after 30 days.			
<hr/>				

**Make Checks Payable to Department of Health
Return Lower Portion to:**

Department of Health
PO Box 1099
Olympia, WA 98507-1099

Office of Drinking Water
Engineering, Planning, and Sanitary Survey Review Form

NAME	WATER DISTRICT 19	
INVOICE NUMBER	N02500	
INVOICE DATE	December 12, 2016	NW
AMOUNT	\$1,224.00	

DOH Form #331-332

Return to:
Department of Health
Revenue Section
PO Box 1099
Olympia, WA 98507-1099

For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).



STATE OF WASHINGTON
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310, Kent Washington 98032-2388

ROUTINE SANITARY SURVEY REPORT
October 21, 2016

WATER DISTRICT 19
ID # 38900R, King County

Persons attending

Jeff Lakin, General Manager, Water District 19 (District)
Armin Wahaniak, Operations Lead, Water District 19
Helen Westphal, Operator, Water District 19
Brietta Carter, Washington State Department of Health (DOH)

Last survey 4/13/2011 (see previous survey report for details)

- Collect wellfield (S09) samples from the discharge of the wellfield booster pump station (BPS). Collect arsenic sample at this location. – Complete. 10/31/2011 S09 sample result of 6 parts per billion (ppb).
- Consider reducing the chlorine added to wellfield supply. – Complete.
- If not already present, fit outlet of the 625,000 gallon storage tank with a silt stop. – Complete. Already present.
- Recommend review of security policy, practices, and infrastructure. – Complete. No change. The District does not perceive the low level of historical vandalism as a current risk.
- Cross connection control 15 high-health hazards premises without premise isolation. – Complete. High-hazards have been addressed.
- Work with fire department on proper use of hydrants. – Incomplete – Unable to develop working relationship.

System overview

The system has five wells and two surface water sources, two BPSs, three reservoirs, and one surface water treatment plant, serving five pressure zones. Please refer to the 2007 water system plan for more information.



The District's operator in responsible charge Armin Wahanik fulfills his last day with the District on October 26, 2016. The District designated Helen Westphal as the interim water operator in responsible charge.

Facilities visited during this survey

- Well site
- Morgan Hill site
- Temporary tank site
- S07 32300L/Heights Water Intertie

Water System Plan status

Last plan approval date 04/08/2010, extension requested, next plan in-progress.

Asset management

The District tracks depreciation and cost of replacement for assets with a program they purchased seventeen years ago. This program is not tied to geographic information systems or maintenance tracking. Currently investigating improved options for tracking assets, for example, problem hydrants. Recommend continuing to investigate options for integrating asset management and asset maintenance.

Projects complete

In 2016, the District reconditioned well #1 by injecting carbon dioxide (Figure 1). Localized acidic conditions led to the formation of hydrogen sulfide in the produced water. The District plans to continue to flush to waste until water quality returns to standard prior to putting into service.



Figure 1. Well #1. (Left) Wellhead with sample tap, electrical conduit, and vent. (Right) Well #1 new enclosure.

Projects planned

- Incorporation of the Vashon Meadows well from a group B water system.
- 494 BPS improvements to utilize dead storage in 1 MG and 625,000 gallon storage tanks. Project submitted, but not reviewed at the request of the District.

Well site

The District injects 12.5% hypochlorite (HOCl) solution to the well sources as it enters the 625,000 gallon tank. The BPS transfers 625,000 gallon tank water to the 1MG tank to join surface water sources from the water treatment plant (Figures 2, 3, and 4).

The Well site consists of the following,

- S03, Well #1.
- S04, Well #2.
- S08, Well #4 AKM948.
- S03, S04, S08 hypochlorite treatment facility.
- 1 million gallon (MG) storage tank.
- 625,000 gallon storage tank.

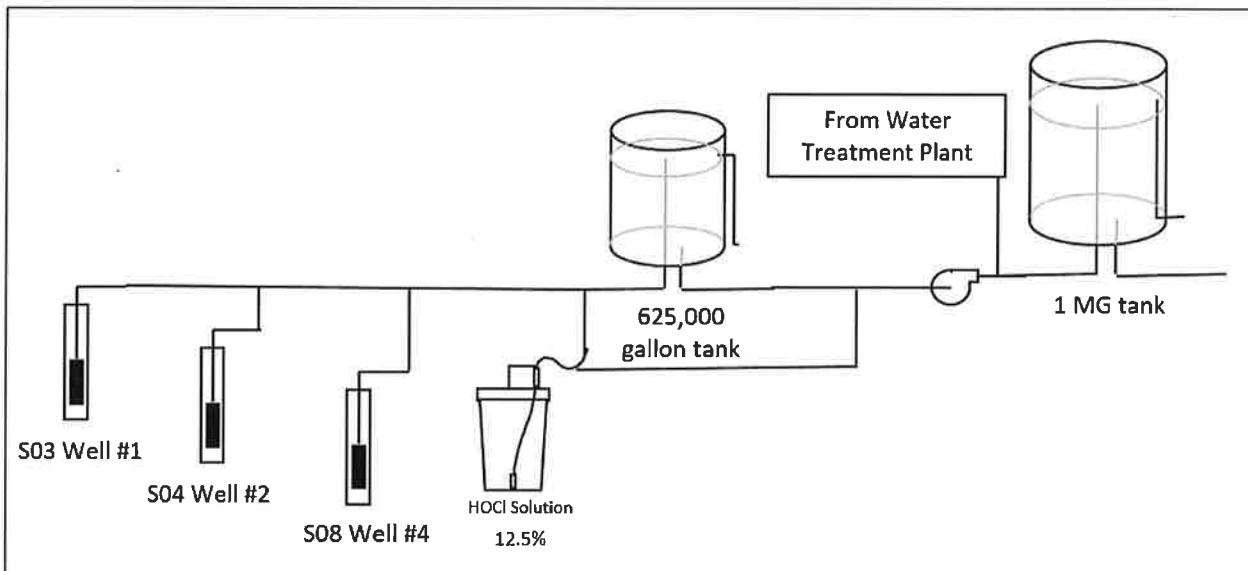


Figure 2. Well site schematic showing source and chlorine input (one HOCl solution tank with two feed pumps) to 625,000 gallon and 1MG storage tanks. Tank inlet position not verified for 1MG tank.



Figure 3. Tank site. (Left) 625,000 gallon tank and 1MG tank. (Right) Each tank overflow to daylight, protected by flapper valves.



Figure 4. Tank site. (Left) 12.5% HOCl solution with two feed pumps. (Right) Transfer pumps.

Water quality in the reservoirs

Both the 625,000 gallon and 1 MG tanks have poor mixing, a large volume of dead storage, and long residence times (5 days for the 625,000 gallon tank). The District included a BPS project to utilize more of their dead space, increase turn over, and potentially reduce their disinfection byproduct (DBP) formation. The District is considering other options to reduce DBP formation, such as installing mixers.

The District collects investigative samples for DBPs, UV254 and total organic carbon to understand water quality of the three storage tanks. Last cleaning and inspection of 625,000 gallon and 1MG tank occurred in 2013 ($\frac{1}{4}$ inch of sediment removed from each).

Water quality in distribution

Distribution sampling includes total coliform, asbestos (nine year), lead and copper, and DBPs. DBPs include Total Trihalomethane (THM) and Halo-Acetic Acids (HAA5). The district collects THM and HAA5 samples quarterly. The maximum contaminant level (MCL) applies to the

running annual average of the quarterly samples. THM MCL = 80 micrograms per liter ($\mu\text{g}/\text{L}$). HAA5 MCL = 60 $\mu\text{g}/\text{L}$.

- Cycle ending December 2015, lead 90th percentile 0.0024 milligrams per liter (mg/L) (0.015 mg/L action level), current copper 90th percentile 0.17 mg/L (1.3 mg/L action level).
- Historical THMs as high as 91 $\mu\text{g}/\text{L}$ (quarterly sample collected in 2013, not comparable to running annual average) and HAA5s as high as 126 $\mu\text{g}/\text{L}$ (quarterly sample collected in 2005, not comparable to running annual average). Most recent running annual average of 39 $\mu\text{g}/\text{L}$ for THM and 18 $\mu\text{g}/\text{L}$ for HAA5.

The flushing program consists of annual flushing of low zones (350 and 240), and annual flushing of one third of high zone (494). Brown water complaints are typically associated with recent hydrant use by the fire department.

Coliform monitoring

Since the last survey in 2011, all samples absent for microbiological contaminants.

District staff are in the process of updating their coliform monitoring plan to reflect the current sample locations and changes to the coliform rule. Regulation requires the District to sample three routine sites per month. In order to provide adequate representation of the distribution system, they cycle through three sets of locations with a total of nine unique routine sample locations. They use DOH publication 331-225, *Coliform Sampling Procedure*.

Emergency preparedness & response

We did not discuss in detail during the survey. The District has an *E. coli* response plan and is in the process of updating the contact information. The well site has a 100 kilowatt back-up power generator with automatic run-ups on Mondays.

Interties

The District has one intertie with Heights Water, which operates both directions. They use the intertie for emergency use only (Figure 5).



Figure 5. Intertie with Heights Water in flooded vault.

Water main break / repair protocol

In the event of water main break or repair, office personnel call affected customers. They provide a schedule of activity and instructions for the customers.

They have a yearly leak detection program, where they cover about one third of the system every year. They input the results to the annual budget requirements for repairs, replacement, or both. The water use efficiency report from 2007 to 2014 indicates 9.2% and 5.2% distribution system leakage respectively. Their efforts continue to improve the integrity of the system.

The District follows the DOH publication, 331-338, *Responding to a pressure-loss event*. Office personnel call affected customers. They collect water quality samples and wait for a satisfactory bacteriological results prior to opening the service connections.

Cross connection control program

The District has addressed all high hazards and will follow-up on any noted changes within the community. No formal notification for changes in building use. The District does not send cross connection surveys to customers. The District continues to identify individuals that have auxiliary wells and take steps to protect their distribution system.

Morgan Hill site

The Morgan Hill site consists of the following (Figure 6),

- S06, Well #3 (100K Tank Site) and hypochlorite treatment.
- 100,000 gallon storage tank and booster station.

Well #3 (S06) meets CT6 requirement with a target chlorine residual of 0.5 ppm at the reservoir discharge.

The District is in the process of integrating the station into their SCADA system.



Figure 6. Morgan Hill site. (Left) Morgan Hill site overview. BPS off screen to the left, 100,000 gallon storage tank, and wellhouse with treatment. (Right) Inside wellhouse. HOCl solution tank and feed pump.

Temporary tank site

The temporary tank site serves six connections at 115th avenue southwest and southwest Bank road and it is physically separated from the rest of the system by air gap (Figure 7). The site consists of the following,

- Storage tank (volume not verified).
- Data logger to measure flow.
- Two 86 gallon Well X Trol pressure tanks with pressure gauge and ASME relief valve. No pressure relief valve between the pressure tank and the shut off valve.
- Portable power generator chained to nearby tree to prevent theft.

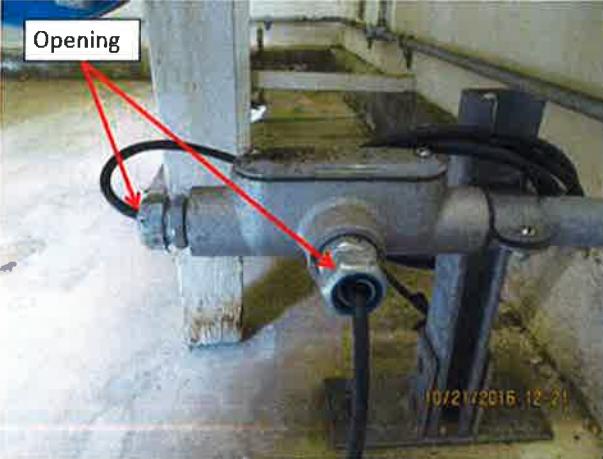


Figure 7. Temporary tank site overview.

The District expects low pressure seasonally (every summer) and plans to install larger diameter mains for the long-term solution.

Recommendations/Directives

Please respond to all items within **30 days**. The response may include a photo, a written response with schedule, or both.

1	<p>Please seal two openings to electrical conduit for Well #2 (S04).</p> 
2	<p>Morgan Hill site –</p> <p>Seal apparent opening in well cap with silicone or caulk to prevent entry of dust, insects, or other contaminants.</p> <p>Please ensure any valve or vent that permits air to enter the well has a 24-mesh screen facing downward.</p> <p>Refer to DOH publication 331-232, <i>Simple fixes for wellhead openings</i> at http://www.doh.wa.gov/portals/1/Documents/pubs/331-232.pdf.</p> 

- 3 Temporary Tank site – Please ensure vents and openings to the storage tank have 24-mesh screen, facing downward to prevent rainwater entry.



- 4 Please retrofit the vent on the 625,000 gallon tank to, a) better prevent rainwater and other windblown contaminants from entering the tank, and b) still provide adequate ventilation (photo from 2013 inspection provided by the District).



- 5 Seal openings in all hypochlorite solution tanks and install air vent. Recommend venting to the outside of the building where applicable.



6	Verify the sanitary integrity of the Morgan Hill tank. Please provide photos of the access hatch and air vent from your next routine inspection. Within 30 days, please provide the date of the next routine inspection. Reoccurring every sanitary survey.
7	Temporary Tank site – Please provide calculations demonstrating that storage and pumping capacity for the remote pumping zone are sufficient to meet the anticipated demand. Refer to email Derek Pell sent on 8/12/2016.
8	Recommend annual inspections of combination air vacuum relief valves and valve vaults.
9	Continue to work with fire department on proper use of hydrants. Consider the level of service the District wants to provide and whether or not that should include brown water complaints resulting in fire department misuse of hydrants.
10	Morgan Hill site – Recommend installing hard board walls. The current insulation provides good home for rodents and represents a health risk to individuals in the facility.
11	Temporary Tank site – Recommend ASME pressure relief between shut off valve and each pressure tank. 

APPENDIX L

CROSS-CONNECTION CONTROL PROGRAM

**WATER DISTRICT
19**

Premise Isolation
Cross-Connection Control Program

Purpose:

The purpose of the Water District #19 cross-connection control program shall be to protect the public water system, as defined in WAC 246-290-010, from contamination via cross-connections.

General:

Except where specifically designated herein, all words used in this procedure shall carry their customary meanings. Words used in the present tense include the future, and plural includes the singular: The word “shall” is always mandatory; the word “may” denotes a use of discretion in making a decision.

Definitions:

“Approved air gap” means a physical separation between the free-flowing end of a potable water supply pipeline and the overflow rim of an open or nonpressurized receiving vessel. To be an air gap approved by the department, the separation must be at least:

- Twice the diameter of the supply piping measured vertically from the overflow rim of the receiving vessel, and in no case be less than one inch, when unaffected by vertical surfaces (sidewalls); and;
- Three times the diameter of the supply piping, if the horizontal distance between the supply pipe and a vertical surface (sidewall) is less than or equal to three times the diameter of the supply pipe, or if the horizontal distance between the supply pipe and intersecting vertical surfaces (sidewalls) is less than or equal to four times the diameter of the supply pipe and in no case less than one and one-half inches.

“Approved atmospheric vacuum breaker” means an AVB of make, model, and size that is approved by the department. AVBs that appear on the current approved backflow

prevention assemblies list developed by the University of Southern California Foundation for Cross-Connection and Hydraulic Research or that are listed or approved by other nationally recognized testing agencies (such as IAPMO, ANSI, or UL) acceptable to the local administrative authority are considered approved by the department.

“Approved backflow preventer” means an approved air gap, an approved backflow prevention assembly, or an approved AVB. The terms “approved backflow preventer,” “approved air gap,” or “approved backflow prevention assembly” refer only to those approved backflow preventers relied upon by the purveyor for the protection of the public water system. The requirements of WAC 246-290-490 do not apply to backflow preventers installed for other purposes.

“Approved backflow prevention assembly” means an RPBA, RPDA, DCVA, DCDA, PVBA, or SVBA of make, model, and size that is approved by the department. Assemblies that appear on the current approved backflow prevention assemblies list developed by the University of Southern California Foundation for Cross-Connection control and Hydraulic Research or other entity acceptable to the department are considered approved by the department.

“Assessment of risk” shall express the results of an evaluation of a health, system, or plumbing hazard. The evaluation required in making a determination of the type of backflow preventer needed to isolate a specific cross connection (e.g., a plumbing fixture), or a group of cross connections contained within a facility or complex of facilities (e.g., a shopping mall) is comprised of the following steps:

- Determine the degree of potential health hazard risk to the public water system. (In assessing the purveyor’s risk of contamination of the public water system, if knowledge of the degree of hazard posed by a substance is not known, the purveyor must assume that it is high. Generally, almost all substances other than potable water are considered a health hazard of some degree).
- Determine the high or low probability that a cross-connection may occur.
 1. The probability increases that an existing cross-connection will go undetected as the complexity of a piping system increases.
 2. Piping changes will create new cross-connections, or change the operating conditions from backsiphonage to backpressure conditions.
 3. A backflow preventer could be by-passed or removed from service.
 4. A substance could be changed or increased in strength.
 5. A substance may deteriorate, and thus become a health hazard.
 6. A substance, when combined with the chemicals in the potable water supply, or when exposed to certain piping material, may react and form a compound that poses a health hazard, such as CO₂ mixing with water to form carbolic acid that leaches copper from a service pipe.
 7. A substance, if it contains a bacteriological contaminant, could become a health hazard long after it enters the potable water supply, through bacteria re-growth.

- Determine the risk level acceptable to the purveyor, and
- Determine the reliability required of the backflow preventer.

“Authorized agent” means any person who:

- Makes decisions regarding the operation and management of a public water system whether or not he or she is engaged in the physical operation of the system;
- Makes decisions whether to improve, expand, purchase, or sell the system; or
- Has discretion over the finances of the system.

“Backflow” means the undesirable reversal of flow of water or other substances through a cross-connection into the public water system or consumer’s potable water system.

“Backflow assembly tester” means a person holding a valid BAT certificate issued in accordance with chapter 246-292 WAC.

“Backpressure” means a pressure (caused by a pump, elevated tank or piping, boiler, or other means) on the consumer’s side of the service connection that is greater than the pressure provided by the public water system and which may cause backflow.

“Backsiphonage” means backflow due to a reduction in system pressure in the purveyor’s distribution system and/or consumer’s water system.

“Combination fire protection system” means a fire sprinkler system that:

- Is supplied only by the purveyor’s water;
- Does not have a fire department pumper connection; and
- Is constructed of approved potable water piping and materials that serve both the fire sprinkler system and the consumer’s potable water system.

“Consumer” means any person receiving water from a public water system from either the meter, or the point where the service line connects with the distribution system if no meter is present. For purposes of cross-connection control, “consumer” means the owner or operator of a water system connected to a public water system through a service connection.

“Consumer’s water system” as used in WAC 246-290-490, means any potable and/or industrial water system that begins at the public water system point of delivery; that is, at the immediate downstream side of the water meter, and is located on the consumer’s premises. The consumer’s water system includes all auxiliary sources of supply, storage, treatment, and distribution facilities, piping, plumbing, and fixtures under the control of the consumer.

“Contaminant” means a substance present in drinking water that may adversely affect the health of the consumer or the aesthetic qualities of the water.

“Cross-connection” means any actual or potential physical connection between a public water system or the consumer’s water system and any source of nonpotable liquid, solid, or gas that could contaminate the potable water supply by backflow.

“Cross-connection control program” means the administrative and technical procedures the purveyor implements to protect the public water system from contamination via cross-connections as required in WAC 246-290-490.

“Cross-connection control specialist” means a person holding a valid Washington State Cross-Connection Control Specialist certificate issued in accordance with chapter 246-292 WAC.

“Cross-connection control summary report” means the annual report required by the department that describes the status of the purveyor’s cross-connection control program.

“Department” means the Washington state department of health or health officer as identified in a joint plan of operation in accordance with WAC 246-290-030(1).

“Direct service connection” means a service hookup to a property that is contiguous to a water distribution main and where additional mains or extensions are not needed to provide service.

“Distribution system” means all piping components of a public water system that serve to convey water from transmission mains linked to source, storage and treatment facilities to the consumer excluding individual services.

“District” shall mean Water District #19.

“Flow-through fire protection system” means a fire sprinkler system that:

- Is supplied only by the purveyor’s water;
- Does not have a fire department pumper connection;
- Is constructed of approved potable water piping and materials to which sprinkler heads are attached; and
- Terminates at a connection to a toilet or other plumbing fixture to prevent the water from becoming stagnant.

“General manager” shall mean the General Manager of the District. Any act in this procedure required or authorized by the General Manager may be done on his or her behalf by an authorized representative of the District.

“Health hazard” shall mean any condition, device, or practice in a water supply system and/or its operation that creates or may create, a danger to the health and well being of a customer.

“Health officer” means the health officer of the city, county, city-county health department or district, or an authorized representative.

“High health cross-connection hazard” means a cross-connection which could impair the quality of potable water and create an actual public health hazard through poisoning or spread of disease by sewage, industrial liquids or waste.

“In-premise protection” means a method of protecting the health of consumers served by the consumer’s potable water system, located within the property lines of the consumer’s premises by the installation of an approved air gap or backflow prevention assembly at the point of hazard, which is generally a plumbing fixture.

“Local administrative authority” means the local official, board, department, or agency authorized to administer and enforce the provisions of the Uniform Plumbing Code as adopted under chapter 19.27 RCW (WAC 51-46-0603).

“Low health cross-connection hazard” means a cross-connection that could cause an impairment of the quality of potable water to a degree that does not create a hazard to the public health, but does adversely and unreasonably affect the aesthetic qualities of such potable waters for domestic use.

“Potable” means water suitable for drinking by the public.

“Premise isolation” means a method of protecting a public water system by installation of approved air gaps or approved backflow prevention assemblies at or near the service connection or alternative location acceptable to the purveyor (at the point where the water purveyor no longer has legal jurisdiction and/or authority to control the water system) to isolate the consumer’s water system from the purveyor’s distribution system.

“Plumbing hazard” shall mean a cross-connection in a consumer’s potable water system that may permit backsiphonage in the event of a negative pressure in the supply line.

“Public water system” is defined and referenced under WAC 246-290-020.

“Purchased source” means water a purveyor purchases from a public water system not under the control of the purveyor for distribution to the purveyor’s consumers.

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

“Regional public water supplier” means a water system that provides drinking water to one, or more, other public water systems.

“Resident” means an individual living in a dwelling unit served by a public water system.

“Service connection” means a connection to a public water system designed to provide potable water to a single-family residence, or other residential or nonresidential population.

“System hazard” shall mean a threat to the physical properties of the public or the consumer’s potable water system by a material not dangerous to health but aesthetically objectionable that would have a degrading effect on the quality of the potable water in the system.

“Unapproved auxiliary water supply” means a water supply (other than the purveyor’s water supply) on or available to the consumer’s premises that is either not approved for human consumption by the health agency having jurisdiction or is not otherwise acceptable to the purveyor.

“Used water” means water which has left the control of the purveyor.

“Water quality coordinator” shall be that person employed by the District that is certified as a Washington State cross-connection control specialist and is qualified to administer the district cross-connection control program.

Code Authority and Enforcement:

The enforcement of this cross-connection control program in the area served by the District, will be in accordance with WAC 246-290-490, Cross-connection control, effective April 9, 1999, District Resolution No. 1026, dated January 14, 2003 and the Water District #19 Cross-Connection Control Program.

General Policy:

It is the intention of this policy to provide for the permanent abatement or control of all cross-connections under the control of the water purveyor of the Water District #19. Where it is officially, actually and/or economically unfeasible to find, eliminate or to permanently control all cross-connections of the consumer’s water system, and when it is mandated by WAC 246-290-490 and/or deemed necessary by the district cross control specialist (CCS), there shall be installed at the district water service connection an approved backflow prevention assembly commensurate with the assessed degree of hazard posed by the consumer’s water system upon the public water supply.

The following methods of cross-connection control are considered minimum protection at the water service connection at the property line:

1. The public water supply to any premise listed under WAC 246-290-490(4)(b)(i)(ii)(iii)(Table 9) shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

2. The public water supply to any premise on which material dangerous to health or toxic substances are stored or handled, and which, in the assessment of the district CCS poses a potential high health cross-connection hazard to the public water system, shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

3. The public water supply to any premise where entry is restricted so that inspection for cross-connections cannot be made with sufficient frequency or at sufficient short notice to assure that cross-connections do not exist shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

4. The public water supply to any premise having a repeated history of cross connections being established or re-established, shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

5. The public water supply to any premise which has an unapproved auxiliary water supply on or available to the consumer's premises that is either not approved for human consumption by the health agency having jurisdiction or is not otherwise acceptable to the purveyor, and with no known cross-connections, shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

6. The public water supply to any premise which has internal cross-connections that are not correctable or which has complex plumbing arrangements that make it impractical to ascertain whether or not cross-connections exist, shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

7. The public water supply to any premise which has a heat exchanger or a solar hot water system shall require a risk assessment inspection by the district CCS to determine the level of backflow protection that may be required to be installed immediately downstream of the domestic water service connection, prior to any branch connections.

8. The public water supply to a fire system which will contain any chemical additives, including food-grade additives, shall require an approved reduced pressure backflow assembly (or reduced pressure detector assembly) installed immediately downstream of the public water service connection, prior to any branch connections.

9. The public water supply to a fire system with no chemical additives shall require an approved double check valve assembly (or double check detector assembly) installed immediately downstream of the public water service connection, prior to any branch connections.

10. The public water supply to any premise which poses a high probability of changes in the use of water by tenants, such as, but not limited to, shopping malls or strip malls, shall require an approved double check valve assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

11. The public water supply to any premise where cross-connections are unavoidable or not correctable, such as, but not limited to, tall buildings (over 30 feet), or water booster pump systems, shall require an approved double check valve assembly installed immediately downstream of the water service connection, prior to any branch connections.

Coordination, and delineation of responsibilities with local administrative authorities.

The control of cross-connections requires cooperation between the water purveyor, the local administrative authority, the health officer and the consumer.

- WAC 246-290-490(1)(d): The purveyor's responsibility for cross-connection control shall begin at the water supply source, include all the public water treatment, storage, and distribution facilities, and end at the point of delivery to the consumer's water system, which begins at the downstream end of the service connection or water meter located on the public right-of-way or utility-held easement.
- WAC 246-290-490(1)(e): Under the provisions of this section, purveyors are not responsible for eliminating or controlling cross-connections within the consumer's water system. Under chapter 19.27 RCW, the responsibility for cross-connections within the consumer's water system, i.e., within the property lines of the consumer's premises, falls under the jurisdiction of the local administrative authority.
- WAC 246-290-490(2)(d): The purveyor shall coordinate with the local administrative authority in all matters concerning cross-connection control. The purveyor shall document and describe such coordination, including delineation of responsibilities, in the written cross-connection control program required in (e) of this subsection.

The district CCS shall make available to all local administrative agencies the information maintained in the district cross-connection control program files, which may include, but is not limited to: (1) a master list of all premises that have been isolated from the district water system in accordance with the district cross-connection control program; (2) information concerning any internal cross-connections that come to the attention of the district CCS during risk assessment evaluations of premises; and (3) notification of any termination of water service for failure to comply with the requirements of WAC

246-290-490, District Resolution Number 1026, and/or the Water District #19 Cross-Connection Control Program.

Risk Assessment Survey:

A risk assessment survey for cross-connections and sanitary hazards requires a water use evaluation of new and existing buildings, structures, and grounds. The systematic evaluation shall be prioritized by risk to public health and shall be conducted as outlined below:

1. Upon application for a water service connection, the property owner (applicant) shall complete an application for district water service and a water usage questionnaire, which shall be reviewed by the district CCS. The district CCS shall make a determination of the risk posed to the public water system by the property owner's water system. The district CCS shall classify the water service connection as either a high health hazard or a low health hazard cross-connection, and shall specify the need and identify the type of backflow protection required (if applicable) for premise isolation backflow protection. When deemed necessary, the district CCS shall request the district engineering division to require a detailed plan and specification for the plumbing installation in order to facilitate risk-assessment review of the water use at the property.
2. The district CCS shall review all water system related plans and specifications to assess the following:
 - The actual or potential health hazard or contamination risk to the public water system
 - The complexity of any existing and/or proposed water piping system
 - The probability of occurrence of cross-connections within a property owner's water system
 - The determination of what cross-connections might constitute acceptable risks
 - The determination of the reliability required of any backflow prevention assembly utilized within a facility or mandated for premise isolation
 - The actual or potential use and/or availability of any unapproved auxiliary water supply systems
 - The storage and handling of material dangerous to health or toxic substances which, if introduced into the water system, would constitute a system, plumbing, or health hazard.

If, upon review, it is determined that any of these conditions will exist, the district CCS will advise the property owner in writing that such cross-connections exist, and will, as a courtesy, offer technical guidance in eliminating or controlling such cross-connections. If the district CCS determines that the property owner's water system represents a potential health hazard risk to the district water system, such as, but not limited to, WAC 246-290-490(4)(b)(Table 9) facilities and/or systems,

- an approved backflow prevention assembly commensurate with the assessed degree of hazard shall be required for premise isolation at the water service connection, notwithstanding any point of hazard, point of use, or fixture protection existing within the property lines of the premises.
3. During the construction phase of any new building, structure, or ground installation, a district cross-connection control specialist (district CCS) shall perform the required premise isolation cross-connection control inspection. Upon completion of the inspection, but prior to the establishment of a water service connection, the district CCS shall advise the property owner/authorized agent, that subject cross-connection control inspection has been made and advise if any additional backflow protection is required. The district CCS shall advise the property owner/authorized agent that it is the property owner's responsibility to have a Washington State certified backflow assembly tester (BAT) test the backflow assembly prior to use of the water service, and that annual testing is required thereafter. The district CCS shall attend and witness the initial test of all backflow assemblies installed under district jurisdiction. It is the responsibility of the property owner/authorized agent to contact the district CCS and coordinate an appointment time for the district CCS to attend and witness the required test of a backflow assembly (24 hour advance notice required).

Existing Buildings, Structures, and Grounds:

The district CCS will evaluate all high health hazard premises, all commercial and/or industrial premises, all premises with fire systems, all premises with water systems using booster pumps, and all premises with buildings 30' or more in height to insure premise isolation protection has been provided at the water service connection. Premises to be evaluated will be selected in order from an established list prioritized by expected degree of health hazard and/or risk of contamination. Premises not on the established priority list that come to the attention of the district CCS, and upon evaluation are determined deficient in required premise isolation backflow protection, shall be brought into current compliance without regard to any established priority list. Inspections of residential properties will not be routinely conducted unless those properties pose a potential health hazard risk to the district water supply, and for any reason, come to the attention of the district CCS.

The initial evaluation shall proceed according to the following steps:

1. A priority list shall be established using existing water service records, telephone directory yellow page listings, and other resources as beneficial.
2. Beginning with the highest rated health hazard on the program's priority list, the district CCS will make an risk assessment evaluation of each property for actual or potential cross-connections and/or any conditions that might tend to contaminate the district water system.

3. Upon completion of the risk assessment evaluation, the district CCS will determine whether or not premise isolation backflow protection will be required, and will determine the level of protection required commensurate with the assessed degree of hazard.
4. The district CCS will prepare a written report to the file system that will include, but is not limited to, the following:
 - a. A list of all cross-connections found, their location, and any optional methods of elimination or control.
 - b. Any applicable drawings, sketches, blueprints, or photos.
 - c. A summary of the findings, recommendations and requirements for corrective actions, and a time (normally a maximum of 90 days) in which the corrective action must be completed.
5. The district CCS shall notify the property owner/authorized agent, in writing, of the district's requirement for premise isolation backflow protection. The code enforcement letter shall include the requirements for corrective actions and a corrective action completion date. One copy of the completed letter shall reside in the district cross-connection control program jacket file for the facility.
6. On the corrective action completion date, the district CCS shall contact the property owner/authorized agent and ask if the corrective actions have been completed. If the corrective actions have been completed, the district CCS shall inspect each required premise isolation backflow assembly located at the district water service connections to the property. If the corrective actions are in progress but more time is required for completion, a new completion date may be set by the district CCS. If corrective actions have been disregarded, the district shall take appropriate corrective action within its authority, per WAC 246-290-490(2)(j)(i)(ii)(iii), District Resolution Number 1026, and the District Cross-Connection Control Program, which may include, but is not limited to, denying or discontinuing water service to a consumer's premises until the cross-connection hazard is eliminated or controlled to the satisfaction of the district.
7. When all required actions have been completed, a copy of the completed required actions letter shall be placed in the cross-connection control file for the property, together with all copies of correspondence, notes, related documents and any completed backflow assembly test report forms.
8. Reinspection of premise isolation for each premise found to be subject to this procedure shall be accomplished annually, if possible, or more often if

the degree of hazard so indicates, or whenever there is a change in the use of the premises.

Records and Reports:

Cross-Connection Control Program File System:

1. A separate jacket file shall be established by the district CCS, for each individual customer that requires the installation of a premise isolation backflow prevention assembly. Jacket files shall be filed in alphabetical sequence by premise name or customer name (last name first, first name last). A computer software database will be utilized for compiling and extracting information required for tracking compliance as well as Department of Health annual summary reporting.
2. The following information shall be maintained in each individual jacket file:
 - (a) Copies of all correspondence with customer relative to cross-connection control
 - (b) Copies of evaluation reports, complete with field drawings (if applicable)
 - (c) Copies of all completed backflow assembly test report forms
 - (d) Copies of all reports or correspondence pertaining to enforcement action, cross-connections, or backflow incidents.

Adv. Backflow History

Location No	Account No.	Name	Service Address	Route	Sequence	Service	Serial Number
Assembly Type	Manufacturer	Model	Size	Test Date	Test By	Certif. Num.	Test Result
100	100	VAN BUSKIRK	17633 97TH PL SW,	1	11890	WATER	N03716
DCDA	WILKINS	350DA	4"	06/24/2016	RICH RHOME	B4090	PASSED
100	100	VAN BUSKIRK	17633 97TH PL SW,	1	11890	WATER	U16709
DCVA	WILKINS	350A	6"	06/24/2016	RICH RHOME	B4090	PASSED
100	100	VAN BUSKIRK	17633 97TH PL SW,	1	11890	WATER	W008241XLD
DCVA	WILKINS	950XL	3/4"	06/24/2016	RICH RHOME	B4090	PASSED
12150	12150	PETER J HEFFERNAN	10602 SW COVE RD,	1	11175	WATER	A00987
DCVA	AMES	2000B	1"	07/28/2016	GABE DUNLAP	B-6371	PASSED
18300	18300	V M ISL HERITAGE	10105 SW BANK RD,	1	11860	WATER	60056
DCVA	BEECO	FDC	3/4"	06/24/2016	RICH RHOME	B4090	PASSED
18300	18300	V M ISL HERITAGE	10105 SW BANK RD,	1	11860	WATER	??
DCVA	BEECO	DDC-11	4"	06/24/2016	RICH RHOME	B4090	PASSED
18351	18351	VASHON APTS C/O	10106 SW BANK RD,	1	00142	WATER	16654
DCVA	WATTS	007M1QT	1"	10/11/2016	RICH RHOME	B4090	PASSED
18351	18351	VASHON APTS C/O	10106 SW BANK RD,	1	00142	WATER	A04535
DCVA	FEBCO	805Y	2"	10/11/2016	RICH RHOME	B4090	PASSED
18351	18351	VASHON APTS C/O	10106 SW BANK RD,	1	00142	WATER	AB2980
DCVA	FEBCO	805Y	2"	10/11/2016	RICH RHOME	B4090	PASSED
18400	18400	VASHON ISLAND FIRE &	10020 SW BANK RD,	1	00140	WATER	9H0908
DCVA	AMES	2000 SS	4"	05/27/2016	RICH RHOME	B4090	PASSED
18410	18410	VASHON ISLAND FIRE &	10019 SW BANK RD,	1	00130	WATER	13206
DCVA	RAINBIRD	DC QT	1 1/2"	05/27/2016	RICH RHOME	B4090	PASSED
2100	2100	VASHON HOUSEHOLD	17305 96TH PL SW,	1	12255	WATER	81418
DCVA	WATTS	007M2QT	1 1/2"	05/27/2016	RICH RHOME	B4090	PASSED
2101	2101	VASHON HOUSEHOLD -	17300 96TH PL SW,	1	12254	WATER	1535822
DCVA	WILKINS	950XLT	3/4"	05/28/2016	RICH RHOME	B4090	PASSED
2101	2101	VASHON HOUSEHOLD -	17300 96TH PL SW,	1	12254	WATER	H08472DC
DCVA	FEBCO	850	2"	05/27/2016	RICH RHOME	B4090	PASSED
2101	2101	VASHON HOUSEHOLD -	17300 96TH PL SW,	1	12254	WATER	N08496
DCDA	WILKINS	350DA	4"	05/27/2016	RICH RHOME	B4090	PASSED
2200	2200	MATHEWS COMPANY	9740 SW BANK RD,	6	06460	WATER	09116
OTHER	WATTS	007M2QT	1 1/4"	06/24/2016	RICH RHOME	B4090	PASSED
2200	2200	MATHEWS COMPANY	9740 SW BANK RD,	6	06460	WATER	182725
RPBA	WATTS	009QT	3/4"	06/24/2016	RICH RHOME	B4090	PASSED
2200	2200	MATHEWS COMPANY	9740 SW BANK RD,	6	06460	WATER	268238
RPBA	WATTS	009M3QT	1/2"	06/24/2016	RICH RHOME	B4090	PASSED
2200	2200	MATHEWS COMPANY	9740 SW BANK RD,	6	06460	WATER	272549
OTHER	WATTS	009QT	1/2"	07/15/2016	RICH RHOME	B4090	PASSED
22800	22800	FAIR ISLE ANIMAL	17312 VASHON HWY SW,	6	06210	WATER	209500
RPBA	WATTS	009M2QT	1"	05/06/2016	RICH RHOME	B4090	PASSED
24820	24820	VASHON PARK	17505 VASHON HWY SW,	6	06430	WATER	1319409
DCVA	WILKINS	950XLT	1"	05/17/2016	RICH RHOME	B4090	PASSED
24820	24820	VASHON PARK	17505 VASHON HWY SW,	6	06430	WATER	1319415
DCVA	WILKINS	950XLT	1"	05/17/2016	RICH RHOME	B4090	PASSED
24900	24900	MATHEWS COMPANY	17510 VASHON HWY SW, SEE	6	06110	WATER	07647

Location No	Account No.	Name	Service Address		Route	Sequence	Service	Serial Number			
			Assembly Type	Manufacturer	Model			Size	Test Date	Test By	Certif. Num.
DCVA	WATTS		007M2QT		1 1/4"	06/24/2016	RICH RHOME		B4090	PASSED	
24900	24900	MATHEWS COMPANY		009M3QT	3/4"	06/24/2016	RICH RHOME	17510 VASHON HWY SW, SEE 6	06110	WATER	119427
RPBA	WATTS		SS007M1QT		1"	07/15/2016	RICH RHOME		B4090	PASSED	
24900	24900	MATHEWS COMPANY		17510 VASHON HWY SW, SEE 6		06110	WATER		192364		
DCVA	WATTS		009M2QT		1"	06/24/2016	RICH RHOME		B4090	PASSED	
24900	24900	MATHEWS COMPANY		17510 VASHON HWY SW, SEE 6		06110	WATER		197679		
RPBA	WATTS		009M2QT		1"	06/24/2016	RICH RHOME		B4090	PASSED	
24900	24900	MATHEWS COMPANY		17510 VASHON HWY SW, SEE 6		06110	WATER		209499		
RPBA	WATTS		009M2QT		1"	06/24/2016	RICH RHOME		B4090	PASSED	
24900	24900	MATHEWS COMPANY		17510 VASHON HWY SW, SEE 6		06110	WATER		49306		
DCDA	HERSEY/GRINNEL	DDC-11		8"		06/24/2016	RICH RHOME		B4090	PASSED	
24900	24900	MATHEWS COMPANY		17510 VASHON HWY SW, SEE 6		06110	WATER		49306B		
DCVA	HERSEY/GRINNEL	FDC		3/4"		06/24/2016	RICH RHOME		B4090	PASSED	
3500	3500	EVERGREEN VILLAGE		17200 97TH PL SW,	6	06592	WATER		G43897		
DCVA	WILKINS		950XLT		2"	04/29/2016	RICH RHOME		B4090	PASSED	
36901	36901	EERNISSE		17905 97TH PL SW,	6	61157	WATER		18456		
DCVA	AMES		2000B		1 1/2"	05/28/2016	RICH RHOME		B4090	PASSED	
38040	38040	PACIFIC RESEARCH		10221 SW 188TH ST,	3	03340	WATER		12040		
PVBA	WATTS		LF009/73QT		3/4"	06/24/2016	RICH RHOME		B4090	PASSED	
38040	38040	PACIFIC RESEARCH		10221 SW 188TH ST,	3	03340	WATER		371696		
DCVA	WILKINS		950XL		1"	06/24/2016	RICH RHOME		B4090	PASSED	
38040	38040	PACIFIC RESEARCH		10221 SW 188TH ST,	3	03340	WATER		387506		
RPBA	WATTS		009QT		1/2"	06/24/2016	RICH RHOME		B4090	PASSED	
38040	38040	PACIFIC RESEARCH		10221 SW 188TH ST,	3	03340	WATER		940504659		
DCDA	FEBCO		806YD		8"	06/24/2016	RICH RHOME		B4090	PASSED	
38040	38040	PACIFIC RESEARCH		10221 SW 188TH ST,	3	03340	WATER		A03013		
RPZA	FEBCO		860		1"	06/24/2016	RICH RHOME		B4090	PASSED	
38040	38040	PACIFIC RESEARCH		10221 SW 188TH ST,	3	03340	WATER		AJ5272		
DCVA	FEBCO		805YB		3/4"	06/24/2016	RICH RHOME		B4090	PASSED	
38040	38040	PACIFIC RESEARCH		10221 SW 188TH ST,	3	03340	WATER		B6168B		
DCDA	FEBCO		806YD		8"	06/24/2016	RICH RHOME		B4090	PASSED	
38040	38040	PACIFIC RESEARCH		10221 SW 188TH ST,	3	03340	WATER		Z1854		
DCVA	FEBCO		805Y		3/4"	06/24/2016	RICH RHOME		B4090	PASSED	
38060	38060	BANGASSER &		18850 103RD AVE SW,	3	03391	WATER		46492		
RPBA	CONBRACO		40-204-02		3/4"	12/13/2016	RICH RHOME		B4090	PASSED	
38720	38720	KC WTD - EAST		9615 SW 171ST ST,	1	01465	WATER		123439		
RPBA	WATTS		009M2QT		1 1/2"	06/07/2016	LARRY WOODS		B4947	PASSED	
38720	38720	KC WTD - EAST		9615 SW 171ST ST,	1	01465	WATER		2104899		
DCVA	WILKINS		950 XLD		3/4"	06/07/2016	LARRY WOODS		B4947	PASSED	
38720	38720	KC WTD - EAST		9615 SW 171ST ST,	1	01465	WATER		237072		
RPBA	WATTS		009M3QT		3/4"	06/07/2016	LARRY WOODS		B4947	PASSED	
38720	38720	KC WTD - EAST		9615 SW 171ST ST,	1	01465	WATER		246540		
RPBA	WATTS		009M3QT		3/4"	06/07/2016	LARRY WOODS		B4947	PASSED	
Note: PASSED AFTER REPLACING CHECK VALVES											
38720	38720	KC WTD - EAST		9615 SW 171ST ST,	1	01465	WATER		264159		
RPBA	WATTS		009M2QT		2"	06/07/2016	LARRY WOODS		B4947	PASSED	
38720	38720	KC WTD - EAST		9615 SW 171ST ST,	1	01465	WATER		360941		
RPBA	WATTS		009M2QT		1"	06/07/2016	LARRY WOODS		B4947	PASSED	
38720	38720	KC WTD - EAST		9615 SW 171ST ST,	1	01465	WATER		N21249		
DCVA	WILKINS		350DA		6"	06/07/2016	LARRY WOODS		B4947	PASSED	
38730	38730	EERNISSE		17905 97TH PL SW,	6	61158	WATER		18455		

Location No	Account No.	Name	Service Address		Route	Sequence	Service	Serial Number	
			Assembly Type	Manufacturer	Model			Test By	Certif. Num.
DCVA	AMES	2000B			1 1/2"	05/28/2016	RICH RHOME	B4090	PASSED
38740	38740	EERNISSE			17905 97TH PL SW,	6	61159	WATER	A22784
DCVA	WATTS	007M2QT			1 1/2"	05/28/2016	RICH RHOME	B4090	PASSED
38760	38760	EERNISSE			17905 97TH PL SW,	6	61160	WATER	29672
DCVA	AMES	2000B			1 1/2"	05/28/2016	RICH RHOME	B4090	PASSED
38770	38770	EERNISSE			17905 97TH PL SW,	6	61161	WATER	2649488
DCVA	WILKINS	950 XLD			3/4"	05/28/2016	RICH RHOME	B4090	PASSED
38770	38770	EERNISSE			17905 97TH PL SW,	6	61161	WATER	2808013
DCVA	WILKINS	950XLT			1"	05/28/2016	RICH RHOME	B4090	PASSED
38770	38770	EERNISSE			17905 97TH PL SW,	6	61161	WATER	V12956
DCDA	WILKINS	350AOA			4"	05/28/2016	RICH RHOME	B4090	PASSED
38780	38780	EERNISSE			17905 97TH PL SW,	6	61162	WATER	18450
DCVA	AMES	2000B			1 1/2"	05/28/2016	RICH RHOME	B4090	PASSED
3910	3910	KING COUNTY LIBRARY	17210 VASHON HWY SW,		6		06241	WATER	018054
RPBA	WATTS	009M2			1"	08/02/2016	GEORGE CHASTAIN	B5732	PASSED
3910	3910	KING COUNTY LIBRARY	17210 VASHON HWY SW,		6		06241	WATER	018369
RPBA	WATTS	009M2			1"	08/02/2016	GEORGE CHASTAIN	B5732	PASSED
3910	3910	KING COUNTY LIBRARY	17210 VASHON HWY SW,		6		06241	WATER	32157
DCVA	WATTS	719			3/4"	08/02/2016	GEORGE CHASTAIN	B5732	PASSED
3910	3910	KING COUNTY LIBRARY	17210 VASHON HWY SW,		6		06241	WATER	C0434
DCVA	FEBCO	805Y			1 1/2"	08/02/2016	GEORGE CHASTAIN	B5732	PASSED
3910	3910	KING COUNTY LIBRARY	17210 VASHON HWY SW,		6		06241	WATER	H45037
DCVA	FEBCO	805Y			2"	06/24/2016	RICH RHOME	B4090	PASSED
3910	3910	KING COUNTY LIBRARY	17210 VASHON HWY SW,		6		06241	WATER	N1307310223
DCDA	FEBCO	856			4"	08/02/2016	GEORGE CHASTAIN	B5732	PASSED
40100	40100	F.O.E. AERIE #3144	18134 VASHON HWY SW -		3		32735	WATER	323468
OTHER	WATTS	009QT			1/2"	09/14/2016	JEREMY SIMKINS	B3255	PASSED
40200	40200	NEIL MORRIS	18016 VASHON HWY SW,		3		32790	WATER	17488
RPBA	WATTS	009QT			1/2"	11/08/2016	MARK GRAHAM	B5952	PASSED
40510	40510	PUGET SOUND ENERGY	18125 VASHON HWY SW,		3		00375	WATER	HB59724
DCVA	FEBCO	850			1"	08/09/2016	TRACY HUNTER	B6302	PASSED
40800	40800		18025 VASHON HWY SW,		3		00360	WATER	H09037DC
DCVA	FEBCO	850			2"	05/27/2016	RICH RHOME	B4090	PASSED
41200	41200	ISLAND FUNERAL	18005 VASHON HWY SW,		3		00330	WATER	3737769
RPBA	WILKINS	975XL2			3/4"	07/12/2016	RICH RHOME	B4090	PASSED
41900	41900	DR. SJARDO STENEKER	17917 VASHON HWY SW,		3		00310	WATER	W157178
RPBA	WILKINS	975XL			2"	08/23/2016	RICH RHOME	B4090	PASSED
42000	42000	METHODIST CHURCH	17928 VASHON HWY SW,		3		32840	WATER	105306
RPBA	WATTS	009QT			3/4"	07/12/2016	RICH RHOME	B4090	PASSED
42000	42000	METHODIST CHURCH	17928 VASHON HWY SW,		3		32840	WATER	J01092
DCVA	WILKINS	350			4"	07/12/2016	RICH RHOME	B4090	PASSED
42900	42900	PRESBYTERIAN	17708 VASHON HWY SW,		6		61090	WATER	1-06716
DCVA	AMES	2000 SS			4"	11/28/2016	MIKE MAGAWAY	B-6003	PASSED
4305	4305	ISLAND PROPERTY	17141 VASHON HWY SW,		1		01445	WATER	2029033
DCVA	WILKINS	950XLT			1"	06/15/2016	MCLAUGHLIN	B4253	PASSED
4305	4305	ISLAND PROPERTY	17141 VASHON HWY SW,		1		01445	WATER	A01841
DCVA	WATTS	007M1QT			1"	06/15/2016	MCLAUGHLIN	B4253	PASSED
43989	43989	EERNISSE	17905 97TH PL SW,		6		61156	WATER	18459
DCVA	AMES	2000B			1 1/2"	05/28/2016	RICH RHOME	B4090	PASSED
47805	47805	KATHLEEN FRAPPIER	20010 81ST AVE SW,		2		21752	WATER	005215

Location No	Account No.	Name	Service Address		Route	Sequence	Service	Serial Number	
			Assembly Type	Manufacturer	Model	Size	Test Date	Test By	Certif. Num.
DCVA	WATTS	LF007M1QT	1"	06/03/2016	TERRY LEONARD	B-5949	PASSED		
47805	47805	KATHLEEN FRAPPIER	20010 81ST AVE SW,	2	21752	WATER	005371		
DCVA	WATTS	LF007M3QT	3/4"	06/03/2016	TERRY LEONARD	B-5949	PASSED		
49000	49000	KURT ZUMWALT	20264 77TH PL SW,	2	21970	WATER	2276372		
DCVA	WILKINS	950XLT	1"	12/26/2016	MARK GRAHAM	B5952	PASSED		
5100	5100	VASHON YOUTH &	9822 SW GORSUCH RD,	1	01780	WATER	W000650		
RPBA	WILKINS	975XL	1/2"	11/29/2016	RICH RHOME	B4090	PASSED		
5100	5100	VASHON YOUTH &	9822 SW GORSUCH RD,	1	01780	WATER	W122806		
RPBA	WILKINS	975XL	1"	11/29/2016	RICH RHOME	B4090	PASSED		
62500	62500	BRIAN VAN BUREN	22613 KINGSBURY RD SW,	5	05560	WATER	15082		
RPBA	WATTS	009QT	1/2"	09/26/2016	MCLAUGHLIN	B4253	PASSED		
62500	62500	BRIAN VAN BUREN	22613 KINGSBURY RD SW,	5	05560	WATER	KR710		
DCVA	CONBRACO	40-105-A2	1"	09/26/2016	MCLAUGHLIN	B4253	PASSED		
62700	62700	MARK RADFORD	22621 KINGSBURY RD SW,	5	05580	WATER	0256P		
DCVA	CONBRACO	40-107-A2	1 1/2"	08/22/2016	MCLAUGHLIN	B4253	PASSED		
63700	63700	JONATHAN N TINTER	22905 KINGSBURY RD SW,	5	05680	WATER	387879		
DCVA	WATTS	007M1QT	1"	07/28/2016	MITCH NICKEL	B-6374	PASSED		
65000	65000	MICHAEL COOPER	23211 KINGSBURY RD SW,	5	05810	WATER	W217621		
OTHER	WILKINS	975XL	1/2"	12/15/2016	MARK GRAHAM	B5952	PASSED		
69200	69200	JOSEPH C CURIEL	22024 MONUMENT RD SW,	5	51440	WATER	H01311		
DCVA	FEBCO	850	1 1/4"	07/28/2016	MARK GRAHAM	B5952	PASSED		
69600	69600	DAVID JACK	9129 SW QUARTERMASTER	5	51480	WATER	16278		
OTHER	WATTS	009M3QT	3/4"	05/27/2016	RICH RHOME	B4090	PASSED		
72300	72300	CHAI MANN	22532 100TH PL SW,	5	51900	WATER	183997		
RPBA	WATTS	009QT	1/2"	06/29/2016	JONATHAN WALLE	B5636	PASSED		
75855	75855	STUART HENNESSEY	10119 SW 212TH ST,	3	31335	WATER	A03238		
DCVA	AMES	2000B	1 1/2"	12/12/2016	MARK GRAHAM	B5952	PASSED		
7900	7900	KC WTD - EAST	9621 SW 171ST ST,	1	01460	WATER	23254		
RPBA	WATTS	009M2QT	1 1/4"	06/07/2016	LARRY WOODS	B4947	PASSED		
7900	7900	KC WTD - EAST	9621 SW 171ST ST,	1	01460	WATER	32104		
RPBA	WATTS	009M2QT	1 1/4"	06/07/2016	LARRY WOODS	B4947	PASSED		
79000	79000	VASHON PARK	9526 SW 204TH ST,	4	00420	WATER	285651		
RPBA	WATTS	009QT	1/2"	05/17/2016	RICH RHOME	B4090	PASSED		
79000	79000	VASHON PARK	9526 SW 204TH ST,	4	00420	WATER	T6090		
RPBA	FEBCO	825Y	2"	05/17/2016	RICH RHOME	B4090	PASSED		
79000	79000	VASHON PARK	9526 SW 204TH ST,	4	00420	WATER	U3722		
RPBA	FEBCO	825Y	2"	05/17/2016	RICH RHOME	B4090	PASSED		
80000	80000	BICYCLE TREE LLC	20312 VASHON HWY SW,	3	32080	WATER	302632		
RPBA	WATTS	009QT	1/2"	08/08/2016	MARK GRAHAM	B5952	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	10045		
DCVA	WATTS	007M1PCQT	3/4"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	16221		
RPBA	WATTS	LF909	4"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	20268		
DCVA	WATTS	007M1QT	3/4"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	288599		
RPBA	WATTS	909QT	1"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	3046097		
DCVA	WILKINS	950XL	3/4"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	328863		

Location No	Account No.	Name	Service Address		Route	Sequence	Service	Serial Number	
			Assembly Type	Manufacturer	Model	Size	Test Date	Test By	Certif. Num.
RPBA	WATTS	009M2QT	2"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	395542		
RPBA	WATTS	009M2QT	1"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	396750		
RPBA	WATTS	009M3QT	3/4"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	3E10521		
DCDA	AMES	3000SS	6"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	42092		
DCVA	FEBCO	850	2"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	52033		
DCVA	FEBCO	805Y	2"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	69590		
RPBA	WATTS	009M3QT	3/4"	08/23/2016	RICH RHOME	B4090	PASSED		
80302	80302	VASHON SCHOOL DIST	9600 SW 204TH ST / H.S.,	7	72120	WATER	V36279		
DCDA	WILKINS	350 ADA	6"	08/23/2016	RICH RHOME	B4090	PASSED		
81000	81000	DR. THOMAS	19715 VASHON HWY SW,	3	03780	WATER	H11799		
RPBA	FEBCO	860	3/4"	12/02/2016	MARK GRAHAM	B5952	PASSED		
83400	83400	LS CEDAR	19506 VASHON HWY SW,	3	32380	WATER	15702		
DCVA	HERSEY/GRINNEL	FDC	3/4"	03/28/2016	RICH RHOME	B4090	PASSED		
83400	83400	LS CEDAR	19506 VASHON HWY SW,	3	32380	WATER	?		
DCDA	HERSEY/GRINNEL	FDC	8"	03/28/2016	RICH RHOME	B4090	PASSED		
84100	84100	K2 SKI COMPANY	19215 VASHON HWY SW,	3	03520	WATER	25608		
RPBA	WATTS	009M2QT	1 1/4"	12/23/2016	CRAIG ROBINSON	B-5188	PASSED		
84300	84300	K2 SKI COMPANY	19215 VASHON HWY SW,	3	03500	WATER	13966		
RPBA	WATTS	009RPZQT	1"	12/23/2016	CRAIG ROBINSON	B-5188	PASSED		
84600	84600	MARK LEONARD	19120 VASHON HWY SW,	3	32440	WATER	228569		
RPBA	WATTS	009M2QT	1"	07/19/2016	MCLAUGHLIN	B4253	PASSED		
87112	87112	VASHON SCHOOL DIST	9329 SW CEMETERY	7	72223	WATER	045662		
RPBA	WILKINS	975XL	1"	08/16/2016	RICH RHOME	B4090	PASSED		
87112	87112	VASHON SCHOOL DIST	9329 SW CEMETERY	7	72223	WATER	08776		
DCVA	FEBCO	850	2"	08/16/2016	RICH RHOME	B4090	PASSED		
87112	87112	VASHON SCHOOL DIST	9329 SW CEMETERY	7	72223	WATER	119563		
RPBA	WILKINS	975	1"	08/23/2016	RICH RHOME	B4090	PASSED		
87112	87112	VASHON SCHOOL DIST	9329 SW CEMETERY	7	72223	WATER	19846		
DCVA	WATTS	007M1QT	3/4"	08/16/2016	RICH RHOME	B4090	PASSED		
87112	87112	VASHON SCHOOL DIST	9329 SW CEMETERY	7	72223	WATER	265/01040		
DCVA	AMES	2000 SS	4"	08/23/2016	RICH RHOME	B4090	PASSED		
87112	87112	VASHON SCHOOL DIST	9329 SW CEMETERY	7	72223	WATER	3G10145		
DCDA	AMES	3000SS	4"	08/16/2016	RICH RHOME	B4090	PASSED		
87112	87112	VASHON SCHOOL DIST	9329 SW CEMETERY	7	72223	WATER	HB08788		
DCVA	FEBCO	850	1"	08/16/2016	RICH RHOME	B4090	PASSED		
87800	87800	JEREMY WEBB	8813 SW CEMETERY RD,	4	41450	WATER	219906		
RPBA	WATTS	009QT	1/2"	08/19/2016	RICH RHOME	B4090	PASSED		



Public Water System Cross-Connection Control Activities Annual Summary Report for Year 2014

Part 1: Public Water System (PWS) and Cross-Connection Control Specialist (CCS) Information

PWS ID: 38900	PWS Name: WATER DISTRICT 19	County: KING
Provide name and Cert No. of CCS who develops and implements your CCC program		
CCS Name (last, first & mi): Wahanik, Armin R.		CCS Phone: (206) 463-9007
CCS Cert No.: 10794	BAT Cert. No. (if applicable):	
CCS is (check one): PWS owner or employee <input checked="" type="checkbox"/> On contract to PWS <input type="checkbox"/> Volunteer or other <input type="checkbox"/>		

Part 2: Status of Cross-Connection Control (CCC) Program at end of 2014

PWS has (check one box in each column below):			
A written CCC program plan	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	CCC implementation activities	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>

(Written program may be a separate document, or part of water system plan or small water system management program).

Provide information regarding PWS's specific CCC Program Elements

Program Element Number	Description of Element [See WAC 246-290-490(3)]	This Program Element is Currently:	
		Included in Written Program	Being Implemented or Is Completed
1	Legal Authority Established	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>
2	Hazard Evaluation Procedures and Schedules	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>
3	CCC Procedures and Schedules	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>
4	Certified CCS Provided	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>
5	Backflow Preventer Inspection and Testing	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>
6	Testing Quality Control Assurance Program	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>
7	Backflow Incident Response Procedures	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>
8	Public Education Program	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>
9	CCC Records	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>
10	Reclaimed Water Permit	Y <input type="checkbox"/> N <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/> N/A <input checked="" type="checkbox"/>

Part 3A: System Characteristics at End of 2014

Indicate the number of connections of each type that the PWS serves (whether or not they are protected by backflow preventers). Estimate if necessary.

Type of Service Connection	Number
Residential (As defined by PWS)	1202
All Other (Include dedicated fire sprinkler and irrigation lines and PWS-owned facilities such as water and wastewater treatment plants and pumping stations, parks, piers and docks.)	219
Total Number of Connections	1421

Page 1

Part 3B: Cross-Connection Control for High-Hazard Premises or Systems Served by the PWS

If PWS does not serve any high-hazard premises or systems, check here and go to Part 4A.

- Complete all cells. Enter zero (0) in cells if PWS does not serve such premises.
- Estimate number of connections served if necessary (OK to use phone book).
- Hazard evaluations do not need to be done to complete this table.

Type of High-Hazard Premises or Systems [WAC 246-290-490(4)(b)]	Number of Connections at end of 12/31/2014			
	A. Being Served Water by PWS ¹	B. With Premises Isolation by AG/RP	C. With Column B AG Inspected or RP Tested ²	D. Granted Exception from Mandatory Premises Isolation
Agricultural (farms and dairies)	5	0	0	0
Beverage bottling plants (including breweries)	0	0	0	0
Car washes	0	0	0	0
Chemical plants	0	0	0	0
Commercial laundries and dry cleaners	1	1	1	0
Both reclaimed water and potable water provided	0	0	0	0
Film processing facilities	1	1	1	0
Dedicated fire protection systems with chemical addition or using unapproved auxiliary supplies	0	0	0	0
Food processing plants (including canneries, slaughter houses, rendering plants)	1	1	1	0
Hospitals, medical centers, nursing homes, veterinary, medical and dental clinics, and blood plasma centers	14	4	4	0
Separate irrigation systems using purveyor's water supply and chemical addition ⁴	0	0	0	0
Laboratories	0	0	0	0
Metal plating industries	0	0	0	0
Petroleum processing or storage plants	0	0	0	0
Piers and docks	0	0	0	0
Radioactive material processing plants or nuclear reactors	0	0	0	0
Survey access denied or restricted	0	0	0	0
Wastewater lift/pump stations (non-residential only)	0	0	0	0
Wastewater treatment plants	2	2	2	0
Unapproved auxiliary water supply interconnected with potable water supply	0	0	0	0
Public schools	3	3	3	0
Plastic and fiberglass manufacture	2	2	2	0
Swimming Pool	2	2	2	0
Totals	31	16	16	0

¹Count multiple connections or parallel installations as *separate* connections.

²Count only those connections with AG or RPBA installed for premises isolation. Don't include connections with in-premises protection only, or connections with DCVA/DCDAs installed for premises isolation.

³Count only those connections whose premises isolation preventers were inspected (AG) or tested (RPBA) during 2014.

⁴For example, dedicated lines to irrigation systems in parks, playgrounds, golf courses, cemeteries, estates, etc.

⁵Premises with hazardous materials or processes (requiring isolation by AG or RPBA) such as: aircraft and automotive manufacturers, pulp and paper mills, metal manufacturers, military bases, and wholesale customers that pose a high hazard to the PWS. May be grouped together in categories, e.g.: other manufacturing or other commercial. If needed, attach additional sheet giving same information as requested in table.

Part 3C: Cross-Connection Control for Medical Category High-Hazard Premises Served by the PWS

If PWS does not serve any medical type premises, check here and go to Part 4A.

- Complete all cells. Enter zero (0) in cells if PWS does not serve such premises.
- Estimate number of connections served if necessary (OK to use phone book).
- Hazard evaluations do not need to be done to complete this table.

Type of High-Hazard Premises or Systems [WAC 246-290-490(4)(b)]	Number of Connections at end of 12/31/2014			
	A. Being Served Water by PWS ¹	B. With Premises Isolation by AG/RP	C. With Column B AG Inspected or RP Tested ²	D. Granted Exception from Mandatory Premises Isolation
Hospitals				
Hospitals (include psychiatric hospitals and alcohol and drug treatment centers)	0	0	0	0
Facilities for Treatment and Care of Patients Not Located in Hospitals Counted Above				
Same day surgery centers	0	0	0	0
Out-patient clinics and offices	3	1	1	0
Alternative health out-patient clinics and offices	2	0	0	0
Psychiatric out-patient clinics and offices	0	0	0	0
Chiropractors	2	0	0	0
Hospice care centers	0	0	0	0
Childbirth centers	0	0	0	0
Kidney dialysis centers	0	0	0	0
Blood centers	0	0	0	0
Dental clinics and offices	5	1	1	0
Facilities for Housing Patients				
Nursing homes	0	0	0	0
Boarding homes	0	0	0	0
Residential treatment centers	0	0	0	0
Other Medical-Related Facilities				
Mortuaries	1	1	1	0
Morgues and autopsy facilities (not in hospitals)	0	0	0	0
Veterinarian offices, clinics and hospitals	1	1	1	0
All other (describe in Part 6: Comments on page 6)	0	0	0	0
Totals	14	4	4	0

¹Count multiple connections or parallel installations as *separate* connections.

²Count only those connections with AG or RPBA installed for premises isolation. Don't include connections with in-premises protection only, or connections with DCVA/DCDAs installed for premises isolation.

³Count only those connections whose premises isolation preventers were inspected (AG) or tested (RPBA) during 2014.

Part 4A: Backflow Preventer Inventory and Testing Data During Year 2014

- Complete all cells. Enter zero (0) if there are no backflow preventers in that category.
- Count only the backflow preventers that the PWS relies upon for protection of the distribution system. If your records do not distinguish between premises isolation and in-premises protection preventers, enter all data in Premises Isolation section and check the box.
- Count AVBs on irrigation systems only. **If you do not track AVBs, enter "UNK".**
- Count multiple tests or failures for any particular backflow preventer as one test or failure for that backflow preventer.
- Multiple Service or Parallel Connections: Count each assembly separately.
- Assemblies on Dedicated Fire or Irrigation Lines: Count as Premises Isolation Assemblies.

Backflow Preventer Category and Testing/Inspection Information	Air Gap	RPBA	RPDA	DCVA	DCDA	PVBA	SVBA	AVB
Premises Isolation, including preventers isolating PWS-owned facilities. If In-Premises Protection preventers are also included, check here. <input type="checkbox"/>								
Rows 1-3 pertain ONLY to Premises Isolation preventers in service at beginning of 2014								
1 In service on 1/1/2014	0	12	0	0	0	0	0	unk
2 Inspected and/or Tested in 2014 ¹	0	12	0	0	0	0	0	unk
3 Failed Inspection or Test in 2014	0	0	0	0	0	0	0	unk
Rows 4 - 6 pertain ONLY to NEW Premises Isolation preventers installed during 2014								
4 New preventers installed in 2014 ²	0	0	0	0	0	0	0	unk
5 Inspected and/or Tested in 2014 ¹	0	0	0	0	0	0	0	unk
6 Failed inspection or test in 2014 ³	0	0	0	0	0	0	0	unk
7 Preventers taken out of service in 2014 ³	0	0	0	0	0	0	0	0
Premises Isolation Total at end of 2014⁴	0	12	0	0	0	0	0	unk
In-Premises Protection (Fixture Protection or Area Isolation), including preventers within PWS-owned facilities.								
Rows 8 - 10 pertain ONLY to In-Premises Protection Preventers in service at beginning of 2014								
8 In service on 1/1/2014	1	46	0	67	12	1	0	unk
9 Inspected and/or Tested in 2014 ¹	0	34	0	60	12	1	0	unk
10 Failed Inspection or Test in 2014	0	2	0	0	1	1	0	unk
Rows 11 - 13 pertain ONLY to NEW In-Premises Protection Preventers installed during 2014								
11 New preventers installed in 2014 ²	0	0	0	0	0	0	0	unk
12 Inspected and/or Tested in 2014 ¹	0	0	0	0	0	0	0	unk
13 Failed inspection or test in 2014	0	0	0	0	0	0	0	unk
14 Preventers taken out of service in 2014 ³	0	0	0	0	0	0	0	0
In-Premises Protection Total at end of 2014⁴	1	46	0	67	12	1	0	unk
Grand Total at end of 2014	1	58	0	67	12	1	0	unk

¹Initial and/or routine annual inspection (for proper installation and approval status) and/or test (for testable assemblies only using DOH/USC test procedures).Includes preventers installed on connections where backflow prevention was not previously required and any preventers that replaced those in service at beginning of 2014. Replacement preventers may be of a different type than the original.

²Includes preventers installed on connections where backflow prevention was not previously required and any preventers that replaced those in service at the beginning of 2014. Replacement preventers may be of a different type than the original.

³New or existing preventers taken out of service, whether or not they were replaced by the same type or different type of preventer.

⁴Total at end of 2014 should be equal to the number of preventers in service at beginning of 2014 plus those installed during 2014 minus the number of preventers taken out of service during 2014.

Part 4B: Other Implementation Activities in 2014

Complete all cells. Enter zero (0) if not applicable.

Activity or Condition	Number
New service connections evaluated for cross-connection hazards to PWS in 2014.	0
New service connections requiring backflow protection to protect PWS. ¹	0
Existing service connections evaluated for cross-connection hazards to PWS in 2014.	0
Existing service connections requiring backflow protection to protect PWS. ^{1,2}	0
Exceptions granted to high-hazard premises per WAC 246-290-490(4)(b) in 2014. ³	0
CCC enforcement actions taken by PWS during 2014. ⁴	0

¹Include services where either premises isolation or in-premises preventers were required to protect the PWS.

²Include existing services that need new, additional or higher level backflow prevention.

³A DOH Exceptions to Hazard Premises Form *must* be attached for each exception granted during the year.

⁴"Enforcement actions" mean actions taken by the PWS (such as water shut-off, PWS installation of backflow preventer) when the customer fails to comply with PWS's CCC requirements.

Part 5: Backflow Incidents and "Off-Normal" Events in 2014

Backflow Incidents, Risk Factors and Indicators during 2014		Number (Enter 0 if none)	Check if Data Not Available
<i>Backflow Incidents during 2014</i>			
1	Backflow incidents that contaminated the PWS ⁵ .	0	<input type="checkbox"/>
2	Backflow incidents that contaminated the customer's drinking water system <i>only</i> ⁵ .	0	<input type="checkbox"/>
<i>Risk Factors for Backflow during 2014</i>			
3	Distribution main breaks per 100 miles of pipe.	0.00	<input type="checkbox"/>
4	Low pressure events (<20 psi in PWS distribution system).	5	<input type="checkbox"/>
5	Water outage events.	0	<input type="checkbox"/>
<i>Indicators of Possible Backflow during 2014</i>			
6	Total health-related complaints received by PWS. ⁶	0	<input type="checkbox"/>
7	Received during BWA or PN events. ⁷	0	<input type="checkbox"/>
8	Received during low pressure or water outage events.	0	<input type="checkbox"/>
9	Total aesthetic complaints (color, taste, odor, air in lines, etc.).	32	<input type="checkbox"/>
10	Received during BWA or PN events. ⁷	0	<input type="checkbox"/>
11	Number of these complaints received during low pressure or water outages events.	0	<input type="checkbox"/>

⁵Complete and submit a Backflow Incident Report form for each known backflow incident.

⁶Such as stomach ache, headache, vomiting, diarrhea, skin rashes, etc.

⁷"BWA" means **Boil Water Advisory** and "PN" means **Public Notification** for water quality reasons.

Page 5

Part 6: Comments and Clarifications

Enter comments or clarifications to any of the information included in this report. Note for on-screen completion: Comments will not "word wrap" from one line to the next. Press to continue on new line. Maximum length of each comment is 255 characters, including spaces.

Part No.	Date Added	Comment
Gener	5/13/13	Transitioned to new Backflow Software.

Part 7: Report Completion Information

I certify that the information provided in this CCC Activities Report is complete and accurate to the best of my knowledge.

CCC Program Mgr. Name ¹ : Armin R. Wahanik	Title: Operations Lead
---	------------------------

Signature:	Date: 06/26/2015
------------	------------------

Phone: (206) 463-9007	E-mail: awahanik@water19.com
-----------------------	------------------------------

I have reviewed this report and certify that the information provided is complete and accurate to the best of my knowledge.

PWS Mgr./Owner Name ² : Jeffrey Lakin	Title: General Manager
--	------------------------

Signature:	Op. Cert. No.: 11206	Date: 06/26/2015
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¹ CCC Program Manager is generally the CCS who is responsible for development and implementation of the PWS's CCC Program.

² The person that the CCC Program Manager reports to or other manager having direct responsibility and/or oversight of the CCC program.

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Cross-Connection Control Program Summary Report For 2014

Describe the characteristics of the PWS's CCC Program at the end of 2014. Complete this form only if PWS had written CCC program plan, policies or procedures at end of 2014.

Part 1: Public Water System (PWS) Identification

PWS ID: 38900	PWS Name: WATER DISTRICT 19	County: KING
---------------	-----------------------------	--------------

Part 2: Cross-Connection Control (CCC) Program Characteristics

A. Type of Program Currently Implemented

Type of Program	Check One
Premises isolation only.	<input type="checkbox"/>
Combination program: reliance on both premises isolation and in-premises protection.	<input checked="" type="checkbox"/>
In transition from a combination program to a premises isolation only program.	<input type="checkbox"/>

B. Coordination with Authority Having Jurisdiction (AHJ) on Cross-Connection Issues

Indicate the status of coordination with AHJs in your service area. The AHJ is the entity that enforces the Uniform Plumbing Code. *Check one box in each of last 3 columns for each AHJ in your service area.*

AHJ No.	Name of AHJ (e.g., the City or County Building Department)	PWS Currently:		AHJ Declined to Coordinate
		Coordinates with AHJ	Has Written Agreement with AHJ	
1	Seattle / King County	Y <input type="checkbox"/> N <input checked="" type="checkbox"/>	Y <input type="checkbox"/> N <input checked="" type="checkbox"/>	Y <input type="checkbox"/> N <input checked="" type="checkbox"/>
2		Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>
3		Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>
4		Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>
5		Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>	Y <input type="checkbox"/> N <input type="checkbox"/>

¹ If more than 5 AHJs, attach separate sheet giving the above information.

C. Corrective or Enforcement Actions Available to the Purveyor

Type of Corrective Action	Indicate Whether Available	Most Often Used (Check One)
Denial or discontinuance of water service.	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	<input checked="" type="checkbox"/>
Purveyor installs backflow preventer and bills customer.	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>
Assessment of fines (in addition to elimination or control of cross-connection).	Y <input type="checkbox"/> N <input checked="" type="checkbox"/>	<input type="checkbox"/>
Other corrective actions (describe):	Y <input type="checkbox"/> N <input type="checkbox"/>	<input type="checkbox"/>

Page 1

D. CCC Program Responsibilities

Do not include enforcement action related procedures or circumstances.

CCC Program Activity	Responsible Party (Check one per row)	
	Customer	Purveyor
Hazard Evaluation by DOH-certified CCS	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Backflow preventer (BP) ownership	<input checked="" type="checkbox"/>	<input type="checkbox"/>
BP installation	<input checked="" type="checkbox"/>	<input type="checkbox"/>

BP <i>initial</i> inspection (for proper installation - all BPs)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
BP <i>initial</i> test (for testable assemblies)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
BP <i>annual</i> inspection (Air Gaps and AVBs)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
BP <i>annual</i> test (for testable assemblies)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
BP maintenance and repair	<input checked="" type="checkbox"/>	<input type="checkbox"/>

E. Backflow Protection for Fire Protection Systems

Please remember to enter number of days allowed if you require retrofitting.

PWS coordinates with <i>AHJ</i> on CCC issues for fire protection systems(FPS).	Y <input type="checkbox"/> N <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
PWS coordinates with <i>local Fire Marshal</i> on CCC issues for FPS.	Y <input type="checkbox"/> N <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
PWS ensures backflow prevention is installed before serving <i>new</i> connections with FPS.	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>
PWS requires retrofits to <i>high</i> -hazard FPS.	Y <input checked="" type="checkbox"/> No. of days allowed: 30 N <input type="checkbox"/> N/A <input type="checkbox"/>
PWS requires retrofits to <i>low</i> -hazard FPS.	Y <input checked="" type="checkbox"/> No. of days allowed: 90 N <input type="checkbox"/> N/A <input type="checkbox"/>

F. Backflow Protection for Irrigation Systems

Minimum level of backflow prevention required on irrigation systems <i>without</i> chemical addition.	Not Addressed <input type="checkbox"/> AVB <input type="checkbox"/> PV/SVBA <input type="checkbox"/> DCVA <input checked="" type="checkbox"/> RPBA <input type="checkbox"/>
PWS currently inspects AVBs upon <i>initial</i> installation.	Y <input type="checkbox"/> N <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
PWS currently inspects AVBs upon repair, reinstallation or relocation.	Y <input type="checkbox"/> N <input type="checkbox"/> N/A <input checked="" type="checkbox"/>

G. Used Water

PWS prohibits, by ordinance, rules, policy or agreement, the intentional return of used water (e.g. for heating or cooling) into the distribution system.	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>
If not prohibited at present, date plan to prohibit use.	N/A <input type="checkbox"/>
Current number of service connections returning used water to distribution system.	0

H. Backflow Protection for Auxiliary Water Supplies¹ NOT Interconnected with PWS

Indicate the minimum backflow preventer and type of protection required for service connections having unapproved auxiliary water supplies when they are NOT interconnected to the PWS. Check one box per row.

Existing service connections.	None <input type="checkbox"/> DCVA <input type="checkbox"/> RPBA <input checked="" type="checkbox"/> AG <input type="checkbox"/>
Type of protection required.	None <input type="checkbox"/> In-premises protection <input type="checkbox"/> Premises isolation <input checked="" type="checkbox"/>
New service connections.	None <input type="checkbox"/> DCVA <input type="checkbox"/> RPBA <input checked="" type="checkbox"/> AG <input type="checkbox"/>
Type of protection required.	None <input type="checkbox"/> In-premises protection <input type="checkbox"/> Premises isolation <input checked="" type="checkbox"/>

¹ An auxiliary water supply is any water supply on or available to customer's premises in addition to the purveyor's potable water supply.

I. Backflow Protection for Tanker Trucks and Temporary Water Connections

Minimum level of backflow protection (installed on or associated with the truck) required for tanker trucks taking water from PWS.	AG <input checked="" type="checkbox"/> DCVA <input type="checkbox"/> RPBA <input type="checkbox"/> Not Specified <input type="checkbox"/> Tanker trucks not allowed <input type="checkbox"/>
PWS requires tanker trucks to obtain water at designated filling sites each equipped with permanently installed backflow preventer(s).	Y <input type="checkbox"/> (Min. protection: DCVA <input type="checkbox"/> RPBA <input type="checkbox"/>) N <input checked="" type="checkbox"/> N/A <input type="checkbox"/> No sites provided <input type="checkbox"/>
PWS currently accepts tanker trucks approved by other PWSs without further inspection or testing.	Y <input type="checkbox"/> N <input checked="" type="checkbox"/> N/A <input type="checkbox"/>
Minimum level of backflow protection required for temporary	AG <input type="checkbox"/> DCVA <input type="checkbox"/> RPBA <input checked="" type="checkbox"/>

water connections (e.g. for construction sites).	Not specified <input type="checkbox"/> Temp. connections not allowed <input type="checkbox"/>
PWS requires testing each time the temporary connection backflow preventer is relocated.	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/> (Temp. connections not allowed)
PWS provides approved backflow preventer for temporary connections.	Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A <input type="checkbox"/> (Temp. connections not allowed)

J. Backflow Protection for Non-Residential Connections

For each category shown, indicate whether PWS has non-residential connections of that type and the **minimum** level of *premises isolation* backflow protection required (whether or not PWS currently has that type of customer).

Type of Connection	PWS has Customers of this Type	Minimum Premises Isolation Backflow Protection Required
Commercial	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Not Required <input type="checkbox"/> DCVA <input checked="" type="checkbox"/> RPBA <input type="checkbox"/>
Industrial	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Not Required <input type="checkbox"/> DCVA <input checked="" type="checkbox"/> RPBA <input type="checkbox"/>
Institutional	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Not Required <input type="checkbox"/> DCVA <input checked="" type="checkbox"/> RPBA <input type="checkbox"/>

K. Backflow Protection for Wholesale Customers

Indicate whether the PWS requires backflow protection at interties with wholesale customers (other PWSs).

Type of Intertie	PWS has (plans to have) Customers of this Type	Backflow Protection Required
Existing	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Not specified / Not required <input checked="" type="checkbox"/> Always required <input type="checkbox"/> Required only if purchaser's CCC program is inadequate <input type="checkbox"/> Minimum required (if applicable): DCVA <input type="checkbox"/> RPBA <input type="checkbox"/>
New	Y <input type="checkbox"/> N <input checked="" type="checkbox"/>	Not specified / Not required <input type="checkbox"/> Always Required <input type="checkbox"/> Required only if purchaser's CCC program is inadequate <input type="checkbox"/> Minimum required (if applicable): DCVA <input type="checkbox"/> RPBA <input type="checkbox"/>

Page 3

L. Exceptions to Mandatory Premises Isolation

PWS's written CCC Program Plan <i>allows</i> system to grant Exceptions to mandatory premises isolation per WAC 246-290-490(4)(b)(iii).	Y <input type="checkbox"/> N <input checked="" type="checkbox"/> Doesn't Address <input type="checkbox"/>
PWS currently grants new Exceptions.	Y <input type="checkbox"/> N <input checked="" type="checkbox"/>
PWS granted Exceptions in previous reporting years.	Y <input type="checkbox"/> N <input checked="" type="checkbox"/>

Part 3: CCC Program Record-Keeping and Inventory

Indicate the type or name of computer software used by the PWS to track CCC records.

Cross-Track (BMI) <input type="checkbox"/>	BPMS <input type="checkbox"/>	XC2 (Engsoft) <input type="checkbox"/>	Tokay <input type="checkbox"/>	Other commercial CCC software (specify) <input checked="" type="checkbox"/> Continental Enterprise Software
Custom developed for or by PWS ¹ <input type="checkbox"/>	Other non-CCC software (e.g. Excel) <input type="checkbox"/>			None Used <input type="checkbox"/>

¹ Do not include commercial CCC software customized for PWS. If PWS uses customized commercial software, check the box for the appropriate commercial software name.

Part 4: Comments and Clarifications

Enter comments or clarifications to any of the information provided in this report.

Part No.	Date Added	Comment

General	5/13/13	Transitioned to Continental for our software data management, Continental is our current Enterprise software, so this allows us to track devices with accounts.

Part 5: CCC Program Summary Completion Information

I certify that the information provided in this CCC Program Summary is complete and accurate to the best of my knowledge.

CCC Program Mgr. Name ¹ : Armin R. Wahanik	Title: Operations Lead
Signature:	Date: 06/26/2015
Phone: (206) 463-9007	E-mail*: awahanik@water19.com

I certify that the information provided in this report accurately represents the status and description of this water system's CCC Program.

PWS Mgr/Owner Name ² : Jeffrey Lakin	Title: General Manager
Signature:	Op. Cert. No.: 11206
	Date: 06/26/2015

*Required Field. For security reasons, an e-mail address must be provided. DOH will e-mail you to confirm any changes made to your data

¹ The CCC Program Manager is generally the CCS responsible for developing and implementing the PWS's CCC program.

² The person that the CCC Program Manager reports to or other manager having direct responsibility and/or oversight of the CCC program. This person doesn't need to be in charge of the entire water system.

RESOLUTION NO. 1026

**A RESOLUTION OF THE BOARD OF COMMISSIONERS OF
WATER DISTRICT NO. 19, KING COUNTY, WASHINGTON,
ESTABLISHING A CROSS CONNECTION CONTROL PROGRAM;
REPEALING RESOLUTION NO. 683**

WHEREAS, District #19 provides water supply to residents and property located within its boundaries; and

Whereas, the District must comply with state and federal law and regulations, including regulations governing cross connections with the District's public water supply; and

Whereas, the State of Washington recently adopted revised regulations governing cross connection control;

NOW THEREFORE BE IT RESOLVED, that the Board of Commissioners of King County Water District #19 establishes the following:

1. **Cross Connection Control Policy.** Cross connections are declared illegal. The District shall protect the public water supply by eliminating any cross connection, or if the cross connection can be controlled consistent with the public safety by installation of approved air gaps or approved backflow prevention assemblies at the backside downstream of each meter, and through the implementation of the cross connection control program provided for in this resolution.
2. **Cross Control Specialist.** The District shall employ a Cross Control Specialist who shall be certified as a CCS in compliance with State regulations. The CCS shall be responsible for administering the District's cross connection control policy under the direction of the District Manager and in compliance with Department of Health regulations.
 - a. The CCS shall eliminate cross connections by appropriate enforcement action as provided herein; but
 - b. Whenever a cross connection cannot be eliminated, the CCS shall require the installation of a backflow prevention device commensurate to the degree of hazard as described by State and Federal regulations and/or AWWA guidelines for Cross Connection Control, at the expense of the user.
3. **Cross Connection Control Policy.** The CCS shall oversee installation of cross connection control devices and the maintenance and testing thereof as follows:
 - a. **New Services.** After the effective date of this Resolution, all new services that pose a potential health hazard as described by state and federal regulations and/or AWWA guidelines for cross connection control shall be isolated from the public system at the backside of the meter by an approved backflow preventer. The property owner shall be responsible for maintaining and testing the devices and providing the CCS reports required by the District's cross control manual.
 - b. **Business, Commercial, and Industrial** After the effective date of this resolution all services that are classified as business, commercial or industrial shall be required to install premise isolation commensurate to the degree of hazard as described by the state and federal regulations and/or guidelines set by AWWA for cross connection control. The District CCS will survey and asses the degree of hazard for each premise and recommend the type of backflow device required. Installation of backflow preventers shall be done in accordance with local state and federal plumbing codes by a qualified plumber. The property owner shall be responsible for maintaining and testing the devices and providing the CCS reports required by the District's cross connection control manual.
 - c. **Existing Residential.** Cross connection protective devices approved for premise isolation cross connection control shall be installed,

maintained and tested under the oversight of the CCS in accordance with the District's cross control manual.

4. **Cross Connection Control Enforcement.** The CCS is responsible for cross control enforcement.

a. **Failure to Comply.** The CCS shall take appropriate enforcement action against consumers who fail to control cross connections, as, or who fail to install, maintain, repair or test backflow preventers as required by the District.

b. **Enforcement Action.** The CCS may discontinue service until compliance is achieved, with appropriate notice to the local District Administrator or cause an appropriate backflow preventer to be installed at the expense of the consumer.

5 CCS – Duties. The District's CCS shall administer the District's cross connection control program and, in addition to duties heretofore set forth, the CCS shall be responsible for:

a. **Manual.** The CCS shall develop the District's cross connection control manual incorporating good engineering and public health practices and policies stressing practical economics and finances, including the use of private contractors. The CCS may refer to the *Manual of Cross Connection Control* (USC Manual) or the *Cross-Connection Control Manual, Accepted Procedure and Practice* (PNWS-AWWA Manual), or such other references approved by the Department of Health when developing the cross control manual.

b. **Records.** The CCS shall develop and maintain the records required by WAC 246-290-490 (3) (j) & (8).

c. **Testing and Inspection.** The CCS shall develop and include in the Manual, procedures for initial evaluations of new and existing services, a schedule for re-evaluations of services, procedures for notification to the consumer and the local administrative agency.

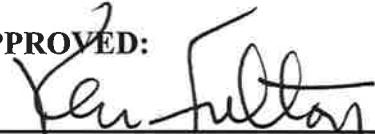
d. **Coordination and Reports.** The CCS shall coordinate with the District Administrator by providing notice of: (1) all premises that have been isolated from the public system in accordance with this Resolution, (2) any internal cross connections about which the CCS learns, (3) Shutoffs for failure to comply with requirements of the Resolution or the WAC state or federal requirements, and (4) the CCS shall report to the ratepayer through the District's newsletter about the cross connection control program, its purpose and rationale.

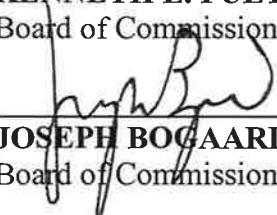
e. **Approved Backflow Preventers.** The CCS shall develop and include in the Manual practices and procedures for installing and testing backflow preventers in accordance with WAC 246-290-490 (5) (6) & (7).

6. **Repealer. Resolution No 683 dated May 11, 1993 is repealed.**

ADOPTED at a regular meeting of the Board of Commissioners of Water District No. 19 held on **January 14, 2003**.

APPROVED:


KENNETH E. FULTON, President
Board of Commissioners


JOSEPH BOGAARD, Secretary
Board of Commissioners

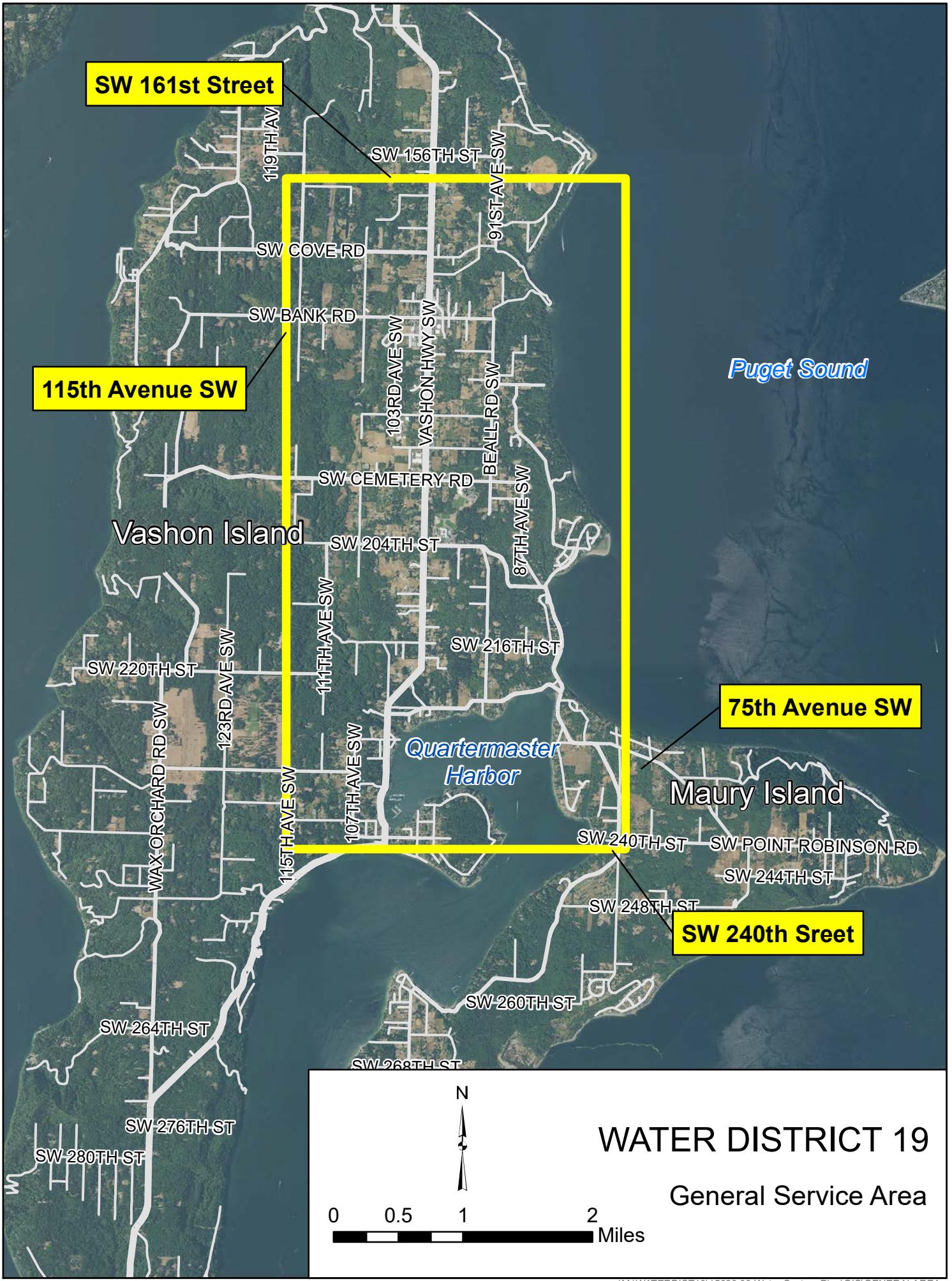
ATTEST:

Absent
STEVE REED, Commissioner
Board of Commissioners

RESOLUTION NO. 1026

APPENDIX M

EMERGENCY RESPONSE, MAP AND LETTERS



WARNING:

Do not drink tap water without boiling it first!

- Fecal coliform**
 E. coli bacteria
 Other: _____

were detected in the water supply on:
(date)_____.

Boiling kills bacteria and other organisms in the water:

- Bring water to a boil
- Continue boiling for 3-5 minutes
- Let water cool before using

To avoid possible illness: use boiled or purchased bottled water for drinking, making ice, brushing teeth, washing dishes, and food preparation until further notice.

Contact your doctor, if you experience one or more of these symptoms: nausea, cramps, diarrhea, jaundice, headache and/or fatigue. People with chronic illnesses, infants and the elderly may be at higher risk and should seek medical advice.

Water System: _____
I.D.: _____
County: _____
Contact: _____
Telephone: _____
Date notice distributed: _____

What is fecal coliform and E. coli?

Fecal coliform and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these waters can cause short-term effects, such as diarrhea, cramps, nausea, headaches or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

How long will this warning be in effect?

We will consult with the Washington State Department of Health about this incident. We will notify you when you no longer need to boil the water.

WARNING:

Do not drink tap water without boiling it first!

- Fecal coliform**
 E. coli bacteria
 Other: _____

were detected in the water supply on:
(date)_____.

Boiling kills bacteria and other organisms in the water:

- Bring water to a boil
- Continue boiling for 3-5 minutes
- Let water cool before using

To avoid possible illness: use boiled or purchased bottled water for drinking, making ice, brushing teeth, washing dishes, and food preparation until further notice.

Contact your doctor, if you experience one or more of these symptoms: nausea, cramps, diarrhea, jaundice, headache and/or fatigue. People with chronic illnesses, infants and the elderly may be at higher risk and should seek medical advice.

Water System: _____
I.D.: _____
County: _____
Contact: _____
Telephone: _____
Date notice distributed: _____

What is fecal coliform and E. coli?

Fecal coliform and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these waters can cause short-term effects, such as diarrhea, cramps, nausea, headaches or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

How long will this warning be in effect?

We will consult with the Washington State Department of Health about this incident. We will notify you when you no longer need to boil the water.

ADVERTENCIA:

¡No tome el agua de la llave sin antes hervirla!

Bacteria coliforme fecal

Bacteria E. coli

Otra: _____

fueron encontradas en su sistema de agua:
(el día)_____.

Hervir el agua mata a las bacterias y otros organismos en el agua:

- Haga hervir el agua
- Continúe hirviendo el agua durante 3 a 5 minutos
- Deje enfriar el agua antes de usarla

Para evitar posibles enfermedades y hasta nuevo aviso: use agua hervida o agua potable embotellada para tomar, hacer hielo, limpiarse los dientes, lavar los platos y para preparar comidas.

Hable con su doctor si usted tiene uno o más de los siguientes síntomas: náusea, dolor estomacal, diarrea, ictericia, dolores de cabeza y/o cansancio. La gente con enfermedades crónicas, bebés y personas mayores de edad, pueden estar en situación de alto riesgo y deben consultar con su médico o proveedores de servicios médicos.

Sistema de agua: _____

I.D.: _____

Condado: _____

Contacto: _____

Teléfono: _____

Fecha de notificación: _____

¿Qué son las bacterias coliforme fecal y E. coli?

Coliformes fecales o E. coli son bacterias cuya presencia indica que el agua está contaminada con desechos humanos o de animales. Microbios de esos desechos pueden causar diarrea, dolor estomacal, náusea, dolores de cabeza u otros síntomas. Pueden representar un peligro para la salud de bebés, niños y niñas de corta edad y personas con sistemas inmunológicos en alto riesgo.

¿Por cuánto tiempo va a estar en efecto esta advertencia?

Vamos a consultar con el Departamento de Salud del estado de Washington acerca de este incidente. Le vamos a notificar cuando ya no sea necesario hervir el agua.

See reverse side for English versión.

ADVERTENCIA:

¡No tome el agua de la llave sin antes hervirla!

Bacteria coliforme fecal

Bacteria E. coli

Otra: _____

fueron encontradas en su sistema de agua:
(el día)_____.

Hervir el agua mata a las bacterias y otros organismos en el agua:

- Haga hervir el agua
- Continúe hirviendo el agua durante 3 a 5 minutos
- Deje enfriar el agua antes de usarla

Para evitar posibles enfermedades y hasta nuevo aviso: use agua hervida o agua potable embotellada para tomar, hacer hielo, limpiarse los dientes, lavar los platos y para preparar comidas.

Hable con su doctor si usted tiene uno o más de los siguientes síntomas: náusea, dolor estomacal, diarrea, ictericia, dolores de cabeza y/o cansancio. La gente con enfermedades crónicas, bebés y personas mayores de edad, pueden estar en situación de alto riesgo y deben consultar con su médico o proveedores de servicios médicos.

Sistema de agua: _____

I.D.: _____

Condado: _____

Contacto: _____

Teléfono: _____

Fecha de notificación: _____

¿Qué son las bacterias coliforme fecal y E. coli?

Coliformes fecales o E. coli son bacterias cuya presencia indica que el agua está contaminada con desechos humanos o de animales. Microbios de esos desechos pueden causar diarrea, dolor estomacal, náusea, dolores de cabeza u otros síntomas. Pueden representar un peligro para la salud de bebés, niños y niñas de corta edad y personas con sistemas inmunológicos en alto riesgo.

¿Por cuánto tiempo va a estar en efecto esta advertencia?

Vamos a consultar con el Departamento de Salud del estado de Washington acerca de este incidente. Le vamos a notificar cuando ya no sea necesario hervir el agua.

See reverse side for English version.

APPENDIX N

DEVELOPER STANDARDS

Water District 19

Standards and Details for Constructing Extensions to the Water System

Developer Standards Handbook

March 2014



Prepared by RH2 ENGINEERING, INC.

22722 29th Drive SE; Suite 210

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WATER DISTRICT 19
DEVELOPER STANDARDS HANDBOOK
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INTRODUCTION

The purpose of this document is to provide information regarding the standards for design and construction of water system improvements to the Water District 19's domestic water system. Information in this document is partially obtained from the following sources.

- Water District 19 Comprehensive Water System Plan
- Water District 19 Developer Extension Agreement (DEA)
- Washington State Dept. of Transportation Standard Specifications
- American Water Works Association (AWWA) Standards
- Washington State Dept. of Health, Water System Design Manual

Where any signed agreement exists between the District and the party providing the infrastructure, any such standards or requirements outlined in said agreement shall take precedence over this document.

For the purposes of clarity, the party whom will be providing the new infrastructure will be referred to as the "Developer" in this document. Employees, agents, contractors, subcontractors and volunteers of said party shall be included under the name "Developer", and shall be bound to the same conditions outlined herein.

Legal and contractual requirements for Developers and projects are outlined in the DEA and not repeated herein.

SECTION I: DESIGN STANDARDS

The following standards are to be followed in the design of extensions to the water system of the DISTRICT and in the preparation of plans and specifications for the construction of these extensions. These standards are to be followed except where specific deviations are approved by the DISTRICT.

When the DEVELOPER proposes to design and to prepare construction plans using his own engineer, a pre-design conference with the DISTRICT and the DISTRICT's engineer is recommended to assure there is a clear understanding of the DISTRICT Standards and the specific improvements required to extend the DISTRICT water system to serve the DEVELOPER's property.

Design of pump stations and reservoirs shall be performed by the District's Engineer.

Coordination with Other Agencies

1. The Developer shall submit plans to the King County Fire District 13 for approval of hydrant locations and written Fire District approval shall be submitted to the District.
2. Prior to submittal of water system plans for review, street layout shall be finalized with the transportation agency (City or County). Subsequent revisions to streets will require redesign and re-review of water system plans. The District may make contact with the City or County to verify that the plans have been received and are being reviewed.
3. Utility mainlines and services shall be located to avoid interferences while meeting all applicable agency standards.
- 4.

Construction Drawing Format

Complete plan sets shall be provided to the District, including but not limited to the following:

- Plat Map – Project Overview
- Street Plan and Profile
- Water System Plan and Profile
- Sanitary Sewer, Storm Sewer and Dry Utility Plan and Profile
- Water System Standard Details (obtain current set from District)

Plans may be combined where practical. Sanitary and storm sewers should be shown on the Water Plan and Profile to facilitate review of potential interferences. Incomplete plan sets will not be reviewed.

Include an identified space on the first water system plan sheet for signature by the Water District Manager.

The DEVELOPER shall furnish two (2) copies of the final plat map, contour map, and proposed roads profile sheets prior to the DISTRICT's ordering of the engineering plans from

its Engineer, or if DEVELOPER uses its own engineer prior to submission of plans to the DISTRICT for approval. The contour elevation and road profile elevations shall be referenced to King County Survey data. In the event the DEVELOPER's engineer prepares the construction plans and specifications, the above plans shall accompany the extension construction plan to be reviewed and approved by the DISTRICT's Engineer.

Sheet size: ANSI D (22" x 34") or ARCH D (24" x 36")

Plat Map: The final plat map shall be to the scale of 1" = 100'. The contour map shall have a standard engineering scale and contour intervals of five (5) feet or less. The remaining sheets may be to any suitable scale as selected by the DEVELOPER.

The DISTRICT desires to maintain a consistent format to its construction drawings and, therefore, requires that all construction drawings conform to the following format unless exceptions are approved in advance by the DISTRICT and/or DISTRICT's Engineer.

The following format and requirements are minimum for typical system extensions. Unusual or special facilities or construction requirements may dictate additional drawings and drawing requirements.

Water Plan: a separate construction plan is required at a standard engineering scale of not more than 1"=50', showing all existing or proposed utilities, existing or proposed street surfacing and improvements, street centerline and stationing, street right-of-way margins, street names, legal identifications of properties such as lot number or tax lot number, section subdivision lines, all property lines and all water or other utility easements and rights-of-way. A north arrow shall be included on all plans.

All Water Plans shall show the following information:

- Size, material, location and length of each water main. Length measured between fittings or appurtenances.
- Station and offset to all fittings and valves and listing of each fitting and the type of connection, i.e., flanges (FL), mechanical joint (MJ), restrained joint (RJ), etc.
- Station and offset to all appurtenances such as fire hydrants, blow off and air vacuum release assemblies.
- Details showing how the connection to the existing water system is to be made and how the new mains are to be tested and sampled for bacteriological analysis prior to connection.
- Location and size of all water services and whether the service is a double or single.
- Lot numbers and phasing, if applicable.

Water Profile: A drawing showing the vertical profile will be required for water lines. The horizontal scale of profile shall match the corresponding plan view with an appropriate vertical

exaggeration. Other utilities (sanitary sewer, storm drain, etc.) shall also be shown on the profile.

Notes and Approval: The DISTRICT's General Notes shall be included on or prior to the first water plan sheet. Each water plan shall include a signature block for DISTRICT approval.

As Built: After construction, the DEVELOPER's Surveyor shall provide to the DISTRICT the hard covered field book(s) containing the as-built notes and one set of white prints of the project drawings upon which he has plotted the notes of the Contractor locating existing utilities, and one set of white prints of the project drawings upon which he has plotted the as-built location of the new Work as he recorded in the field book(s). This drawing shall bear the Surveyor's seal and signature certifying its accuracy.

The DEVELOPER shall prepare and submit to the DISTRICT as-built record drawings showing all field changes. As-built record drawings shall be provided in AutoCAD Drawing (.DWG) and Adobe Portable Document (.PDF) electronic formats. Water service will not be provided until as-built record drawings have been received and approved.

Water System Design

The design of water extensions shall be consistent with the DISTRICT's approved Comprehensive Plan, Standard Details, the regulations and standards of the Department of Ecology, Department of Health, Department of Social and Health Services, King County Fire Marshall and all other applicable State, County, and Local agency standard regulations. Specific standards established by the DISTRICT are as follows:

Transmission and Distribution Mains

1. Minimum size for all water mains shall be 8-inches except at the discretion of the DISTRICT. 10-inch and 14-inch diameter mains are not allowed.
2. Minimum size for mains in commercial and industrially zoned areas shall be 12 inches. The DISTRICT may reduce this to 8 inches depending on potential for growth, type of structures, and general character of the area.
3. Any existing steel, asbestos cement (AC), and/or undersized pipes that are adjacent to properties under development shall be replaced to current standards by the DEVELOPER to the farthest property boundary in all directions unless otherwise approved in writing by the DISTRICT. Any existing water services along the existing main(s) shall be reconnected to the new main(s). See notes under Water Services.
4. Waterlines shall be located in Public Right-of-Ways or in easements which have been granted to the DISTRICT. Water mains and service lines shall be located in accordance with Section 8.02 of the King County Road Design and Construction Standards (latest edition), and shall generally be located parallel to the roadway centerline, unless otherwise approved by the DISTRICT. Fittings will be used when

necessary to maintain, as closely as possible, the uniform offset from centerline and in accordance with manufacturer's recommendations so as not to exceed allowable deflection at pipe joints.

5. Water mains shall be located no closer than 7 feet from the face of curb. The DISTRICT may elect to reduce this to 5 feet under special circumstances.
6. Water mains shall not be located under permanent concrete structures unless cased.
7. Water mains shall be ductile iron pipe or polyvinyl chloride (PVC) for pipe sizes 4-inch to 24-inch. Water mains shall be ductile iron pipe for sizes greater than 24-inches. Ductile iron pipe shall conform to AWWA C151. Except where trench, backfill and/or loading conditions dictate a stronger class pipe, all 10-inch and smaller ductile iron pipe shall be class 52; 12-inch and larger ductile iron shall be class 50, except where operating pressures exceed 149 psi in which case class 52 pipe shall be used. PVC pipe shall conform to AWWA C900/905. Except where trench, backfill and/or loading conditions dictate a stronger class pipe, all PVC pipe shall have a minimum dimension ratio (DR) or 18 (PC150).
8. The locations and size of oversized mains or special structures such as a pressure reducing station shall be designated by the DISTRICT Engineer.
9. Water lines shall be looped and dead-end lines avoided if possible. Dead-end lines are not permitted except where the DEVELOPER can demonstrate to the DISTRICT's satisfaction that it would be impractical to extend the line at a future date. Water mains on platted cul-de-sacs shall extend to the plat line beyond the cul-de-sac to neighboring property for a convenient future connection, and a 2-inch blowoff assembly shall be provided.
10. The bury for all waterlines shall be 48-inches minimum and 54 inches maximum as measured from the top of the pipe to top of the subgrade. Whenever excavation or fill changes the cover over an existing waterline then, at the discretion of the DISTRICT, the water main may be required to be replaced to the specified grade.
11. Water and sanitary sewer mains separation shall conform to Department of Ecology Standards. For all other utilities, the water main shall have a minimum separation of 36-inches, unless waived by the DISTRICT.
12. Vertical separation from utilities other than sanitary sewer shall be 6 inches minimum. If this is not possible, the DISTRICT may allow closer separation with the addition of "blueboard" insulation to prevent utilities from bearing directly on each other.
13. Extensions which are not to the benefit of the DISTRICT shall be private and isolated from the system with a double check detector assembly.
14. All water main pipe and fittings shall be restrained. Concrete thrust blocking is the DISTRICT's preferred method. Mechanical restraint (i.e. megalugs) may be used with DISTRICT approval, but may not be used on PVC pipe.

Valves and Hydrants

1. Where ever possible, valves shall be clustered at the tee or crosses of connecting intersecting water lines. Full valve clusters are required.

2. Valves shall be installed at intervals not to exceed 1,000 feet, unless otherwise approved by the DISTRICT.
3. Valves shall be installed at each end of easement.
4. All buried valves and valve clusters shall be pressure tested outside the trench prior to installation.
5. Zone valves shall be located at all pressure zone interfaces to allow future pressure zone re-alignment without the need for additional pipe construction.
6. Isolation valves shall be located wherever necessary to allow individual pipelines to be shut down for repair or installing services. In general, four valves shall be provided per cross and three valves per tee.
7. Combination air/vacuum release valves shall be placed at all high points or "crowns" in all pipelines.
8. Fire hydrants are required approximately every 600 feet in residential areas. Fire hydrant are required approximately every 300 feet in commercial areas, or as required by the Fire Marshall.
9. Hydrants shall be located at street intersections whenever possible.
10. A fire hydrant shall be installed at all dead-end roads and streets. Fire hydrants at dead end streets and roads shall be located within approximately 350 feet from the frontage center of the farthest lot, as measured linearly along the street or road.
11. Length of hydrant runs from the mainline to the hydrant shall not exceed 50 feet.
12. Pipes connecting fire hydrants to mains shall be at least 6-inches in diameter.

Water Services

1. Service lines shall only be connected to public distribution mains. Connection to hydrant runs, fire lines, private mains, or dedicated transmission mains will not be allowed. The District may reconsider this standard at their discretion if there is public health benefit.
2. All water service lines shall be 1" or larger in road crossings; all others shall be a minimum of $\frac{3}{4}$ ". Each service line shall be tapped separately on the water main; dual services are not allowed.
3. Water services taps on existing or new PVC pipe shall be made using a service saddle.
4. All water service lines are to be located within road right-of-way or easement and installed perpendicular (at 90 degrees) to the water main and street centerline.
5. Meter boxes shall be located within right of way and within sidewalks whenever possible. Where sidewalks do not exist, the boxes shall be adjacent to the right of way line whenever possible.
6. Standard DISTRICT practice is to serve properties no more than two deep from the water main.

7. Meter boxes shall be installed with sufficient clearance from side sewers, transformers, pedestals and other utility service equipment to provide for safe maintenance access and maintain water quality. Generally clearance required is 10 feet from side sewers and 3 feet clear from dry utilities.
8. Where existing mains are being replaced, all existing water services shall be connected to the new main. For newer services with full size meter boxes and poly service lines, the service lines need only be reconnected at the main. For older small meter chambers, the chambers shall be rebuilt to current standards and located in the right of way. For any existing services with a steel service pipe, the pipe shall be replaced with poly; existing copper service pipes shall be exposed by the DEVELOPER for DISTRICT inspection and evaluation. If DISTRICT determines that the service pipe requires replacement, the DEVELOPER shall replace the pipe with poly. Service reconstructions shall be reconnected to the customer side line.
9. For a site served by a master meter and/or private on-site domestic distribution, a cross-connection device, commensurate with the degree of hazard shall be installed. See WAC 246-290-490. Installation will be at the point of delivery which is the downstream side of the water service (Premises Isolation) unless In-Premises backflow preventers are providing a level of protection commensurate with the District's assessment. The DEVELOPER's Engineer shall size the device to pass all anticipated flows which may include domestic, irrigation and fire sprinkler demands. Per WAC 246-290-490(1)e, Purveyors are not responsible for eliminating or controlling cross-connections within the consumer's water system. Under Chapter 19.27 RCW, the responsibility for cross-connection control within the consumer's water system, i.e., within the property lines of the consumer's premises, falls under the jurisdiction of the local administrative authority (Local Building Department). DEVELOPER's engineer/architect shall verify if premise isolation will be required at each structure.
10. Pressure regulating valves shall be provided downstream of the DISTRICT's meter to protect private system (i.e. property owner) plumbing in accordance with local Plumbing and Building Codes. The DISTRICT or DISTRICT's Engineer shall not be responsible for the protection of the private system downstream of the meter.

Pressure Reducing Stations

1. District Standard Detail for PRV stations shall be used for design. Prepackaged stations may be allowed at the discretion of the District.
2. Vaults are to be sized to provide adequate working space including clear head room and sufficient clearance to service and remove all equipment.
3. Vaults shall include drywell drains, daylight drains or sump pumps.
4. Pressure relief valves shall be considered for closed pressure zones to prevent over-pressurization if a PRV fails in the open position.
5. Stations shall include a large valve for emergency flow and small bypass valve for domestic flows.

6. Hydraulic control valves 2-inch and larger shall be manufactured by Cla-Val, no substitutions.

State Highway and Stream Crossings

1. All state highway and stream crossing shall be encased with a steel casing, unless otherwise approved by the DISTRICT and appropriate regulatory Agency.
2. Steel casing shall be of a sufficient diameter, size and strength to enclose carrier pipe and to withstand maximum highway loading. Sizing and wall thickness of casing is subject to DISTRICT and Agency approval.
3. Casing spacers shall be installed at ten feet on-center along the pipeline. The spacers shall be Uni-Flange Series UFRCS 1300 or approved equal.
4. Sand backfill between the casing and the carrier pipe shall be required. In order to prevent the sand from being washed from the casing, the ends of the casing shall be bricked and cemented after installation, backfill, and testing of the pipe are completed.

Easements

Whenever water lines are located outside of public streets, the right-of-way or easement shall be of sufficient width to allow for future replacement of the facility without damage to permanent adjacent improvements. In general, wherever a water main is to be laid other than in a public street, a permanent easement of not less than seven and one-half feet on each side of the centerline of the main shall be provided. In addition, the DEVELOPER shall provide a temporary construction easement not less than 25 feet in width adjacent to the permanent easement. Special circumstances may require additional easement widths. Vehicle access, as approved by the DISTRICT shall be provided to all manholes and facilities. Easements must be shown on the water plan and recorded on the plat.

Any required easements shall be obtained by the DEVELOPER at his sole cost and expense, name the DISTRICT as grantee, and a copy of such easement in a form acceptable to the DISTRICT shall be delivered to the DISTRICT prior to the time the DEVELOPER commences construction hereunder. Upon completion of construction and prior to acceptance of the extension by the DISTRICT in accordance with the provision hereof, the original easement shall be delivered to the DISTRICT. The DEVELOPER shall provide all necessary easements at his sole cost regardless of changes in the Contract Plans, together with good and sufficient evidence of clear title, and if required, a title insurance policy in a sum not less than \$5,000 per 500 feet of easement, insuring clear title to the easement in the DISTRICT.

SECTION 2: CONSTRUCTION STANDARDS

Construction materials and procedures and construction details shall comply with the Standards and Details for Construction of Public Works Projects as prepared by the Washington State Department of Transportation and the Washington State Chapter of the American Public Works Association except as revised or modified by the DISTRICT.

The DEVELOPER shall use licensed and bonded Contractors to do all water system related work. After the Plans have been approved a pre-construction conference will be held prior to field construction beginning.

The DEVELOPER shall provide a minimum of one bench mark, on the project site; and the elevation and location of the bench mark shall be indicated on the maps furnished by the DEVELOPER.

A preconstruction conference is required prior to construction and 48 hours advance notification of the King County, the Water District 19 and all affected utility companies prior to the actual start of work. Preconstruction conferences may only be held on Mondays, Tuesdays, Wednesday or Thursdays.

Where field inspection, direction and decisions are described hereafter, the terms Engineer and District Inspector shall be considered interchangeable.

1. STATUS OF ENGINEER

- a) The Engineer shall have general supervision and direction of the work, provided, however, nothing contained herein or elsewhere in the Extension Documents shall be construed as required the Engineer to direct the method or manner of performing any work by the DEVELOPER under this contract. The Engineer has the authority to stop work whenever, in his opinion, such stoppage may be necessary to ensure proper execution of the contract. The Engineer may also reject all work and materials which, in his opinion, do not conform to the contract.
- b) It is understood and agreed by and between the parties hereto that the work (except the method or manner of performing the work) included in the application is to be done under the general supervision and to the complete satisfaction of the Engineer, or his duly authorized representative, and the decision of the Engineer as to the true interpretation and meaning of the application, plans, specifications, and estimates and as to all questions arising as to proper performance of the work shall be final.
- c) The Engineer shall decide any and all questions which may arise as to the quality or acceptability of materials furnished and work performed and all questions as to be acceptable fulfillment and performance of the Application on the part of the DEVELOPER. The decision of the Engineer in such matters shall be final.
- d) The Engineer may direct the sequence of conducting work when it is in locations where the DISTRICT is doing work either by contract or by its own forces or where such other works may be affected by the contract, in order that conflict may be avoided and the work under these specifications be harmonized with that under other contracts, or

with other work being done in connection with, or growing out of, operations of the DISTRICT. Nothing herein contained, however, shall be taken to relieve the DEVELOPER of his obligations or liabilities under the application.

- e) Neither the Engineer nor his representatives have the authority to waive the obligation of the DEVELOPER to perform work in accordance with the Extension Documents. Failure or omission on the part of the Engineer or his representatives to condemn unsuitable, inferior, or defective work and/or labor or material or equipment furnished under the application shall not release the DEVELOPER or his bond from performing the work in accordance with the Extension Documents.

2. SURVEYS, PERMITS, LAWS, AND REGULATIONS

- a) The DEVELOPER shall furnish all property boundary surveys unless otherwise specified. Permits, permission under franchises, licenses, and bonds of a temporary nature necessary for the prosecution of the work, and inspection fees in connection therewith shall be secured and paid for by the DEVELOPER. Where the DISTRICT is required to secure such permits, permission under franchises, and licenses and bonds and to pay the fees, the costs incurred by the DISTRICT shall be reimbursed to the DISTRICT by the DEVELOPER.
- b) The DEVELOPER shall give all notices and comply with all laws, ordinances, rules, and regulations bearing on the conduct of the work required by the Extension Documents. If the DEVELOPER observed that the Extension Documents, or any part thereof, are inconsistent or at variance therewith, he shall promptly notify the Engineer in writing, and any necessary changes shall be made as provided in the Application for changes in the work. If the DEVELOPER performs any work contrary to such laws, ordinances, rules and regulations, or prior to obtaining permits, permission under franchises, licenses, and/or bonds as required to be furnished by or obtained by the DISTRICT, he does so at his own risk.
- c) The DEVELOPER shall carefully preserve benchmarks, reference points and stakes, and in the case of destruction shall be charged with the resulting expense to restore said benchmarks, reference points and stakes, and shall be responsible for any mistakes that may be caused by their absence or disturbance.

3. CONSTRUCTION STAKING

- a) The DEVELOPER shall, at DEVELOPER's sole expense, furnish all construction points, stakes, and instructions necessary to control the horizontal and vertical placement of all facilities to be constructed by the DEVELOPER pursuant to the application. The DEVELOPER shall not proceed to place any construction points or stakes until written notification from the DISTRICT or the Engineer that the DEVELOPER may proceed with construction under the application. Construction points, stakes and instructions to be provided by DEVELOPER shall meet the following minimum requirements:
 - i) Horizontal location of all water mains at 50 foot stations offset 10 feet from the water main location.

- ii) The location of and two direction 10 foot offsets to locate all pipe intersections, cast iron bends, valves, hydrants, blow off assemblies, and air and vacuum assemblies.
 - iii) A stake at the edge of the public right-of-way, easement or other right-of-way adjacent the water main marking the horizontal locations of all water service meter box assemblies.
 - iv) Sufficient horizontal and vertical reference marks to accurately locate and construct all other water facilities and structures such as pressure reducing stations.
- b) The DEVELOPER shall perform all property surveys necessary for placement of the construction stakes including surveys of easements. The DEVELOPER shall provide to the DISTRICT drawings showing the bearing and dimensions of all property lines, ties to adjacent subdivisions and section control and the calculated closure of all control traverses. All surveying and construction staking shall be performed by a professional land surveyor licensed in the State of Washington.
- c) The DEVELOPER shall record the location prior to the backfilling of the trenches, by centerline station, offset, and depth below pavement, of all existing utilities uncovered or crossed during his Work as covered under this project. The DEVELOPER's shall have his Surveyor locate by centerline station, offset and elevation each major item of Work. Major items of Work shall include but not be limited to: manholes and vaults, valves, vertical and horizontal bends, junction boxes, hydrants, water services, blowoffs, air valve assemblies, and major changes in design grade.
- d) After construction, the DEVELOPER's Surveyor shall provide to the DISTRICT the hard covered field book(s) containing the as-built notes and one set of white prints of the project drawings upon which he has plotted the notes of the Contractor locating existing utilities, and one set of white prints of the project drawings upon which he has plotted the as-built location of the new Work as he recorded in the field book(s). This drawing shall bear the Surveyor's seal and signature certifying its accuracy

5. INSPECTION AND TESTS

- a) Inspection of the work by the DISTRICT and its authorized agents shall be strictly for the benefit of the DISTRICT, and nothing contained herein shall be construed to relieve the DEVELOPER of his obligations under this application.
- b) The Engineer and his representatives shall, at all times, have access to the work for the purpose of inspecting and testing wherever it is in preparation or progress, and the DEVELOPER shall provide proper facilities for such access and for such inspection and testing.
- c) The DEVELOPER shall give the Engineer timely notice that the work, or any part thereof, which has been constructed within the DISTRICT's service area, is ready for inspection. In no event shall the work, or any portion thereof, be covered up or placed into operation until the Engineer has completed the inspection.
- d) All inspections by the Engineer will be made with reasonable promptness but, in no event, shall the lack of prompt inspection be construed to allow the DEVELOPER to cover up the work or any portion of it without inspection.

- e) If any work should be covered up without approval or consent of the Engineer; it must, if required by the Engineer, be uncovered for inspection at the DEVELOPER's expense.
- f) Re-examination of questioned work may be ordered by the Engineer; and, if so ordered, the work shall be uncovered by the DEVELOPER. If such work be found by the Engineer to be in accordance with the Extension Documents, the DISTRICT shall pay the cost of re-examination and replacement. If such work be found not in accordance with the Extension Documents, the DEVELOPER shall pay such costs.
- g) The DEVELOPER shall make tests of the work as required by the Engineer at the DEVELOPER's expense and shall maintain a record of such tests.
- h) For a performance test to be observed by the Engineer, the DEVELOPER shall make whatever preliminary test are necessary to assure that the material and/or equipment are in accordance with the specifications. If, for any reason, the test observed by the Engineer is unsatisfactory, the DEVELOPER shall pay all costs incurred by the Engineer for the inspection and supervision of all further testing.
- i) Where work is performed other than during the normal 40-hours week, the DEVELOPER shall pay additional costs of DISTRICT for inspection and supervision.
- j) Where the specifications, the Engineer's instructions, laws, ordinances, or any government authority require any work to be specifically tested or inspected, the DEVELOPER shall give the Engineer timely notice of the date fixed for such inspection. Required certificates of inspection by other authority than the Engineer shall be secured by the DEVELOPER.
- k) Inspection during construction will be provided as deemed necessary by the Engineer.
- l) Written notice of deficiencies, adequately describing the same, shall be given to the DEVELOPER upon completion of each inspection, and the DEVELOPER shall correct these deficiencies within seven (7) days of notice thereof and before final inspection will be made by the Engineer.
- m) A representative of the DEVELOPER or the DEVELOPER's contractor shall arrange a time with and accompany the Engineer on the final inspection and subsequent inspections, if required, thereafter.
- n) Deficiencies discovered at the final inspection shall be corrected within seven (7) days notice thereof and, in no instance, shall service be provided until said deficiencies are corrected and the extension passes re-inspection.
- o) A deposit to cover all costs, including actual construction, engineering, and administration, may be required at the discretion of the DISTRICT to cover correction of deficiencies discovered at the final inspection.
- p) All costs incurred by the DISTRICT for inspection, including the fees and charges of its Engineer, except as specifically provided for in this section, shall be paid by the DEVELOPER, and a deposit, therefore, for this may be required in advance by the DISTRICT.

- q) Neither inspection nor acceptance by the DISTRICT shall relieve the DEVELOPER of any responsibility or liability, whether to the DISTRICT or others, provided in the Extension Documents.

6. PLANS AND SPECIFICATIONS ACCESSIBLE

- a) For District designed work, the DEVELOPER shall be furnished three (3) signed copies of plans and specifications and shall keep at least one (1) copy of the same constantly accessible at the construction site.
- b) Where shop drawings are required to be submitted for acceptance, one (1) copy of the approved shop drawings shall be kept constantly accessible at the construction site.

7. OWNERSHIP OF DRAWINGS

- a) All drawings, specifications and copies thereof prepared or furnished by the Engineer are his property. They are not to be used on other work and, with the exception of the signed application, are to be returned to him upon completion of the work.

8. INSURANCE

- a) The DEVELOPER shall obtain and keep in force during the term of the contract, Commercial General Liability insurance policies with insurance companies which have an A.M. Best's rating of A VII or better and who are approved by the Insurance Commissioner of the State of Washington pursuant to Title 48 RCW.
- b) Prior to the execution of the contract, the DEVELOPER shall purchase and maintain during the term of this project a Commercial General Liability insurance policy meeting the requirements set forth herein. The DEVELOPER shall file with the DISTRICT either a certified copy of all insurance policies or a Certificate of Insurance with such endorsements attached, as are necessary to comply with these specifications. Failure of the DEVELOPER to fully comply with the requirements regarding insurance will be considered a material breach of contract and shall be cause for immediate termination of this Application and of any and all DISTRICT obligations, regarding same.
- c) The DEVELOPER shall not begin work under the agreement or under any special condition until all required insurance has been obtained and until such insurance has been approved by the DISTRICT. Said insurance shall provide coverage to the DEVELOPER, and the DISTRICT. The coverage so provided shall protect against claims from bodily injuries, including accidental death, as well as claims for property damage which may arise from any act or omission of the DEVELOPER, his subcontractors, or by anyone directly or indirectly employed by either of them.
- d) The insurance policies shall specifically name the following as insureds with regards to damages and defense of claims arising from: (a) activities performed by or on behalf of the DEVELOPER; or (b) products and completed operations of the DEVELOPER, or (c) premises owned, leased or used by the DEVELOPER.
 - Water District 19, its elected or appointed officials, officers, employees, agents and volunteers,

- RH2 Engineering, Inc., and
 - Water and Sewer Risk Management Pool
- e) The policy endorsement shall be provided to confirm the above. The insurance shall be maintained in full force and effect at the DEVELOPER's expense throughout the term of this Application.
- f) The DISTRICT shall be given at least 45 days written notice of cancellation, nonrenewal, material reduction or modification of coverage, such notice to be given by certified mail.
- g) The coverage provided by the DEVELOPER's insurance policies are to be primary to any insurance maintained by the DISTRICT, except as respects losses attributable to the sole negligence of the DISTRICT. Any insurance that might cover this agreement which is maintained by the DISTRICT shall be in excess of the DEVELOPER's insurance and shall not contribute with it.
- h) The DEVELOPER's insurance policies shall protect each insured in the same manner as though a separate policy had been issued to each. The inclusion of more than one insured shall not affect the rights of any insured as respects any claim, suit or judgment made or brought by or for any other insured or by or for any employee of any other insured. However, this provision shall not increase the limits of the insurer's liability.
- i) The General Aggregate provision of the DEVELOPER's insurance policies shall be amended to show that the General Aggregate Limit of the policies applies separately to this project. Provide a policy endorsement to confirm the amendment.
- j) The DEVELOPER's insurance policies shall not contain deductibles or self-insured retentions in excess of \$10,000 unless approved by the DISTRICT.
- k) The DEVELOPER's insurance policies shall contain a provision that the DISTRICT has no obligation to report events which might give rise to a claim until a claim has been filed with the DISTRICT's Board of Commissioners.
- l) Providing of coverage in the stated amounts shall not be construed to relieve the DEVELOPER from liability in excess of such limits.
- m) In addition, the DEVELOPER shall have its Insurance Agent/Representative complete the Insurance Coverage Questionnaire contained in the agreement and attach it to the Certificate of Insurance for DISTRICT's approval.
- n) The DEVELOPER shall maintain Workers' Compensation Insurance and/or Longshore and Harbor Workers Insurance as required by State or Federal statute, for all of his employees to be engaged in work on the project under this contract and, in case any such work is sublet, the DEVELOPER shall require the subcontractor similarly to provide Workers' Compensation Insurance and/or Longshore and Harbor Workers' Insurance for all of the latter's employees engaged in such work. The DEVELOPER's Labor and Industries account number shall be noted on the Certificate of Insurance.
- o) In the event any class of employees engaged in the work under this Contract is not covered under Workers' Compensation insurance or Longshore and Harbor Workers' Insurance as required by State and Federal statute, the DEVELOPER shall maintain and cause each subcontractor to maintain Employer's Liability Insurance for limits of at

least \$1,000,000 each employee for disease or accident, and shall furnish the DISTRICT with satisfactory evidence of such.

- p) The DEVELOPER shall be solely and completely responsible for safety and safety conditions on the job site, including the safety of all persons and property during performance of the work. The services of the DISTRICT's or engineer's personnel in conducting construction review of the DEVELOPER's performance is not intended to include review of the adequacy of the DEVELOPER's work methods, equipment, bracing, scaffolding, or trenching, or safety measures in, on, or near the construction site. The DEVELOPER shall provide safe access for the DISTRICT and its inspectors to adequately inspect the quality of work and the conformance with project specifications.
- q) The DEVELOPER shall be solely and completely responsible to perform all work and furnish all materials in strict compliance with all applicable state, city, county, and federal laws, regulations, ordinances, orders, and codes. The DEVELOPER's attention is directed to the requirements of the Washington Industrial Safety and Health Act (WISHA), Chapter 49.17 RCW.
- r) The Contractual coverage of the DEVELOPER's policy shall be sufficiently broad enough to insure the provisions of the HOLD HARMLESS CLAUSE of this Application.
- s) Nothing contained in these insurance requirements is to be construed as limiting the extent of the DEVELOPER's responsibility for payment of damages resulting from his operations under this DEVELOPER.
- t) Types and Limits of Insurance Required:
 - i) Commercial General Liability
 - (1) \$1,000,000 per occurrence and \$2,000,000 annual aggregate Bodily Injury and Property Damage Liability (including extended bodily injury)
 - (2) Employees and volunteers as Additional Insureds
 - (3) Premises and operations
 - (4) Broad form property damage including underground, explosion, and collapse hazards (XCU)
 - (5) Products completed operations (through guaranty period)
 - (6) Blanket contractual
 - (7) Subcontractors
 - (8) Personal Injury with EE exclusion deleted
 - (9) Employer's liability (Stop gap)
 - ii) Automobile
 - (1) \$1,000,000 per accident Bodily Injury and Property Damage Liability, covering:
 - (2) Any owned automobile

- (3) Hired automobiles
 - (4) Non-owned automobile
- iii) Umbrella Liability
- (1) \$2,000,000 per occurrence
 - (2) \$2,000,000 aggregate
- u) As an alternative to the above indicated Commercial General Liability and Umbrella Liability insurance policies the DEVELOPER may provide the DISTRICT with an Owners and Contractors Protective (OCP) policy with a limit of coverage of \$5,000,000. The DEVELOPER shall additionally provide the DISTRICT with evidence that the DISTRICT has been named as additional insured on the DEVELOPER's General Liability policy for at least products completed operations coverage.

9. MATERIAL AND EQUIPMENT; MATERIAL AND EQUIPMENT LIST

- a) Material and equipment shall be new and shall be specified in the extension documents or, if not specified, shall be of a quality approved by the Engineer. All materials and equipment furnished are warranted by the DEVELOPER as new and as in compliance with the plans and specifications, if specified therein, and as suitable for the intended purpose. In addition thereto, the DEVELOPER shall furnish the DISTRICT with copies of the supplier's warranty and adopt the same as the warranty of the DEVELOPERs and shall also be liable thereon to the DISTRICT.
- b) The DEVELOPER shall file three (3) copies of materials and equipment list with the Engineer prior to proceeding with construction. This list shall include the quantity, manufacturer and model number, if applicable, of materials and equipment to be installed under the application. This list will be checked by the Engineer as to conformity with the plans and specifications. The Engineer will pass upon the list with reasonable promptness, making required corrections.
- c) The DEVELOPER shall make any required corrections and file two (2) corrected copies with the Engineer within one week after receipt of required corrections. The Engineer's review and acceptance of the lists shall not relieve the DEVELOPER from responsibility for deviations from the drawings and specifications or warranty for suitability for the intended purpose unless the DEVELOPER has, in writing, called the Engineer's attention to such deviations at the time of submittal and secured the Engineer's written approval for such deviation.

10. SHOP DRAWINGS

- a) The DEVELOPER shall check and verify all field measures. He shall submit with such promptness as to cause no delay in his own work or in that of any other contractor three (3) copies, checked and approved by the DEVELOPER, of all shop or setting drawings and schedules (all collectively herein referred to as "shop drawings") required for the work of the various trades in the performance of the work or where requested by the Engineer and shall verify all field measurements or conditions to which the shop drawings are applicable. The Engineer shall pass upon them with reasonable promptness making required corrections, including those related to design and artistic

effect. The DEVELOPER shall make any corrections required by the Engineer and, within one week after receipt of the required corrections, shall file with the Engineer two (2) corrected copies and furnish such other copies as may be needed by the Engineer. The Engineer's acceptance of such drawings or schedules shall not relieve DEVELOPER from responsibility for deviation from drawings or specifications, unless the DEVELOPER has, in writing, called the Engineer's attention to such deviation at the time of submission and secured the Engineer's written approval, nor shall it relieve the DEVELOPER from responsibility for errors in shop drawings or schedules.

11. CUTTING AND FITTING

- a) The DEVELOPER shall do all cutting and fitting of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other DEVELOPERS or contractors shown or reasonably implied by the drawings and specifications for the completed structure, and the DEVELOPER shall restore all surfaces damaged by cutting and fitting as the Engineer may direct.

12. LABOR, MATERIALS, EQUIPMENT, FACILITIES, AND WORKMEN

- a) The DEVELOPER shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation and other facilities necessary for the execution and completion of the work, except as otherwise stipulated in the Extension Documents.
- b) The DEVELOPER shall, at all times, enforce strict discipline and good order among his employees and shall not employ on the work any person unfit or not skilled in the work assigned to him. Employees or agents of the DEVELOPER who, in the opinion of the Engineer, may impair the quality of the work shall forthwith be discharged by the DEVELOPER upon the written request of the Engineer.
- c) During the term of this application, neither party shall employ nor hire any employee of the other party, nor of the Engineer, without the written consent of the other party or of the Engineer. The DEVELOPER shall not use any work performed or any information obtained from any employee hired in violation of this provision in making a claim against the DISTRICT or Engineer and shall be liable to the DISTRICT, as liquidated damages, in an amount equal to double the amount of salary or wages paid to any such employees so hired in violation hereof.
- d) Necessary sanitation conveniences for the use of workmen on the job, properly secluded from public observation, shall be provided and maintained by the DEVELOPER.
- e) Contractors working within the right of way or on existing DISTRICT infrastructure shall be licensed, bonded and have experience installing public domestic water systems and be prepared to present examples of five such projects upon request by the DISTRICT.

13. SAMPLES

- a) The DEVELOPER shall furnish for approval all samples as directed by the Engineer. The finished work shall be in accordance with approved samples. Approval of samples

by the Engineer does not relieve the DEVELOPER of performance of the work in accordance with the Extension Documents.

14. DETERMINATION OF "OR EQUAL"

- a) The Engineer shall be the sole judge of the questions of "or equal" of any supplies or materials proposed by the DEVELOPER. The DEVELOPER shall pay to the DISTRICT the cost of tests and evaluation by the Engineer to determine acceptability of alternatives proposed by the DEVELOPER, in accordance with the established rates of the Engineer for time and expense work.

15. ROYALTIES AND PATENTS

- a) The DEVELOPER shall defend, indemnify and hold the DISTRICT harmless for all claims and/or suits brought against the DISTRICT by reason of infringement of patent rights or license on any material, machine, appliance, or process that he may use on the work or incorporate into the finished job except where specifically exempted by Special Provisions. Such indemnity shall include the costs of defense by an attorney of DISTRICT's choice.

16. PROTECTION OF WORK AND PROPERTY AND SAFETY

- a) DEVELOPER shall continuously maintain adequate protection of the work from damage and shall protect DISTRICT's property from injury or loss arising in connection with or during the existence of this application. DEVELOPER shall make good any such damage, injury, or loss, except as may be directly due to errors in the Extension Documents or caused by agents or employees of the DISTRICT. He shall adequately protect adjacent property from damage or loss occasioned by performance of the work. He shall provide and maintain all passageways, guard fences, lights, and other facilities for protection required by public authority or local conditions.
- b) DEVELOPER shall bear the risk of loss or damage for all finished or partially finished work until the entire extension is accepted by the DISTRICT.
- c) DEVELOPER shall take all necessary precautions for the safety of employees on the work site and shall comply with all applicable provisions of Federal, State, and Municipal safety laws and building codes. We shall erect and properly maintain, at all times, as required by the conditions and progress of the work, all necessary safeguards for protection of workmen and the public, shall post danger signs warning against known or unusual hazards; and he shall designate a responsible member of his organization on the construction site whose duty shall be the prevention of accidents. The name and position of such person so designated shall be reported in writing to the Engineer by the DEVELOPER.
- d) Bridging shall be provided across private driveways and roadways during the period that the trenches are open, in such a manner as not to constitute a hazard to the people who use them. All construction operations shall be conducted in such a manner as to interfere as little as possible with the normal procedure of traffic.

17. EXISTING UTILITIES OR OBSTRUCTIONS

- a) DEVELOPER shall not enter upon or place materials on other private premises except by written consent of the individual owners, and he shall save DISTRICT harmless from all suits and actions of every kind and description that may result from his use of private property.
- b) DEVELOPER shall investigate and locate all buried utilities or obstructions in the construction area prior to construction of new water facilities. The DEVELOPER shall call for utility locates (One-Call) prior to construction and shall coordinate all work with any utility companies affected by the work.
- c) Underground utilities of record shall be shown on the construction plans insofar as it is possible to do so. These, however, are shown for convenience only, and DISTRICT assumes no responsibility for improper locations or failure to show utility locations on the construction plans.
- d) DEVELOPER shall take adequate precautions to protect existing lawns, trees, and shrubs outside rights-of-way, sidewalks, curbs, pavements, utilities, adjoining property, and structures, and to avoid damage thereto caused by his operations to the satisfaction of the Engineer, except as otherwise provided in the Extension Documents.

18. REPLACING IMPROVEMENTS

- a) Whenever it is necessary, in the course of construction, to remove or disturb culverts, driveways, roadways, pipelines, monuments, property stakes, or other existing improvements, without limiting the generality thereof and whether on private or public property, they shall be replaced to a condition equal to that existing before they were so removed and disturbed. If it is necessary to trench through lawns, the sod shall be removed before trenching and replaced after backfilling.

19. SUPERINTENDENCE AND SUPERVISION

- a) The DEVELOPER shall keep on the construction site during the progress of the work a competent superintendent and any necessary assistants, all satisfactory to the Engineer. The superintendent shall not be changed except with the consent of the Engineer unless the superintendent proves to be unsatisfactory to the DEVELOPER and ceases to be in his employ. The superintendent shall represent the DEVELOPER in his absence, and all directions given to the superintendent shall be as binding as though given to the DEVELOPER. Instructions to the DEVELOPER shall be confirmed in writing upon his request in each case. The DEVELOPER shall give efficient supervision to the work, using his best skill and attention.

20. WARRANTIES OF DEVELOPER

- a) Upon completion of the extension work and approval thereof by the DISTRICT and simultaneously with the acceptance of the title by the DISTRICT, the DEVELOPER warrants to the DISTRICT as follows:
 - i) That the DEVELOPER is the owner of the property and the same is free and clear of all encumbrances and that the DEVELOPER has good right and authority to

transfer title thereto to the DISTRICT and will defend the title of the DISTRICT against the claims of all third parties claiming to own the same or claiming an encumbrance against the same; and

- ii) That the water extension is in proper working condition, order, and repair and that it is adequate and fit for the intended purpose of use as a water system and as an integral part of the water system of the DISTRICT; and
- iii) That for a period of two years from the date of final acceptance and transfer of title of the extension to the DISTRICT, all parts of the extension shall remain in proper working condition, order and repair except where abused or neglected by the DISTRICT; and the DEVELOPER shall repair or replace, at its own expense, any work or material which may prove to be defective during the period of this warranty. The DEVELOPER shall obtain warranties and guaranties from its subcontractors and/or suppliers where such warranties or guaranties are specifically required herein and shall deliver copies to the DISTRICT upon completion of the work. When corrections of defects occurring within the warranty period are made, the DEVELOPER shall further warrant correct work for one year after acceptance by the DISTRICT.

22. CORRECTION OF DEFECTS OCCURRING WITHIN WARRANTY PERIOD

- a) When defects occurring within the warranty period are discovered, the DEVELOPER shall start work to remedy any such defects within seven (7) days of mailing notice of discovery thereof by the DISTRICT and shall complete such work within a reasonable time. In emergencies, where damage may result from delay and where loss of service may result, corrections may be made by the DISTRICT immediately upon discovery; in which case the cost thereof shall be borne by the DEVELOPER. In the event the DEVELOPER does not commence and/or accomplish corrections within the time specified, the work shall be otherwise accomplished and the cost of same shall be paid by the DEVELOPER.
- b) The DEVELOPER shall be responsible for any expenses incurred by the DISTRICT resulting from defects in the DEVELOPER's work including actual damages, cost of materials, and labor expended by the DISTRICT in making emergency repairs, cost of engineering, inspection, and supervision by the DISTRICT or Engineer, as well as reasonable attorney's fees to be fixed by the court in any action which the DISTRICT may commence against the DEVELOPER to enforce the provisions hereof.

23. INDEMNITY

- a) The DEVELOPER shall defend, indemnify and hold harmless the DISTRICT, its elected and appointed officers, officials, employees, agents, volunteers, and the Engineer, from and against any and every claim and risk and all losses, damages, demands, suits, judgments and attorney fees, and other expenses of any kind, on account of injury to or death of any and all persons and/or on account of all property damage of any kind, whether tangible or intangible, including loss of use resulting therefrom, in connection with the work performed under this Application, or caused or

occasioned in whole or in part by reason of the presence of the DEVELOPER or its subcontractors, or their property, employees or agents, upon or in proximity to the property of the DISTRICT, or any other property upon which the DEVELOPER is performing any work called for or in connection with this Application, except only for those losses resulting solely from the negligence of the DISTRICT, its officers, officials, employees and agents.

- b) Should a court of competent jurisdiction determine that this Application is subject to Chapter 4.24.115 RCW, then in the event of liability for damages arising out of bodily injury to persons or damages to property caused by or resulting from the concurrent negligence of the DEVELOPER and the DISTRICT, its officials, officers, employees, agents, and Engineer the DEVELOPER's liability hereunder shall be only to the extent of the DEVELOPER's negligence. It is further specifically and expressly understood that the indemnification provided herein constitutes DEVELOPER's waiver of immunity under industrial insurance, Title 51 RCW, solely for the purposes of this indemnification. This waiver has been mutually negotiated by the parties.
- c) If a lawsuit arises in respect to this Application, the DEVELOPER shall appear and defend that lawsuit at its own cost and expense, and if judgment is rendered or settlement made requiring payment of damages by the DISTRICT, its elected or appointed officers, officials, employees, agents, volunteers, and Engineer, the DEVELOPER shall pay the same..

24. SUBLETTING AND SUBCONTRACTING

- a) The DEVELOPER agrees that he is fully responsible to the DISTRICT for the acts and omissions of subcontractors and persons either directly or indirectly employed by subcontractors, as well as the acts and omissions of persons directly employed by the DEVELOPER. Consent to subcontracting part of the work shall in no way release the DEVELOPER from responsibility under the application, and he will be held, in all respects, accountable for the same as if no consent had been given. Nothing contained in the Extension Documents shall create any contractual relation between any subcontractor and the DISTRICT.

25. SEPARATE CONTRACT; INTERFERENCE WITH OTHER DEVELOPERS

- a) The DISTRICT reserves the right to perform the work with its own forces or to let contracts for work under similar general conditions in connection with this project or other projects. The DEVELOPER shall afford the DISTRICT and other contractors reasonable opportunity for the execution of their respective work and shall properly connect and coordinate his work with theirs.

26. USE OF COMPLETED PORTIONS

- a) The DISTRICT shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding that the time may not have expired for completing the entire work or such portions, which will not interfere with the DEVELOPER performing the remaining work. Such taking possession and use

shall not be deemed an acceptance of any work not completed and inspected in accordance the Contract Documents or DISTRICT standards.

27. CONSTRUCTION CLOSEOUT

- a) Formal acceptance of the project is accomplished by resolution at a Commissioner's meeting. Acceptance also begins the warranty period. Once the final project is accepted by the District as complete, ownership of the facilities are transferred to the District via Bill of Sale. For applicable projects, a Department of Health Construction Completion Report shall be filled out and filed with DOH and the District.
- b) If a Latecomer's Agreement (aka Reimbursement Agreement) is desired, the proponent has 12 months after formal acceptance to prepare and submit an acceptable version of said agreement to the District. Additional requirements for preparation of said agreement can be found in the DEA document.

SECTION III: WATER DISTRICT 19 SPECIAL PROVISIONS

Included as separate document.

DIVISION 7

DRAINAGE STRUCTURES, STORM SEWERS, SANITARY SEWERS, WATER MAINS AND CONDUITS

7-08 General Pipe Installation Requirements

7-08.3 Construction Requirements

7-08.3(2)B Pipe Laying

Delete the third paragraph of Section 7-08.3(2)B and REPLACE it with the following:

Variance from established line and grade shall not be greater than 1/32-inch per inch of pipe diameter and not to exceed 1/2-inch, provided that such variation does not result in a level or reverse sloping invert; provided also, that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces, does not exceed 1/64-inch per inch pipe diameter, or 1/2-inch maximum.

7-09 Pipe and Fittings for Water Mains

7-09.1 Description (Supplemental Section)

Water main pipe, fittings, valves, and appurtenances shall be constructed in accordance with the *Water District No. 19 Standards and Details for Constructing Extensions to the Water System (Developer Standards Handbook)*, latest edition.

7-09.3(1) General (Supplemental Section)

The total length of pipe sections installed, prior to pressure testing and flushing, shall be limited to 1,500 feet. The Owner may require that the first section of pipe, not less than 1,000 feet in length, installed by each of the Contractor's crews, be pressure tested to qualify the crew and/or material.

7-09.3(4) Removal of Existing Street Improvements (Supplemental Section)

Driveways, curbs, gutters, landscaping, trees, sidewalks, and wheelchair ramps shall be removed as necessary to install the improvement as shown on the construction plans.

7-09.3(5) Grade and Alignment (Supplemental Section)

The water main profile is shown on the plans. Adjustment in depth to avoid conflicting utilities shall be accomplished by either deflecting the pipe at the joints in conformance with manufacturer's recommendations or by the use of vertical bends and thrust blocking. The Contractor shall lay the pipe at grades which prevent localized high points.

7-09.3(6) Existing Utilities (Replacement Section)

The Contractor shall comply with the Construction Notes section of the construction plans and the General and Supplemental Provisions of these specifications.

7-09.3(7) Trench Excavation (Supplemental Section)

Prior to trenching through areas improved with lawn or through fences, rockeries, shrubs, plants, or other improvements, these improvements shall be removed, stored and protected. After the utility installation is complete, the improved area shall be returned to a condition equal to or better than the area before the utility installation. If any stored improvements are not suitable for reuse after construction, they shall be replaced with an improvement of equal or better quality.

The Contractor shall provide all materials, labor, and equipment necessary to adequately shore trenches to protect the work, existing property, utilities, pavement, and any other improvements, and to provide safe working conditions in the trench. The Contractor may use any method of shoring, provided that the method complies with all local, state, and federal safety codes. The Contractor alone shall be responsible for worker safety, and the Owner and its agents assume no responsibility. Damages resulting from improper shoring or failure to shore shall be the sole responsibility of the Contractor. Shoring below the pipe will not be removed if, in the opinion of the Owner's Representative (OE), such removal will disturb the pipe bed.

The length of the water main trench shall not exceed one hundred feet in advance of pipe laying. The maximum trench width shall be in accordance with the details shown on the construction plans.

7-09.3(7)A Dewatering of Trench (Supplemental Section)

Gravel required in the bottom of trench due to action of weather or workmen shall be furnished by Contractor without expense to the Owner.

7-09.3(8) Removal and Replacement of Unsuitable Materials (Supplemental Section)

All unsuitable material, as determined by the Owner, removed from the trench shall be hauled to a disposal site provided by the Contractor.

7-09.3(10) Backfilling Trenches (Supplemental Section)

The Contractor shall load excavated materials directly into a dump truck for haul and disposal at an approved off-site disposal location. No stockpiling of excavated materials will be allowed. All backfill shall be crushed surface base course meeting the requirements of Section 9-03.9(3).

In backfilling the trench, the Contractor shall take all necessary precautions to protect the pipe from damage, or shifting. In general, backfilling shall be performed by pushing the material from the end of the trench into, along, and directly over the pipe so that the material will be applied in the form of a rolling slope rather than by side filling, which may damage the pipe. All asphalt concrete pavement and all rocks larger than 4-inches as measured in any direction, shall be removed and disposed of legally by the Contractor.

A sand cushion must be placed between the new water main and any existing utilities within 12 inches of the new water main.

7-09.3(10)A Trench Restoration (New Section)

All trench excavations shall be paved daily with HMA per King County Road Standards and the Plans. Trenches shall be compacted per specification prior to paving. Paved trench sections that are disturbed to repair sections of water main that do not pass

pressure testing shall be repaved at the Contractor's expense. Any sections of trench left unpaved must be sheeted at the end of the work day. Two-way traffic must be restored by the end of the workday.

7-09.3(11) Compaction of Backfill (*Supplemental Section*)

Backfill shall be compacted to 95 percent of maximum dry density using the modified proctor test in accordance with ASTM D1557. Backfill compaction will be tested periodically by the Owner. The Contractor shall provide access to accomplish compaction testing and collection of backfill samples. Should any compaction test fail, the Contractor shall take the necessary corrective measures to comply with this specification and all additional compaction testing costs shall be at the Contractor's expense.

7-09.3(13) Handling of Pipe (*Supplemental Section*)

The Contractor shall only lay out that length of pipe that will be installed during that day's work shift. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and pipe forced home and brought to correct line and grade. The pipe shall be secured in place with select backfill tamped under it. Precaution shall be taken to prevent dirt from entering the joint space. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a water-tight plug. If water is in the trench when work resumes, the seal shall remain in place until the trench is pumped completely dry. No pipe shall be laid in water or when trench conditions are unsuitable.

7-09.3(15) Laying of Pipe on Curves (*Supplemental Section*)

Pipe shall be laid with bell ends facing in the direction of the laying, unless otherwise approved by the Owner. Wherever it is necessary to deflect pipe from a straight line, the amount of deflection allowed shall not exceed pipe manufacturer's recommendations. Deflection of PVC pipe shall be performed in accordance with the manufacturer's recommendations and AWWA M23. No deflection shall be allowed at the pipe bell to spigot joint. Deflections equal to and greater than 11¼ degrees shall be made with a ductile iron fitting and shall conform to AWWA C110 or C153. Curved alignments shall be constructed by manually bending the pipe or providing a bell by bell PVC coupling or ductile iron fitting. The minimum pipeline radii for uniformly bending the pipe without couplings or fittings shall be per Section 7-09.3(15)B of the Standard Specifications. For connections of mechanical joints, the socket, plain end of each pipe and gasket shall be cleaned of dirt before jointing, and shall be jointed according to manufacturer's directions. Bolts shall be tightened alternately at top, bottom, and sides so pressure on gasket is even.

7-09.3(18) Coupled Pipe 4-inches in Diameter and Greater (*Supplemental Section*)

For connection of "Tyton" and PVC joints, the jointing shall be done according to manufacturer's recommendations, with special care used in cleaning gasket seat to prevent dirt or sand from getting between the gasket and pipe. Lubricant to be used on the gasket shall be as recommended by the pipe manufacturer, non-toxic and free from contamination. When a pipe length is cut, the outer edge of the cut shall be beveled with a file to prevent injury to the gasket during jointing.

7-09.3(19)A Connections to Existing Mains (Supplemental Section)

No permanent connections to the existing system shall be made until the new water main has been tested and approved by the Owner's Representative (OE). No temporary connections of the untested, unapproved new water main to the existing system shall be made without the installation of a double check valve assembly between the new water main and existing system. The Contractor shall verify the size, material, and location of the existing main at the connection point prior to installing the new connecting water main.

Each connection shall be made in compliance with the construction plans. Connections to existing mains shall comply with the requirements for maintaining service as described herein.

Existing water mains shall be cut by the Contractor. The Contractor shall remove the portions of pipe to provide for the installation of the required fittings at the points of connection as shown on the construction plans.

The Contractor shall notify the Owner minimum of five (5) working days prior to constructing connections to the existing system. No connections shall be made until all tests have been performed and accepted by the Owner. An Owner representative shall witness all the connection work. Where the water line is to be removed from service, the Contractor shall coordinate with the Owner in notifying those customers that will be without service. The Contractor shall expose the existing water main and review the connection procedure prior to removing the water main from service.

7-09.3(19)B Maintaining Service (Replacement Section)

Water service shall be maintained as described on the construction plans and as follows:

The Contractor will be required to notify the Owner five (5) working days prior to any planned, major connection to an existing water main. Water main shut-offs shall not be scheduled to take place on Fridays, Mondays, Owner Holiday's, or on the day before or after an Owner holiday. The Owner will be responsible for all tasks involved with shut-off and turn-on of the existing water mains. Unless directed otherwise by the Owner's Representative (OE), the Contractor will not operate existing water system valves. The Contractor will be supplied with "water shut-off notice" cards that shall be distributed 48 hours prior to a system shut-off. The Contractor shall write the date and time that the shut-off will be in effect and distribute them to all affected residents, businesses, property owners, etc. The Owner will determine the extent of the affected customers to be notified by the Contractor.

Prior to commencement of any work on a connection to an existing water main, the Contractor will assemble all materials, equipment, and labor necessary to properly complete the work. Once the water has been shut off, the Contractor shall diligently pursue the connection to completion so that the time required for the shut-off will be held to a minimum. All connections to existing water mains shall be completed the same day that they are started. The Contractor shall time his operations so that the water will not be shut off over weekends, or during holidays.

The existing water mains are intended to remain in service until testing and disinfecting have been approved by the Owner and until all water service connections have been transferred. If, due to the Contractor's actions, the existing water system fails to provide service to adjacent residences, then the Contractor shall provide temporary service to the affected residences. Furthermore, the temporary services, if required, shall be approved by the Owner's Representative (OE) prior to installation. All costs of providing and maintaining temporary service for the necessary time durations shall be completely borne by the Contractor. Should the Contractor neglect or needlessly delay in the pursuit of this work item, the Owner may at its discretion dispatch crews to remedy the situation and deduct all costs associated with the employment of their crews from monies owed the Contractor.

7-09.3(21) *Concrete Thrust Blocking (Replacement Section)*

Provide concrete blocking at all fittings, and horizontal or vertical angle points. Blocking shall conform to the Owner's standard details for general blocking and vertical blocks. All fittings to be blocked shall be wrapped with 8-mil polyethylene plastic. Concrete blocking shall be properly formed with plywood or other acceptable forming materials and shall not be poured around joints. The forms shall be stripped prior to backfilling. Blocking shall be commercial concrete and poured in place (hand mixed concrete is not allowed). Timber blocking will not be permitted. Thrust blocks shall be poured as soon as possible after setting the fittings in place to allow the concrete to "set" before applying the pressure test. The concrete thrust blocks shall be in place before beginning the pressure test. Anchor blocks shall be allowed to set sufficiently to develop the necessary bond strength between the reinforcing rods and the concrete anchor before beginning the pressure test.

Concrete shall have a compressive strength of at least 3,000 psi.

7-09.3(23) *Hydrostatic Pressure Test (Replacement Section)*

All water mains, appurtenances, and service connections to the meter setter shall be tested in convenient length under a hydrostatic pressure equal to 150 psi in excess of that under which they will operate. In no case shall the test pressure be less than 225 psi. All pumps, gauges, plugs, saddles, corporation stops, backflow prevention devices, miscellaneous hose and piping, and other equipment necessary for performing the test shall be furnished and operated by the Contractor.

Sections to be tested shall normally be limited to 1,500 feet. The Owner's Representative (OE) may require that the first section of pipe, not less than 1,000 feet in length, installed by each of the Contractor's crews, be tested in order to qualify the crew and materials. Pipe laying shall not be continued more than an additional 1,000 feet until the first section has been tested successfully.

The pipeline trench shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and sufficiently cured to reach design strength before testing. Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking and remove it after testing.

The mains shall be filled with water and allowed to stand under pressure for a minimum of 24 hours to allow the escape of air and/or allow the lining of the pipe to absorb water. The Owner will furnish the water necessary to fill the pipelines for testing purposes at a time of day when excess quantities of water are available for normal system operation. An

approved backflow prevention device and hydrant meter shall be provided by the Contractor and be used when drawing water from the Owner's system. The Contractor will be charged for the water used.

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves and hydrants. In general, permanent air vents shall be provided at all high points within the waterline being tested. If permanent air vents are not located at all high points and upon receiving written approval from the Owner's Representative, the Contractor may install temporary corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged by the Contractor and inspected by the Owner's Representative prior to backfill.

After the main has been filled and all air expelled, the pipeline shall be pumped to a hydrostatic test pressure of 150 psi over working pressure or 250 psi, whichever is greater. This pressure shall be maintained for a period of not less than thirty (30) minutes to insure the integrity of the thrust restraint systems and anchor blocks. During this period, there shall be no measurable loss of pressure in the pipeline.

Following the hydrostatic pressure test, a leakage test shall be performed on the pipeline. The leakage test shall be conducted at 50 psi over working pressure or 200 psi, whichever is greater. The test shall be accomplished by pumping the main up to the required pressure, stopping the pump for two (2) hours and then pumping the main up to the test pressure again. During the test, the section being tested shall not be observed to detect any visible leakage. A clean container shall be used for holding water for pumping pressure on the main being tested. This makeup water shall be sterilized by the addition of chlorine to a concentration of 1 mg/l.

The quantity of water required to restore the initial hydrostatic pressure shall be accurately determined by either; 1) pumping from an open container of suitable size such that accurate volume measurement can be made by the Owner or, 2) by pumping through a positive displacement water meter with a sweep unit hand registering one gallon per revolution. The meter shall be approved by the Owner.

Acceptability of the test will be determined by two factors, as follows:

- 1) The quantity of water lost from the main shall not exceed the number of gallons per hour as listed in the following table.

AND

- 2) The loss in pressure shall not exceed 5 psi during the test period, per AWWA standards.

Allowable Leakage Per 1,000 Ft. of Pipeline* - GPH

PSI	<i>Nominal Pipe Diameter* -- Inches</i>						
	6	8	10	12	16	20	24
450	0.95	1.27	1.59	1.91	2.55	3.18	3.82
400	0.90	1.20	1.50	1.80	2.40	3.00	3.60
350	0.84	1.12	1.40	1.69	2.25	2.81	3.37
290	0.77	1.02	1.28	1.53	2.04	2.55	3.07
275	0.75	1.00	1.24	1.49	1.99	2.49	2.99
250	0.71	0.95	1.19	1.42	1.90	2.37	2.85
225	0.68	0.90	1.13	1.35	1.80	2.25	2.70
200	0.64	0.85	1.06	1.28	1.70	2.12	2.55

* If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size, or for those diameters of pressures not listed, by the formula stated in Section 7-11.3(11) of the Standard Specifications.

Pressure gauges used in the test shall be certified for accuracy by a testing laboratory approved by the Owner. Testing certifications shall be provided as requested by the Owner.

Any visible leakage detected shall be corrected by the Contractor to the satisfaction of the Owner regardless of the allowable leakage specified. Should the test section fail to meet the pressure test successfully as specified, the Contractor shall, at his own expense, locate and repair the defects and then retest the pipeline.

All hydrostatic pressure and leakage tests shall be made with the hydrant auxiliary valve open and pressure against the hydrant valve. Pipeline hydrostatic and leakage testing shall not be performed against closed valves. Following pipeline testing, each valve shall be tested by closing each in turn and relieving the pressure beyond. This test of the valve will be acceptable if there is no immediate loss of pressure on the gauge when the pressure comes against the valve being checked. The Contractor shall verify that the pressure differential across the valve does not exceed the rated working pressure of the valve. Valve testing shall be performed only after the pipeline has successfully passed the pressure test. With approval from the Owner's Representative (OE), the test pressure may be reduced to not less than 150 psi during valve testing.

Prior to calling out the Owner's Representative (OE) to witness the pressure test, the Contractor shall have all equipment set up completely ready for operation and shall have successfully performed the test to assure that the pipe is in a satisfactory condition.

7-09.3(24) Disinfection of Water Mains (Supplemental Section)

Taps of the existing main required by the Contractor for flushing and chlorination purposes shall be provided by the Contractor and approved by the Owner.

The Contractor shall provide all equipment and materials to chlorinate the water main at a concentration of no less than 50 mg/l either by pumping in a premix from a container or by a metering pump into the water main until it appears at the opposite end of the pipes. The chlorinated water shall remain in the water main for 24 hours. After 24 hours the

water main shall be dechlorinated and flushed from the main. The Contractor shall not discharge water to the sanitary sewer system. Alternatively, the Contractor may truck away the chlorinated water. Contractor shall supply a plan for flushing the water main.

Dry calcium hypochlorite will not be allowed for disinfection of the pipeline on this Project.

7-09.3(24)D *Dry Calcium Hyperchlorite (Deleted)*

Section 7-09.3(24)D of the Standard Specifications is DELETED.

7-09.3(24)P *Dechlorination (Additional Section)*

Water containing chlorine residuals shall not be disposed into the storm drainage system or any waterway. Should the Contractor wish to discharge chlorinated water into a storm system or waterway, dechlorination of this water per AWWA standards will be required.

7-09.3(25) Existing Water Main Abandonment (Additional Section)

The existing water mains shall be abandoned as shown on the construction plans. All exposed lines shall be capped or plugged with concrete. Branch valves shall be closed and in-line valves shall remain open. Valve boxes shall be removed and surfaces restored to match the adjacent surrounding.

7-09 Valves for Water Mains

7-12.3 *Construction Requirements (Supplemental Section)*

All valves with operating nuts located more than 42 inches below finished grade shall be equipped with extension stems per the *Water District No. 19 Developer Standards and Standard Details*.

7-12.3(1) *Installation of Valve Marker Post (Supplemental Section)*

Valve marker posts shall be installed per *Water District No. 19 Standard Details* where the valve box is located in an unimproved area.

7-09 Hydrants

7-14.1 *Description (Supplemental Section)*

Hydrants shall conform to *Water District No. 19 Developer Standards and Standard Details*.

7-14.3(1) *Setting Hydrants (Supplemental Section)*

Hydrants shall be installed in accordance with the *Water District No. 19 Developer Standards and Standard Details*.

Fire hydrants shall be supplied with factory coating and field coated with two coats of Rust-Oleum V7400 Alkyd Enamel. Upon the completion of water system testing and final acceptance by the District, the District will perform hydrant flow testing to determine the rated flow for the new hydrant. Following completion of the hydrant flow test, the contractor shall paint the hydrant cap to indicate the hydrant flow rating in accordance with NFPA 291. Hydrant caps shall be coated with two coats of Rust-Oleum V7400 Alkyd Enamel, color to be determined as follows:

Hydrant Flow Rate	Hydrant Cap Color
1500 GPM or more	Blue
1000 – 1499 GPM	Green
500 – 999 GPM	Orange
Below 500 GPM	Red

7-14.3(2) *Hydrant Connections (Supplemental Section)*

Contractor shall provide vertical bends and blocking as necessary to avoid existing utilities and other obstructions and provide a hydrant connection that meets the Owner's Standard Detail and Specifications.

7-14.3(7) *Abandoning Hydrants (Additional Section)*

All existing hydrants connected to the abandoned water main shall be removed and abandoned as shown on the plans and as required in the construction details. Fire hydrants shall be cleaned and delivered to the Owner's shop. Also, the associated lane marker for each hydrant shall be removed.

7-15 Service Connections

7-15.2 *Materials (Supplemental Section)*

Service connections shall conform to *Water District No. 19 Developer Standards and Standard Details*.

7-15.3 *Construction Requirements (Supplemental Section)*

Construction of water services shall be in accordance with the details shown on the construction plans and the requirements specified herein and on the Plans.

Customer water services shall not be connected to the new main until the new main and service lines and connections have been tested, approved, and put into service.

END OF DIVISION SEVEN

DIVISION 9

MATERIALS

9-30 Water Distribution Materials

9-30.1 Pipe and 9-30.2 Fittings

Sections 9-30.1 and 9-30.2 are supplemented with the following:

(*****)

Water mains to be installed shall be ductile iron pipe or polyvinyl chloride (PVC) for pipe sizes 4-inch to 24-inch unless specifically noted otherwise. Water mains to be installed shall be ductile iron pipe for all sizes greater than 24-inch unless specifically noted otherwise.

Ductile iron pipe for water mains shall conform to AWWA C151 Standards, and current amendments thereto, except the ductile iron pipe shall be thickness Class 53 for 6-inch pipe, Class 52 for 8-inch, 10 -inch and 12 -inch and Class 50 for larger than 12 -inch pipe. Grade of iron shall be a minimum of 60-42-10. The pipe shall be cement lined to a minimum thickness of 1/16 -inch meeting NSF standards for potable water and the exterior shall be coated with asphaltic coating.

PVC pipe shall conform to AWWA C900/905 Standards and current amendments thereto. The pipe shall be provided to meet the specified pressure rating requirements and shall have minimum dimension ratio (DR) of 18 (PC150). The pipe shall be manufactured to cast iron pipe outside diameters in accordance with AWWA C900. The pipe shall be blue or white in color. Pipe materials shall be suitable for use in potable water applications and shall meet the requirements of ANSI/NSF 61. Each length of ductile iron pipe shall be plainly marked with the manufacturer's identification, year case, thickness, class of pipe and weight. Each length of PVC pipe shall be plainly marked in accordance with AWWA C900/905 and including the manufacturer's identification, manufactured date, pressure rating and dimension ratio. The District shall be provided with the manufacturer's date coding for translation. Pipe shall be installed with the manufacturing label showing on top.

The pipe shall be furnished with mechanical joint or push-on type, employing a single gasket, such as "Tyton", except where otherwise calling for flanged ends. Bolts furnished for mechanical joint pipe and fittings shall be high strength ductile iron, with a minimum tensile strength of 50,000 psi. PVC push-on type pipe joints shall consist of an integral thickened wall section with an elastomeric seal. The wall thickness in the bell section shall conform to the requirements of Section 6.2 of ASTM D3139, "Standard Specification for Joint for Plastic Pressure Pipes Using Flexible Elastomeric Seals." The seal shall meet the requirement of ASTM F477 "Standard for Elastomeric Seals (Gaskets) for Joining Plastic Pipe."

Restrained joint ductile iron pipe shall be push-on type with "Field-Lok" gaskets as furnished by U.S. Pipe or equal for 24" diameter and smaller pipe and "TR Flex" as furnished by U.S. Pipe or equal for larger diameter pipes. The restrained joint pipe shall meet all other requirements of the non-restrained pipe.

All pipe shall be jointed by the manufacturer's standard coupling, be all of one manufacturer, and be carefully installed in complete compliance with the manufacturer's recommendations.

Joints shall be “made up” in accordance with the manufacturer’s recommendations. Standard joint materials, including rubber ring gaskets, shall be furnished with the pipe. Material shall be suitable for the specified pipe size and pressures.

All fittings shall be short-bodied, ductile iron complying with applicable AWWA C110 or C153 Standards for 350 psi pressure rating for mechanical joint fittings and 250 psi pressure rating for flanged fittings. All fittings shall be cement lined and either mechanical joint or flanged.

Fittings in areas required restrained joints shall be mechanical joint fittings with a mechanical joint restraint device. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be EBAA Iron, Inc., MEGALUG, or approved equal. PVC pipe restraint shall conform to ASTM F1674 and be a type accepted by the pipe manufacturer.

All couplings shall be ductile iron mechanical joints sleeves.

The pipe and fittings shall be inspected for defects before installation. All lumps, blisters and excess coal tar coating shall be removed from the bell and spigot end of each pipe, and the outside of the spigot and the inside of the bell shall be wire-brushed and wiped clean and dry, and free from oil and grease before the pipe is laid. PVC pipe used on the project shall be new, having been manufactured within 18 months prior to the date of installation, and shall be kept clean and protected against sunlight and heat damage. Pipe that is older than 18 months at the time of installation, or that is damaged due to sunlight or heat, shall be removed from the project site and replaced by the Contractor at no cost to the District.

Tracer wire (locator wire) shall be #14 AWG, single conductor solid, bare annealed copper, 30-Volt construction, water-resistant insulation, in 2,500 foot coils. The coating shall be blue in color. Direct bury splice enclosures shall be the Spears brand DS-500 Splice Wire Connector, no exceptions.

Detectable marking tape shall consist of inert polyethylene plastic that is impervious to all known alkalis, acids, chemical reagents, and solvents likely to be encountered in the soil, with a metallic foil core to provide the most positive detection and pipeline locators. The tape shall be color coded and shall be imprinted continuously over its entire length in permanent black ink. The message shall convey the type of line buried below and shall also have the word “Caution” prominently shown. Color coding of the tape shall be blue. The width of the tape shall be as recommended by the manufacturer for the depth of installation.

9-30.3 Valves

Sections 9-30.3 is supplemented with the following:

(*****)

All valves 14” and larger shall be butterfly valves. All valves 12” and smaller shall be resilient seated gate valves.

9-30.3(1) Gate Valves (3-inches to 12-inches)

Sections 9-30.3(1) is replaced with the following:

(*****)

Resilient seated gate valves shall be manufactured to meet or exceed the requirements of AWWA Standard C509 latest revisions.

All external and internal ferrous metal surfaces of the gate valve shall be coated for corrosion protection with fusion bonded epoxy. The epoxy coating shall be factory applied to all valve parts prior to valve assembly and shall meet or exceed the requirements of AWWA Standard C-550 latest revision. Valves shall be provided with two (2) internal O-ring stems seals. The valves shall be equipped with one (1) anti-friction washer. The resilient gate valve shall have rubber sealing surfaces to permit bi-directional flow. The stem shall be independent of the stem nut or integrally cast.

Valves shall be designed for a minimum water operating pressure of 200 psi. For applications with a working pressure above 175 psi, a valve rated for 250 psi or higher shall be used.

End connections shall be mechanical joints, flanged joints or mechanical by flanged joints as shown on the project plans.

Resilient Seated Gate Valves shall be Clow, M&H, U.S. Pipe, Mueller American Flow Control, or approved equal.

9-30.3(3) Butterfly Valves

Sections 9-30.3(3) is replaced with the following:

(*****)

Butterfly valves shall be the tight-closing rubber seat type with rubber seat either bonded to the body or mechanically retained in the body with no fasteners or retaining hardware in the flowstream. The valves shall meet the full requirements of AWWA Standard C504, Class 150B except the valves shall be able to withstand a 200 psi differential pressure without leakage.

The valve body and disc shall be constructed of cast iron ASTM A-126 Class B. For valves 24-inch and larger, the valve disc shall be constructed from ductile iron ASTM A-536. The disc shall be furnished with Type 316 stainless steel seating edge to mate with the rubber seat on the body. Sprayed mating seat surfaces are not acceptable. The seat shall be of Acrylonitrile-Butadiene (Buna-N). Wetted surfaces (other than stainless steel or rubber) shall be epoxy lined.

The valve shaft shall be Type 304 stainless steel conforming to ASTM A-276. Shaft seals shall be standard self-adjusting split V packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft. Valve bearing shall be sleeve type that are corrosion resistant and self-lubricating.

Valve actuators shall be fully grease packed and have stops in the open/close position. The actuator shall have a mechanical stop which will withstand an input torque of 450 ft. lbs against the stop. The traveling nut shall engage alignment grooves in the housing. The actuators shall have a built in packing leak bypass to eliminate possible packing leakage into the actuator housing. Provide valves equipped with AWWA 2 inch wrench nut for buried applications or hand wheels for exposed locations

Butterfly valves shall be Mueller LineSeal III or Pratt Groundhog.

9-30.3(4) Valve Boxes

Sections 9-30.3(4) is supplemented with the following:

(*****)

Valve boxes shall comply with *Water District No. 19 Standard Details*.

9-30.3(5) Valve Marker Posts

Sections 9-30.3(5) is supplemented with the following:

(*****)

Valve marker posts shall comply with *Water District No. 19 Standard Details*.

9-30.3(6) Valve Stem Extensions

Sections 9-30.3(6) is supplemented with the following:

(*****)

Valve stem extensions shall comply with *Water District No. 19 Standard Details*.

9-30.3(7) Combination Air Release/Vacuum Valve and Assembly (Supplemental Section)

Sections 9-30.3(7) is supplemented with the following:

(*****)

Combination Air Release/Vacuum Valve and Assemblies shall comply with *Water District No. 19 Standard Details*.

Location of the air release valve as show on the plans is approximate. The installation shall be set at the high point of the line.

9-30.3(8) Tapping Sleeve and Valve Assembly (Supplemental Section)

Revise the last sentence of Sections 9-30.3(8) as follows:

(*****)

Tapping sleeves shall be cast iron, ductile iron epoxy-coated steel, stainless steel, or other approved material unless specifically called out otherwise on the plans. Tapping Sleeve and Valve Assemblies shall comply with *Water District No. 19 Standard Details*.

9-30.5 Hydrants

Section 9-30.5 is supplemented with the following:

(*****)

Fire hydrants shall be compression type (opening against pressure) and equal to Clow Medallion, M&H 929, or Mueller Super Centurion 200. Hydrants shall be connected to the main with a 6" mechanical joint shoe with lugs. The nozzle section shall consist of two 2-1/2" hose nozzles and one 4-1/2" pumper nozzle. A permanent anodized short profile Storz hydrant adapter and anodized Storz blind flange shall be installed on the pumper port; adapter size to match Fire District requirements. Hydrants shall be factory coated fire hydrant red and coated in the field per Division 7.

Fire hydrants shall comply with *Water District No. 19 Standard Details*.

9-30.6 Water Service Connections

9-30.6(1) Saddles

Sections 9-30.6(1) is replaced with the following:

(*****)

Service saddles shall comply with *Water District No. 19 Standard Details*.

9-30.6(3B) Polyethylene Tubing

Replace the first paragraph of Sections 9-30.6(3)B with the following:

(*****)

Polyethylene tubing shall meet the requirements of AWWA C904 (Cross-Linked Polyethylene). Tubing shall be high molecular mass with a 200 psi rating. Tubing shall be SDR 9 (copper tube size), all sizes.

9-30.6(4) Service Fittings

Sections 9-30.6(4) is supplemented with the following:

(*****)

Fittings used for copper and polyethylene tubing shall be compression type.

9-30.6(5) Meter Setters

Sections 9-30.6(5) is replaced with the following:

(*****)

Meter setters shall comply with *Water District No. 19 Standard Details*.

9-30.6(7) Meter Boxes

Sections 9-30.6(7) is replaced with the following:

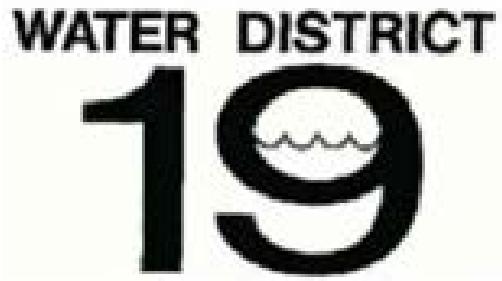
(*****)

Meter boxes shall comply with *Water District No. 19 Standard Details*.

END OF DIVISION NINE

SECTION IV: WATER DISTRICT 19 STANDARD PLANS

Included as separate document.



WATER DISTRICT 19

WATER SYSTEM STANDARD DETAILS INDEX

STANDARD DETAILS

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Water District #19	WATER DISTRICT 19	WATER SYSTEM STANDARD DETAIL	
Index			
File: W19DTW00	Revised: Apr. 28, 15	Printed: Apr. 28, 15	DRAWING NO. W-00

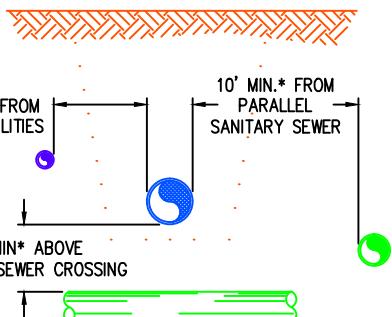
1. CONSTRUCTION OF IMPROVEMENTS SHALL BE IN ACCORDANCE WITH WATER DISTRICT 19 DEVELOPER EXTENSION AGREEMENT (as applicable), DISTRICT STANDARD DETAILS AND THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION, MOST CURRENT EDITION, AS ISSUED BY THE WA. STATE DEPT. OF TRANSPORTATION.
2. A PRECONSTRUCTION CONFERENCE IS REQUIRED PRIOR TO CONSTRUCTION AND 48 HOURS ADVANCE NOTIFICATION OF THE LOCAL MUNICIPALITY, WATER DISTRICT 19 AND ALL AFFECTED UTILITY COMPANIES PRIOR TO THE ACTUAL START OF WORK.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLYING WITH THE PROVISIONS OF THE RIGHT-OF-WAY/STREET CONSTRUCTION PERMIT AS ISSUED BY KING COUNTY FOR THIS PROJECT.
4. LOCATIONS OF EXISTING UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY, LOCATE AND PROTECT ALL UTILITIES WITHIN THE PROJECT AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING OR REPAIRING ANY UTILITIES DAMAGED DURING CONSTRUCTION. SHOW THESE UTILITIES ON THE AS-BUILTS.
5. WATER MAIN TRENCH SECTION AND ALL EXCAVATED AREAS SHALL BE BACKFILLED AND COMPACTED IN ACCORDANCE WITH THE STANDARD DETAILS AND WITH SECTIONS 7-9.3(10) AND 7-9.3(11) OF THE STANDARD SPECIFICATIONS. COMPACTION TESTING SHALL BE REQUIRED DURING BACKFILLING OPERATIONS WITHIN ALL ROADWAYS AND AT THE DISCRETION OF THE WATER DISTRICT. IF TRENCH BACKFILL DOES NOT MEET COMPACTION REQUIREMENTS, CONTRACTOR SHALL EXCAVATE, RECOMPACT AND RETEST MATERIAL AT CONTRACTOR'S EXPENSE.
6. RESTORATION OF DAMAGED ROAD SURFACING SHALL BE IN ACCORDANCE WITH THE LOCAL MUNICIPALITY'S REQUIREMENTS. ALL OTHER AREAS SHALL BE RESTORED TO ORIGINAL CONDITION OR AS DIRECTED BY THE DISTRICT. THIS INCLUDES SHOULDERS, LANDSCAPING, WALLS, FENCES AND OTHER IMPROVEMENTS.
7. THE WATER MAIN SHALL BE INSTALLED WITH A MINIMUM OF 42" OF COVER. INSTALLATION OF MAIN WITH GREATER THAN 60" OF COVER SHALL BE ACCEPTABLE ONLY UNDER THE DIRECTION OF THE WATER DISTRICT. ALL SERVICES, FIRE HYDRANTS AND THRUST BLOCKING SHALL BE INSPECTED BY THE DISTRICT BEFORE BURY.
8. DISTRICT APPROVED THRUST RESTRAINTS ARE REQUIRED FOR ALL UNRESTRAINED FITTINGS. THRUST BLOCKING IS THE PREFERRED METHOD. RESTRAINED JOINTS ARE ALLOWED FOR VERTICAL BENDS, WHERE BLOCKING IS NOT PRACTICAL, AND ARE REQUIRED FOR MAINS THAT WILL BE EXTENDED.
9. A SANITARY GAP MUST BE PROVIDED BETWEEN THE EXISTING AND NEW WATER SYSTEMS. CONNECTION TO THE EXISTING WATER SYSTEM SHALL BE PERFORMED BY THE CONTRACTOR ONLY AFTER COMPLETING OF AN ACCEPTABLE HYDROSTATIC PRESSURE TEST AND THE PIPELINE IS DISINFECTED AND RECEIPT OF APPROVAL OF WATER QUALITY TEST RESULTS FROM THE HEALTH DISTRICT.
10. CONTRACTOR SHALL PERFORM PRESSURE TEST AT 250psi, INCLUDING HYDRANTS AND SERVICE LINES. MAINLINE SHALL BE TESTED IN SECTIONS OF NO MORE THAN 1,500 FEET. PRESSURE DROP SHALL NOT EXCEED 5psi IN 60 MINUTES. THE DISTRICT INSPECTOR HAS DISCRETION TO MODIFY THE TESTING REQUIREMENTS AS HE DEEMS APPROPRIATE.
11. A PIPE PLUG SHALL BE USED ON EACH JOINT DURING INSTALLATION TO PROTECT AGAINST FLOODING OF THE PIPE.
12. NO OTHER UTILITIES SHALL BE INSTALLED WITHIN 36" HORIZONTALLY OF ANY ACTIVE WATER LINE UNLESS OTHERWISE PRE-APPROVED BY THE DISTRICT.
13. CONTRACTOR SHALL POTHOLE A SUFFICIENT DISTANCE AHEAD TO VERIFY DEPTH OF ALL EXISTING WATER MAINS AND CROSSING UTILITIES PRIOR TO CONSTRUCTION AND CONNECTIONS AND TO ANTICIPATE ANY NECESSARY CHANGES IN FITTINGS OR ALIGNMENT.
14. AN AS-BUILT RECORD MUST BE SUBMITTED TO THE DISTRICT BEFORE WATER SERVICE WILL BE PROVIDED.
15. DEFLECTION AT PIPE AND FITTING JOINTS WILL BE ALLOWED UP TO 3.0° (11" OVER 18') OR AS RECOMMENDED BY MANUFACTURER, WHICHEVER IS LESS.
16. CONTRACTOR SHALL ONLY DISPOSE OF WASTE MATERIAL AT SITES APPROVED BY KING COUNTY. STOCKPILE MATERIALS ONLY ON DISTRICT APPROVED SITES.
17. HATCH NOTE: ALL VAULT HATCHES 2'x2' OR LARGER SHALL BE HINGED, SPRING ASSIST OPENING, INCLUDE RECESSED PADLOCK HASP, DRAINABLE FRAME (C OR U CHANNEL WITH PIPE CONNECTION), H2O RATED MINIMUM, ALUMINUM OR GALVANIZED STEEL. IF HATCH WILL BE LOCATED IN A TRAVELED AREA (ROAD OR DRIVEWAY), SUBMIT MANUFACTURER'S STATEMENT THAT HATCH IS RATED FOR CONTINUOUS AND DELIBERATE H2O TRAFFIC SERVICE. HATCHES SHALL BE CAST INTO VAULT LID OR RISER.
18. ALL PIPE 3" AND LARGER SHALL BE DUCTILE IRON (DI) OR C900/C905 PVC (PVC). DUCTILE IRON PIPE SHALL BE MINIMUM CLASS 52 (12" AND SMALLER) AND PVC PIPE SHALL BE A MINIMUM DR 18 PRESSURE CLASS, EXCEPT WHERE TRENCH BACKFILL AND LOADING DICTATE A STRONGER CLASS PIPE OR IN AREAS WHERE PRESSURE EXCEEDS 150 PSI. ALL HYDRANT RUNS AND PIPING INSTALLED WITH MEGA-LUG TYPE JOINT RESTRAINTS SHALL BE DUCTILE IRON PIPE CLASS 52, NO EXCEPTIONS. PIPING INSTALLED WITHIN VAULTS OR OTHER EXPOSED AREAS SHALL BE DUCTILE IRON CLASS 53.
19. CASINGS SHALL BE NEW STEEL, HDPE OR PVC; MATERIAL AND WALL THICKNESS AT THE DISCRETION OF THE DISTRICT. PIPE THROUGH CASINGS SHALL BE SUPPORTED WITH RUNNERS SPACED NO FARTHER THAN 8 FEET APART. RUNNERS SHALL BE MANUFACTURED PRODUCTS (PSI, CALPICO, OR APPROVED EQUAL), NO BLOCKS AND STRAPS. CASING ENDS SHALL BE CAPPED WITH MANUFACTURED CASING END SEALS.
20. CONTRACTORS WORKING WITHIN THE RIGHT OF WAY OR ON EXISTING DISTRICT INFRASTRUCTURE SHALL BE LICENSED, BONDED AND HAVE EXPERIENCE INSTALLING PUBLIC DOMESTIC WATER SYSTEMS AND BE PREPARED TO PRESENT EXAMPLES OF 5 SUCH PROJECTS UPON REQUEST BY THE DISTRICT.

Water District #19		WATER DISTRICT 19	WATER SYSTEM STANDARD DETAIL	
File: W19DTW01		Revised: Sep. 4, 13	Printed: Sep. 5, 13	Construction Notes
DRAWING NO.				W-01

NOTES:

- ALL COMPACTION REQUIREMENTS LISTED ARE PER ASTM D1557 (MODIFIED PROCTOR).
- ALL BACKFILL MATERIAL WITHIN ROADWAY RIGHT-OF-WAYS (ROWs) SHALL BE CRUSHED ROCK OR OTHER MATERIAL AS APPROVED BY KING COUNTY ROADS.
- BEDDING AND BACKFILL SHALL BE COMPAKTED TO 95% OF MAXIMUM DENSITY WITHIN TRAVELED ROADWAYS AND SHOULDERS. CONTRACTOR SHALL ADD WATER AS NECESSARY TO OBTAIN OPTIMUM MOISTURE CONTENT AS DETERMINED BY COMPACTION TESTING PROCTOR.
- ALL CLAY, ORGANICS, ROCKS OVER 6" IN DIAMETER, PEAT, WET SILTS, DEBRIS AND OTHER SUCH MATERIALS IDENTIFIED BY THE DISTRICT ARE UNSUITABLE FOR BACKFILL AND SHALL BE REMOVED AND DISPOSED BY THE CONTRACTOR.
- WHERE UNSTABLE SOILS ARE ENCOUNTERED, THE CONTRACTOR SHALL OVEREXCAVATE TO THE DEPTH SPECIFIED BY THE DISTRICT (MIN. 12") AND PROVIDE CLASS B FOUNDATION MATERIAL PER SECTION 9-03.17 OF THE STANDARD SPECIFICATIONS.
- ALL TRENCHING AND SHORING TO BE DONE IN ACCORDANCE WITH OSHA AND WISHA STANDARDS. CONTRACTOR SHALL BE RESPONSIBLE FOR TRENCH SAFETY AND EXCAVATION AS SOIL CONDITIONS CHANGE IN THE FIELD.
- AT UTILITY CROSSINGS, INSTALL WATER MAIN SO THAT JOINT IS NOT LOCATED AT CROSSING AND SUCH THAT JOINTS ARE SPACED EQUAL DISTANCE FROM CROSSING.

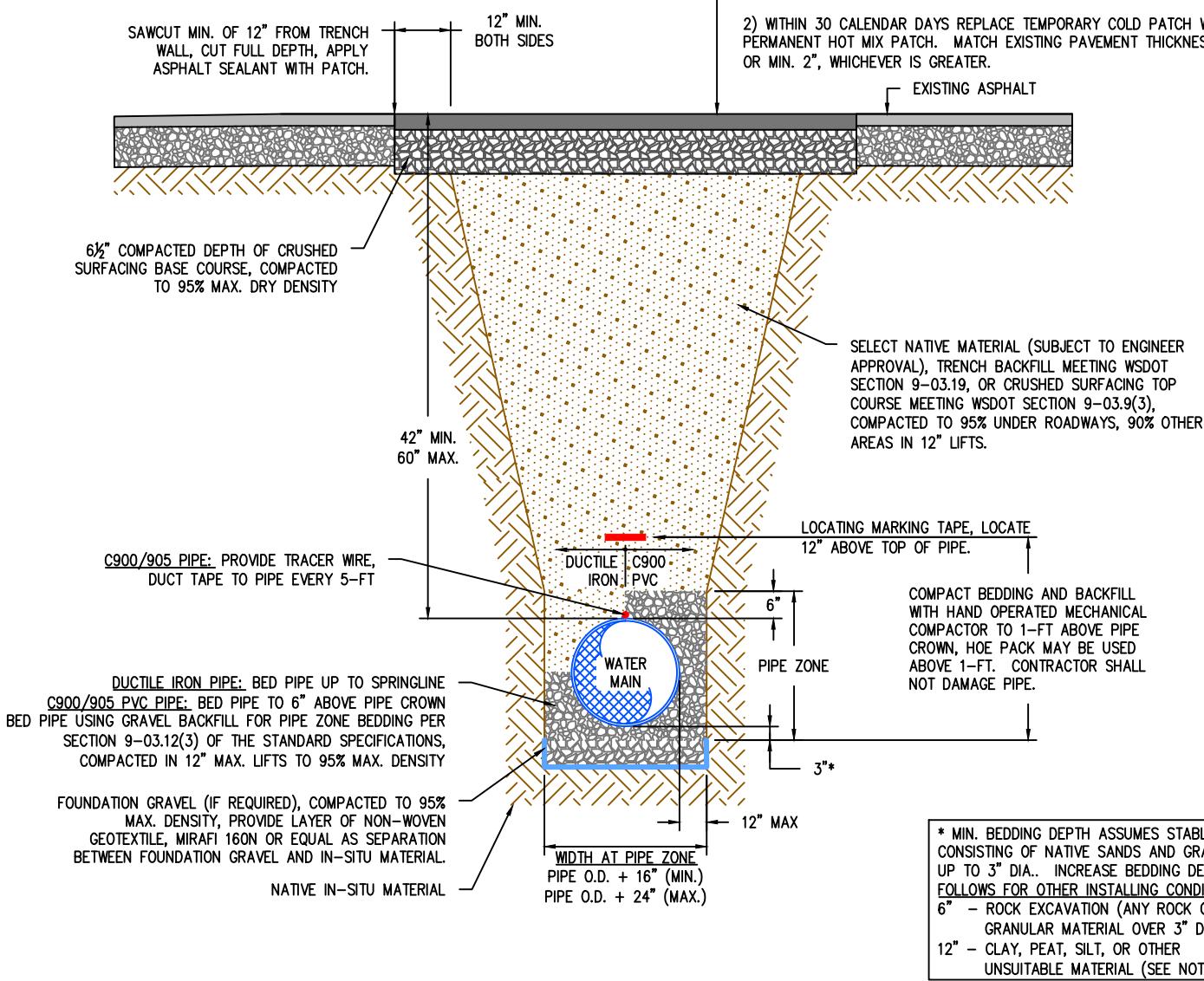
* WHERE MIN. CLEARANCE BETWEEN POTABLE WATER AND SEWER CAN NOT BE ACHIEVED, THE SEWER SHALL BE CONCRETE ENCASED PER DISTRICT STANDARDS. CONCRETE ENCASEMENT SHALL EXTEND MIN. 10' EACH WAY FROM THE POINT OF THE UTILITY CROSSING. WHERE WATER AND SEWER ARE INSTALLED PARALLEL, CONCRETE ENCASEMENT SHALL BE FULL LENGTH.

**TRENCH CLEARANCES**WITHIN PAVED ROADWAYS RIGHT OF WAY

1) APPLY TEMPORARY COLD MIX PATCH IMMEDIATELY AFTER APPROVED BACKFILL AND SUBGRADE COMPACTION. MATCH EXISTING PAVEMENT THICKNESS OR MIN. 2", WHICHEVER IS GREATER.

2) WITHIN 30 CALENDAR DAYS REPLACE TEMPORARY COLD PATCH WITH PERMANENT HOT MIX PATCH. MATCH EXISTING PAVEMENT THICKNESS OR MIN. 2", WHICHEVER IS GREATER.

EXISTING ASPHALT



CONSTRAINTS

- SOIL CONDITIONS AND BEARING CHARACTERISTICS ARE TO BE DETERMINED BY THE DISTRICT.
- THIS STANDARD DETAIL IS FOR HORIZONTAL THRUST RESTRAINT ONLY. THIS DETAIL REPRESENTS THE "MINIMUM" CONSTRUCTION STANDARDS. THE ENGINEER OF RECORD FOR THE PROJECT SHALL BE RESPONSIBLE FOR DETERMINING THE APPROPRIATE BLOCK SIZE AND THRUST RESTRAINT BASED ON EXISTING AND LOCAL CONDITIONS.
- CONCRETE BLOCKING SHALL BE PER DOT/APWA SPECIFICATION 7-09.3(21), CURRENT EDITION.
- MAINTAIN 18" MINIMUM GROUND COVER OVER THE TOP OF ALL CONCRETE BLOCKING.
- ALL THRUST BLOCKS TO BE FORMED AND FITTINGS COVERED IN PLASTIC. FORM CONCRETE TO ALLOW FOR REMOVAL OF BOLTS.
- ANY TEMPORARY BLOCKING USED TO SUPPORT FITTINGS DURING CONSTRUCTION SHALL BE REMOVED PRIOR TO BACKFILLING.

PROCEDURE

- DETERMINE BEARING FACTOR IN TABLE 1 CORRESPONDING TO APPROPRIATE PIPE SIZE AND TYPE OF FITTING.
 - MULTIPLY THE BEARING FACTOR DETERMINED IN TABLE 1 BY THE MULTIPLICATION FACTOR IN TABLE 2 FOR THE APPROPRIATE SOIL CLASSIFICATION.
- THE RESULT IS THE REQUIRED AREA OF CONCRETE (IN SQ. FT.) WHICH MUST BEAR AGAINST UNDISTURBED SOIL.
- USING TABLE 3 LOCATE THE MINIMUM DEPTH OF CONCRETE (D_{min}) CORRESPONDING TO THE REQUIRED BEARING AREA.
 - USING D_{min} , THE HEIGHT AND LENGTH OF THE THRUST BLOCKING CAN BE DETERMINED FROM THE DIMENSION RELATIONSHIPS ILLUSTRATED IN FIGURE 1 AND DESCRIBED BELOW:
 - "H" EQUALS "D"
 - MAX. "L" EQUALS $2 \times "H"$
 - MIN. "L" EQUALS "H"

SIZE	TEST PRESSURE	TEES DEAD ENDS	90° BEND	45° BEND	22½° BEND	11¼° BEND
3	300	2.3	2.3	2.3	2.3	2.3
4	300	2.3	2.6	2.3	2.3	2.3
6	300	3.7	5.3	2.9	2.2	2.2
8	300	6.4	9.1	4.9	2.5	2.2
10	300	9.7	13.7	7.4	3.8	2.2
12	300	13.7	19.4	10.5	5.3	2.7
14	300	18.4	26.0	14.1	7.2	3.6
16	300	23.8	33.6	18.2	9.3	4.7
18	300	29.9	42.2	22.9	11.7	5.9

* 2.3 BASED ON GEOMETRIC FACTORS

TABLE 1 - BEARING FACTOR

SOIL CONDITION	MULTIPLICATION FACTOR
*MUCK, PEAT, etc.	-
SOFT CLAY	3.0
SAND	1.5
SAND AND GRAVEL	1.0
SAND AND GRAVEL CEMENTED W/ CLAY	0.75
HARD SHALE	0.30

* THRUST BLOCKING SHALL BE DESIGNED BY ENGINEER

TABLE 2 - MULTIPLICATION FACTOR

REQ'D BEARING AREA (SQ. FT.)	MINIMUM DEPTH D _{min}
2.25 MIN. - 5.0	1.5'
5.01 - 10.0	2.3'
10.01 - 15.0	3.0'
15.01 - 30.0	4.0'
30.01 - 40.0	4.5'
40.01 - 50.0	5.0'
50.01 - 70.0	6.0'

BEARING AREA FORMULA

$$\frac{\text{BEARING FACTOR (FROM TABLE 1)} \times \text{MULTIPLICATION FACTOR (FROM TABLE 2)}}{\text{BEARING AREA (SQ. FT)}}$$

TABLE 3 - BLOCK SHAPE

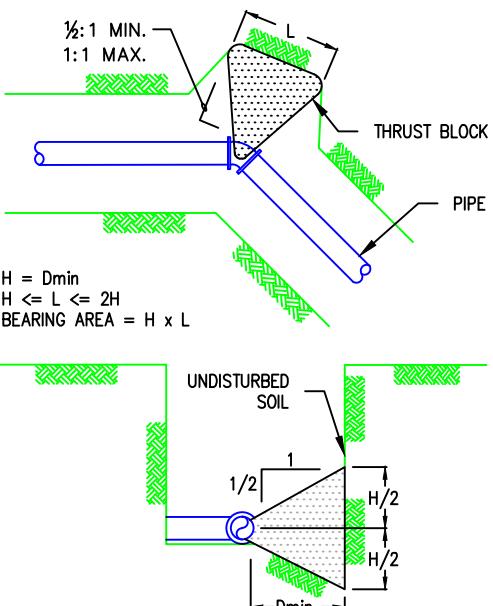
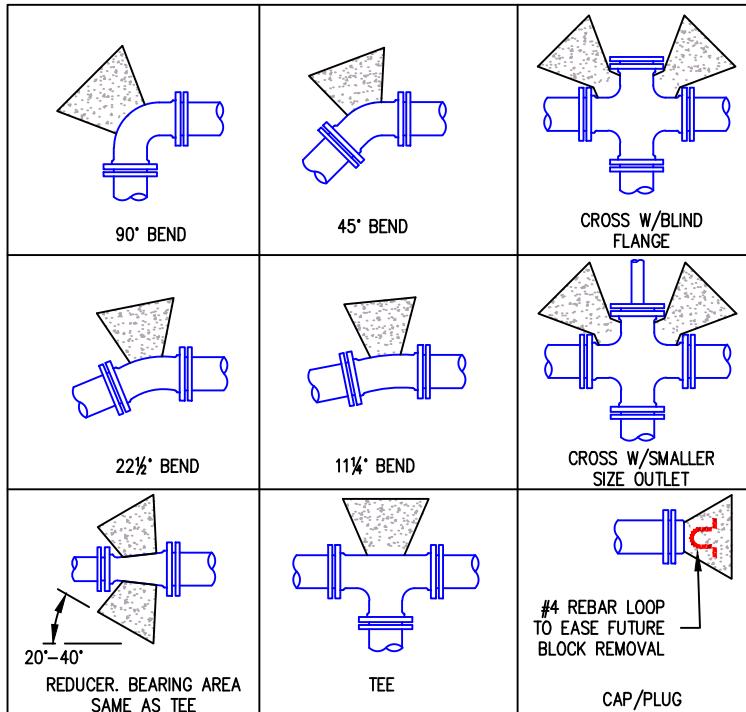


FIGURE 1

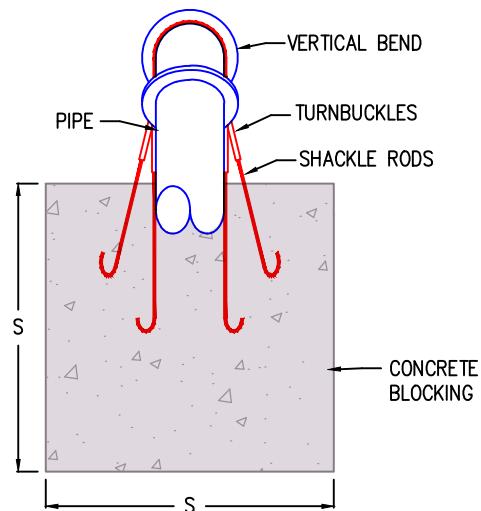
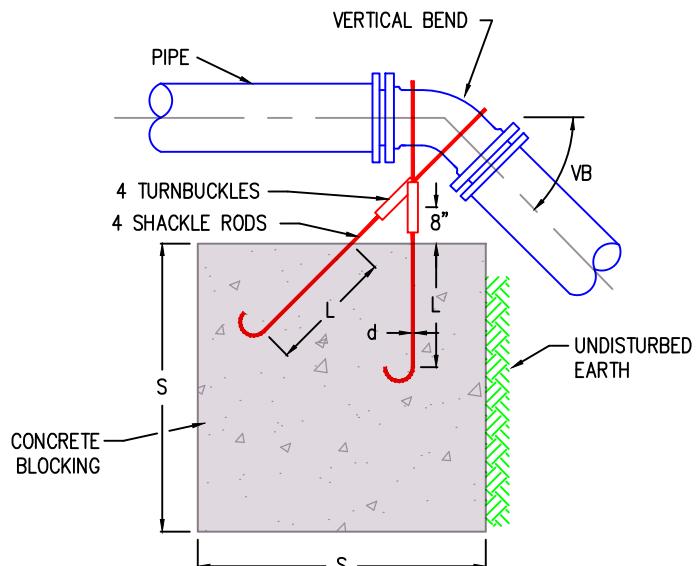
Water District #19

**WATER DISTRICT
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WATER SYSTEM STANDARD DETAIL

Horizontal Thrust Blocking

VERTICAL THRUST BLOCKING FOR 11.25°, 22.5°, AND 45° BENDS						
PIPE SIZE NOM. DIAMETER - INCHES	TEST PRESSURE PSI	VB VERTICAL BEND DEGREES	AMOUNT CONCRETE BLOCKING - CU FT	S	d	L
3"	300	11 1/4	5.8	1.8	5/8	12"
		22 1/2	11.5	2.3	5/8	12"
		45	22.6	2.8	5/8	12"
4"	300	11 1/4	8.5	2.0	5/8	12"
		22 1/2	17.0	2.6	5/8	12"
		45	33.2	3.2	5/8	12"
6"	300	11 1/4	17.6	2.6	5/8	12"
		22 1/2	35.0	3.3	5/8	12"
		45	68.7	4.1	5/8	12"
8"	300	11 1/4	30.3	3.1	3/4	12"
		22 1/2	60.2	3.9	3/4	12"
		45	118	4.9	3/4	12"
10"	300	11 1/4	45.5	3.6	3/4	12"
		22 1/2	90.6	4.5	3/4	12"
		45	178	5.6	3/4	24"
12"	300	11 1/4	64.4	4.0	3/4	12"
		22 1/2	128	5.1	3/4	12"
		45	251	6.3	3/4	12"
14"	250	11 1/4	86.5	4.4	3/4	12"
		22 1/2	172	5.6	3/4	24"
		45	338	7.0	1"	24"
16"	250	11 1/4	112	4.8	3/4	12"
		22 1/2	223	6.1	3/4	12"
		45	436	7.6	1"	12"
18"	250	11 1/4	141	5.2	3/4	24"
		22 1/2	280	6.5	1"	24"
		45	549	8.2	1-1/4"	24"



FRONT ELEVATION

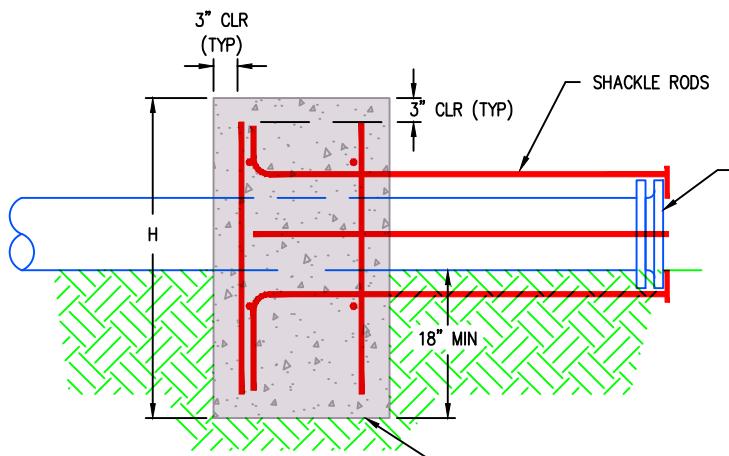
NOTES:

1. RESTRAINED JOINTS PER DETAIL W-07 ARE PREFERRED OVER VERTICAL THRUST BLOCKING UNLESS RESTRAINTS ARE NOT PRACTICAL.
2. CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI.
3. SHACKLE RODS TO BE COR-TEN STEEL, STAINLESS STEEL, OR FACTORY EPOXY COATED.

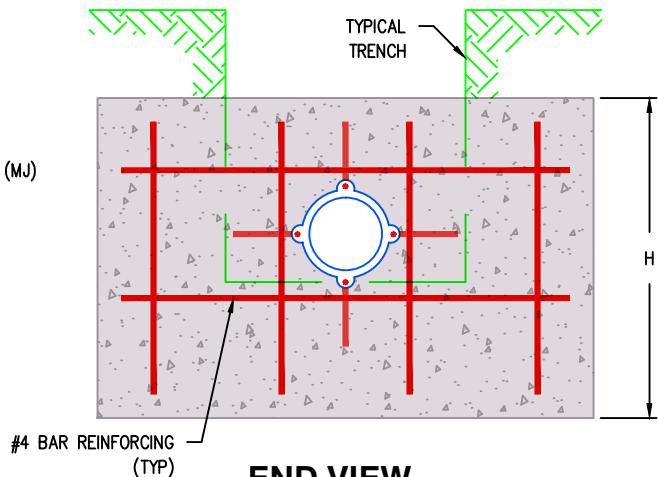
WATER DISTRICT
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WATER SYSTEM STANDARD DETAIL

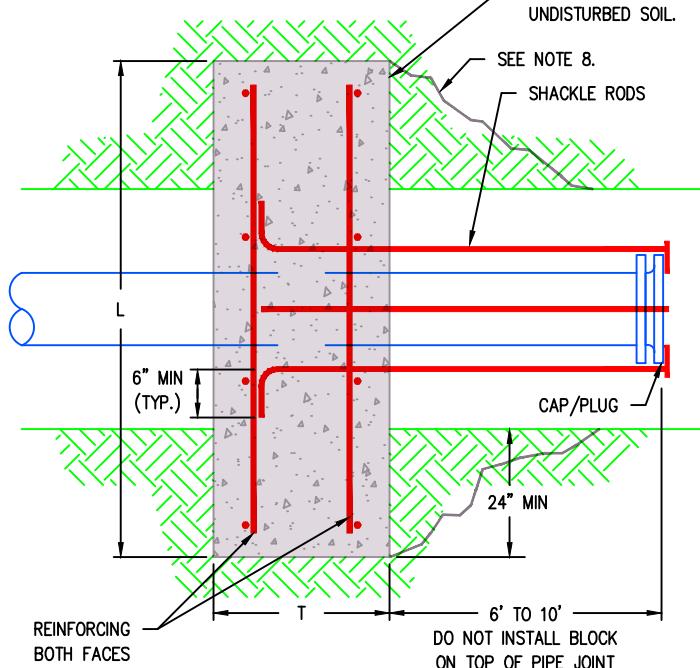
Vertical Thrust Blocking



ELEVATION



END VIEW



PLAN VIEW

NOTES

1. DETAIL W-07 IS THE PREFERRED METHOD FOR RESTRAINING A DEAD END PIPE. THIS DETAIL MAY BE USED ONLY WITH APPROVAL FROM THE DISTRICT.
2. CONCRETE BLOCK SHALL BE PER APWA SPECIFICATION 7-11.3(13), CURRENT EDITION.
3. MAINTAIN 18" MINIMUM COVER OVER THE TOP OF BLOCK.
4. BOTTOM OF BLOCK IS TO BE ON UNDISTURBED SOIL.
5. TRENCH TO BE BACKFILLED WITH CRUSHED ROCK COMPAKTED TO 95% DENSITY ON ALL SIDES OF BLOCK AND A DISTANCE OF 4' MIN. IN FRONT OF BLOCK TO FULL DEPTH OF BLOCK.
6. UPON EXTENSION OF WATER MAIN, SHACKLE RODS ARE TO BE CUT, REMOVE PLUG. CONCRETE BLOCK TO REMAIN IN PLACE.
7. FOR SOIL CONDITIONS NOT SHOWN, BLOCK IS TO BE DESIGNED BY ENGINEER.
8. IF BLOCK CANNOT BE KEYED INTO UNDISTURBED SOIL TO THE SATISFACTION OF THE WATER DISTRICT OR ENGINEER, a) THE BLOCK LENGTH SHALL BE EXTENDED TO PROVIDE AN ADEQUATE KEY OR b) CDF SHALL BE USED TO FILL BACK TO NATIVE SOIL OR c) THE TRENCH SHALL BE BACKFILLED AND COMPAKTED TO 95% DENSITY A MINIMUM DISTANCE OF 15 FEET IN FRONT OF THE BLOCK TO THE SATISFACTION OF THE WATER DISTRICT OR ENGINEER.
9. SEE STANDARD DETAIL W-06 FOR ADDITIONAL SHACKLE ROD INFORMATION.
10. BLOCK SIZING BASED ON A MAXIMUM 300 PSI TEST PRESSURE. FOR PRESSURES GREATER THAN 300 PSI, THE BLOCKING SHALL BE SIZED AND DESIGNED BY A PROFESSIONAL ENGINEER.

SIZING TABLE

PIPE DIA	T (min)	H (min)	SHACKLE RODS	REINFORCING
6"	18"	36"	(4) #5 (5/8" dia)	#4 @ 10" OC EW
8"	18"	42"	(4) 3/4" dia	#4 @ 12" OC EW
10"	24"	52"	(6) 3/4" dia	#4 @ 12" OC EW
12"	24"	54"	(6) 7/8" or (8) 3/4" dia	#4 @ 8" OC EW
14"	24"	56"	(8) 7/8" or (10) 3/4" dia	#4 @ 6" OC EW
16"	30"	58"	(10) 7/8" dia	#4 @ 5" OC EW

MIN. BLOCK LENGTH (L)

SOIL CONDITION						
PIPE DIA	SOFT CLAY	SILT	SANDY SILT	SAND	SANDY CLAY	HARD CLAY
6"	84"	72"	72"	72"	72"	72"
8"	108"	84"	75"	75"	75"	75"
10"	132"	104"	77"	77"	77"	77"
12"	180"	138"	82"	80"	80"	80"
14"	228"	174"	102"	82"	82"	82"
16"	288"	216"	126"	100"	84"	84"

Water District #19

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WATER SYSTEM STANDARD DETAIL

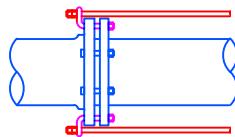
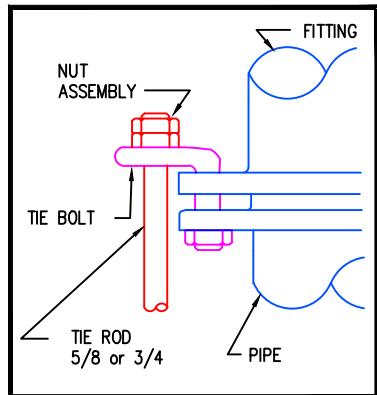
Deadman Thrust Blocking

TIE ROD SELECTION TABLES

PIPE DIAMETER	NUMBER OF TIE RODS PER JOINT			MAXIMUM TIE ROD LENGTH, FEET				ROD DIAMETER: 5/8" OR (3/4")
	TEE DEAD END 90° BEND	45° BEND	22.5° BEND	11.25° BEND	TEE DEAD END 90° BEND	45° BEND	22.5° BEND	
3	2 -	2 -	2 -	2 -	100 --	100 --	100 --	100 --
4	2 (2)	2 (2)	2 (2)	2 (2)	100 (100)	100 (100)	100 (100)	100 (100)
6	2 (2)	2 (2)	2 (2)	2 (2)	60 (90)	80 (100)	100 (100)	100 (100)
8	4 (3)	2 (2)	2 (2)	2 (2)	50 (50)	50 (70)	90 (100)	100 (100)
10	6 (4)	4 (2)	2 (2)	2 (2)	40 (60)	60 (50)	60 (80)	100 (100)
12	8 (6)	4 (4)	2 (2)	2 (2)	60 (60)	60 (80)	50 (80)	100 (100)
14	10 (5)	6 (4)	4 (2)	2 (2)	60 (70)	60 (60)	80 (60)	80 (100)
16	12 (8)	8 (6)	4 (3)	2 (2)	60 (50)	60 (70)	60 (70)	60 (90)
18	16 (12)	8 (6)	6 (3)	3 (2)	50 (50)	50 (60)	70 (50)	70 (70)

ASTM A36 STEEL OR 304SS									ROD DIAMETER: 5/8" OR (3/4")
3	2 -	2 -	2 -	2 -	100 --	100 --	100 --	100 --	100 --
4	2 (2)	2 (2)	2 (2)	2 (2)	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)
6	2 (2)	2 (2)	2 (2)	2 (2)	60 (90)	80 (100)	100 (100)	100 (100)	100 (100)
8	4 (3)	3 (2)	2 (2)	2 (2)	50 (50)	70 (70)	90 (100)	100 (100)	100 (100)
10	6 (4)	4 (4)	2 (2)	2 (2)	70 (60)	60 (90)	60 (80)	100 (100)	100 (100)
12	8 (6)	6 (4)	4 (2)	2 (2)	80 (90)	80 (80)	100 (80)	100 (100)	100 (100)
14	12 (8)	8 (6)	4 (4)	2 (2)	70 (90)	80 (90)	80 (100)	80 (100)	80 (100)
16	16 (10)	10 (6)	4 (4)	3 (2)	70 (80)	80 (70)	90 (90)	90 (90)	90 (90)
18	- (14)	12 (8)	6 (4)	3 (2)	-- (80)	80 (80)	70 (70)	70 (70)	70 (70)

ATTACHMENT DETAIL



TIE BOLT

STAR SUPPLY CORPORATION OR APPROVED EQUAL

GENERAL NOTES

- 1) TIE RODS SHALL BE "ALL THREAD" ROD OF EITHER ASTM A242 (COR-TEN), GALVANIZED OR EPOXY COATED A36 STEEL, OR 304 STAINLESS STEEL. UNCOATED MILD STEEL WILL NOT BE ALLOWED.
- 2) TIE RODS SHALL HAVE "NATIONAL-COARSE" THREAD WITH EITHER TWO NUTS OR ONE SELF-LOCKING NUT AT EACH END (ALL NUTS SHALL BE GALVANIZED). NUTS ARE TO BE STAR NATIONAL TIENUT OR NUT OF EQUIVALENT OR GREATER OUTER DIAMETER.
- 3) NUMBER OF TIE RODS PER JOINT SHALL BE IN ACCORDANCE WITH TIE ROD SELECTION TABLES ABOVE UNLESS OTHERWISE SHOWN ON APPROVED DESIGN PLANS.
- 4) TIE ROD ASSEMBLY SHALL BE COATED WITH 2 COATS OF COAL TAR EPOXY. EPOXY SHALL BE APPLIED ONLY AFTER ASSEMBLY IS COMPLETE SO THAT NO ADDITIONAL DAMAGE TO COATING OCCURS. ANY DAMAGE SHALL BE TOUCHED UP PRIOR TO BURY.
- 5) TIE RODS SHALL BE ASSEMBLED SYMMETRICALLY ABOUT EACH JOINT (IF AN EVEN NUMBER OF RODS ARE USED THEN EACH ROD SHALL HAVE A ROD LOCATED ON THE DIRECT OPPOSITE SIDE OF JOINT. IF 3 OR 6 RODS ARE USED THEN AN EQUAL NUMBER OF UNSHACKLED BOLT HOLES SHALL BE LEFT BETWEEN ANY TWO TIE RODS.)
- 6) TIE ROD NUTS SHALL BE TIGHTENED UNIFORMLY AT EACH JOINT PRIOR TO COATING.
- 7) TIE ROD LENGTHS SHALL NOT EXCEED THOSE LISTED IN ABOVE TABLES, UNLESS SPECIFICALLY SHOWN ON APPROVED PLANS.
- 8) TIE ROD COUPLINGS SHALL BE GALVANIZED "STAR NATIONAL PRODUCTS TIECOUPLING" OR APPROVED EQUAL.
- 9) TIE RODS SHALL BE ATTACHED TO JOINTS WITH TIE BOLTS. TIE BOLTS SHALL BE GALVANIZED "STAR NATIONAL PRODUCTS TIEBOLT" OR APPROVED EQUAL. "DUC-LUGS" ARE NOT ALLOWED.
- 10) 20" FITTINGS AND LARGER SHALL HAVE TIE ROD DESIGN INCLUDED ON DESIGN PLANS.

Water District #19

WATER DISTRICT
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WATER SYSTEM STANDARD DETAIL

Shackle Rods and Tie Rods

RESTRAINED JOINT PIPE IS APPROPRIATE TO USE IN MANY SITUATIONS. HOWEVER, THE DISTRICT WILL BE THE SOLE DETERMINER IF THE APPLICATION IS APPROPRIATE ON A GIVEN JOB. TYPICAL APPLICATIONS INCLUDE:

1. DEAD END MAINS THAT MAY BE EXTENDED.
2. SOILS NOT SUPPORTIVE OF THRUST BLOCKING.
3. INSUFFICIENT BEARING SOIL BEHIND FITTINGS.
4. VERTICAL BENDS (not covered here. must be designed by engineer for each job)

THE FOLLOWING PRODUCTS ARE PRE-APPROVED FOR USE IN RESTRAINED JOINT APPLICATIONS. ALL RESTRAINED JOINT PIPE SHALL BE DUCTILE IRON, UNLESS OTHERWISE APPROVED IN WRITING BY THE DISTRICT.

1. GRIFFIN: SNAP-LOK or BOLT-LOK
2. US PIPE: TR-FLEX or FIELD-LOK GASKET
3. PACIFIC STATES: THRUST-LOCK
4. EBAA IRON: MEGALUG
5. ROMAC: ROMA-GRIP

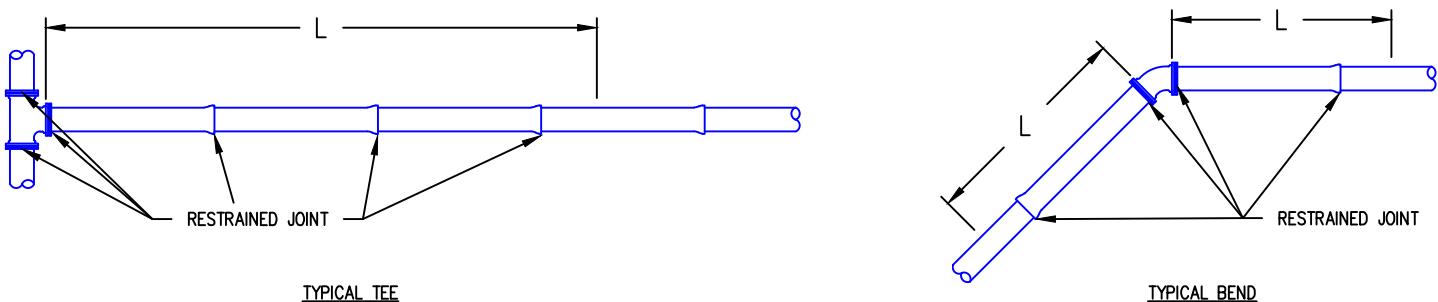
THE FOLLOWING TABLE HAS BEEN DEVELOPED USING THE DUCTILE IRON PIPE RESEARCH ASSOCIATION RESTRAINED JOINT CALCULATOR. THE FOLLOWING CONDITIONS MUST BE MET FOR THESE RESULTS TO BE VALID. IF ANY OF THESE CONDITIONS CANNOT BE MET, PROJECT SPECIFIC CALCULATIONS MUST BE PROVIDED:

- A) THIS TABLE ONLY FOR BARE DUCTILE IRON PIPE. ANY OTHER TYPES OF PIPE WILL REQUIRE RE-EVALUATION.
- B) PIPE LAYING CONDITION TYPE 4 or 5. SELECT GRANULAR BEDDING MATERIAL BELOW PIPE. PIPE ZONE MATERIAL EXTENDING TO TOP OF PIPE MECHANICALLY COMPACTED. PIPE RESTING DIRECTLY ON NATIVE TRENCH BOTTOM IS NOT ACCEPTABLE.
- C) BEDDING SAND IS WELL GRADED WITH FINES. IF GRAVELLY SAND IS USED, LENGTHS MUST BE MULTIPLIED BY 1.3
- D) DEPTH OF COVER IS 3.5 FEET MINIMUM.
- E) 300psi TEST PRESSURE MAXIMUM. FOR HIGHER TEST PRESSURE, TABLE LENGTHS MUST BE MULTIPLIED BY THE PROPORTIONAL DIFFERENCE. EXAMPLE: FOR 350psi, $350/300=1.17$ THEREFORE, LENGTHS MUST BE MULTIPLIED BY 1.17

THE LENGTH "L" GIVEN BELOW INDICATES THE DISTANCE THAT PIPE MUST BE RESTRAINED PAST THE FITTING JOINT. ALL JOINTS WITHIN THIS DISTANCE MUST BE RESTRAINED, INCLUDING THE FITTING.

PIPE DIAMETER	RESTRAINED LENGTH						
	11 $\frac{1}{4}$ * BEND	22 $\frac{1}{2}$ * BEND	45° BEND	90° BEND	TEE w/SAME SIZE BRANCH*	DEAD END	REDUCER **
4"	3'	5'	11'	25'	26'	50'	30'
6"	4'	7'	14'	36'	48'	72'	37'
8"	5'	10'	19'	46'	70'	94'	67'
10"	6'	11'	24'	56'	90'	114'	70'
12"	7'	13'	28'	66'	110'	134'	71'
16"	10'	17'	35'	85'	151'	175'	104'
18"	11'	19'	40'	95'	170'	196'	106'

* assumes all three legs restrained, and a minimum 5' stick of pipe in each run leg.
** assumes reducer down 2 sizes. (example 12"x8"). Larger reductions shall be treated as a tee.



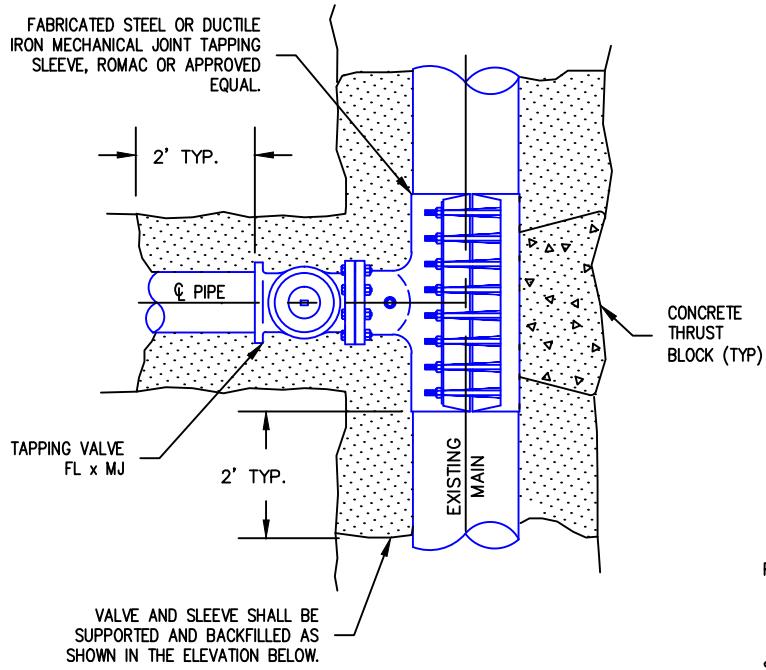
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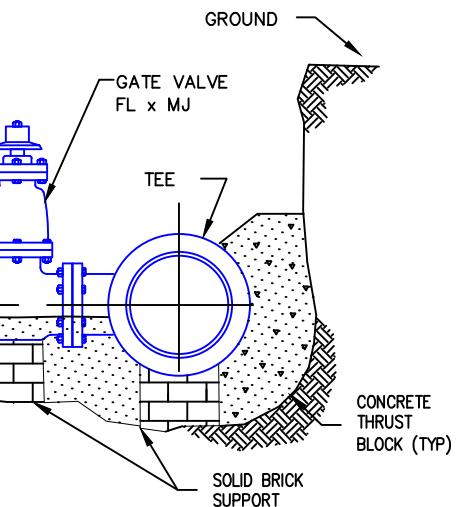
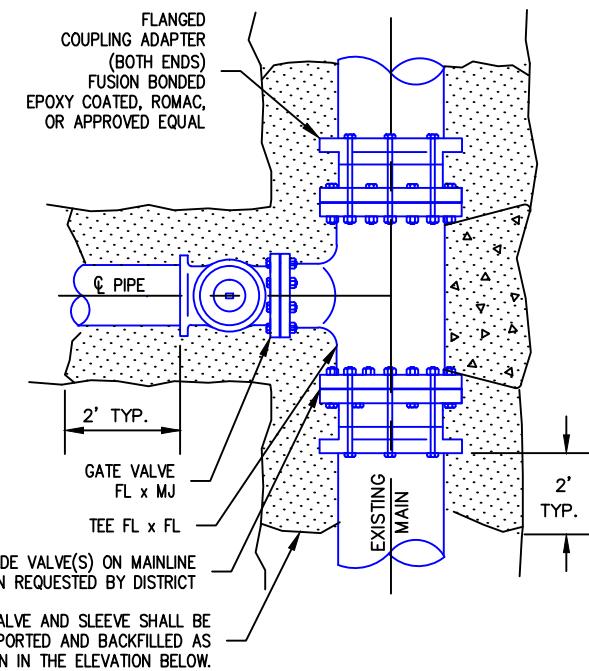
WATER SYSTEM STANDARD DETAIL

Restrained Joint Pipe

LIVE TAP



CUT-IN-TEE



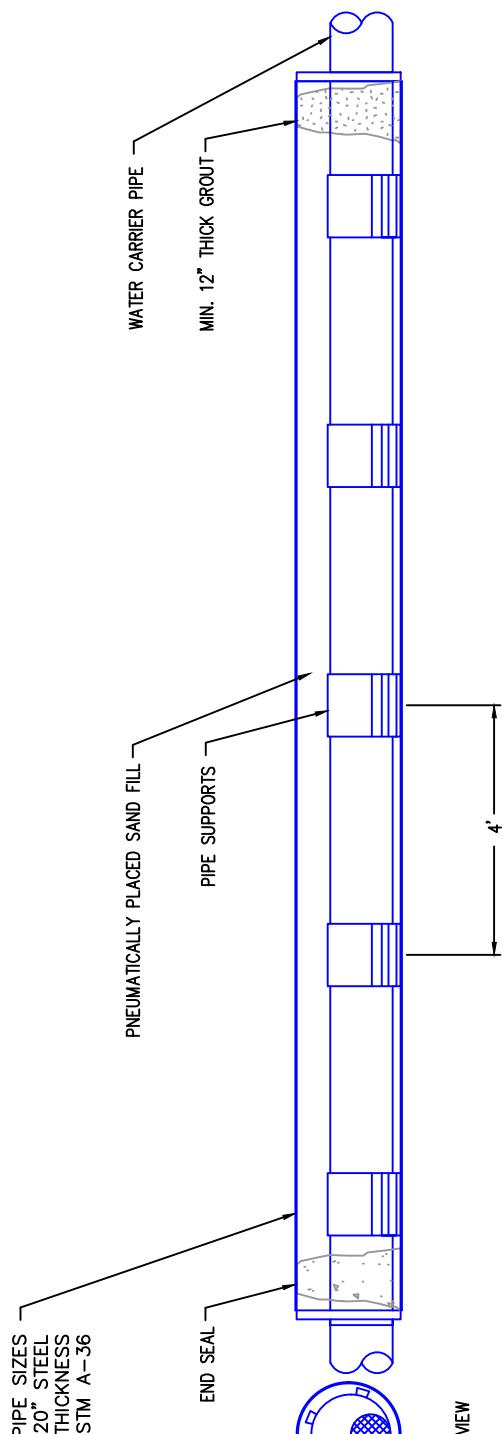
ELEVATION

NOTES:

1. SIZE-ON-SIZE TAPPING TEES SHALL BE DUCTILE IRON MECHANICAL SLEEVE.
2. STEEL TAPPING TEES SHALL BE AT LEAST 2" SMALLER IN DIAMETER THAN THE EXISTING MAIN AND SHALL BE EPOXY COATED OR STAINLESS STEEL.
3. CONNECTIONS TO EXISTING SHALL BE PERFORMED UNDER THE DIRECT SUPERVISION OF THE DISTRICT AND WILL NOT BE ALLOWED ON FRIDAYS, HOLIDAYS OR WEEKENDS. VALVES SHALL BE OPERATED BY DISTRICT ONLY, CONTRACTOR SHALL NOT OPERATE VALVE.
4. 11 MIL PLASTIC OR CONSTRUCTION FABRIC SHALL BE WRAPPED AROUND PIPE AND FITTINGS BEFORE THRUST BLOCK AND CONTROL DENSITY BACKFILL ARE POURED.
5. CONTROLLED DENSITY BACKFILL EQUAL TO WSDOT 2-09.3(1)E.
6. SUPPORT VALVE AND SLEEVE CONTINUOUSLY THROUGH INSTALLATION.
7. TEST TAPPING SLEEVE PRIOR TO CUTTING EXISTING MAIN.

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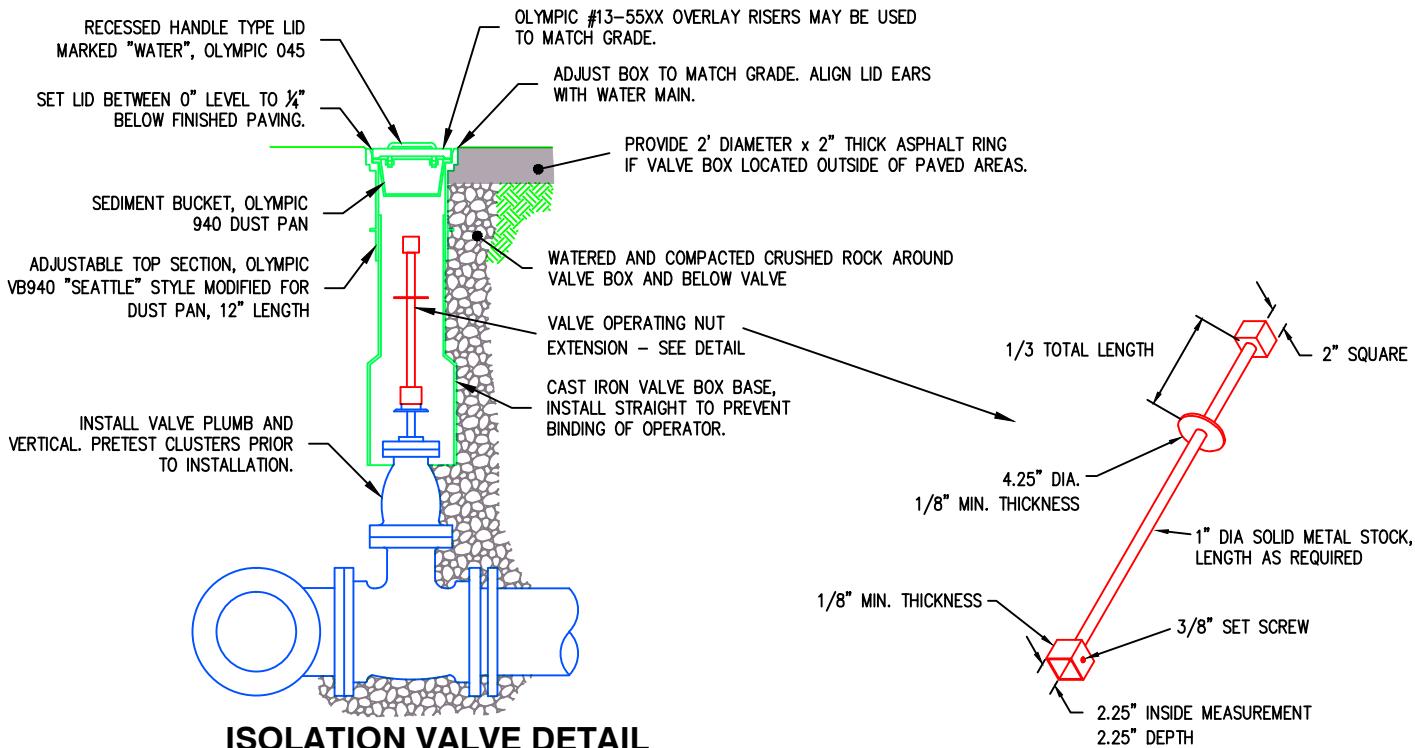
WATER DISTRICT
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FOR CARRIER PIPE SIZES
UP TO 12", 20" STEEL
CASING MIN. THICKNESS
.250" CONFORM TO ASTM A-36

NOTES:

1. CARRIER PIPE SHALL BE PRESSURE TESTED AND VIDEO TAPE (AT SEWER CROSSINGS ONLY) PRIOR TO FILLING VOIDS WITH SAND.
2. CARRIER PIPE WITHIN THE LENGTH OF THE ENCASEMENT PIPE SHALL HAVE RESTRAINED JOINTS.
3. PIPE SUPPORTS FOR PVC AND DIP ARE CALIPICO MODEL PX OR EQUIVALENT, SIZE SKID HEIGHT TO PROVIDE 4" GAP BETWEEN PIPE BELL AND TOP OF CASING.



ISOLATION VALVE DETAIL

ISOLATION VALVE NOTES:

1. VALVES SHALL BE INSTALLED AT NO MORE THAN 1,000 FT SPACING.
2. ISOLATION VALVES 2" AND LARGER ARE TO BE NRS RESILIENT SEAT GATE VALVES MEETING AWWA C509 OR C515. VALVES 14" AND LARGER SHALL BE BUTTERFLY VALVES MEETING AWWA C504.
3. BACKFILL AROUND VALVE BOXES SHALL BE COMPAKTED USING A JUMPING JACK.
4. OLYMPIC FOUNDRY MODEL NUMBERS SHOWN. OWNER APPROVED EQUALS WILL BE ALLOWED.
5. IN-LINE VALVES SHALL BE RESTRAINED WITH DEVICES SHOWN IN W-07, USE ONE FULL STICK OF PIPE ON EACH SIDE OF VALVE.
6. ALL VALVES SHALL BE SUPPLIED WITH VALVE BOX, LID AND DUST PAN. LID SHALL HAVE RECESSED HANDLE. VALVE BOX RISER EARS TO BE INSTALLED WITH THE EARS PARALLEL TO THE DIRECTION OF WATER FLOW.
7. ALL VALVES THAT WILL BE PART OF A CUT-IN CONNECTION OR HOT TAP ON AN EXISTING MAIN SHALL BE PRE-PRESSURE TESTED ON BOTH SIDES OF THE SEAT PRIOR TO INSTALLATION.

OPERATING NUT EXTENSION

EXTENSION NOTES:

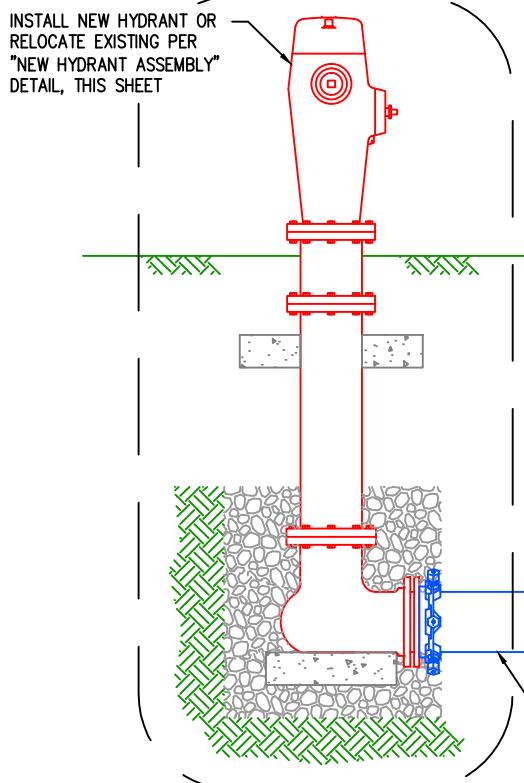
EXTENSIONS ARE REQUIRED WHEN THE VALVE NUT IS MORE THAN 3.5 FEET BELOW FINISHED GRADE. EXTENSIONS ARE TO BE A MINIMUM OF ONE (1) FOOT LONG, ONLY ONE EXTENSION PER VALVE. ALL EXTENSIONS ARE TO BE MADE OF STEEL SIZED AS NOTED, AND PAINTED WITH TWO COATS OF CARBON ELASTIC (ATCO NO. 2221) AS SPECIFIED BY PRESERVATIVE PAINT CO. OR APPROVED EQUAL.

FOR EXTENSIONS LONGER THAN 4 FEET AND/OR VALVES LARGER THAN 12" DIAMETER, BAR SHALL BE 1 1/4" DIAMETER.

VALVE MARKER NOTES:

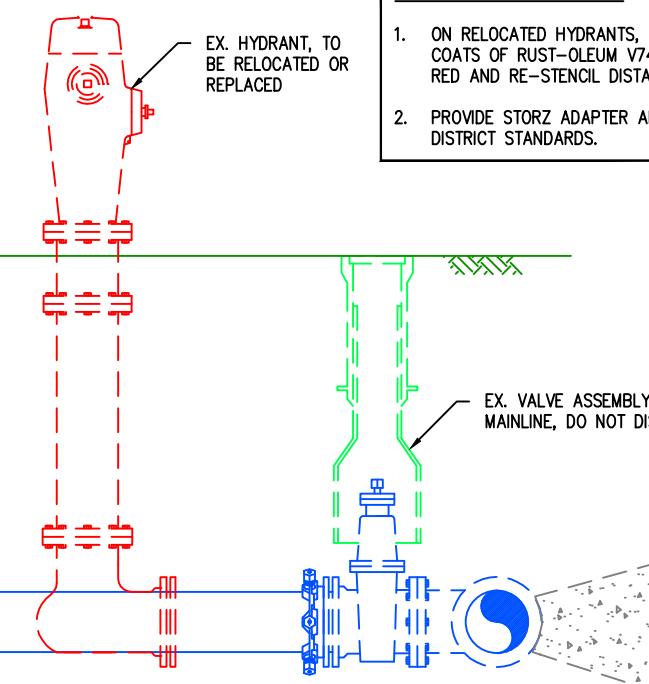
USE MARKER POST WHEN VALVE IS LOCATED OUT OF TRAVELED WAY OR AT THE DIRECTION OF THE DISTRICT.

VALVE MARKER POST SHALL BE A CARSONITE HIGH PERFORMANCE UTILITY MARKER NO. CRM3-066-08 OR APPROVED EQUAL. DISTANCE TO THE VALVE SHALL BE NEATLY STENCILED ON THE POST WITH 1.5" TALL BLACK ON WHITE HIGH INTENSITY REFLECTIVE ADHESIVE NUMBERED STICKERS. STICKERS SHALL BE MADE FROM 3 IN. HIP/HIS REFLECTIVE FILMS AND SHALL BE SPECIFICALLY MANUFACTURED FOR OUTDOOR APPLICATIONS.

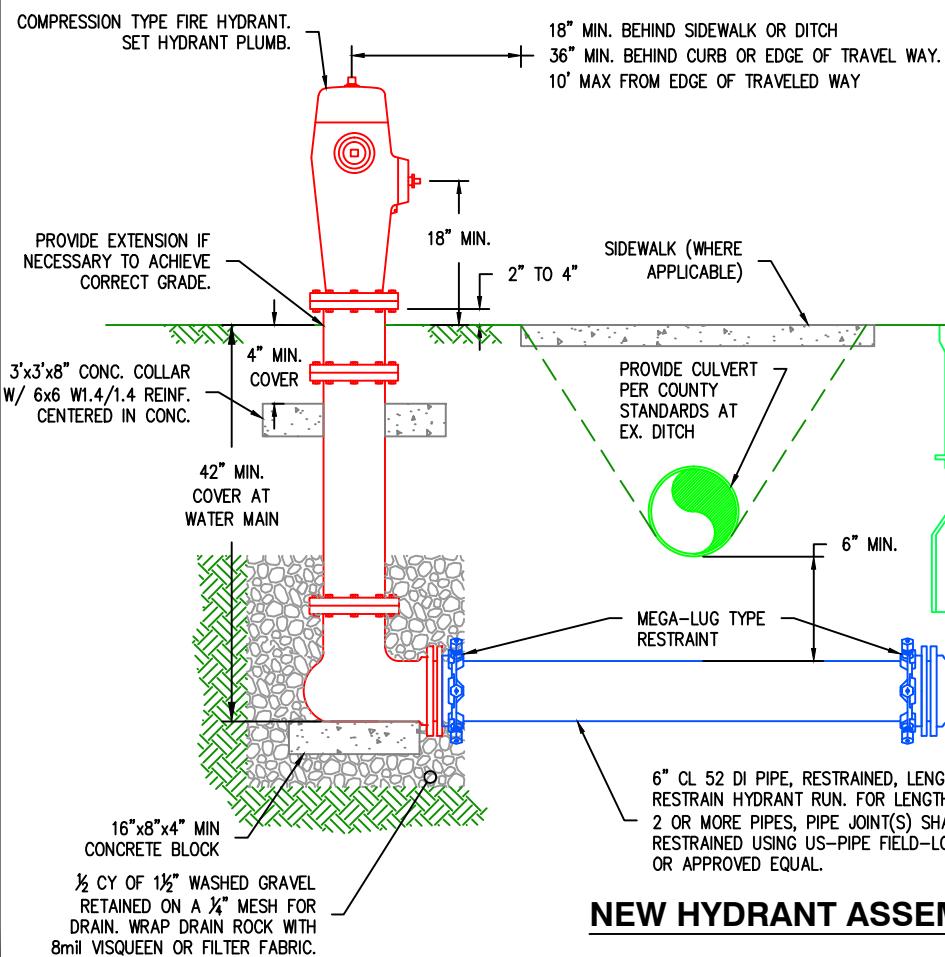


RELOCATED HYDRANT NOTES:

1. ON RELOCATED HYDRANTS, REPAIN HYDRANTS WITH TWO COATS OF RUST-OLEUM V7400 ALKYD ENAMEL, FIRE HYDRANT RED AND RE-STENCIL DISTANCE TO VALVE UNDER PORT.
2. PROVIDE STORZ ADAPTER AND CAP ON PUMPER NOZZLE PER DISTRICT STANDARDS.



HYDRANT RELOCATION



NEW HYDRANT NOTES:

1. SEE STANDARD DETAIL W-12 FOR ADDITIONAL DETAILS REGARDING HYDRANT LOCATION REQUIREMENTS.
2. IF THERE IS AN EXISTING HYDRANT IN THE VICINITY THAT WILL BE DEACTIVATED, REMOVE AND DELIVER HYDRANT TO DISTRICT SHOP. CONFIRM WITH DISTRICT.
3. NEW HYDRANTS TO BE SUPPLIED WITH FACTORY COATING IN RED AND FINISH COATED IN THE FIELD WITH TWO COATS OF RUST-OLEUM V7400 ALKYD ENAMEL, FIRE HYDRANT RED. STENCIL FOOTAGE TO VALVE ON FIRE HYDRANT UNDER PORT.
4. HYDRANT CAP TO BE PAINTED PER NFPA 291 COLOR SCHEME FOLLOWING HYDRANT TESTING. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.

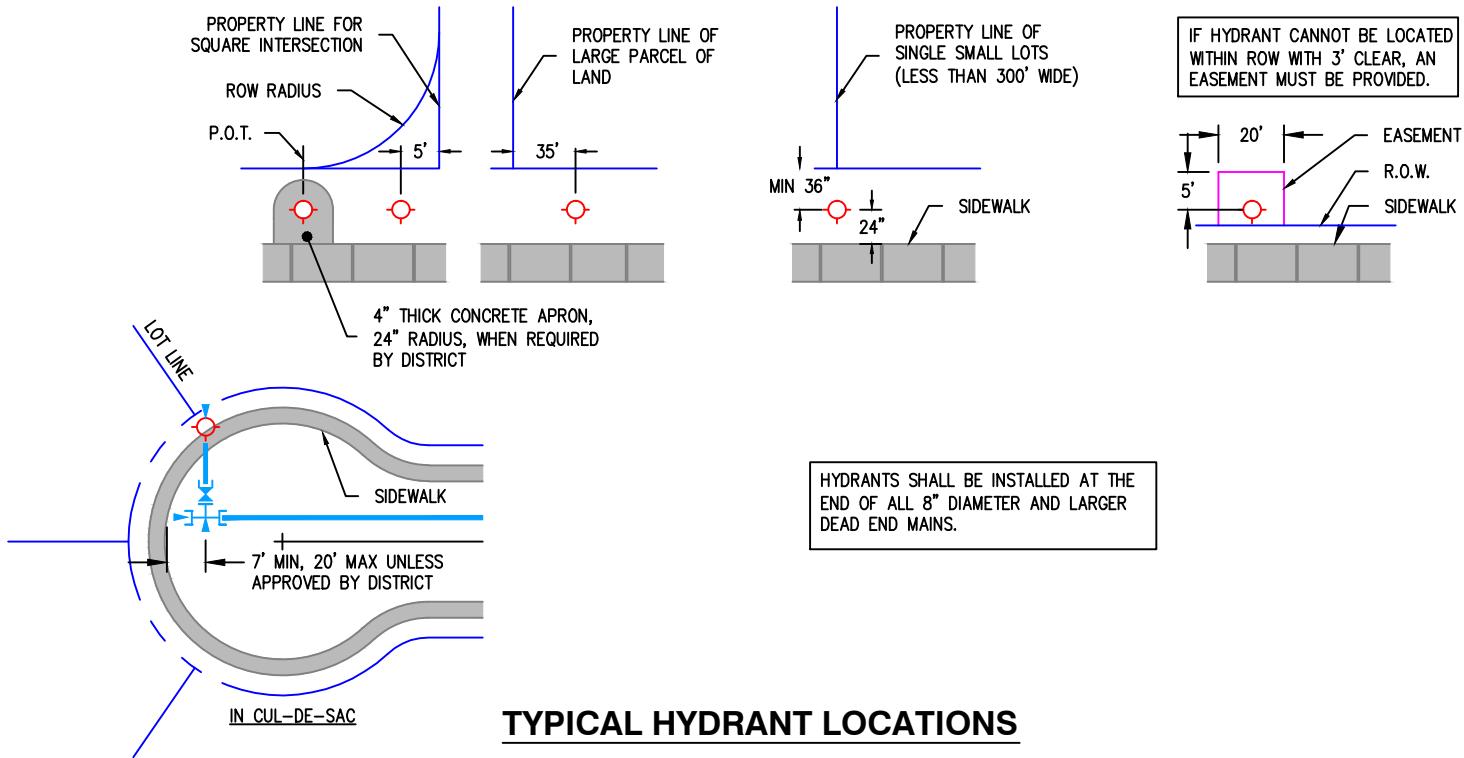
NEW HYDRANT ASSEMBLY

Water District #19

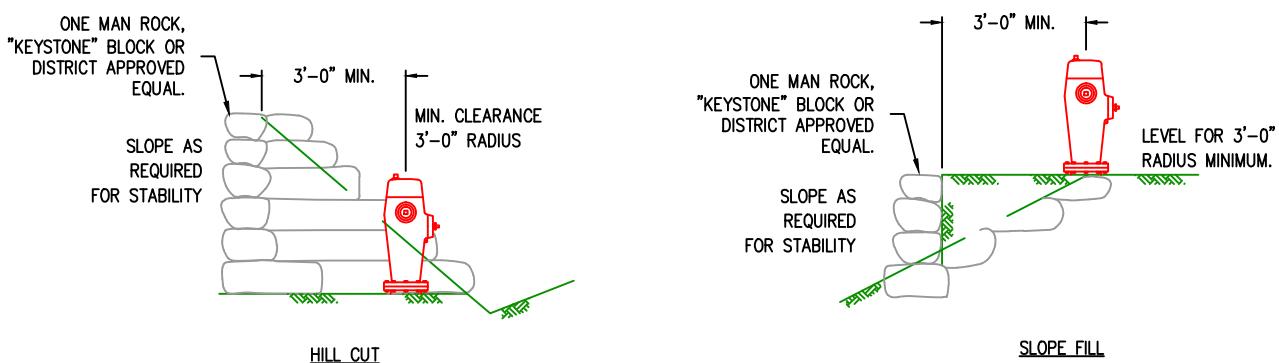
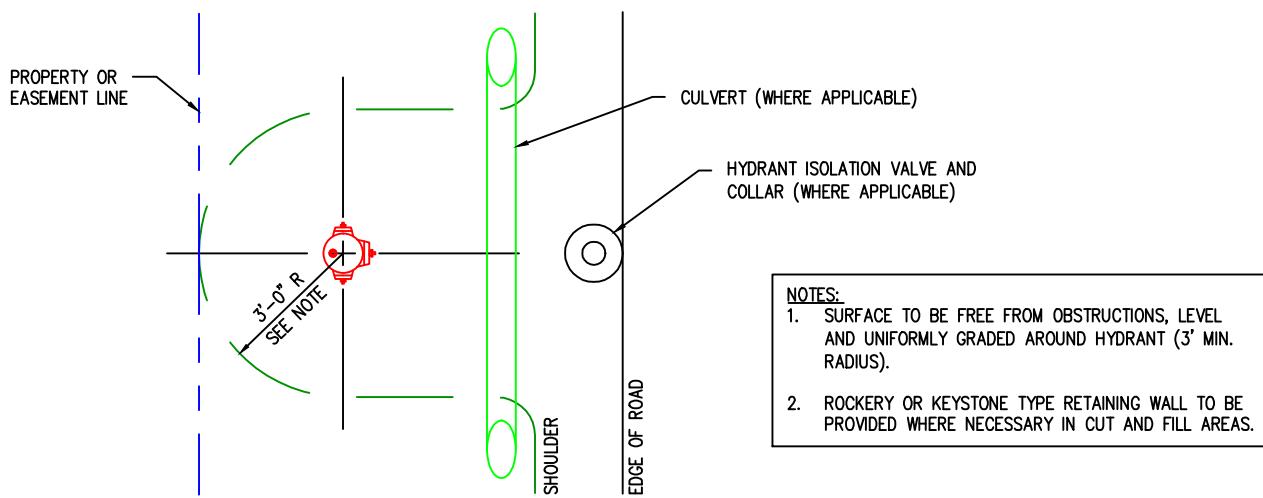
WATER DISTRICT
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WATER SYSTEM STANDARD DETAIL

Fire Hydrant Assembly

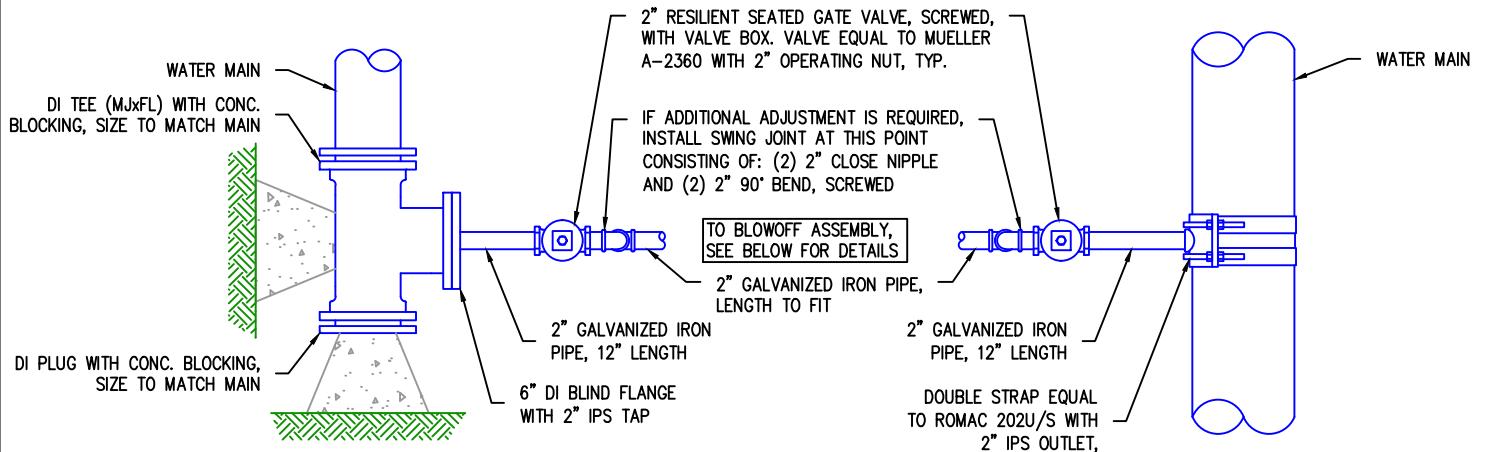


TYPICAL HYDRANT LOCATIONS



GRADING REQUIREMENTS FOR HYDRANT INSTALLATION

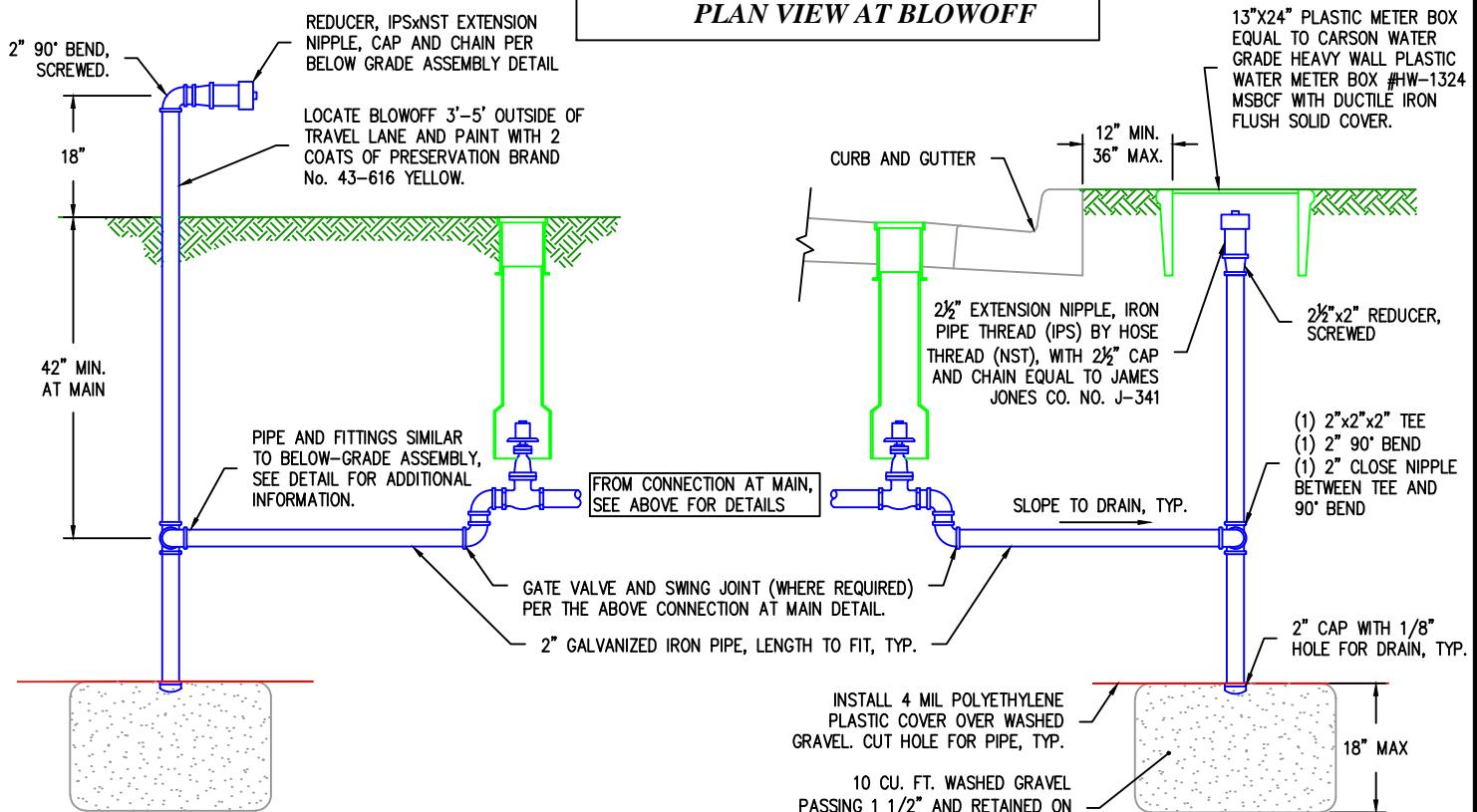
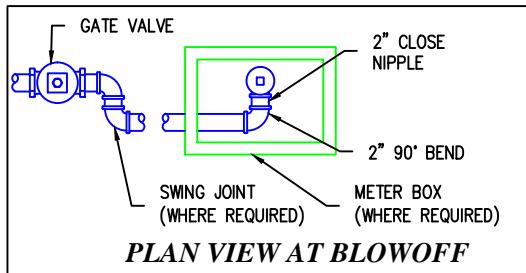
Water District #19



CONNECTION AT MAIN (PLAN VIEW)

NOTES:

1. LOCATE BLOWOFF ASSEMBLY AS CLOSE AS POSSIBLE TO MAIN.
2. SELECT DETAILS FOR CONNECTION AT MAIN AND BLOWOFF ASSEMBLY AS APPROPRIATE FOR THE INSTALLING CONDITION OR AS SPECIFIED ON THE PLANS.
3. PROVIDE ABOVE-GRADE BLOWOFF ASSEMBLY IN RURAL AREAS. ORIENT NOZZLE TOWARDS ROADSIDE DITCH.
4. PROVIDE BELOW-GRADE BLOWOFF ASSEMBLY IN DEVELOPED AREAS OR AS DIRECTED BY THE DISTRICT.



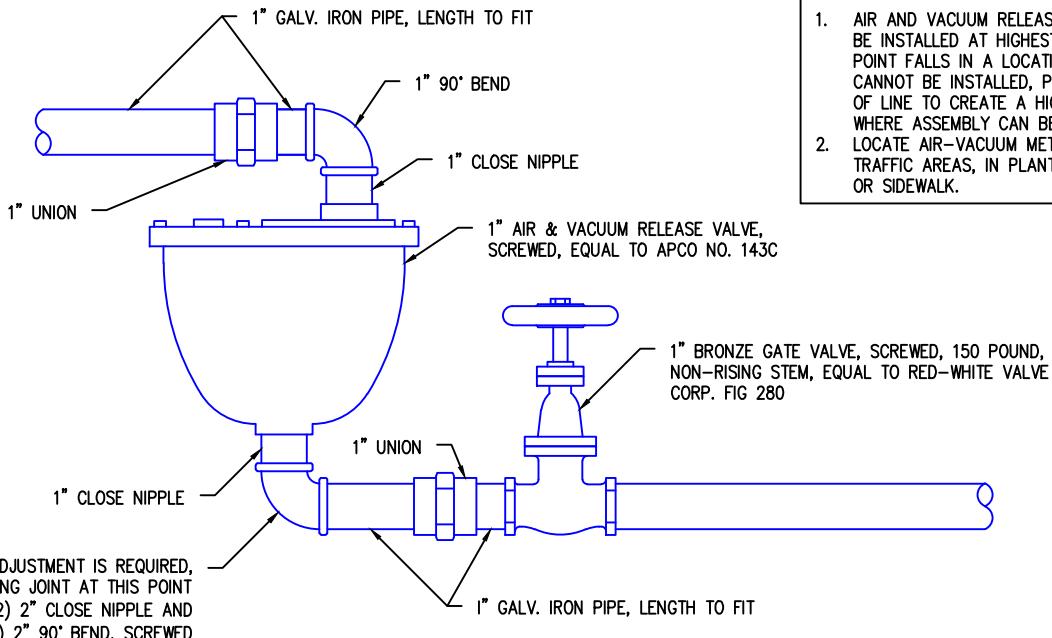
BLOWOFF ASSEMBLY (ELEVATION VIEW)

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WATER SYSTEM STANDARD DETAIL

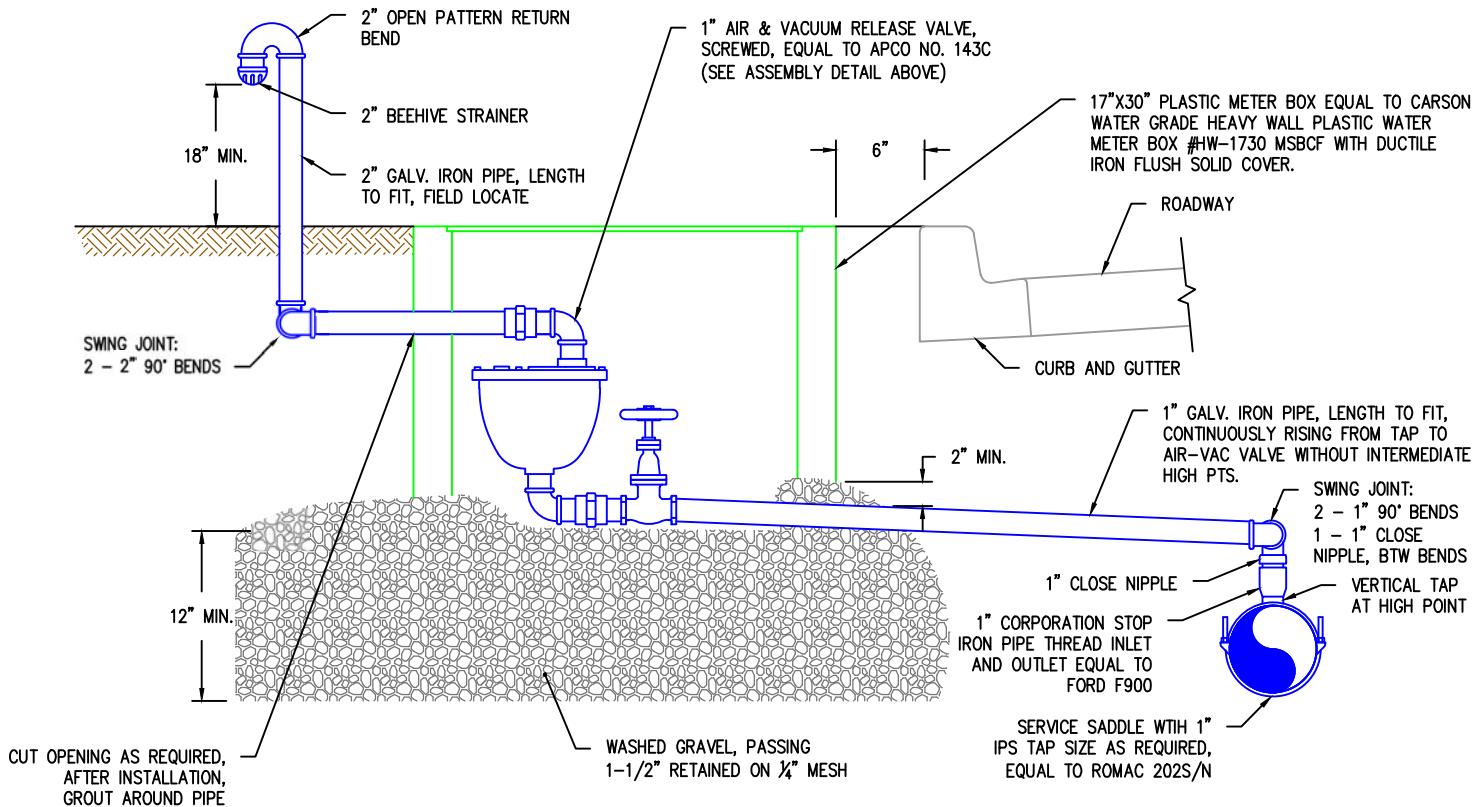
2" Blowoff Assembly



NOTE:

1. AIR AND VACUUM RELEASE VALVE ASSEMBLY SHALL BE INSTALLED AT HIGHEST POINT OF LINE. IF HIGH POINT FALLS IN A LOCATION WHERE ASSEMBLY CANNOT BE INSTALLED, PROVIDE ADDITIONAL DEPTH OF LINE TO CREATE A HIGH POINT AT A LOCATION WHERE ASSEMBLY CAN BE INSTALLED.
2. LOCATE AIR-VACUUM METER BOX OUTSIDE OF TRAFFIC AREAS, IN PLANTING STRIPS, BEHIND CURB OR SIDEWALK.

VALVE ASSEMBLY DETAIL

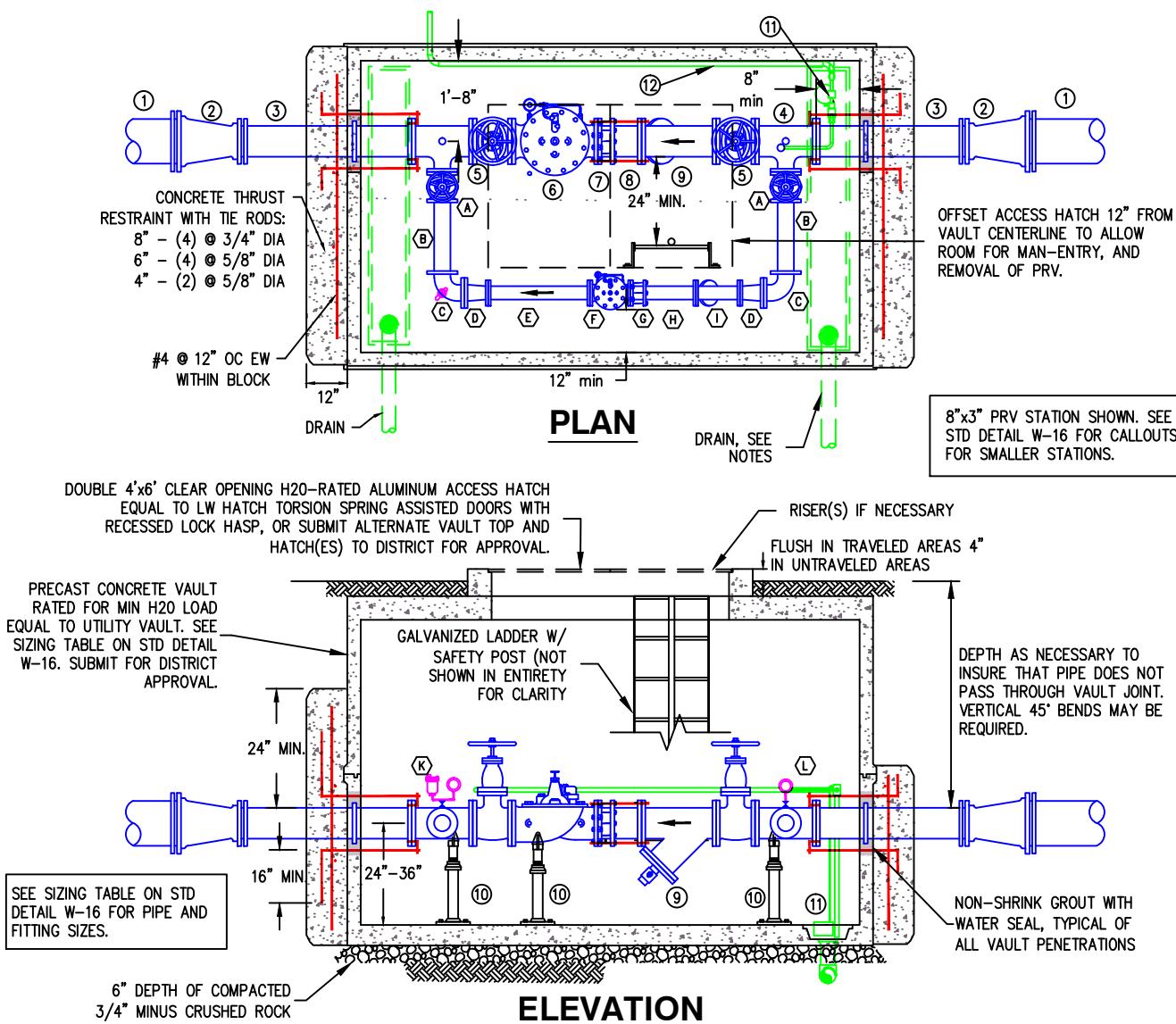


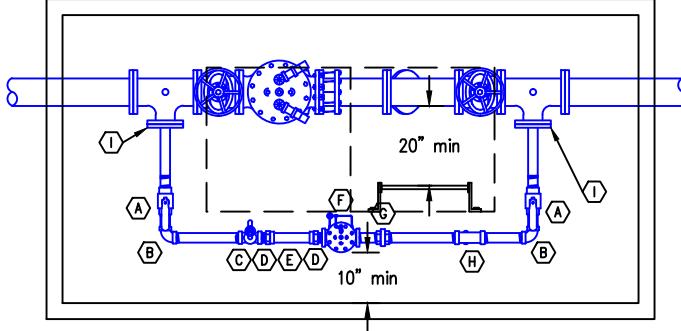
AIR AND VACUUM VALVE ASSEMBLY

Water District #19

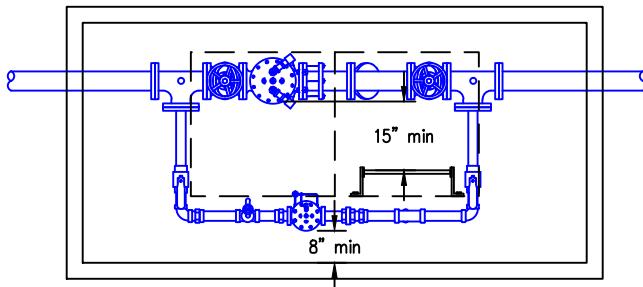
**WATER DISTRICT
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**WATER SYSTEM STANDARD DETAIL
Combination Air and Vacuum
Release Assembly**





6" x 2" PRV STATION



4" x 2" PRV STATION

Main Line	Main PRV	Bypass Line	Utility Vault
12"	8"	3"	712-LA
10"	8"	3"	712-LA
8"	6"	2"	612-LA
6"	4"	2"	5106-LA

1. SEE STD DETAIL W-15 FOR ADDITIONAL STATION INFORMATION.

2. PREP ALL SURFACES PER PAINT MANUFACTURER'S INSTRUCTIONS PRIOR TO APPLICATION. REMOVE ALL DIRT, GREASE, SCALE AND RUST. FACTORY COATINGS SHALL BE ROUGHENED TO PROVIDE ADEQUATE PROFILE FOR TOP COATS.

3. COAT INTERIOR WALLS, DI PIPE, FITTINGS AND STEEL FASTENERS WITH POLYIMIDE EPOXY PAINT, 2 COATS AT 5 DRY MILS EACH. COLORS: OFF WHITE FOR WALLS, LIGHT BLUE FOR PIPE. PIPE SHALL BE EMPTY DURING COATING.

4. COAT VAULT EXTERIOR WITH 20 MIL COAL TAR EPOXY.

5. PROVIDE VAULT DRAINAGE EITHER BY:

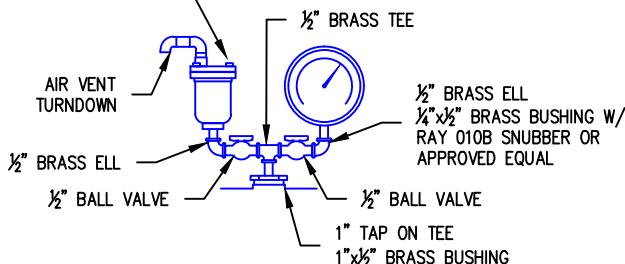
- a) 4" SCH 40 PVC DRAIN TO DAYLIGHT OR STORM SYSTEM, or
- b) GC SYSTEMS HYDROMATIC (WATER-POWERED) PUMP MODEL #996633-51-2

6. IF RESTORED SURFACE GRADE IS TO BE GREATER THAN 2%, VAULT ACCESS SHALL INCLUDE ADJUSTMENT RISERS TO MATCH GRADE.

7. ALL BALL VALVES AND CURB STOP SHALL BE FULL-PORT.

8. ALL FASTENERS SHALL BE STAINLESS STEEL.

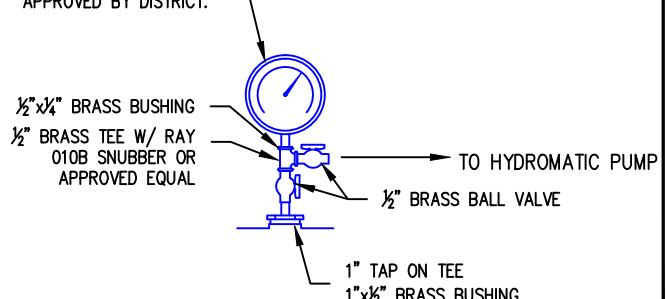
½" AIR RELEASE VALVE, APCO MODEL 50 OR VALMATIC.



GAUGE & AIR VALVE

NOTE, BRASS NIPPLES NOT CALLED OUT,
PROVIDE AS NECESSARY.

PRESSURE GAUGE w/ 4½" FACE, OVERALL
ACCURACY ± ½% OF FULL SCALE.
RANGE 0-200 psi OR AS OTHERWISE
APPROVED BY DISTRICT.



GAUGE

- (A) 2" BRASS BALL VALVE (THREADED)
- (B) 2" BRASS 90° BEND (THREADED)
- (C) 2" BRASS TEE (THREADED)
¾" HOSE BIB
- (D) 2" BRASS THREADxSWEAT ADAPTER
- (E) 2" COPPER PIPE, LTF

- (F) CLA-VAL 90G-01ABS PRESSURE REDUCING VALVE (THREADED). EPOXY LINING, VALVE POSITION INDICATOR.
- (G) 2" BRASS UNION
- (H) STRAINER (THREADED) EQUAL TO WATTS 777S AND BRONZE BALL VALVE FOR BLOW OUT
- (I) 4" DI BLIND FLANGE w/2" TAP

USE THREADED BRASS NIPPLES
(NOT CALLED OUT) ON BYPASS
PIPING. USE CLOSE NIPPLES
WHEREVER POSSIBLE.

SEE STD DETAIL W-06
FOR NUMBER AND SIZE
OF SHACKLE RODS.

12" MIN FROM ALL
FITTINGS (TYP)

#4 @ 12" OC EW WITHIN
BLOCK

4" DRAIN, SEE
NOTES THIS SHEET

12" MIN
INSTALL SLOTTED GRATE
OVER DRAIN CHANNEL

8" MIN

PLAN

ACCESS HATCH. SIZE AND OPENING
LOCATION TO VARY BASED ON
APPURTURENCE.

DRILL 2" HOLE IN INACTIVE
DOOR FOR REMOTE READ PAD

RISER(S) IF
NECESSARY

HATCH FLUSH IN TRAVELED
AREAS 4" ABOVE GRADE IN
UNTRAVELED AREAS

EXACT DEPTH MAY VARY TO
INSURE THAT PIPE DOES NOT
PASS THROUGH VAULT JOINT.
VERTICAL 45° BENDS MAY BE
REQUIRED.

PROVIDE AND INSTALL
MASTIC AT ALL JOINTS

GALV OR ALUMINUM
BOLT-ON LADDER
WITH LADDER-UP
EXTENSION. ANCHOR
TO FLOOR AND LID.
LOCATION TO VARY

NON-SHRINK GROUT WITH
WATER SEAL, TYPICAL OF
ALL VAULT PENETRATIONS

48" MIN

PRECAST CONCRETE
VAULT RATED FOR MIN
H2O LOAD EQUAL TO
UTILITY VAULT. SUBMIT
FOR DISTRICT APPROVAL.

18" MIN

PIPE THROUGH VAULT WALL
MUST BE DI IF SOLID GROUTED.
PVC ALLOWED IF USING A
FLEXIBLE BOOT.

6" DEPTH OF COMPAKTED
3/4" MINUS CRUSHED ROCK

ELEVATION

1. USE ONE FULL LENGTH OF PIPE THROUGH THE VAULT TO INSURE ALIGNMENT. CUT OUT SECTION OF PIPE FOR INSTALLATION OF ASSEMBLY AS NECESSARY.
2. EXTERNAL CONCRETE BLOCKING FOR UTILITY VAULTS SHALL BE INSTALLED BEFORE INTERNAL PIPING IS CUT OUT. BLOCKING SHALL BE FORMED, NOT DIRECTLY POURED AGAINST DIRT WALLS. BLOCKING SHALL BE CONSOLIDATED BY MECHANICAL VIBRATION, MINIMUM 1" DIAMETER STINGER HEAD.
3. ALL VAULT HATCHES 2'x2' OR LARGER SHALL BE HINGED, SPRING ASSIST OPENING, INCLUDE RECESSED PADLOCK HASP, DRAINAGE COLLECTION FRAME (U CHANNEL WITH PIPE CONNECTION), H2O RATED MINIMUM, ALUMINUM OR GALVANIZED STEEL. IF HATCH WILL BE LOCATED IN A TRAVELED AREA (ROAD OR DRIVEWAY), SUBMIT MANUFACTURER'S STATEMENT THAT HATCH IS RATED FOR CONTINUOUS AND DELIBERATE H2O TRAFFIC SERVICE. HATCHES SHALL BE CAST INTO VAULT LID OR RISER. FRAME DRAIN PLUMBLED THROUGH LID TO SURFACE IF LID IS AT LEAST 4" ABOVE GRADE. OTHERWISE, INSTALL 1" OR LARGER SCH 40 PVC PIPE AND FITTINGS FROM THE FRAME DRAIN, ROUTED AND SECURED ALONG THE CEILING AND WALLS TO THE FLOOR.
4. DRAIN SYSTEM MUST BE PROVIDED.
 - 4.1. 4" DRAIN (MIN) TO DAYLIGHT OR STORM SYSTEM, OR
 - 4.2. 2cy DRAIN ROCK WRAPPED IN FILTER FABRIC, OR
 - 4.3. 120VAC SUMP PUMP WITH 15' CORD & 15' HOSE (ONLY WITH DISTRICT APPROVAL)
 - 4.4. FOR DOUBLE CHECK VALVE RP DEVICES, INSTALLATION MUST BE ABOVE GRADE OR VAULT DRAIN BORESIGHTED (LANTERNED) TO DAYLIGHT.
5. VAULT FLOOR SHALL BE SLOPED TO DRAIN.
6. DRAIN CHANNEL SHALL HAVE KNOCKOUTS FOR BOTH BOTTOM AND SIDE DRAINAGE.
7. COAT BURIED VAULT EXTERIOR WITH 20mil COAL TAR EPOXY. DO NOT COAT EXTERIOR OF EXPOSED SURFACES.
8. CRACKED OR OTHERWISE DAMAGED VAULTS WILL BE REJECTED AT THE DISCRETION OF THE DISTRICT.
9. ALL VAULTS MUST BE SUBMITTED TO THE DISTRICT FOR REVIEW. SUBMITTALS MUST INCLUDE DIMENSIONS, HATCH LAYOUT, AND HATCH MATERIALS.

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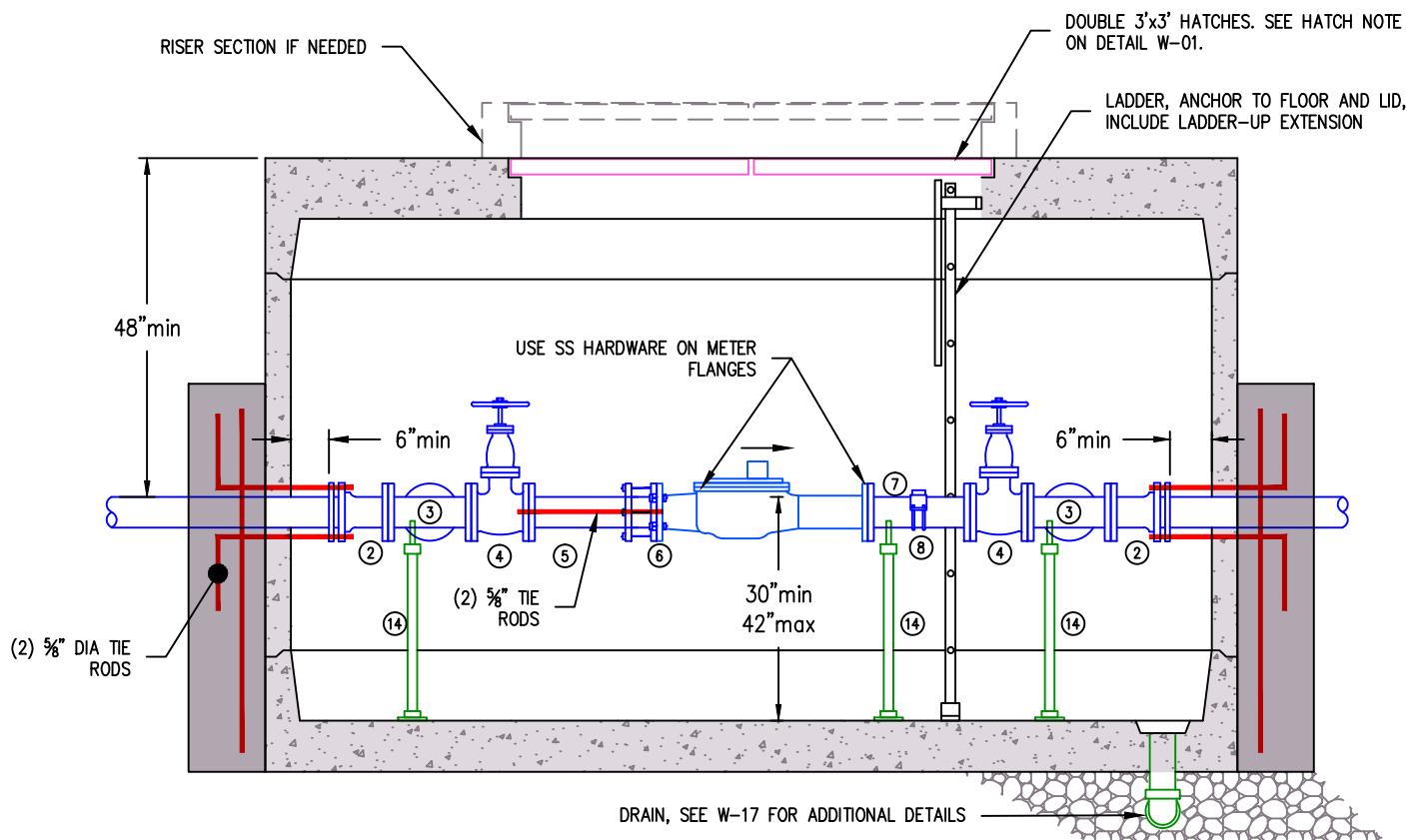
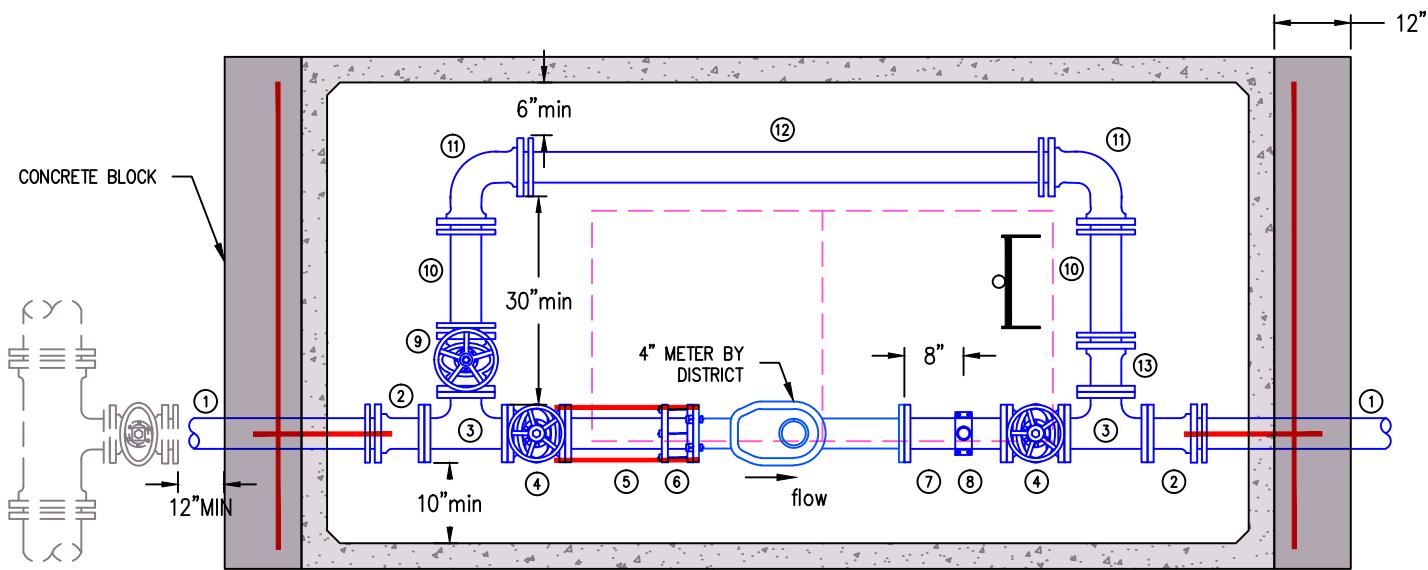
WATER DISTRICT
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WATER SYSTEM STANDARD DETAIL

LARGE VAULTS

- ① 4" DI PIPE
- ② 4" FLxMJ ADAPTER or FCA
- ③ 4" TEE (FL)
- ④ 4" RSGV w/HANDWHEEL (FL)
- ⑤ 4" DI PIPE FLxPE, 20" LENGTH
- ⑥ 4" FCA, DO NOT "PUSH HOME" PIPE
- ⑦ 4" DI PIPE FLxFL, 14" LENGTH
- ⑧ 2"x4" SADDLE w/2" PLUG
- ⑨ 4" RSGV (FLxMJ) w/HANDWHEEL
- ⑩ 4" DI PIPE, 20" LENGTH
- ⑪ 4" 90° BEND (MJ)
- ⑫ 4" DI PIPE, 84" LENGTH
- ⑬ 4" FLxMJ ADAPTER
- ⑭ STANDON OR GRINNELL PIPE SUPPORT (5 total)

1. SEE W-17 FOR ADDITIONAL VAULT INSTALLATION DETAILS
2. TIE RODS TO BE COR-TEN OR STAINLESS.
3. ALL MECHANICAL JOINTS SHALL BE RESTRAINED PER DETAIL W-07.
4. USE ONE FULL LENGTH OF 4" PIPE THROUGH THE VAULT TO INSURE ALIGNMENT. CUT OUT FOR INSTALLATION OF ASSEMBLY.
5. VAULT MINIMUM INSIDE DIMENSIONS OF 12'Lx6'Wx6.5'H, UTILITY VAULT 612LA OR APPROVED EQUAL.
6. 4" METER CAPACITY = 1000 GPM X 80% = 800 GPM



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WATER SYSTEM STANDARD DETAIL

4" METER ASSEMBLY

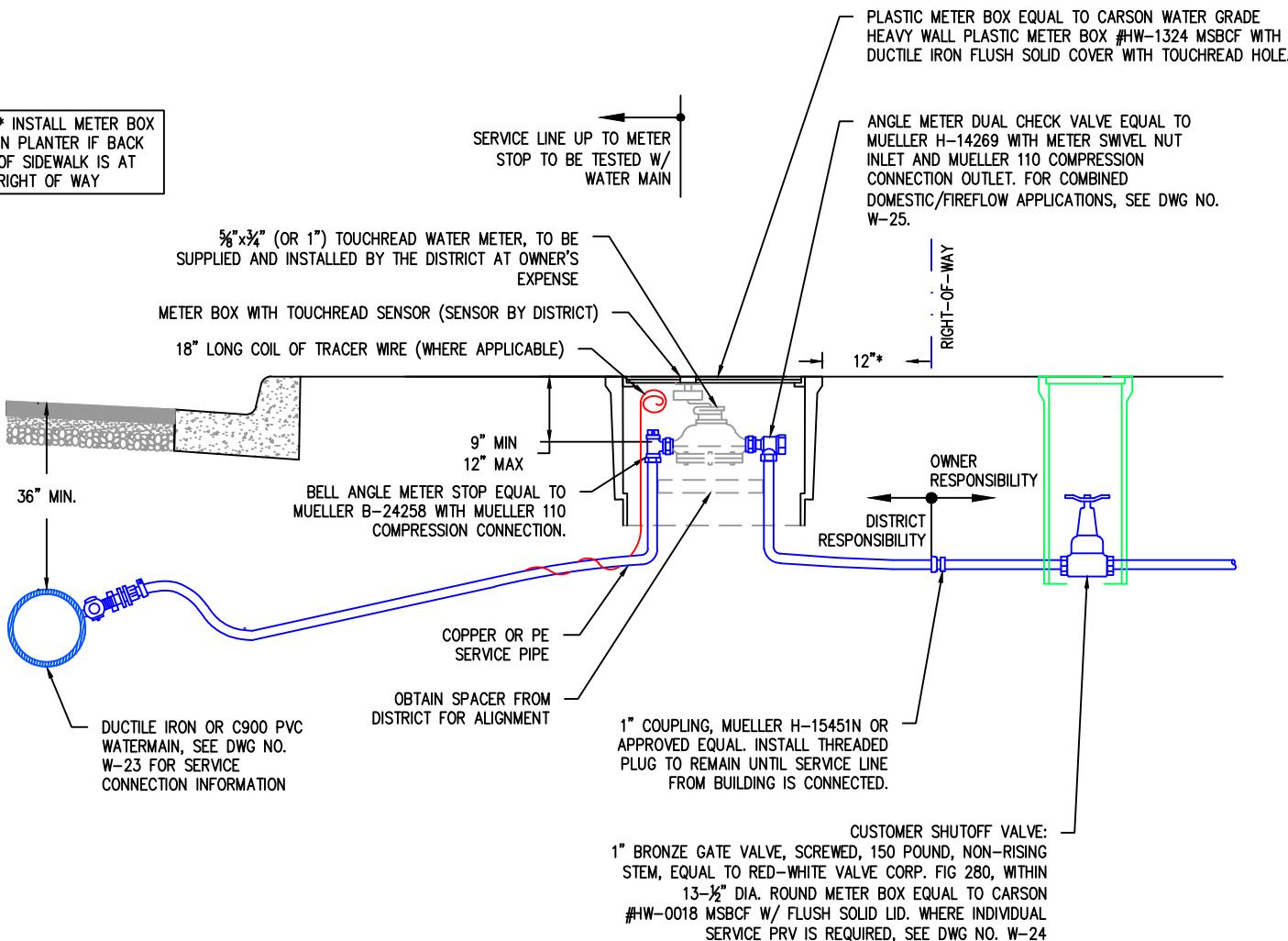
WATER SERVICE MINIMUM SIZING GUIDELINES

1. SADDLE, CORP AND SERVICE PIPE TO BE THE SAME DIAMETER.
2. SERVICE LINE FOR $\frac{3}{4}$ " METER SHALL BE 1" INCH DIAMETER FOR SERVICE LINES WITHIN ROAD OR FOR SERVICE LINES LONGER THAN 30 FT, ALL OTHERS SHALL BE $\frac{3}{4}$ " MIN.
3. SERVICE LINE FOR 1" METER SHALL BE $1\frac{1}{2}$ " MINIMUM, ANY LENGTH.
4. LARGER SIZES MAY BE REQUIRED DEPENDING ON FIRE SPRINKLER DEMANDS OR LONG PIPE RUNS.

NOTES

1. INDIVIDUAL SERVICES REQUIRED FOR EACH PROPERTY. SEE STANDARD PLAN W-23 FOR ADDITIONAL INFORMATION REGARDING SERVICE CONNECTIONS, METER LOCATION AND TOUCHREAD SENSOR MOUNTING.
2. PROVIDE MARKING TAPE FOR ALL SERVICE LINES PER STANDARD PLAN W-23.
3. PROVIDE TRACER WIRE FOR ALL PE SERVICE LINES. SECURE EACH END TO CONDUCTIVE PIPING/FITTING.
4. COMPARABLE "FORD" FITTINGS MAY BE USED IN LIEU OF "MUELLER", OR VICE VERSA. MUELLER 110 CONNECTION CAN BE SUBSTITUTED FOR FORD QUICK JOINT.

* INSTALL METER BOX
IN PLANTER IF BACK
OF SIDEWALK IS AT
RIGHT OF WAY



WATER SERVICE MINIMUM SIZING GUIDELINES

1. SADDLE AND SERVICE PIPE TO BE THE SAME DIAMETER.
2. SERVICE LINE FOR 1½" METER SHALL BE 1½ INCH DIAMETER MINIMUM.
3. SERVICE LINE FOR 2" METER SHALL BE 2" INCH DIAMETER MINIMUM.
4. LARGER SIZES MAY BE REQUIRED DEPENDING ON FIRE SPRINKLER DEMANDS OR LONG PIPE RUNS.

SERVICE SADDLE: STRAP OR U-BOLT STYLE, SIZE AS REQUIRED. EQUAL TO ROMAC 202U/S. SELECT SADDLE THAT IS SMALLEST THAT WILL FIT THE PIPE. PIPE OD SHALL BE IN THE UPPER HALF OF THE SADDLE FIT RANGE.

METER BOX: 24"X36" PLASTIC METER BOX EQUAL TO CARSON WATER GRADE HEAVY WALL PLASTIC WATER METER BOX #HW-2436 MSBCF WITH DUCTILE IRON FLUSH SOLID COVER WITH TOUCHREAD HOLE.

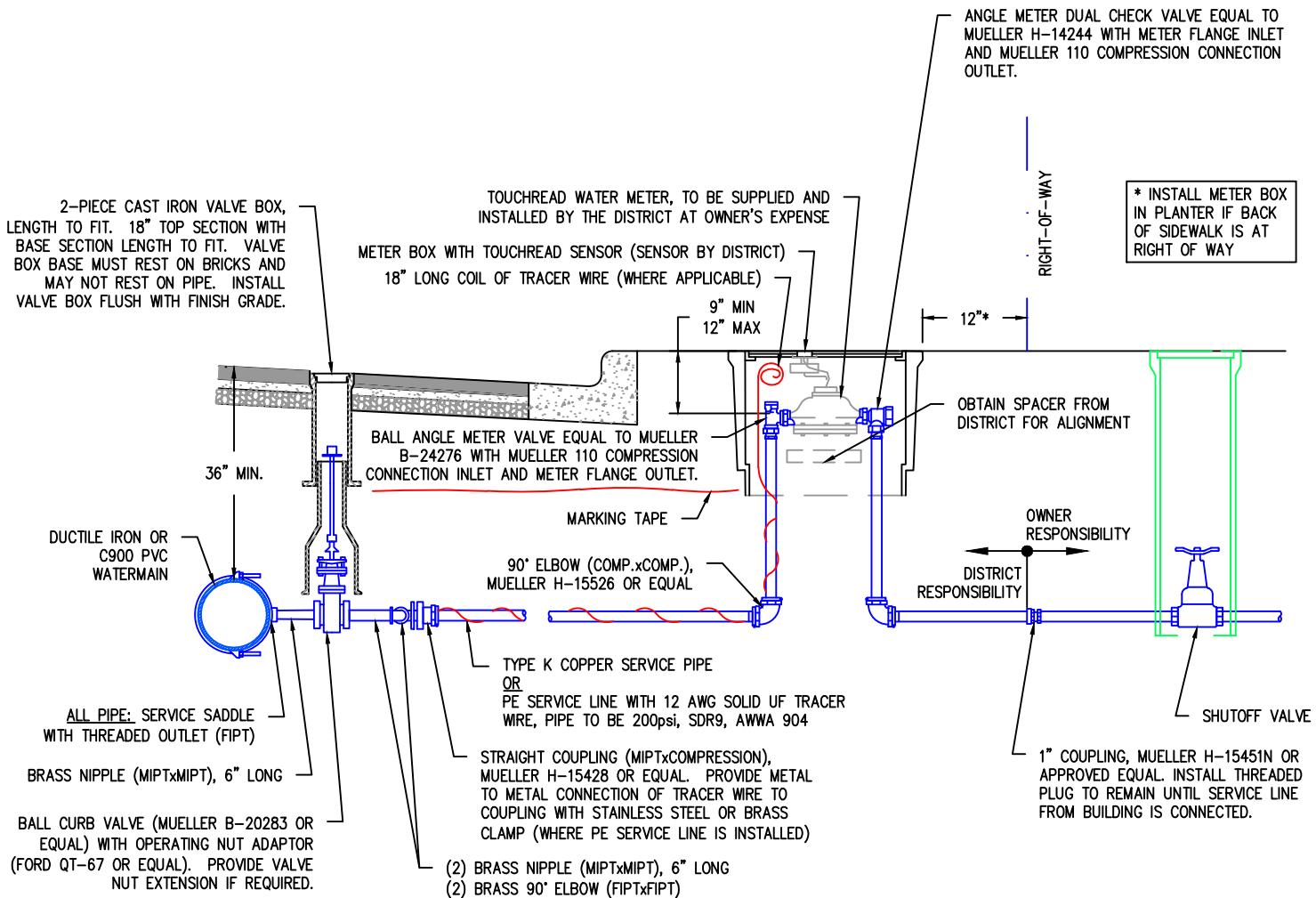
PRESSURE REDUCING VALVES: WHERE INDIVIDUAL SERVICE PRV REQUIRED, SEE STANDARD DWG W-24 FOR MORE INFORMATION.

NOTES

1. INDIVIDUAL SERVICES REQUIRED FOR EACH PROPERTY. SEE STANDARD PLAN W-23 FOR ADDITIONAL INFORMATION REGARDING METER LOCATION AND TOUCHREAD SENSOR MOUNTING.
2. PROVIDE MARKING TAPE FOR ALL SERVICE LINES PER STANDARD PLAN W-23.
3. PROVIDE TRACER WIRE FOR ALL PE SERVICE LINES. SECURE EACH END TO CONDUCTIVE PIPING/FITTING.

SHUTOFF VALVES: 1" BRONZE GATE VALVE, SCREWED, 150 POUND, NON-RISING STEM, EQUAL TO RED-WHITE VALVE CORP. FIG 280, WITHIN 13-1/2" DIA. ROUND METER BOX EQUAL TO CARSON #HW-0018 MSBCF W/ FLUSH SOLID LID.

COMPARABLE "FORD" FITTINGS MAY BE USED IN LIEU OF "MUELLER", OR VICE VERSA.



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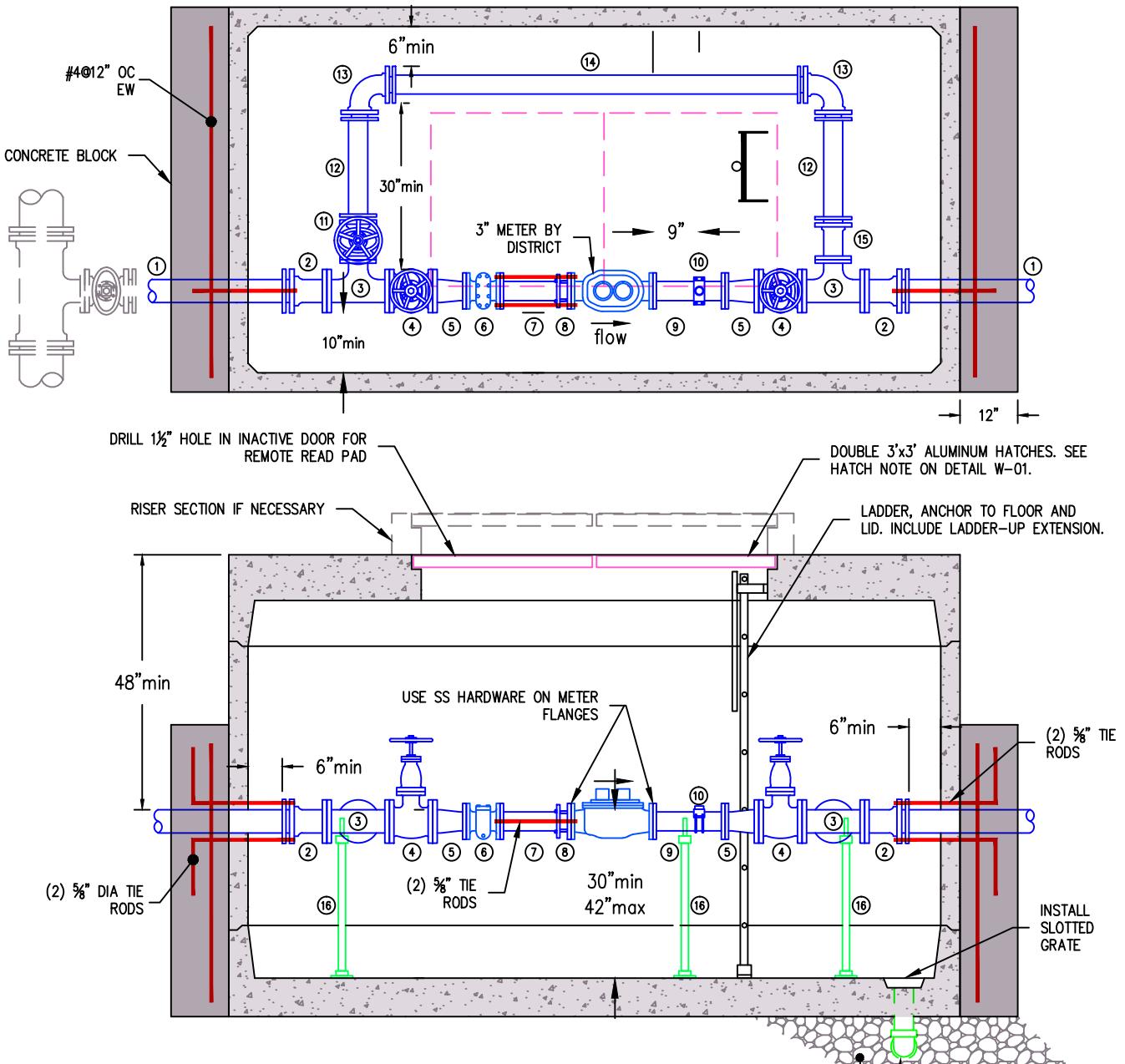
WATER SYSTEM STANDARD DETAIL

1½" and 2" Water Service Assembly

- | | | | |
|---|---------------------------------|---|--|
| ① | 4" DI PIPE | ⑨ | 3" DI PIPE FL, 15" LENGTH |
| ② | 4" FLxMJ ADAPTER | ⑩ | 2"x3" SADDLE w/2" PLUG |
| ③ | 4"x3" TEE (FL) | ⑪ | 3" RSGV (FlxMJ) w/HANDWHEEL |
| ④ | 4" RSGV w/HANDWHEEL (FL) | ⑫ | 3" DI PIPE, 24" LENGTH |
| ⑤ | 4"x3" REDUCER (FL) | ⑬ | 3" 90° BEND (MJ) |
| ⑥ | 3" BASKET STRAINER (FL) | ⑭ | 3" DI PIPE, 90° LENGTH |
| ⑦ | 3" DI PIPE FlxPE, 15" LENGTH | ⑮ | 3" FLxMJ ADAPTER |
| ⑧ | 3" FCA, DO NOT "PUSH HOME" PIPE | ⑯ | STANDON OR GRINNELL PIPE SUPPORT (5 total) |

1. CRACKED OR OTHERWISE DAMAGED VAULTS WILL BE REJECTED AT THE DISCRETION OF THE DISTRICT.

2. TIE RODS TO BE COR-TEN OR STAINLESS.



3. ALL MECHANICAL JOINTS SHALL BE RESTRAINED PER DETAIL W-07.

4. USE ONE FULL LENGTH OF 4" PIPE THROUGH THE VAULT TO INSURE ALIGNMENT. CUT OUT FOR INSTALLATION OF ASSEMBLY.

5. VAULT MINIMUM INSIDE DIMENSIONS OF 12'Lx6'Wx6.5'H, UTILITY VAULT 612LA OR APPROVED EQUAL. INSTALL MASTIC IN JOINTS.

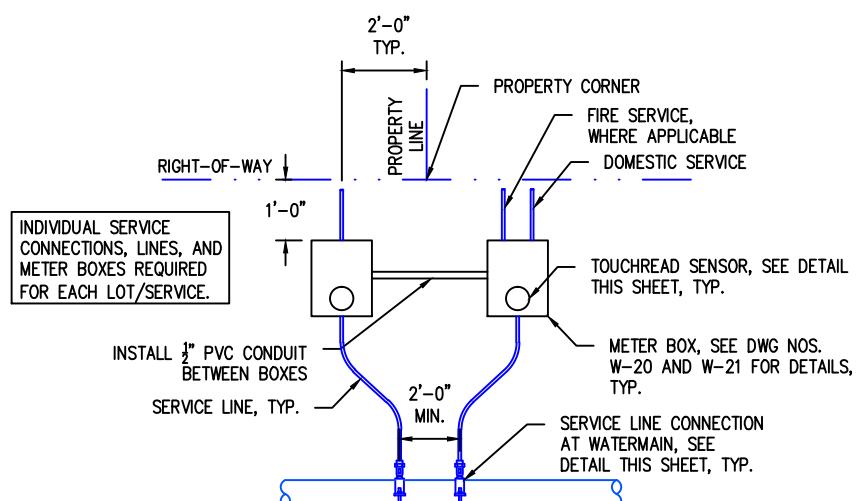
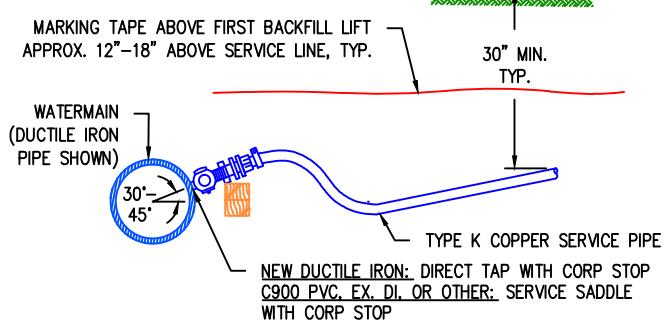
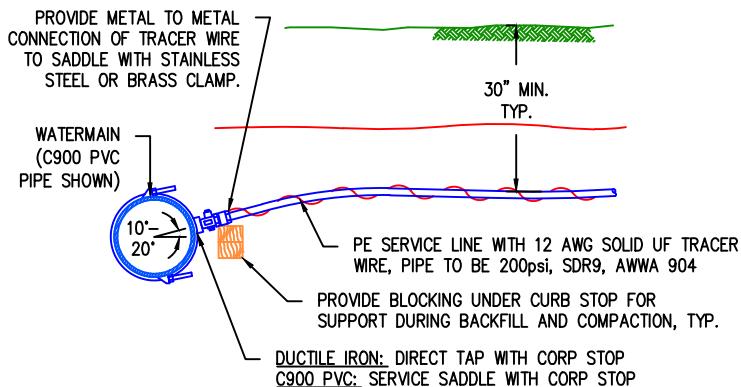
6. 3" METER CAPACITY = 450 GPM X 80% = 360 GPM

Water District #19

**WATER DISTRICT
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WATER SYSTEM STANDARD DETAIL

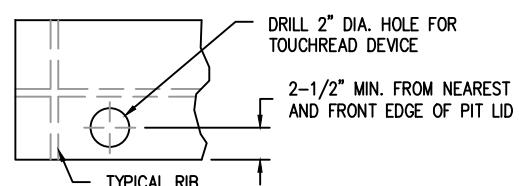
3" Meter Assembly



METER LOCATION PLAN

SERVICE SADDLE: STRAP OR U-BOLT STYLE, SIZE AS REQUIRED. EQUAL TO ROMAC 101U/S. SELECT SADDLE THAT IS SMALLEST THAT WILL FIT THE PIPE. PIPE OD SHALL BE IN THE UPPER HALF OF THE SADDLE FIT RANGE.

CORPORATION STOP: AWWA TAPER THREAD (CC) INLET WITH GROUND KEY, COMPRESSION ADAPTER CONNECTION FOR TYPE K COPPER OR PE SERVICE LINE (CTS), SIZE TO MATCH SERVICE PIPE SIZE. PROVIDE STAINLESS STEEL INSERT FOR PE LINES. EQUAL TO MUELLER H-15008. INSTALL AT 30°-45° FOR COPPER SERVICE LINES OR 10°-20° FOR PE SERVICE LINES.

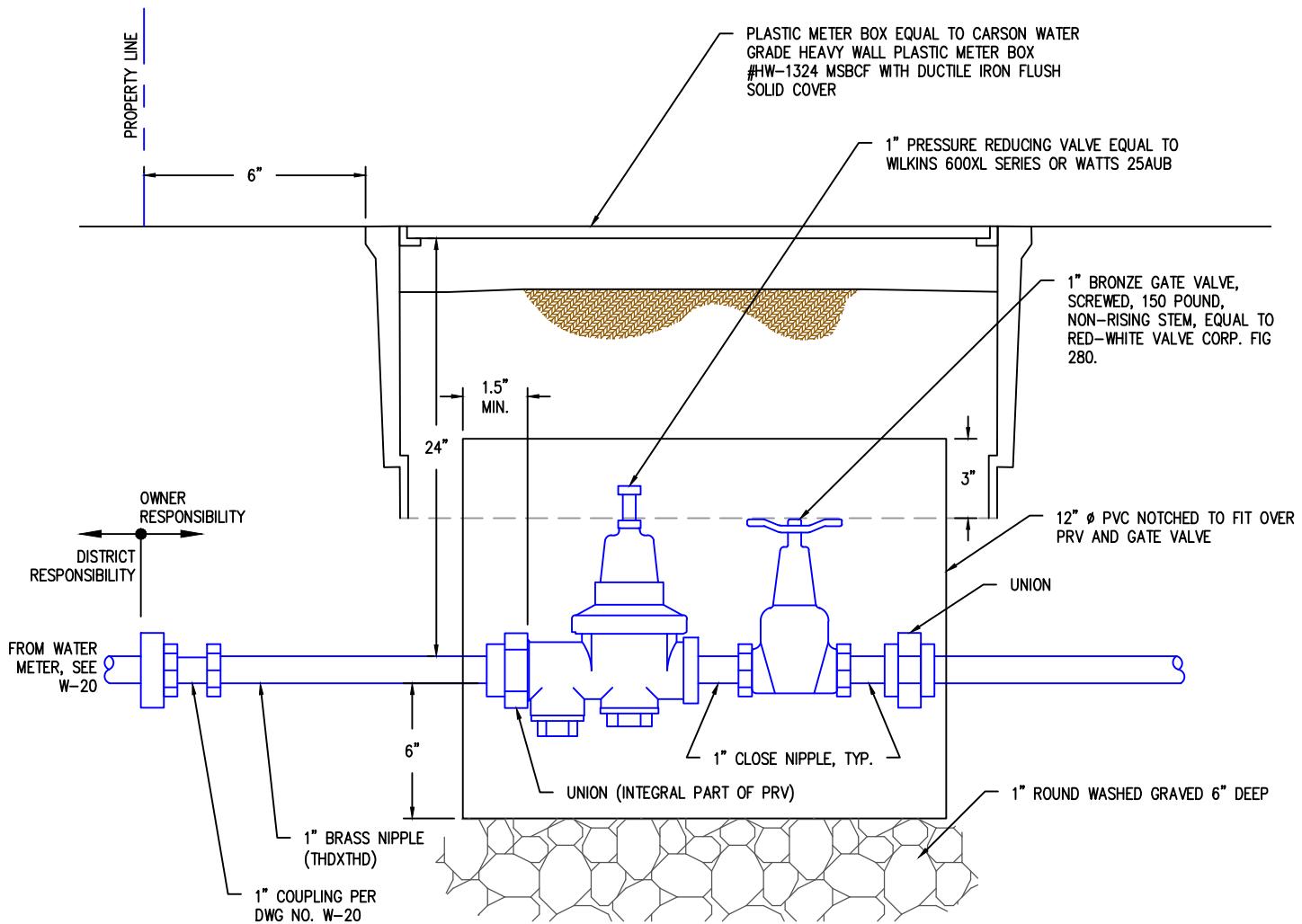


AMR SENSOR INSTALLATION NOTE:
THE CENTER OF THE HOLE MUST BE AT LEAST 1" FROM UNDERNEATH RIBS UNLESS THE RIB SPACING ALLOWS THE NUT TO TIGHTEN AGAINST THE OPEN SIDE OF MORE THAN ONE RIB.

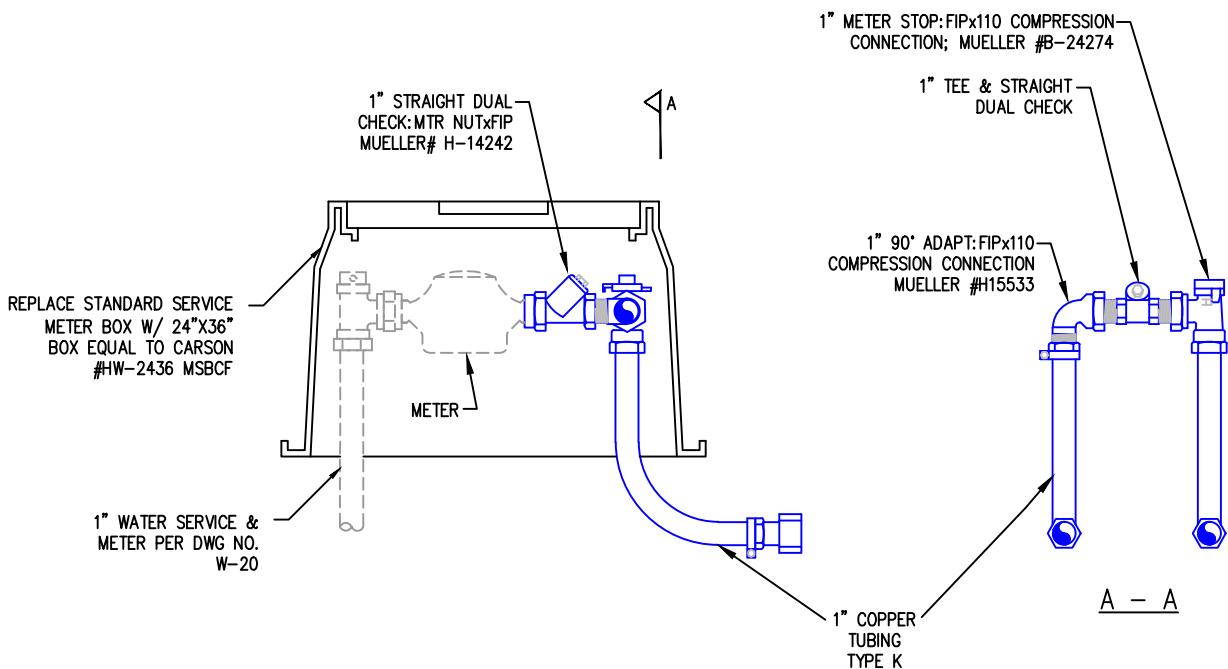
TOUCHREAD SENSOR MOUNTING

NOTES:

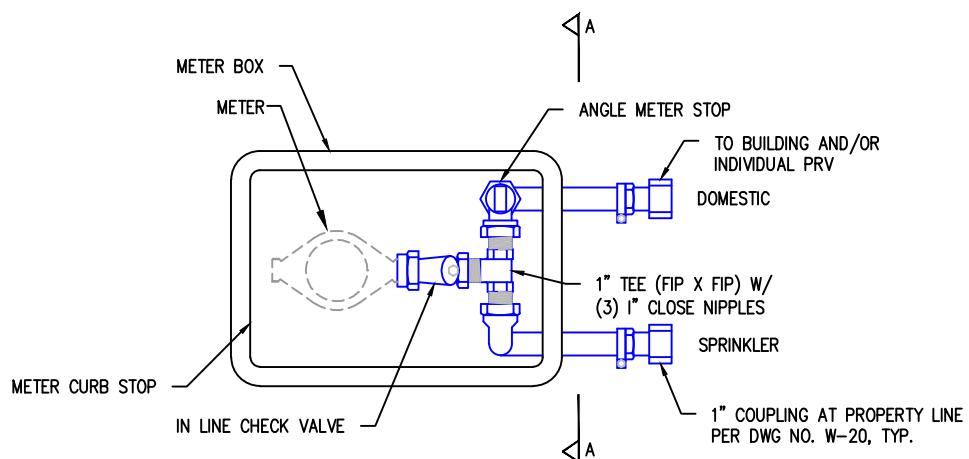
1. THE FUNCTION OF A PRESSURE REDUCING VALVE IS TO REDUCE HIGH-WATER PRESSURES IN THE SERVICE CONNECTION TO AN ACCEPTABLE RANGE OF 25 TO 75 PSI. INSTALLATION OF A PRESSURE REDUCING VALVE IS REQUIRED WHERE THE SERVICE CONNECTION PRESSURE EXCEEDS 80 PSI IN ACCORDANCE TO THE UNIFORM PLUMBING CODE.
2. THE PRESSURE REDUCING VALVE SHALL BE LOCATED ON THE CUSTOMER'S PROPERTY "DOWNSTREAM" OF THE METER BOX. RESPONSIBILITY FOR PROPER INSTALLATION, OPERATION, AND MAINTENANCE OF THE VALVE SHALL BE ASSUMED BY THE CUSTOMER. THREE POSSIBLE CONFIGURATIONS FOR INSTALLATION OF THE VALVE ARE SHOWN BELOW.
3. DETAIL APPLICABLE FOR 1" AND SMALLER WATER SERVICES. FOR LARGER APPLICATIONS PROVIDE COMPARABLE INSTALLATION. DO NOT REDUCE SERVICE LINE SIZE AT PRV.



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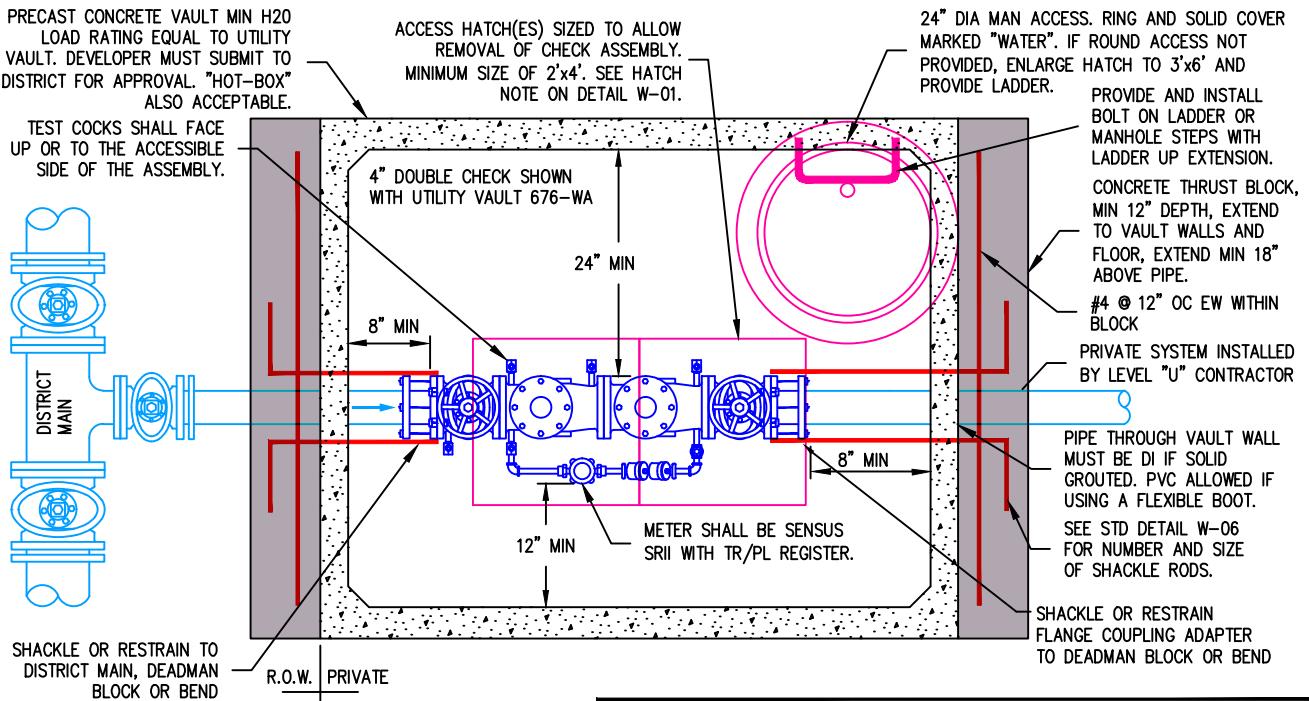
PROFILE



PLAN

NOTES:

1. TAG METER CURB STOP "DO NOT SHUT OFF. FIRE LINE"
2. DETAIL APPLICABLE FOR 1" & SMALLER WATER SERVICES. FOR LARGER WATER SERVICE, FIRE SERVICE DETAIL TO BE DESIGNED BY DEVELOPERS ENGINEER AND APPROVED BY DISTRICT.
3. COMPARABLE "FORD" FITTINGS MAY BE USED IN LIEU OF "MUELLER" OR VICE VERSA.



1. ASSEMBLY TO BE MAINTAINED BY OWNER AND ANNUAL CERTIFICATION REQUIRED.
2. WATER MAIN SHALL NOT BE PLACED IN SERVICE UNTIL AFTER DOUBLE CHECK IS APPROVED BY A DISTRICT INSPECTOR.
3. RESTRAIN CHECK DETECTOR WITH RESTRAINED JOINT PIPE OR SHACKLE RODS AS APPROVED BY THE DISTRICT.
4. DISTRICT OWNERSHIP TERMINATES AT R.O.W. OR VULT WALL, WHICHEVER IS REACHED FIRST.
5. THIS PLAN IS SHOWN FOR GENERAL LAYOUT ONLY. ENGINEER MUST PROVIDE DETAILED AND DIMENSIONED PLAN FOR EACH INSTALLATION INCLUDING HATCH AND LADDER LOCATIONS.
6. ENGINEER TO VERIFY SIZE OF DCDA REQUIRED PER MANUFACTURER AND FIRE DISTRICT CRITERIA. SUBMIT SIZING INFORMATION TO DISTRICT FOR REVIEW.
7. SEE STANDARD DETAIL W-27 FOR MORE INFO.
8. RP=REDUCED PRESSURE PRINCIPAL.
9. NOTHING ON THESE DETAILS SHALL BE INTERPRETED AS WAIVING STATE CROSS CONNECTION CONTROL REQUIREMENTS.

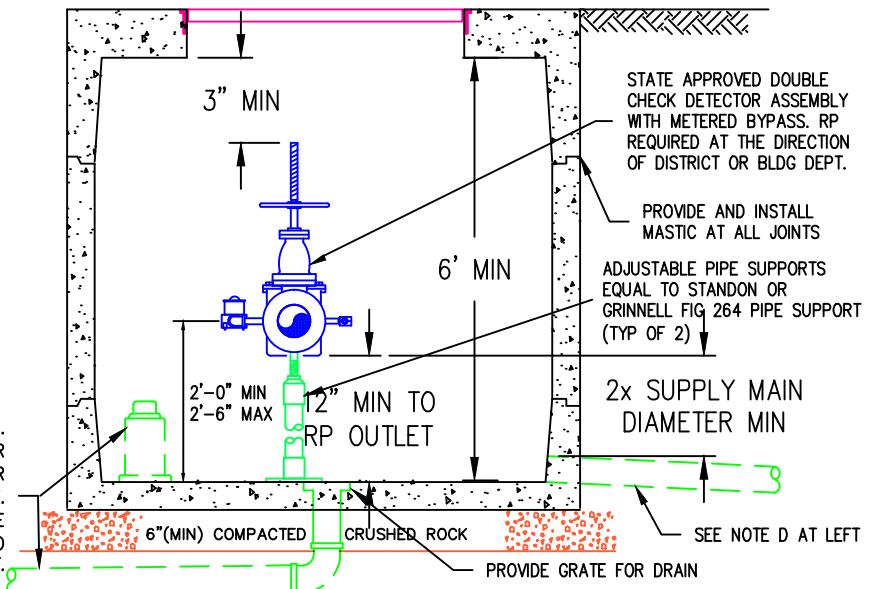
VULT MIN. INSIDE LENGTHXWIDTH

VALVE SIZE	MAX FLOW*	LENGTHXWIDTH
2½"	225 gpm	5'x5'
3"	320 gpm	5'x5'
4"	500 gpm	6'x5'
6"	1000 gpm	7'x5'
8"	1600 gpm	8'x5'
10"	2300 gpm	9.5'x5.5'

CLEARANCES SHOWN MUST BE MAINTAINED. VULT DIMENSIONS ARE MINIMUMS AND LIKELY A LARGER VULT WILL BE REQUIRED. OWNER'S ENGINEER TO CONFIRM SIZING.

* MAXIMUM FLOW RATE OBTAINED FROM AWWA C510, C511 AND FCCC

12" AND LARGER, CONSULT WITH DISTRICT

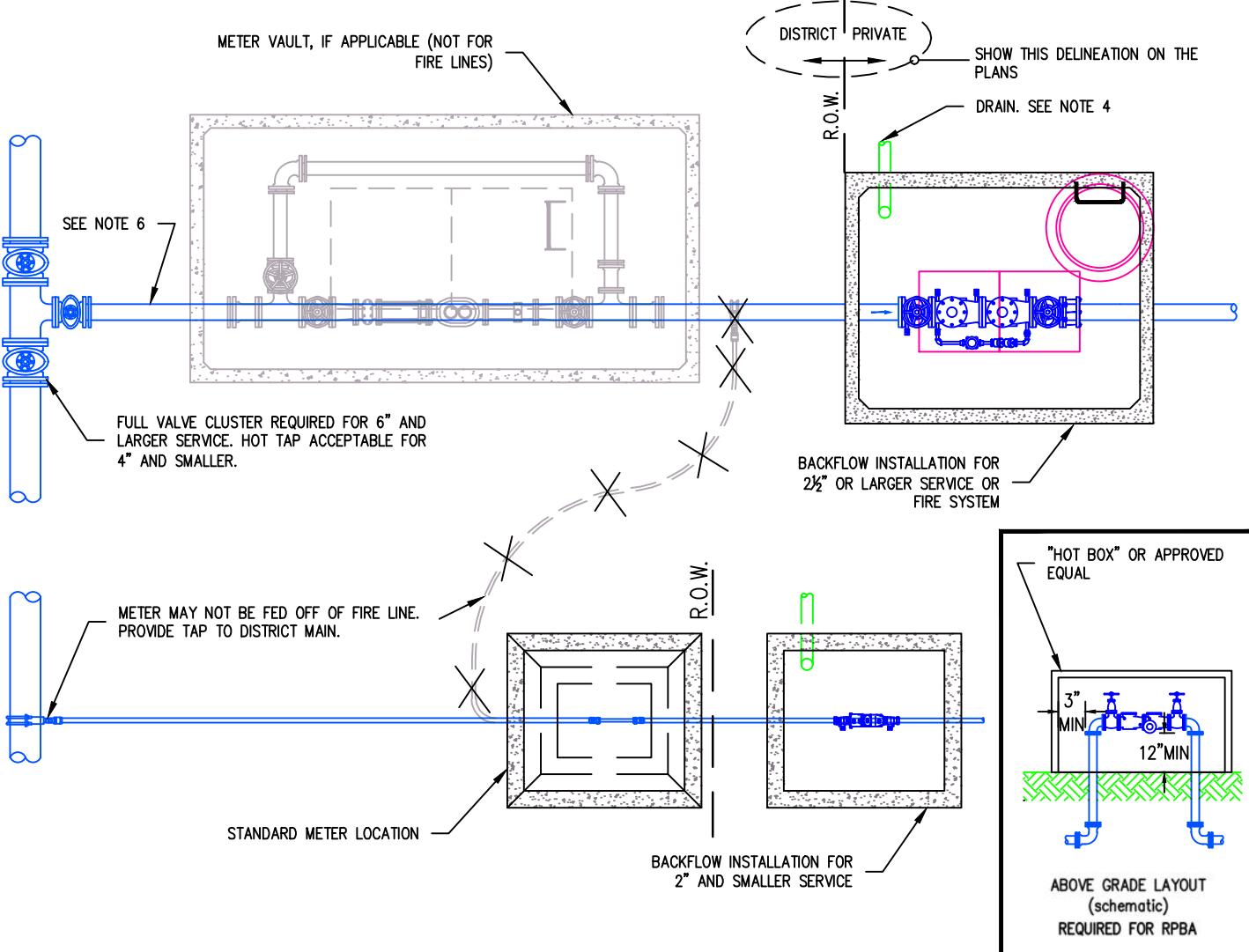


Water District #19

WATER DISTRICT
19

WATER SYSTEM STANDARD DETAIL

Double Check Detector Assembly



- 1) THIS DETAIL IS MEANT AS A GENERAL REFERENCE FOR COMMON CROSS CONNECTION CONTROL STANDARDS. EACH PROJECT SHALL BE REVIEWED BY THE DISTRICT ON A CASE-BY-CASE BASIS AND MAY REQUIRE ADDITIONAL ACTIONS.
 - 2) ASSEMBLY INSTALLATION SHALL FOLLOW THE REQUIREMENTS OF WAC 246-290-490 THE PNWS-AWWA CROSS CONNECTION CONTROL MANUAL.
 - 3) HOT-BOXES OR APPROVED EQUAL ARE PERMITTED.
 - 4) IF A BURIED VAULT IS USED, A DRAIN MUST BE PROVIDED. FOR A NON-RPBA, THE DRAIN MAY GO TO DAYLIGHT OR A SUMP. FOR AN RP DEVICE, THE DRAIN MUST BE BORESIGHTED TO DAYLIGHT AND SIZED TO PASS THE DUMP-VALVE FLOW AS STATED BY THE MANUFACTURER'S DATA. DAYLIGHT DRAIN OUTLET MUST INCLUDE AIR GAP OF AT LEAST 2X DRAIN DIAMETER. RPBA MUST BE INSTALLED ABOVE GRADE.
 - 5) PIPE SIZE BETWEEN MAIN AND VAULT SHALL MEET DISTRICT CRITERIA OF MAXIMUM 8.0fps VELOCITY.
 - 6) BACKFLOW ASSEMBLY SHALL INCLUDE DETECTOR ASSEMBLY IF MAINLINE IS NOT OTHERWISE METERED. DETERMINATION OF THE NEED FOR AN RPBA SHALL REST SOLELY WITH THE DISTRICT.
 - 7) IN-PREMISE BACKFLOW PREVENTION IS THE JURISDICTION OF THE CITY OR COUNTY BUILDING DEPARTMENT AND DETERMINATION OF ANY ADDITIONAL BACKFLOW PREVENTION SHALL BE MADE BY THAT AGENCY. RCW 19.27.
- RP=REDUCED PRESSURE. RPBA=REDUCED PRESSURE BACKFLOW PRINCIPAL ASSEMBLY.

Water District #19

WATER DISTRICT
19

WATER SYSTEM STANDARD DETAIL

Backflow Assembly Installation

APPENDIX O

DISTRICT APPROVALS

WATER DISTRICT 19
BOARD OF COMMISSIONERS MEETING
Tuesday, November 30, 2021

SPECIAL MEETING 6:00 PM

Board President Bob Powell called the Special Meeting of the Water District 19 Board of Commissioners to order at 6:00 PM. Those also in attendance were **Commissioners Seth Zuckerman and Mike Weller**, **General Manager Jim McRae**, and **Office Administrator Melody Snyder**.

VISITOR BUSINESS

- None

BOARD – ACTION REQUIRED

The Water System Plan: **Commissioner Powell** is ready to authorize Kerri Sidebottom of Gray & Osborne to submit the Comprehensive Plan Draft to the Department of Health and King County for review. **Commissioner Weller** made a Motion to approve sending the Draft Plan to Gray & Osborne; **Commissioner Powell** seconded. Motion approved unanimously.

The Board requested **Office Administrator Snyder** to get in touch with the Vashon Beachcomber about getting the notification on the front page for the December 14th Board Meeting.

Commissioner Zuckerman shared with the Board a discussion he had with Burton Water Purveyor Evan Simmons about the possibility to provide Satellite management for their water system. They are looking at the possibility of selling the water company to their shareholders.

General Manager McRae shared with the Board that District Operator Jovanovich had given his resignation, effective December 10, 2021. He also informed the Board that a Hydrant on Vashon Highway @ SW 156th Street was needing to be replaced. Work to be done on the First of December.

The Board announced meeting again on Thursday the 2nd of December to hold another Special Meeting at 6:30 PM. The purpose of the Special Meeting will be to discuss the qualifications of an applicant for public employment. **Office Administrator Snyder** to post the notification on the district's website, on the front door of the office and to notify the Vashon Beachcomber.

THE BOARD CONCLUDED THE REGULAR MEETING AT 6:55 PM at which time the Board entered Executive Session to discuss the qualifications of an applicant for public employment under the provisions of RCW 42.30.110(1)(g).

RETURN TO REGULAR MEETING: The Board came out of Executive Session at 7:13 PM. No decisions were taken during Executive Session.

Commissioner Weller made a Motion to adjourn at 7:14 PM. **Commissioner Powell** seconded. Approved unanimously.

WATER DISTRICT 19
BOARD OF COMMISSIONERS MEETING
Tuesday, December 14, 2021

REGULAR MEETING 6:00 PM

Board President Bob Powell called the Regular Meeting of the Water District 19 Board of Commissioners to order at 6:18 PM. Those also in attendance were **Commissioners Seth Zuckerman and Mike Weller, General Manager Jim McRae, and Office Administrator Melody Snyder**. Visitors present were newly elected Board Member Robin Pfohman, newly hired General Manager John Martinak, and Kara Hill and Kerri Sidebottom, Engineer from Gray & Osborne, Inc. by Zoom conferencing.

• VISITOR BUSINESS

- Kara Hill came to the meeting via Zoom conferencing to hear about the Water System Plan and to express her frustration about many discolored water events at her house and at her neighbors in the Tramp Harbor area. The Board appreciated her coming to the meeting to voice her frustration and to let her know some of the capital projects in the system plan are to replace the aging infrastructure in her area which would greatly if not eliminate the discolored water issues. Grant money and other ways to pay for the capital projects was also discussed.

• BOARD – ACTION REQUIRED

- Presentation of Water System Plan by Kerri Sidebottom – Kerri explained the next steps to the audience about the Water System Plan and what to expect from King County Utilities Technical Review Committee and the Department of Health (DOH). She has submitted the plan to those two organizations and to five other water purveyors on Vashon (Burton Water Co., Dockton Water, Maury Mutual Water, Heights Water District and Westside Water). Kerri has been in contact with the Department of Health concerning questions they may have because of the delay in submitting the plan and she feels that should not be a problem moving forward. Kerri went through the System Analysis slides which included: Source, Treatment, Storage, Booster Stations, Distribution, Water Use Efficiency, Watershed Control Program, Capital Improvement Program, the Capital Improvement Map, and the Financial Program. Next steps will be to formally adopt the plan, adopt water use efficiency goals and measures, respond to DOH comments and submit revised plan to DOH. The approval of the plan can take up to 6 months before final approval. The plan will be available for customer review on the districts website, at the office and at the Vashon Library.
- Approve minutes from Regular Meetings held on **October 12, 2021**- **Commissioner Zuckerman** made a Motion to approve the minutes as amended; **Commissioner Weller** seconded and **November 9, 2021** – **Commissioner Weller** made a Motion to approve the minutes as amended; **Commissioner Powell** seconded. Special Meetings held on **October 18, 2021** - **Commissioner Zuckerman** made a Motion to approve the minutes as submitted; **Commissioner Powell** seconded, **October 27th, 2021** – **Commissioner Weller** made a Motion to approve the minutes as Amended; **Commissioner Powell** seconded, **November 3, 2021** - **Commissioner Powell** made a Motion to approve the minutes as amended; **Commissioner Zuckerman** seconded, **November 16, 2021** – **Commissioner Powell** made a Motion to approve the minutes as amended; **Commissioner Zuckerman** seconded, **November 23, 2021** – **Commissioner Weller** made a Motion to approve the minutes as amended; **Commissioner Powell** seconded, **November 30, 2021** – **Commissioner Powell** made a Motion to approve the minutes as amended; **Commissioner Zuckerman** seconded and **December 2, 2021** –

Commissioner Weller made a Motion to approve the minutes as amended; **Commissioner Powell** seconded. All approved unanimously.

- Approve purchase of replacement of Melody's laptop - Tabled
- Approve Operator's COLA 5.5% for 2022 – It was noted by the board that the annual COLA schedule has already been incorporated into the Collective Bargaining Agreement - Appendix A, with the district's operators. No approval from the board is necessary. Office Administrator Snyder requested that Office Assistant Kathy Good and herself be included in the 5.5% COLA increase. **Commissioner Weller** made a Motion to approve the 5.5% COLA increase for Office Administrator Snyder and Office Assistant Good bringing them line with the Operators COLA effective January 1, 2022; **Commissioner Powell** seconded. Motion approved unanimously.

• **BOARD – DISCUSSION/TABLE/MORE INFORMATION**

- **Commissioner Zuckerman** had a conversation with Leslie Ferrell, Board Member of Vashon Household about her desire to work with the district on ways that can allow multifamily housing development within the district's boundaries. **Commissioner Zuckerman** would like to revisit the calculations that determine the multifamily ERU's in 2022.
- **New General Manager announcement** – **Commissioner Zuckerman** introduced to the audience, new General Manager John Martinak. Welcome John! He will start the first week January 2022. Outgoing General Manager McRae will take on a new position with the district also effective the first week in January 2022.
- **New Board Member announcement** – newly elected Water District 19 Commissioner Position #3 Robin Pfohman was also introduced to the audience. Welcome Robin! This was outgoing Commissioner Powell's last meeting with the district. Commissioner Powell has been on the board for the last 12 years. He will be missed!

• **ADMINISTRATION REPORT**

- General Manager's report – provided in Board Packet and not discussed at this time
- Financial report through November 2021- provided in Board Packet and not discussed at this time
- Operations & Production report through November 2021 - provided in Board Packet

Adjournment

There being no further business to come before the Board, the Commissioners moved to adjourn the meeting at 8:06 PM.

R E S O L U T I O N N O. 1175

**A RESOLUTION OF THE BOARD OF COMMISSIONERS OF
WATER DISTRICT 19, KING COUNTY, WASHINGTON,
APPROVING THE NOVEMBER 2021 COMPREHENSIVE PLAN
UPDATE AS PREPARED BY GRAY & OSBORNE ENGINEERS, INC.**

WHEREAS, the Board of Commissioners approved authorizing Gray & Osborne Engineers, Inc. at the November 30th, 2021 Special Board meeting and recorded in the minutes to submit the 2021 Comprehensive Plan to the Washington Department of Health and King County for review, and,

WHEREAS, having involved the customers of District 19 in a public meeting, Gray & Osborne Engineers, Inc. has completed the District's Comprehensive Plan update and presented it to the Board of Commissioners for their approval, and,

WHEREAS, the Board of Commissioners has reviewed the Comprehensive Plan update and believe it is in the best interest of Water District 19 to approve said Comprehensive Plan update for the use of the District,

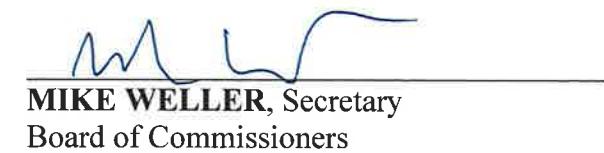
NOW THEREFORE, BE IT RESOLVED by the Board of Commissioners of Water District 19, King County, Washington, that **the Comprehensive Plan update dated November 2021 is hereby approved, contingent upon approval by King County and Department of Health.**

ADOPTED at a special meeting of the Board of Commissioners of Water District 19 held on **June 7th, 2022**.

APPROVED:



SETH ZUCKERMAN, President
Board of Commissioners



MIKE WELLER, Secretary
Board of Commissioners

ATTEST:



ROBIN PFOHMAN, Commissioner
Board of Commissioners

APPENDIX P

CORRESPONDENCE

April 13, 2022

JOHN MARTINAK, GENERAL MANAGER
WATER DISTRICT 19
jmartinak@water19.com

RE: Water District 19 ID# 38900
King County
2016 Water System Plan
Submittal #21-1202

Dear John Martinak:

Thank you for submitting your 2016 Water System Plan (WSP) for Water District 19 received in this office on December 7, 2021. We have reviewed the plan and offer the following comments. These comments must be adequately addressed prior to approval of the WSP.

Water System Description

1. Please provide a WSP adoption ordinance from King County.

Basic Planning Data

2. The WSP provides historical water use data up to 2016 and begins the demand forecast in year 2017. How does forecasted demand for 2017 – 2021 compare to actual water use for those years as submitted in your annual water use efficiency reports?

System Analysis

3. Chapters 1, 3, and 6 reference chlorine injection and settled precipitated manganese as treatment for removal of manganese. Please note that this is not recognized as treatment for removal.
4. Regarding Table 3-12 Annual Withdrawal Water Rights Analysis, how were the Water Right Surplus /(Deficit) values calculated.
5. Consider revising the last sentence in the dead storage section on page 3-24. It appears that there is dead storage in the 1MG storage tank. Has any recent consideration been given to adding a pump station to pump from the 1MG to the distribution system?
6. What is the status of the main replacement project meant to address the low system pressure addressed by the temporary tank site at 115th Avenue SW and SW Bank Road?
7. Does the District still operate the temporary tank site at 115th Avenue SW and SW Bank Road? What is the status of the water main replacement project, long-term solution, meant to address seasonal low pressures? How has the District addressed water quality concerns of customers served by the temporary tank system?

8. Chapter 3 references “non-acute MCL” violations and are required to notify both DOH and system consumers. Please note under the Revised Total Coliform Rule Coliform that Total Coliform presence in a routine and a repeat sample is now a Treatment Trigger Technique and not a violation. The requirement is to conduct a Level 1 or Level 2 Assessment. Notifying customers is not required. Failing to conduct an Assessment is a violation and would require public notice. Please revise.
9. Chapter 3 references Fecal Coliform. Please note under the Revised Total Coliform Rule Fecal Coliform has been replaced with Total Coliform. Please revise.
10. Please update the plan to reference the current routine coliform sample requirements from 3 to 4 samples. Update table 3-10.
11. Update Appendix E to reference current Coliform sample requirements from 3 to 4. Update section F ‘Routine Sample Rotation Schedule’ to reflect current number of samples per month.
12. Update Appendix E to include source 11, Vashon Meadow AFA518, in Coliform Monitoring Plan.

Water Use Efficiency Program (WUE) and Water Rights Assessment

13. Respond to Department of Ecology’s e mail comment letter from Doug Wood dated January 28, 2022.
14. Why was the District’s 2019 annual water use efficiency report not filed? What was the distribution system leakage in 2019? Are there more resources and actions to put towards your water loss control action plan not already identified in chapter 4? When was the last time the source meters were calibrated and at what frequency does the District perform calibration? Were all the service meters replaced by the end of 2021 as suggested on page 4.

Source Protection

No comment.

Operations & Maintenance and Water Quality

15. Please describe the District’s Asset Management Program.
16. Regarding the discussion of required water quality monitoring, please include the District’s requirement to monitor and report the distribution system disinfection residual every calendar day and at the same time and place as routine coliform samples. Thank you for including daily chlorine residual monitoring in Table 3-10, Water Quality Monitoring Requirements. We suggest clarifying that the frequency is every calendar day.
17. Table 6-3, Water Treatment Plant Maintenance Schedule, shows pH meter calibration on a monthly schedule but pH meter calibration needs to occur weekly at a minimum. Best practice is to calibration daily. Refer to DOH publication 331-620, Monitoring Surface Water Treatment Processes. Please update.
18. DOH was notified that the District has not yet certified it’s Risk and Resilience Assessment (RRA) or Emergency Response Plan (ERP) as required by the 2018 America’s Water Infrastructure Act. Were the RRA and ERP completed? Please discuss.

19. Please include the Disinfection By-product Monitoring Plan.
20. Policy WS-5 on page 1-21 and the power failure section on page 6-16 refer to water shortage response measures. Please include the water shortage response plan as a component of the reliability and emergency response requirements under WAC 246-290-420. Refer to DOH publication 331-301, Preparing Water Shortage Response Plans for guidance.
21. Include in the appendices District Resolution No 1046 that adopts the cross-connection control program (CCCP).
22. Please update the CCCP.
 - a. Include a revision date on the CCCP.
 - b. Review for completeness. It appears that some of the required program elements are missing. Backflow incident response procedures and public education program elements for example.
23. Please update Table 6-6 'Biological Distribution System' to reference the current 4 samples per month requirement.

Distribution Facilities Design and Construction Standards

24. The standard drawing No. W-14 Combination Air and Vacuum Release Assembly shows a drilled hole to drain the vent line. The Department considers this a potential cross-connection. Think about eliminating the drilled hole from the air vacuum release valve design.
25. Please ensure that the specifications and drawings require above grade installation for Reduced Pressure Backflow Assemblies.

Improvement Program

26. Regarding Table 8-1, possible typo (2019-2016).
27. The 2016 routine sanitary survey identified the 625,000-gallon storage tank air vent design as inadequate protection from windblown contaminants. The District response indicated plans to replace the air vent during a planned interior coating project. Was this project completed? Table 1-8, 2008 Water System Plan CIP Project Status Summary and chapter 8 do not include any storage tank recoating / improvement projects. Please explain.

Financial Planning

28. What is the average monthly water bill for residential customers?
29. What amount of depreciation expense is transferred to the Capital Improvement Fund annually?

Other Documentation

30. The water system must meet the consumer input process outlined in WAC 246-290-100(8). Please include documentation of a consumer meeting discussing the WSP, prior to DOH approval of the WSP.
31. Prior to DOH approval, the District's governing body must approve and adopt the WSP.

Water District 19
April 13, 2022
Page 4

32. Provide a signed State Environmental Policy Act (SEPA) Checklist and SEPA threshold determination with the final WSP submittal.

Closing

We hope that you have found these comments to be clear, constructive and helpful in the development of your final draft WSP. We ask that you submit the revised WSP on or before **July 14, 2022**. In order to expedite the review of your revised submittal, please include a cover letter summarizing how each of the above comments was addressed in the revised WSP and where each response is located (i.e., page numbers, Appendices, etc.)

Regulations establishing a schedule of fees for review of planning, engineering, and construction documents have been adopted (WAC 246-290-990). The total cost is **\$3,705.00**. An itemized invoice for the review of this project has been sent to the primary contact on file for your water system. Please note that this fee covers our current review and one more submittal for this project. If additional submittals are required, then an invoice for additional fees will be included with our final approval letter. Please remit complete payment in the form of a check or money order within thirty days of the date of this letter in the enclosed envelope or mail payment to: WSDOH, Revenue Section, PO Box 1099, Olympia WA 98507-1099.

Thank you again for submitting your revised Water System Plan for our review. If you have any comments or questions concerning our review, please contact me at (253) 395-6771.

Sincerely,



Richard Rodriguez
Regional Planner
Northwest Drinking Water Operations
Richard.Rodriguez@doh.wa.gov

Enclosure (invoice)

ecc:

Julie Horowitz, Public Health – Seattle & King County, jhorowitz@kingcounty.gov
Lynn Schneider, Public Health – Seattle & King County, Lynn.Schneider@kingcounty.gov
Ria Berns, WSDOE – NWRO, ria.berns@ecy.wa.gov
Jae Hill, King County UTRC, jhill@kingcounty.gov
Brietta Carter, PE, Regional Engineer, DOH, brietta.carter@doh.wa.gov



King County

Utilities Technical Review Committee
Department of Local Services
35030 SE Douglas St #210
Snoqualmie, WA 98065
www.kingcounty.gov

King County Water District 19, Water System Plan

King County Water District 19 (“the District”) has submitted a new Water System Plan (“Plan”) for review by the King County Utilities Technical Review Committee (UTRC). The District’s Service Area includes much of Vashon-Maury Island, including Vashon Rural Town. The District is a Title 57 special purpose district, responsible for its own SEPA review. The district has a new manager who just started in the position, and is familiarizing himself with the system and the planning efforts.

Staff has reviewed the Plan for local statutory requirements and impacts on service to residents in the unincorporated county.

On February 16, 2022, the UTRC held an open public meeting and deliberated the plan content, then directed Staff to issue this comment letter. The UTRC would like to see a matrix of the following clarifications and revisions as detailed below:

General Discussion

- A requirement under state statute was that plans contain a six-year capital improvement program, though with the recent changes to allow ten-year plans, the capital improvement program should also likely extend that duration, but this should be confirmed with staff from the State Office of Drinking Water.
- The plan includes a planning horizon from 2016-2026, for which an approval would only grant at most four years from today, if acceptable to the Office of Drinking Water staff. The UTRC highly recommends bringing the capital program and planning projections to ten-years from today, ending in 2032, within this planning cycle, to avoid having to develop a new water system plan—a very expensive and time-consuming endeavor—just four years from now.
- There is an intertie with Heights Water. If they have additional capacity to serve, have you considered purchasing water from them to improve capacity?
- Burton Water Company, an adjacent privately-owned purveyor, is for sale. Has anyone from the proposed Burton Water Co-op reached out about intertie, merger, acquisition, satellite management, or other relationship?

Requested Clarification and Corrections

- Pg 2-2: “Using this information, and based on an average of two people per dwelling unit, the District served an estimated population of 2,718 people in 2016.” You state that the average of 2 persons per household was derived from PSRC and Census data. Table 2.12 indicates that’s likely 2.4 persons per household which is a difference of nearly 500 people, or a deviation of 18%. Did you use 2 or 2.4 persons throughout your planning and capacity estimates?

- Pg 2-11. The data here is current as of 2016? Is there anything more recent in the last six years?
- Pg 2-12: This seems to indicate the extended planning horizon ends at 2036, which is only 14 years away and not 20.
- Pg 2-12: Since we're more than halfway from 2016-2026, have the numbers tracked with expectations?
- Pg 2-13: Does Table 2-14 indicate that the District is out of water for the foreseeable future? If the District has in fact exhausted all of its production capacity, what efforts are they taking to secure new supply? Why has the District denied service to island residents if there is excess capacity indicated elsewhere in the plan?
- Table 3-10: Some of the required testing timeframes appear to have been exceeded.
- Table 3-12: Does this indicate that the District in fact has additional unused source capacity?
- Table 3-13: Does this indicate that the District is only producing half of their allocated rights, despite a moratorium on new connections?
- Table 3-20: Since the plan was modeled in 2016 with projections to 2022 and 2026... how well do the projections track with observable metrics?
- Figure 5-2 should reference Table 5-3 for descriptions of the numbered items.
- Page 8-1: "The modeling analysis in Chapter 4 indicates..." Chapter 4 is the Water Use Efficiency Program. Chapter 2 contains some discussion on modeling but then refers the reader to Appendix F for full results.
- Table 8-1: How many of these projects have been completed since this plan began development?
- Page 8-4: SO-4 mentions habitat restoration in the creek, SEPA checklist says no projects will occur in creeks. Please clarify.
- Page 8-4: SO-6 discusses a new water source—is this anticipated to be a well? There is mention of surface water flows being inadequate during the summer.
- Table 9-1 thru 9-5: Actuals are missing between 2016 and 2022.
- Tables 9-7 thru 9-10: Again, projections only go to 2026. How have the actuals compared to projected?

Kerri Sidebottom

From: Wood, Doug (ECY) <DWOO461@ECY.WA.GOV>
Sent: Wednesday, June 15, 2022 16:18
To: Kerri Sidebottom
Cc: 'John Martinak'; Rodriguez, Richard (DOH); Cook, Jay (ECY)
Subject: RE: [External] FW: Comments for WD19 WSP (Submittal #21-1202)

Kerri,

The only change from my initial comment letter is that Ecology no longer uses the P and C in the water right number to differentiate between Permits and Certificates. However, for the purpose of this WSP, I would not consider this an issue.

Thanks,

Doug Wood
WR-NW Region

From: Kerri Sidebottom <ksidebottom@g-o.com>
Sent: Wednesday, June 15, 2022 4:07 PM
To: Wood, Doug (ECY) <DWOO461@ECY.WA.GOV>
Cc: 'John Martinak' <jjmartinak@gmail.com>; Rodriguez, Richard (DOH) <Richard.Rodriguez@DOH.WA.GOV>; Cook, Jay (ECY) <johc461@ECY.WA.GOV>
Subject: RE: [External] FW: Comments for WD19 WSP (Submittal #21-1202)

THIS EMAIL ORIGINATED FROM OUTSIDE THE WASHINGTON STATE EMAIL SYSTEM - Take caution not to open attachments or links unless you know the sender AND were expecting the attachment or the link

Hi Doug,

Water District 19 is in the process of finalizing the Water System Plan and responding to all agency comments. We appreciate your input and corrections on the District's water rights tabulation. It is our understanding that your review of the water rights presented in the WSP did not result in any changes to the total Qi and Qa numbers used for the water rights analysis. We have incorporated your comments and corrections regarding the water right ID numbers and the specific additive and non-additive Qa/Qi amounts into the water rights discussions and tables throughout the WSP, as well as the Water Rights Self-Assessment.

The District will be responding to comments from DOH in the coming weeks, and we will copy you on that correspondence.

Please let me know if you have any further questions or comments.

Thank you,

*Kerri Sidebottom, P.E. | 206.284.0860 p | 206.283.3206 f
Gray & Osborne, Inc. | 1130 Rainier Ave. S., #300, Seattle, WA, 98144*

Please consider the environment before printing this email.

Electronic File Transfer- Note that these electronic files are provided as a courtesy only. Gray & Osborne, Inc. in no way guarantees the accuracy or completeness of the digital data contained within these files. Furthermore, Gray & Osborne, Inc. assumes no liability for any errors or omissions in the

digital data herein. Anyone using the information contained herein should consult the approved or certified hard copy drawings or reports for the most current information available.

From: Rodriguez, Richard (DOH) <Richard.Rodriguez@DOH.WA.GOV>
Sent: Friday, January 28, 2022 9:05 AM
To: Wood, Doug (ECY) <DWO0461@ECY.WA.GOV>; Jim McRae <jmcrae@water19.com>
Cc: Cook, Jay (ECY) <johc461@ECY.WA.GOV>
Subject: RE: Comments for WD19 WSP (Submittal #21-1202)

Thank you Doug

Sincerely,

From: Wood, Doug (ECY) <DWO0461@ECY.WA.GOV>
Sent: Friday, January 28, 2022 8:50 AM
To: Jim McRae (jmcrae@water19.com) <jmcrae@water19.com>
Cc: Rodriguez, Richard (DOH) <Richard.Rodriguez@DOH.WA.GOV>; Cook, Jay (ECY) <johc461@ECY.WA.GOV>
Subject: Comments for WD19 WSP (Submittal #21-1202)

January 28, 2022

King County Water District 19
c/o Jim McRae
176300 100th Ave SW
Vashon, WA 98070

RE: King County Water District 19 (Water System ID 38900)
2021 Water System Plan Comment Letter

Dear Mr. McRae:

Thank you for the opportunity to review the King County Water District 19 Water System Plan (WSP), dated November 2021, and received on January 13, 2022. Consistent with the Memorandum of Understanding between the Department of Health (DOH) and Department of Ecology (Ecology), regarding joint review and approval of WSPs, this letter is being sent to your office with Ecology's comments. Specific elements of the WSP review included the Water Rights Self-Assessment as well as additional water rights documentation, including Ecology's water right files and previous King County Water District 19 WSPs and project reports, as applicable.

Ecology identified the following relatively minor issues during review of the WSP and supplemental documentation.

The water right numbers for the two surface water rights were incorrect in Table 3 and the Water Right Self-Assessment (WRSE). They should be S1-*01490C (SWC 889) for the Beall Creek diversion and S1-*01925C (SWC 836) for the Ellis Creek diversion. It should be noted that the annual quantity (Qa) listed in Table 3 and the WRSE for these two water rights represents the quantities that would result from use of the sources for 24 hours per day over a full year. There is no evidence in Ecology files that this has occurred over the life of the diversions. These rights therefore have not as yet been fully perfected and there remains a possibility that they may not be in the future. If these surface water sources were to be changed to groundwater sources, only the portion of the Qa that is perfected could be transferred.

Water right G1-23519C in Table 3 and in the WRSE does not correctly reflect the changes to this right that occurred in 2014. The permit half, G1-23519P(B), should be listed separate from G1-23519C(A). The B half represents unperfected water after the 2014 change to the original certificate (G1-23519C). The quantities associated with G1-23519P(B) are $Q_{IN}=250$ gpm and $Q_{aA}=78$ ac-ft/yr. The perfected quantities under G1-23519C(A) are $Q_{IA}=250$ gpm and $Q_{aA}=222$ ac-ft/yr. Both together, once the B portion is perfected, would allow $Q_i=250$ gpm and $Q_a=300$ ac-ft/yr, but keep in mind that the B half potentially may not become fully perfected. Well 3 is limited under G1-23519C(A) and G1-23519P(B) to 35 gpm and 45 ac-ft/yr. Note that the A subscript in the quantity (Q) represents Additive quantities and the N subscript Non-Additive quantities.

Water right G1-28746 in Table 3 and WRSE should be labeled G1-28746P. This water right is still in permit stage similar to G1-23519P(B) above. The final Q_a therefore may not result in the permitted Q_a when certificated.

Water right application G1-25499 is no longer active having been rejected in October 2021. It should not therefore be included in the Water Rights portfolio.

Table 1 below shows the water rights portfolio held by District 19 as reflected in Ecology records.

Table 1. Water District 19 Existing Water Rights

Water Right	Priority Date	Source Name	Instantaneous Rate (cfs/gpm)		Annual Quantity (ac-ft/yr)	
			Additive	Non-Additive	Additive	Non-Additive
S1-0149C (SWC887)	9/11/1925	Beale Creek	0.90 cfs		651	
S1-0192C (SWC836)	11/14/1926	Ellis Creek	0.50 cfs		361	
G1-23519C(A)	11/30/1979	Wells 1, 2, 3* & 4	250 gpm		222	
G1-23519P(B)	11/30/1979	Wells 1, 2, 3* & 4		250 gpm	78	
S1-15998CAL (SWC8145)	4/14/1960	Beall Greenhouse	180 gpm		55	
G1-28746P	12/21/2012	Vashon Meadows	20 gpm		1.16	
TOTALS:			1,078 gpm		1,368.16	

gpm = Gallons per Minute; cfs = cubic feet per second; ac-ft/yr = Acre-feet per Year;

* Well 3 maximum $Q_i = 35$ gpm and maximum $Q_a = 45$ ac-ft/yr.

Beyond the issues above, the portfolio totals are in agreement with what is included in the WSP with Q_i totaling 1,078 gpm and Q_a 1,368.16 ac-ft/yr.

Based on projected growth, the current Q_i and Q_a of the system are adequate to supply needs to the year 2036.

No change in service area is being sought through the WSP.

Please contact me with any questions you may have by phone at (206) 594-0196 or by email at Doug.Wood@ecy.wa.gov.

Sincerely,

Douglas H. Wood, M.Sc., LHG
Hydrogeologist and Permitting Specialist
Water Resources Program

cc: Richard Rodriguez, Department of Health



This communication is a public record and may be subject to disclosure as per the Washington State Public Records Act, RCW 42.56.

Kerri Sidebottom

From: Carter, Brietta J (DOH) <brietta.carter@doh.wa.gov>
Sent: Tuesday, May 24, 2022 14:21
To: Kerri Sidebottom; Rodriguez, Richard (DOH)
Subject: RE: [External] RE: King County Water Dist 19 WSP Comments

Hi Kerri,

Yes, 331-301 is the correct reference. Admittedly, I sent this off before reading carefully what Richard wrote. As the lead for the plan, we'll go with his approach. I was thinking of customers expectations given the water shortage plan is a required element of the water system plan and the several mentions of moratorium in the planning document. Any progress here would be appreciated.

Thanks,
Brietta

From: Kerri Sidebottom <ksidebottom@g-o.com>
Sent: Tuesday, May 24, 2022 9:39 AM
To: Carter, Brietta J (DOH) <brietta.carter@doh.wa.gov>; Rodriguez, Richard (DOH) <Richard.Rodriguez@DOH.WA.GOV>
Subject: RE: [External] RE: King County Water Dist 19 WSP Comments

External Email

Would this include completing Document 331-301 before we can resubmit the WSP for approval?

Thanks,
Kerri Sidebottom, P.E. / 206.284.0860 p / 206.283.3206 f
Gray & Osborne, Inc. / 1130 Rainier Ave. S., #300, Seattle, WA, 98144

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From: Carter, Brietta J (DOH) <>
Sent: Tuesday, May 24, 2022 07:36
To: Kerri Sidebottom <ksidebottom@g-o.com>; Rodriguez, Richard (DOH) <richard.rodriguez@doh.wa.gov>
Subject: RE: [External] RE: King County Water Dist 19 WSP Comments

Mostly yes. Be sure to include the water shortage plan in the ERP for the WSP.

From: Kerri Sidebottom <ksidebottom@g-o.com>
Sent: Monday, May 23, 2022 10:08 AM
To: Rodriguez, Richard (DOH) <Richard.Rodriguez@DOH.WA.GOV>

Cc: Carter, Brietta J (DOH) <brietta.carter@doh.wa.gov>
Subject: RE: [External] RE: King County Water Dist 19 WSP Comments

External Email

Thanks for the clarifications! Just to confirm on the ERP elements, the WSP currently does include information on the District's emergency response procedures for a number of issues (earthquake, power failure, fire, contamination, etc.) and an emergency call-up list in Chapter 6. Is this sufficient for WSP approval?

The District plans to complete a more thorough ERP that covers all of the requirements of the AWIA, but it is unlikely that this can be done in the short-term. We can provide an estimated timeframe for completing a standalone ERP in the comment response letter.

Thanks,

Kerri Sidebottom, P.E. | 206.284.0860 p | 206.283.3206 f
Gray & Osborne, Inc. | 1130 Rainier Ave. S., #300, Seattle, WA, 98144

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From: Rodriguez, Richard (DOH) <>
Sent: Monday, May 23, 2022 09:15
To: Kerri Sidebottom <ksidebottom@g-o.com>
Cc: Carter, Brietta J (DOH) <brietta.carter@doh.wa.gov>
Subject: [External] RE: King County Water Dist 19 WSP Comments

From: Kerri Sidebottom <ksidebottom@g-o.com>
Sent: Friday, May 20, 2022 1:37 PM
To: Rodriguez, Richard (DOH) <Richard.Rodriguez@DOH.WA.GOV>
Cc: Carter, Brietta J (DOH) <brietta.carter@doh.wa.gov>
Subject: King County Water Dist 19 WSP Comments

Kerri, Coliform monitoring plan and Disinfection BP to be included in WSP.

Cross Conn C Plan, Look at WAC 246- 290- 490; the nine elements . Identify what you have in place/completed. For those elements not completed, provide schedule when they will be completed.

ERP should be included in WSP. Water shortage response plan can be a work in progress with a scheduled completion date provided.

Asset Mgt. Plan. , provide narrative summarizing what you currently have , and what you plan to do. That will be adequate to approve WSP.

Hope this helps, Richard R

Hi Richard,

I'm hoping to get a little more clarification from you on the Water District 19 WSP comments that were sent to us on April 29th (attached for reference).

You noted that several of the supporting documents are out of date including:

- Cross Connection Control Plan
- Coliform Monitoring Plan
- Disinfection Byproducts Plan

Will DOH require all of these items be updated and included in the WSP appendix in order to approve the Plan? The District anticipates that the Coliform and Disinfection Byproducts Plans can be updated fairly quickly, but the CCC Plan update will take some additional effort and time. Staff is aware that each of the plans will need to be updated and this is on their to-do list.

The District hasn't yet completed the ERP or RRA (or associated water shortage response plan), but is aware that these both need to be done. As these will take a fair amount of time to put together, we want to confirm that approval of the WSP is not contingent on these documents being completed. Please let me know if there's anything specific related to these items that needs to be included in the resubmitted WSP, or if this comment is just to point out the deficiency so the District can correct it.

Similarly, the District does not currently have a robust asset management program at this time, but they are planning to implement a better system to handle this. Would it be sufficient to describe their current inventory tracking system with a few sentences in our response letter and in the CIP chapter of the Plan, and note that the District intends to improve their system in the next several years? Is there more detail that you would need to see in order to approve the Plan?

Thanks, and feel free to give me a call if you'd prefer to discuss over the phone.

*Kerri Sidebottom, P.E. | 206.284.0860 p | 206.283.3206 f
Gray & Osborne, Inc. | 1130 Rainier Ave. S., #300, Seattle, WA, 98144*

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July 11, 2022

Mr. Jae Hill
Principal Planner
Utilities Technical Review Committee
King County Department of Local Services
35030 SE Douglas Street, Suite#210
Snoqualmie, Washington 98065

SUBJECT: WATER DISTRICT 19, ID #38900,
WATER SYSTEM PLAN UPDATE, RESPONSE TO KING COUNTY
COMMENTS
WATER DISTRICT 19, KING COUNTY, WASHINGTON
G&O #15626.01

Dear Mr. Hill:

Thank you for your comments regarding the Water District 19 (District) Water System Plan. In order to more easily respond to the comments, we have placed your original comments in italics, followed by our response.

General Discussion

1. *A requirement under state statute was that plans contain a six-year capital improvement program, though with the recent changes to allow ten-year plans, the capital improvement program should also likely extend that duration, but this should be confirmed with staff from the State Office of Drinking Water.*

The duration of the planning period presented in the Plan was discussed with DOH staff. Because the data presented in the Plan is current as of 2016, the District felt it would be more conservative to consider a planning period that extended 10 years beyond the Plan data, rather than 10 years from approval of the Plan.

2. *The plan includes a planning horizon from 2016-2026, for which an approval would only grant at most four years from today, if acceptable to the Office of Drinking Water staff. The UTRC highly recommends bringing the capital program and planning projections to ten-years from today, ending in 2032, within this planning cycle, to avoid having to develop a new water system plan—a very expensive and time-consuming endeavor—just four years from now.*

Please see the response to Comment 1, above. The District is aware that a new Plan will need to be developed in the relatively near future, but the Plan development process has been delayed for several years. The District believes that approval of the Plan now will better serve the community, for



Mr. Jae Hill
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example, in allowing the District to apply for funding for the CIP program. An amendment to the Plan may be considered in several years rather than a full rewriting of the Plan, with DOH's approval.

3. *There is an intertie with Heights Water. If they have additional capacity to serve, have you considered purchasing water from them to improve capacity?*

A regularly used intertie has not been discussed with Heights Water at this time. The current agreement is for emergency use.

4. *Burton Water Company, an adjacent privately-owned purveyor, is for sale. Has anyone from the proposed Burton Water Co-op reached out about intertie, merger, acquisition, satellite management, or other relationship?*

There has been some informal communication between the District and Burton Water Company, though no formal plans or relationship have been established at this time.

Requested Clarification and Corrections

5. *Pg 2-2: "Using this information, and based on an average of two people per dwelling unit, the District served an estimated population of 2,718 people in 2016." You state that the average of 2 persons per household was derived from PSRC and Census data. Table 2.12 indicates that's likely 2.4 persons per household which is a difference of nearly 500 people, or a deviation of 18%. Did you use 2 or 2.4 persons throughout your planning and capacity estimates?*

The population noted on page 2-2 is based on a count of two people per dwelling unit. This number was determined using population and households documented in Census tract data. Table 2-12 calculates a population based on the total number of dwelling units including single family accounts (assumed to be equivalent to housing units) and multi-family housing units. The calculated population is based on two people per dwelling unit multiplied by the total number of dwelling units. Please note that the population is not used for calculating the demand, only for producing an estimate of the number of people within the District for reference. The growth rates noted in the chapter and in Table 2-14 are applied to the total ERU count, and water usage is estimated on a per ERU basis rather than a per capita basis.

6. *Pg 2-11. The data here is current as of 2016? Is there anything more recent in the last six years?*

The Plan is based on data through 2016. The District's water production and consumption between 2017 and 2020 was reviewed, and the usage tracks similarly to the projections for those years that are included in the Plan. There is no indication at this time that the Plan's projections are out of line with the water usage that has actually occurred or can be expected to occur.



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7. *Pg 2-12: This seems to indicate the extended planning horizon ends at 2036, which is only 14 years away and not 20.*

Correct, the Plan's data extends through 2016, and the Plan is proposing a planning period extending 20 years beyond that time. As this Plan has been delayed, the District would prefer to finalize the plan more quickly at this point with the data included as-is, rather than take additional time to update all of the included usage numbers and projections. A planning period of 10 to 20 years beyond the data included in the Plan will present a more reasonable and conservative set of projections, compared with a planning period extending 16 to 26 years beyond the newest data.

8. *Pg 2-12: Since we're more than halfway from 2016-2026, have the numbers tracked with expectations?*

The District's water production and consumption data for 2017 through 2020 was reviewed to check the accuracy of the projections in the Plan.

Year		2017	2018	2019	2020
Production	Projected – from WSP (gal)	120,200,000	121,900,000	123,500,000	125,500,000
	Actual (gal)	124,128,000	114,991,000	123,793,000	112,540,000
	Percent Difference (Projection - Actual, gal)	-3%	6%	0%	10%
Consumption	Consumption – from WSP (gal)	107,365,480	108,819,640	110,273,800	111,727,960
	Consumption (gal)	103,866,323	113,564,397	109,146,858	108,244,561
	Percent Difference (Projection - Actual, gal)	3%	-4%	1%	3%
Actual DSL		16.3%	1.2%	11.8%	3.8%

The projections in the WSP are within several percentage points of the actuals for 2017 through 2020. The largest deviation is the water production in 2020, but the WSP projection exceeded the actual value, and is therefore more conservative. The assumed DSL of 12 percent per year is also in line with the actual DSL, on average, across the past several years.

9. *Pg 2-13: Does Table 2-14 indicate that the District is out of water for the foreseeable future? If the District has in fact exhausted all of its production capacity, what efforts are they taking to secure new supply? Why has the District denied service to island residents if there is excess capacity indicated elsewhere in the plan?*

The District has included a CIP project (SO-6) to potentially develop a new source in order to leverage a portion of the District's existing water rights capacity, as the water rights currently exceed the installed source capacity. It is anticipated that this source would be an additional



groundwater well. The District is also planning on several well rehabilitation projects to increase the yield of the existing wells.

The District has been working to improve well production so that demonstrated production is adequate to meet the District's outstanding zero-use ERUs as well as waitlist customers. The current WSP as submitted in fact shows that the District is able to exit moratorium in 2023 as projected from 2016 data. The text in Chapter 1 has been updated to make this fact clearer. Since the data was collected in 2016, customers requesting 6 ERUs have left the waitlist, and 41 ERUs have been repurchased from existing zero-use customers and sold to customers on the waitlist. At this time, only three customers remain on the waitlist representing 37 ERUs. Since 2016, the District has not been issuing 14 ERUs annually to waitlist customers as projected in the WSP. The District anticipates that once this plan is approved, they will be able to issue the full number of ERUs remaining, and will thus be able to exit moratorium before the end of 2022.

10. *Table 3-10: Some of the required testing timeframes appear to have been exceeded.*

Noted. The Plan is written to be "current" as of 2017, and as such the dates of some of the required water quality testing have passed. The District is currently up to date on their water quality testing schedule.

11. *Table 3-12: Does this indicate that the District in fact has additional unused source capacity?*

Table 3-12 notes the District's water rights, not source capacity. The District is not using all of its allotted rights, and some of the District's sources do not currently operate at their water right capacity.

12. *Table 3-13: Does this indicate that the District is only producing half of their allocated rights, despite a moratorium on new connections?*

Yes, the District is not limited in its capacity based on its water rights. The District's source capacity is below the water rights capacity.

13. *Table 3-20: Since the plan was modeled in 2016 with projections to 2022 and 2026... how well do the projections track with observable metrics?*

Actual water usage and production in 2017-2020 as shown in Comment 8 appeared to be in line with the projections, and the projections are generally on the more conservative side.

14. *Figure 5-2 should reference Table 5-3 for descriptions of the numbered items.*

Figure 5-2 has been updated in the Plan to reference Table 5-3.



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15. *Page 8-1: “The modeling analysis in Chapter 4 indicates...” Chapter 4 is the Water Use Efficiency Program. Chapter 2 contains some discussion on modeling but then refers the reader to Appendix F for full results.*

Noted. The text has been revised on Page 8-1.

16. *Table 8-1: How many of these projects have been completed since this plan began development?*

The following projects have been completed since the Plan began development in 2015.

- Well 4 Rehabilitation
- Mini Excavator – Purchased
- Beall Creek RTU (SCADA)
- Ellis Creek RTU (SCADA)
- Water Treatment Plant SCADA (not complete, but currently underway)
- District Server Replacement
- Well Site SCADA
- Bank Road to 115th Street Main
- 107th Street Main

This has been more clearly represented in the revised Plan throughout Chapter 8 and in Table 8-1.

17. *Page 8-4: SO-4 mentions habitat restoration in the creek, SEPA checklist says no projects will occur in creeks. Please clarify.*

It is understood that most of the projects presented, including SO-4, will require the SEPA process at the time of design and construction. The SEPA checklist has been revised to clarify that there may be work in or around the Creek for the intake improvements.

18. *Page 8-4: SO-6 discusses a new water source—is this anticipated to be a well? There is mention of surface water flows being inadequate during the summer.*

In the capital improvement plan, the District has provided for the possibility of developing an additional well source near the end of the plan's 20-year planning horizon. Such a project would enable the District to take fuller advantage of its existing water rights, which exceed the current source capacity. This will help the District meet peak demands, as the creek sources may be limited in the future by minimum streamflow



Mr. Jae Hill
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requirements and lower instream flows if weather is drier and warmer. Additionally, the District is already using the only surface water sources available in the area. The source capacity analysis in the WSP assumes a conservative estimate of the available flow from the creeks in the summer (265 gpm from Beall Creek and 160 gpm from Ellis Creek) based on minimum flows recorded during summertime flow monitoring and accounting for the required 45 gpm instream flow within Beall Creek downstream of the intake.

19. *Table 9-1 thru 9-5: Actuals are missing between 2016 and 2022.*
Tables 9-7 and 9-8 include actuals for 2017 through 2020.
20. *Tables 9-7 thru 9-10: Again, projections only go to 2026. How have the actuals compared to projected?*
Tables 9-7 through 9-10 include actuals for 2017 through 2020.

Sincerely,

GRAY & OSBORNE, INC.

Kerri Sidebottom, P.E.

KS/sr
Encl.

cc: Ms. Julie Horowitz, Public Health – Seattle & King County,
Ms. Lynn Schneider, Public Health – Seattle & King County
Ms. Ria Berns, WSDOE – NWRO
Mr. Richard Rodriguez, Regional Planner, DOH
Ms. Brietta Carter, PE, Regional Engineer, DOH
Mr. John Martinak, Water District 19



July 11, 2022

Mr. Richard Rodriguez
Regional Planner
Washington State Department of Health
Northwest Drinking Water Operations
20425 72nd Avenue South, Building 2, Suite 310
Kent, Washington 98032-2388

SUBJECT: WATER DISTRICT 19, ID #38900, WATER SYSTEM PLAN UPDATE,
ODW PROJECT #21-1202 – RESPONSE TO DOH COMMENTS
WATER DISTRICT 19, KING COUNTY, WASHINGTON
G&O #15626.01

Dear Mr. Rodriguez:

Thank you for your comments regarding the Water District 19 (District) Water System Plan. In order to more easily respond to the comments, we have placed your original comments in *italics*, followed by our response.

Water System Description

1. *Please provide a WSP adoption ordinance from King County.*

An adoption ordinance will be provided following King County's acceptance of the revised Plan. Responses to the County's comments and the revised Plan were submitted to the County at the same time as this response letter.

Basic Planning Data

2. *The WSP provides historical water use data up to 2016 and begins the demand forecast in year 2017. How does forecasted demand for 2017 – 2021 compare to actual water use for those years as submitted in your annual water use efficiency reports?*

The District's water production and consumption data for 2017 through 2020 was reviewed to check the accuracy of the projections in the Plan.



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Page 2

Year		2017	2018	2019	2020
Production	Projected – from WSP (gal)	120,200,000	121,900,000	123,500,000	125,500,000
	Actual (gal)	124,128,000	114,991,000	123,793,000	112,540,000
	Percent Difference (Projection - Actual, gal)	-3%	6%	0%	10%
Consumption	Consumption – from WSP (gal)	107,365,480	108,819,640	110,273,800	111,727,960
	Consumption (gal)	103,866,323	113,564,397	109,146,858	108,244,561
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Actual DSL		16.3%	1.2%	11.8%	3.8%

The projections in the WSP are within several percentage points of the actuals for 2017 through 2020. The largest deviation is the water production in 2020, but the WSP projection exceeded the actual value, and is therefore more conservative. The assumed DSL of 12% per year is also in line with the actual DSL, on average, across the past several years.

System Analysis

3. *Chapters 1, 3, and 6 reference chlorine injection and settled precipitated manganese as treatment for removal of manganese. Please note that this is not recognized as treatment for removal.*

Noted. The water from Morgan Hill Well would meet the MCL without manganese precipitation, but the District has found that manganese does precipitate at the Morgan Hill Reservoir. At this time, the District does not receive water quality, color, or odor complaints from customers related to manganese. If such complaints occur in the future, the District will consider options for manganese treatment for Well 3. The text in chapters 1, 3, and 6 has been revised to more clearly indicate that formal manganese treatment is not currently provided.



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4. *Regarding Table 3-12 Annual Withdrawal Water Rights Analysis, how were the Water Right Surplus /(Deficit) values calculated.*

The headers in Table 3-12 were incorrectly labeled, and the ac-ft/yr and MG/yr columns were swapped. The table has been revised with the correct labels and values (see page 3-18).

5. *Consider revising the last sentence in the dead storage section on page 3-24. It appears that there is dead storage in the 1MG storage tank. Has any recent consideration been given to adding a pump station to pump from the 1MG to the distribution system?*

A statement has been added to the dead storage section (page 3-24) clarifying that the 1 MG Reservoir does have dead storage. The District has previously explored the possibility of installing a booster station to leverage the dead storage in the 1 MG Reservoir, but decided not to move forward with this option. The District prefers to maintain its largest zone as an open zone with pressure maintained through gravity rather than operating it as a closed zone for ease of operations.

6. *What is the status of the main replacement project meant to address the low system pressure addressed by the temporary tank site at 115th Avenue SW and SW Bank Road?*

The District is in the process of initiating a short-term improvement to the pump station, but has not been able to secure an easement to access and improve the facility at this time. The District is aware that the temporary tank poses operational and reliability concerns, and a long-term fix (project D-6) is intended to resolve this issue.

7. *Does the District still operate the temporary tank site at 115th Avenue SW and SW Bank Road? What is the status of the water main replacement project, long-term solution, meant to address seasonal low pressures? How has the District addressed water quality concerns of customers served by the temporary tank system?*



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As noted in the response to Comment 6, the District does operate the temporary tank in this location and is aware of the issues associated with it. The long-term solution (project D-6) is noted in the CIP with a target date of 2027. District staff currently inspect the site and check the chlorine residual at the tank daily. Staff also perform regular coliform sampling at this location.

8. *Chapter 3 references “non-acute MCL” violations and are required to notify both DOH and system consumers. Please note under the Revised Total Coliform Rule Coliform that Total Coliform presence in a routine and a repeat sample is now a Treatment Trigger Technique and not a violation. The requirement is to conduct a Level 1 or Level 2 Assessment. Notifying customers is not required. Failing to conduct an Assessment is a violation and would require public notice. Please revise.*

Chapter 3 has been revised to reflect the Revised Total Coliform Rule requirements (see page 3-6).

9. *Chapter 3 references Fecal Coliform. Please note under the Revised Total Coliform Rule Fecal Coliform has been replaced with Total Coliform. Please revise.*

Chapter 3 has been revised to reflect the Revised Total Coliform Rule requirements (see page 3-6).

10. *Please update the plan to reference the current routine coliform sample requirements from 3 to 4 samples. Update table 3-10.*

Table 3-10 has been revised to note the required 4 coliform samples (see page 3-16).

11. *Update Appendix E to reference current Coliform sample requirements from 3 to 4. Update section F ‘Routine Sample Rotation Schedule’ to reflect current number of samples per month.*

An updated Coliform Monitoring Plan has been included in Appendix E to reflect the requirement of 4 samples per month.

12. *Update Appendix E to include source 11, Vashon Meadow AF4518, in Coliform Monitoring Plan.*



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An updated Coliform Monitoring Plan has been included in Appendix E to include source 11.

Water Use Efficiency Program (WUE) and Water Rights Assessment

13. *Respond to Department of Ecology's e mail comment letter from Doug Wood dated January 28, 2022.*

The water rights information has been updated in the Plan to reflect the corrections in the email from Doug Wood. The revised water rights information does not change the overall conclusions related to the District's water rights capacity. An emailed response (dated June 15, 2022) has been sent to Ecology to confirm that the noted corrections have been made.

14. *Why was the District's 2019 annual water use efficiency report not filed? What was the distribution system leakage in 2019? Are there more resources and actions to put towards your water loss control action plan not already identified in chapter 4? When was the last time the source meters were calibrated and at what frequency does the District perform calibration? Were all the service meters replaced by the end of 2021 as suggested on page 4?*

The District has filed the 2019 WUE report as of June 1, 2022. The DSL in 2019 was calculated to be 8.9 percent. The CIP plan documented in the WSP includes a number of main replacement projects to address leaking or aging mains, with the intent of reducing DSL. The District currently does not have a formal calibration plan or schedule, but plans to implement a schedule to ensure that meters are well calibrated. This is expected to occur beginning in 2023. Meter replacement began in 2015, with the intent to replace all meters by the end of 2021. However, this work has slowed and currently 50 percent to 60 percent of the system's meters have been replaced. The District plans to include additional meter replacements in the annual budgets beginning in 2023.



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Operations & Maintenance and Water Quality

15. *Please describe the District's Asset Management Program.*

The District currently does not have a formal Asset Management Program, but creation of a plan is identified as a necessary operational improvement to be implemented in the coming years. The District has an inventory of system elements in a Quickbooks database, where the installation year, cost, useful life, replacement cost, and depreciation are calculated. The existing inventory is semi-complete, and the District is aware that it is in need of updating, to reflect more recent system improvements and replacements. A discussion of this and the District's intent to implement an Asset Management Program has been added to Chapter 8 (page 8-11).

16. *Regarding the discussion of required water quality monitoring, please include the District's requirement to monitor and report the distribution system disinfection residual every calendar day and at the same time and place as routine coliform samples. Thank you for including daily chlorine residual monitoring in Table 3-10, Water Quality Monitoring Requirements. We suggest clarifying that the frequency is every calendar day.*

A statement has been added to page 3-14 noting the disinfection residual monitoring requirements, and Table 3-10 (page 3-16) has been updated for clarify the monitoring frequency.

17. *Table 6-3, Water Treatment Plant Maintenance Schedule, shows pH meter calibration on a monthly schedule but pH meter calibration needs to occur weekly at a minimum. Best practice is to calibration daily. Refer to DOH publication 331-620, Monitoring Surface Water Treatment Processes. Please update.*

Table 6-3 (page 6-8) has been updated to indicate a pH meter calibration frequency of at least once per week.

18. *DOH was notified that the District has not yet certified its Risk and Resilience Assessment (RRA) or Emergency Response Plan (ERP) as required by the 2018 America's Water Infrastructure Act. Were the RRA and ERP completed? Please discuss.*



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The EPA has notified the District of non-compliance with meeting the ERP and RRA certification deadlines and has initiated a “Unilateral Administrative Order to establish a schedule for Water District 19 to complete the required work and certification.” Official deadlines have not yet been indicated by EPA, but the District expects a completion schedule of 6 weeks (end of July 2022) to certify the RRA and 6 months (end of December 2022) to complete the ERP and Water Shortage Response Plan.

19. *Please include the Disinfection By-product Monitoring Plan.*

An updated Disinfection Byproduct Monitoring Plan is included in Appendix E.

20. *Policy WS-5 on page 1-21 and the power failure section on page 6-16 refer to water shortage response measures. Please include the water shortage response plan as a component of the reliability and emergency response requirements under WAC 246-290-420. Refer to DOH publication 331-301, Preparing Water Shortage Response Plans for guidance.*

The District will be preparing the Water Shortage Response Plan as part of the larger ERP effort, and anticipates completing this by the end of this year.

21. *Include in the appendices District Resolution No 1026 that adopts the cross-connection control program (CCCP).*

A copy of Resolution No. 1026 establishing the District's CCCP is provided in Appendix L.

22. *Please update the CCCP.*

- a. *Include a revision date on the CCCP.*

- b. *Review for completeness. It appears that some of the required program elements are missing. Backflow incident response procedures and public education program elements for example.*

The District plans to complete the updated CCCP within 90 days of the resubmittal of the WSP. The CCCP will be forwarded to DOH upon completion.



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23. *Please update Table 6-6 ‘Biological Distribution System’ to reference the current 4 samples per month requirement.*

Table 6-6 has been revised to note the required 4 coliform samples (see page 6-11).

Distribution Facilities Design and Construction Standards

24. *The standard drawing No. W-14 Combination Air and Vacuum Release Assembly shows a drilled hole to drain the vent line. The Department considers this a potential cross-connection. Think about eliminating the drilled hole from the air vacuum release valve design.*

Noted. Detail W-14 has been revised to remove the drilled hole. The updated detail is included in Appendix N.

25. *Please ensure that the specifications and drawings require above grade installation for Reduced Pressure Backflow Assemblies.*

Noted. Detail W-27 has been revised to more clearly indicate above-grade installation for the RPBA. The updated detail is included in Appendix N.

Improvement Program

26. *Regarding Table 8-1, possible typo (2019-2016).*

The dates in the header for Table 8-1 have been revised (page 8-9).

27. *The 2016 routine sanitary survey identified the 625,000-gallon storage tank air vent design as inadequate protection from windblown contaminants. The District response indicated plans to replace the air vent during a planned interior coating project. Was this project completed? Table 1-8, 2008 Water System Plan CIP Project Status Summary and chapter 8 do not include any storage tank recoating / improvement projects. Please explain.*



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The District's tanks were inspected in 2019, and the inspection report concluded that the condition of the tanks was adequate with only minor corrosion or coating deterioration. The air vent improvements were planned to occur at the same time as recoating, but recoating was not deemed to be necessary at that time and the improvements did not happen. The District plans to reinspect the tank this year or next year. The District is aware of and in the process of planning to address the vent improvements as part of the inspection and maintenance process.

Financial Planning

28. *What is the average monthly water bill for residential customers?*

As of 2022, the average bimonthly bill is \$110 for residential customers.

29. *What amount of depreciation expense is transferred to the Capital Improvement Fund annually?*

The depreciation expense noted in Table 9-4 represents 100 percent of the annual depreciation cost of the District's system, based on the District's current system inventory and valuation. The District is aware that the existing system inventory is likely incomplete, and may not capture more recent improvements or replacements. Staff are in the process of setting up a more robust asset management plan and inventory to produce a better overall picture of the system value. The District had historically planned to transfer \$20,000 per month into the capital improvements fund to account for depreciation, but have not been able to meet this goal consistently. Over the next several years, staff will be focusing on implementing an asset management program, as noted in the response to Comment 15 and as described in Chapter 8 of the WSP.

Other Documentation

30. *The water system must meet the consumer input process outlined in WAC 246-290-100(8). Please include documentation of a consumer meeting discussing the WSP, prior to DOH approval of the WSP.*

The minutes for the public meeting are provided in Appendix O.



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31. *Prior to DOH approval, the District's governing body must approve and adopt the WSP.*

Resolution No. 1175 is included in Appendix O, which documents the Board's adoption of the final WSP, following King County's acceptance, and DOH's acceptance of the revised Plan.

32. *Provide a signed State Environmental Policy Act (SEPA) Checklist and SEPA threshold determination with the final WSP submittal.*

An updated SEPA Checklist has been provided in Appendix G.

Sincerely,

GRAY & OSBORNE, INC.

Kerri Sidebottom, P.E.

KS/sr
Encl.

cc: Ms. Julie Horowitz, Public Health – Seattle & King County
Ms. Lynn Schneider, Public Health – Seattle & King County
Ms. Ria Berns, WSDOE – NWRO
Mr. Jae Hill, King County UTRC
Ms. Brietta Carter, PE, Regional Engineer, DOH
Mr. John Martinak, Water District 19
Mr. Doug Wood, M.Sc., LHG, Permitting Specialist – Department of Ecology