LAKE WHATCOM WATER AND SEWER DISTRICT

WHATCOM COUNTY **WASHINGTON**

SUDDEN VALLEY WATER TREATMENT PLANT ASSESSMENT REPORT

G&O #20434
JULY 2020

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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EXECUTIVE SUMMARY

The Lake Whatcom Water and Sewer District (District) contracted with Gray & Osborne to perform a condition assessment for their existing Sudden Valley Water Treatment Plant (WTP). This assessment is part of a larger project that includes a holistic analysis of the South Shore Water System and its components, including treatment, distribution systems, and water sources. The first step in this process is to complete a condition assessment of the existing treatment plant system. The purpose of the assessment is to investigate the integrity of the existing WTP facilities from a structural, electrical, mechanical, architectural, and process perspective in order to guide the District's decisions on use and/or modifications at the WTP. Following this assessment, the District along with Gray & Osborne will complete an alternatives analysis based on the findings and recommendations within the assessment report. Using this alternatives analysis report, the District can then select the most cost-effective alternative(s) and proceed with selected modifications.

The existing WTP is a rapid rate direct filtration plant that uses chlorine gas for disinfection. The plant was originally constructed in 1972 and has a rated capacity of 2.0 million gallons per day (mgd). The WTP has been upgraded several times since its construction, most recently in 1992. The WTP treats surface water from Lake Whatcom and is located on Morning Beach Drive approximately 1 mile northeast of the intersection of Lake Whatcom Boulevard and Marigold Drive.

A site visit was completed on February 12, 2020 by Gray & Osborne process, mechanical, electrical, and structural engineers. During the visit, Gray & Osborne discussed the current operations, perceived deficiencies, and desired needs for the WTP with operations staff, and also assessed the condition of the existing facilities at both the WTP Main Building, Finished Water Pump Building, and Chlorine Contact Basin.

The condition assessment found several items for improvement, but did not find any significant structural, electrical, mechanical, or operational issues that would prevent the WTP from successful operation for the foreseeable future. In general, the facilities are in good condition and only require minor repairs and the completion of regular maintenance items in order to maintain their current function.

The report below does make some recommendations for alternatives that, if enacted, may improve the operational efficiency of the WTP. In addition to these recommendations and the listed repairs, this assessment has identified a number of high-priority improvements that should be addressed to ensure the successful operation of the facility in the future. Table ES-1 provides a summary of the high priority repairs and improvements to the facility.

TABLE ES-1

Sudden Valley WTP High Priority Modifications Summary

Modification	Location(1)	Discipline(2)
Conduct chlorine disinfection system alternatives analysis	MB	P
Chlorine gas system modifications	MB	P
Alum storage and metering pump system modifications	MB	P
Soda Ash storage and metering pump system modifications	MB	P
Conduct backwash system alternatives analysis	MB	P
Replace existing clearwell and CCB level switches	MB	P
Replace corroded steel supports	MB	S
Prepare and coat steel tanks (Floc, Soda Ash, and Filters 1/2)	MB	S
Install seismic bracing for electrical conduit, electrical equipment, and treatment equipment	MB/FPB	S
Complete detailed structural evaluation	MB/FPB	S
Relocate existing laboratory electrical equipment	MB	A
Remove soil cover, vegetation growth, and organic debris from building exterior and roof	MB	A
Provide water upgrades to safety shower and eyewash	MB	A
Add fire and smoke alarm system	MB/FPB	A
Investigate current heating schedule	MB/FPB	M
Combine all existing plant records into a single as-built planset	MB/FPB	E
Complete a comprehensive electrical system audit	MB/FPB	E
Remove chemicals and metering equipment away from MCCs	MB	E
Review historical peak demand electrical consumption	MB/FPB	E
Replace MCC1 and MCC2 with new, current technology	MB/FPB	E
Replace MCC3 to address panel and interior component corrosion	MB	E

(1) MB = WTP Main Building. FPB = Finished Water Pump Building. CCB = Chlorine Contact Basin.

(2) P = Process, S = Structural, A = Architectural, M = Mechanical, and E = Electrical.

If the recommendations listed in Table ES-1 are addressed, the WTP appears capable of successfully, effectively, and efficiently meeting the District's water treatment needs for at least the next 10 to 20 years. Although the original facility is nearly 50 years old, the structures are in good overall condition and do not appear to need significant structural, electrical, mechanical or process modifications.

Based on the findings listed in table ES-1, the District along with Gray & Osborne will complete the second phase of the project. This second phase will include a more thorough analysis of treatment alternatives that will help fully identify the desired scope of modifications to the WTP. This analysis will also help define key design parameters, system requirements, and permitting issues. Lastly, defining the full and complete scope of modifications will also allow the District to develop accurate cost estimates that can be used for budgeting and planning purposes.

CHAPTER 1

INTRODUCTION AND EXISTING FACILITIES

INTRODUCTION

The Lake Whatcom Water and Sewer District (District) contracted with Gray & Osborne to perform a condition assessment for the existing Sudden Valley Water Treatment Plant (WTP) as part of a larger effort to analyze the District's water treatment facilities in order to prioritize funds for rehabilitation, modification, and/or replacement projects. The goal of the assessment is to identify potential improvements for the existing structures and current treatment processes in an attempt to maximize treatment efficiency and extend the operational life of these facilities. The report can also be used to guide selection of feasible water treatment alternatives for longer term treatment of the Lake Whatcom source.

This report summarizes the findings of the WTP condition assessment, which was conducted on February 12, 2020. During this assessment Gray & Osborne personnel investigated the process, operations, structural, architectural, mechanical, and electrical components for the WTP.

Chapter 1 of this report provides a brief background on the District's South Shore Water System and description of water rights for the system. It also includes a description of each of the components utilized for water intake and treatment at the WTP.

Chapter 2 of this report summarizes the findings of the assessment with regards to process, structural, architectural, mechanical, and electrical disciplines.

Finally, Chapter 3 of this report provides a summary of the improvements that would be required for these facilities to meet current structural, mechanical, and electrical codes. This chapter also summarizes the modifications that may help to optimize the treatment process and provide a more efficient workspace for operations staff.

BACKGROUND AND EXISTING FACILITIES

The District operates three Group A water systems ‑ South Shore (DOH #95910), Eagleridge (DOH #08118), and Agate Heights (DOH #52957) ‑ all of which are in and around the shores of Lake Whatcom, which lies southeast of Bellingham in Whatcom County, Washington. The District serves approximately 3,900 residential and commercial water system connections with a residential population of approximately 10,000 people.

The South Shore system is the largest of the three systems and is supplied wholly by water treated at its Sudden Valley Water Treatment Plant. In addition to the WTP, the

District also owns and maintains surface water source, storage, and distribution system facilities. Figure 1-1 shows a map of the District's service area and highlights the location of major facilities. The distribution system includes multiple pressure zones, four booster stations, and approximately 2.8 MG of storage in five reservoirs.

The District also maintains a secondary intertie with the City of Bellingham Water System (DOH #50600) that is used only during emergency situations.

WATER RIGHTS AND PROJECTED DEMAND

The District's Sudden Valley water rights are summarized in Table 1-1. A more detailed discussion of the District's water rights is included in the current Water System Plan (*Wilson Engineering, 2018*). According to the Water System Plan, the District maintains adequate water rights for their existing demands as well as projected maximum day demands.

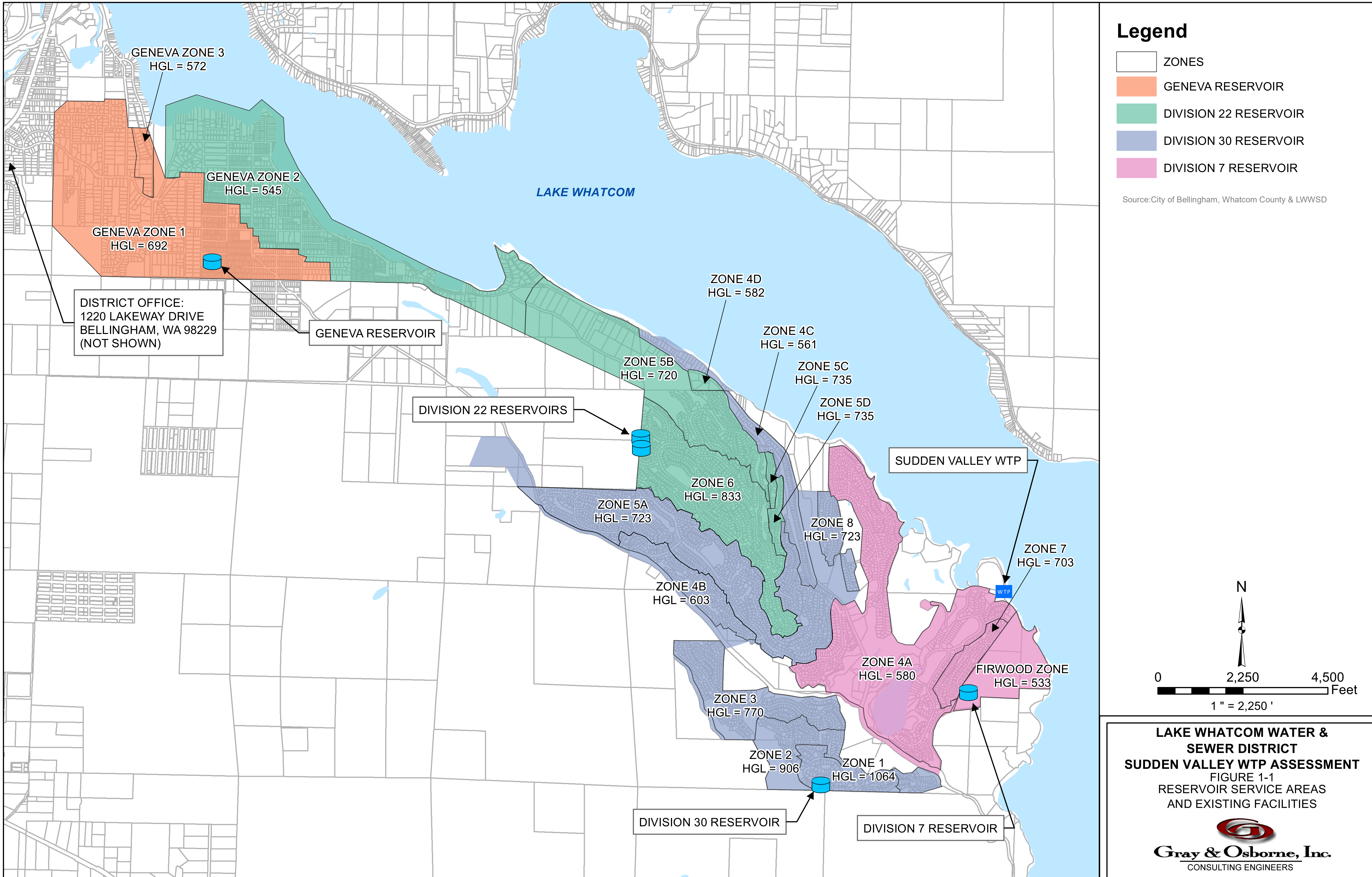
TABLE 1-1

Water Rights Summary

Location	Type	Number	Instantaneous Flow (gpm)	Maximum Annual Withdrawal (acre-feet)
South Shore (Sudden Valley and Geneva)	Surface Water	S1-00736C S1-00734C R1-25120C S1-25121P	1,526	1,800
Eagle Ridge	Intertie(1)	N/A	150	-
Agate Heights	Groundwater	G1-22681P CG1-22763P CG1-23449C	438	506.9
Total			**1,964(2)**	**1,800**

(1) With City of Bellingham, who maintains a large surface water source from Lake Whatcom.
(2) Does not include Eagleridge Intertie water rights.

The District's average day demand (ADD) and maximum day demand (MDD) are summarized in Table 1-2. A more detailed discussion of the District's historical, current, and projected system demands is included in the current Water System Plan (*Wilson Engineering, 2018*). According to the Water System Plan, the District's existing water rights are sufficient to meet projected ADD and MDD for the South Shore system. While the District may possess sufficient water rights to meet projected demands, the data in Table 1-2 suggest that the existing WTP cannot meet these projected demands with its current operational flow of 700 gallons per minute (gpm). The assessments below will address capacity limitations for the individual components of the treatment process. Additionally, Appendix B contains a summary of the District's monthly treatment reports for 2018 and 2019.



LAKE WHATCOM WATER & SEWER DISTRICT
SUDDEN VALLEY WTP ASSESSMENT
FIGURE 1-1
RESERVOIR SERVICE AREAS AND EXISTING FACILITIES

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\Lake Whatcom Water and Sewer District\20434.00 Sudden Valley WTP Assessment and Facility Improvements Plan\GIS\1-1 RESERVOIR SERVICE AREAS.mxd

TABLE 1-2

Water Demand Summary

Parameter	2020	2036	Buildout
Sudden Valley ADD (gpd)(1)	405,000	415,500	490,000
Geneva ADD (gpd)	200,000	208,000	217,000
Combined ADD (gpd)	***605,000***	***623,500***	***707,000***
Sudden Valley MDD (gpd)(2)	675,000	691,000	817,000
Geneva MDD (gpd)	422,000	440,000	458,500
Combined MDD (gpd)	***1,097,000***	***1,131,000***	***1,275,500***
8-Hour Filter Capacity (gallons @ 700 gpm/1,000 gpm)	336,000/480,000		
16-Hour Filter Capacity (gallons @ 700 gpm/1,000 gpm)	672,000/960,000		
WTP Rated Capacity (gpd)(3)	2,000,000		

(1) ADD values taken from 2018 WSP and based on consumption of 150 gpd/ERU.
(2) MDD values taken from 2018 WSP and based on consumption of 250 gpd/ERU.
(3) Based on a current filter surface area of 252 sf and a maximum allowable filtration rate of 6.0 gpm/sf.

WATER TREATMENT PLANT (WTP)

The existing WTP is a rapid-rate, direct filtration plant with a rated capacity of 2.0 million gallons per day (mgd) but currently operates at approximately 1.01 mgd (700 gpm). The WTP is housed in a partially below grade concrete building located on Morning Beach Drive approximately 1 mile northeast of the intersection of Lake Whatcom Boulevard and Marigold Drive. The facility was constructed in 1972 and has undergone several minor improvements since that time, but was most recently upgraded in 1992. The WTP provides coagulation, flocculation, filtration, disinfection, and chlorine contact time before treated water is pumped to the distribution system and storage reservoirs. Each of the individual components of the treatment process is described below. Photographs of the components listed below are provided in Appendix A.

Raw Water Intake

The raw water intake draws from within Lake Whatcom, the shoreline of which is approximately 300 feet from the WTP. The intake structure is located approximately 300 feet from the shoreline at a depth of approximately 70 feet below the water surface. The intake structure consists of a 36-inch diameter tee fitting, intake screens, and transition fittings to connect to the 24-inch ductile iron pipe that proceeds from the intake structure to the shoreline. Near the shoreline, the piping transitions from 24-inch to 10-inch diameter. Approximately 100 feet inland from shore, the incoming piping includes valves for system isolation, check valves to maintain a flooded pipe, overflow/pressure relief appurtenances, and fittings necessary to direct the pipe to the WTP. From this valve assembly, the 10-inch diameter ductile iron pipe continues an additional 200 feet to the entrance at the WTP.

Raw water quality is typically good throughout the year at this location. Annually, raw water temperature ranges between 5.0 - 10.0 degrees C, pH ranges between 6.9 - 7.5, and turbidity ranges between 0.1 - 1.4 NTU. Turbidity fluctuates seasonally and tends to increase during the spring and fall stormy season, or during periods of extended wet weather. A summary of daily water quality information for 2018 and 2019 is provided in Appendix B.

The intake piping is inspected every 5 years, was most recently inspected in 2017 by H_2O Solutions, LLC.

Raw Water Pumps

Inside the WTP, two raw water pumps move raw water from the intake piping, past the chemical injection point, and up to the flocculation tank. Both raw water pumps are located below grade level in a pit adjacent to the flocculation tank. The pumps are accessed by a single, vertical, ladder. The pump pit is covered with aluminum grating and clear plastic sheeting to prevent small objects from falling into the pit.

Both Raw Water Pump 1 and Raw Water Pump 2 are horizontal, centrifugal pumps. The pumps are driven by 20 hp, 3-phase, 1,180 rpm, totally enclosed, fan cooled (TEFC) variable speed motors. Each pump is capable of providing up to 1,400 gpm at 25 feet total dynamic head (TDH). The pumps are operated on an alternating lead/lag schedule and their operational motor speed is controlled by their variable frequency drive (VFD) motor starter which is currently set to deliver approximately 700 gpm each. Both Raw Water Pumps were installed in 1992. In 2002, the District replaced the motor on Raw Water Pump 1. Both pumps are maintained regularly according to the manufacturer’s recommended schedule, and performance issues with the pumps are addressed as required.

Raw Water Flow Meter

The raw water flow meter is located at grade level downstream from the raw water pumps. The flow meter is a 10-inch diameter Toshiba LF400 Series magnetic flow meter with an integral transmitter, local display, and flanged connections. The display shows both the instantaneous flow as well as the cumulative total flow through the meter. The flow values are also displayed on the WTP Supervisory Control and Data Acquisition (SCADA) system and are recorded for trending and tracking purposes. In 2020, the District purchased a replacement raw water flow meter, which is stored onsite and can be installed quickly if the existing raw water meter should fail.

Flocculation

Once through the raw water pumps, water proceeds through approximately 30 feet of piping before entering the flocculation tank. The flocculation tank is a painted, welded steel tank with a diameter of 13.5 feet, a height of 8.6 feet, and a nominal volume of 9,000 gallons. The tank is divided into three equal sections and water flows through the tank in an over-under-over pattern. The tank contains one access ladder welded to the outer sidewall. The tank is coated on both the interior and exterior surfaces; however, the specific coating system components are not known.

The flocculation tank is equipped with a high level float. As the water level rises within the flocculation tank, the float activates and de-energizes the raw water pumps, thus stopping flow to the tank and preventing an overflow condition. This high alarm signal is also relayed to the WTP SCADA system which alerts the WTP staff that the system requires inspection.

The flocculation tank can also provide priming water for the raw water pumps should the intake check valve fail or leak. If needed, water is piped from the flocculation tank down to the intake side of the raw water pump to ensure that the intake piping remains full prior to raw water pump startup. Without this piping connection, the intake piping could empty; and the raw water pumps would lose prime, which will lead to excessive wear and in-rush electrical currents during startup. The WTP staff recently replaced the intake check valve and no longer uses this priming piping; however, the piping is maintained so that it is available for future use.

Rapid Rate Filters

Water leaves the flocculation tank via 12-inch diameter ductile iron piping and is conveyed by gravity to the equalization trough. At the trough, water is evenly distributed among the four filter units. Each filter unit consists of an inlet trough, filter media, an underdrain system, surface wash and backwashing equipment, and filtered water piping.

Filter media includes anthracite, sand, and garnet (Table 1-3). Each filter has a surface area of approximately 63 square feet, a depth of 10 feet, and a nominal media volume of 273 cubic feet. At a typical operational flow of 700 gpm (~1 mgd), the surface loading rate for all four filters is 2.8 gpm/sf, which is well within the maximum allowable rate listed by the Washington State Department of Health (DOH) for a multi-media filter (6 gpm/sf). The surface loading rate using only two filters is 5.55 gpm/sf (700 gpm/126 sf), which suggests that the WTP can operate at the typical flow rate with only two filters in service.

Filters 1 and 2 are contained within a common welded and coated steel tank that rests on a concrete equipment pad. Filters 3 and 4 are contained within a marine grade aluminum tank that rests on a concrete equipment pad.

Typically, the WTP operates for 10 to 16 hours each day, and longer during warm summer months when water demand is high.

TABLE 1-3

Sudden Valley WTP Media Filter Summary

Parameter	Value
Type	Gravity, Direct Filtration
Filter area (sf, total)	252 (4 each at 63 sf)
Rate of Filtration @ 700 gpm (gpm/sf)	2.8
Rate of Filtration @ 1,000 gpm (gpm/sf)	4.0
Rate of Filtration @ 1,390 gpm (gpm/sf)(1)	5.5
Rate of Filtration @ 1,526 gpm (gpm/sf)(2)	6.0
Rate of Backwash (gpm/sf)	20.6
Design Media Depth (inches) #1A Anthracite (1.0 mm - 1.1 mm) F16 Sand (0.45 mm - 0.55 mm) #50 Garnet Sand (0.28 mm - 0.38 mm) #12 Garnet Gravel (1.46 mm - 1.56 mm) #3 Gravel (0.375" - 0.1875") #2 Gravel (0.75" - 0.375") #1 Gravel (1.50" - 0.75")	 18" 9" 4.5" 4.5" 3" 3" 10"

(1) Value is based on WTP rated capacity of 2.0 mgd.
(2) Value is based on current South Shore Water System Water Right (Table 1-1).

During normal filter operation, water is distributed evenly to all four cells and flows through the filter media and into the respective underdrain chambers. As it passes through the filter media, flocculated sediment and small particles are trapped by the media. As additional particles are trapped on the surface of the filter, both the headloss through the filter media and the turbidity of the filtered water increases. Per the District's normal operating procedures, each filter bed is backwashed each day prior to operating the filters.

Once through the filters, water flows through the filter discharge piping to the clearwell. The discharge piping at each filter consists of isolation valves, flow control valves, chemical injection fittings, and flow meters in order to ensure consistent operation.

During the backwash of a filter cell, water from the distribution system served by the District 7 Reservoir flows *upward* by gravity through the filter at approximately 1,300 gpm (20.6 gpm/sf). The backwash flowrate is measured by a magnetic flow meter on the backwash line located on the south wall of the WTP. At this flowrate, the media bed is fluidized to remove the accumulated sediment particles and the particle laden backwash water flows into the filter cell waste trough and into the backwash storage basin. Each filter also includes a surface wash system that consists of two supply arms with up to nine nozzles on each side (18 total nozzles). The pressure and flow of backwash water through these nozzles causes the arms to rotate and disperse spray that agitates the media surface. Spray from these nozzles only occurs during backwash and helps to prevent the formation of mudballs on the media bed. The complete backwash sequence includes the following steps:

- 4.0 minutes of surface wash only;
- 2.5 minutes of surface wash and filter backwash;
- 5 minutes of filter backwash;
- up to 20 minutes settling, equalization, and drainage; and
- 15 minutes of filter to waste.

After this backwash sequence, the filters return to normal operation and water flows through the filters and into the clearwell. According to WTP staff, the entire backwash process for all four filters typically takes 120 to 160 minutes.

The backwash storage basin is located underground between the WTP building and the finished water pump building. The basin has a volume of approximately 16,000 to 17,000 gallons and provides an opportunity for settling of the removed particles. Backwash water within the basin is pumped via one of two submersible pumps several times as part of each backwash sequence. The backwash water is pumped to the residential sewer system where water proceeds to the City of Bellingham's Post Point Wastewater Treatment Plan (WWTP) for treatment. Overflow from the backwash basin is directed back to Lake Whatcom.

Clearwell

Once through the media filters, water flows through 6-, 8-, and 10-inch diameter piping to the clearwell. The clearwell is a concrete basin below the floor slab of the WTP and is accessed via a 24-inch access hatch in the clearwell's northwest corner. The access hatch is located very near the entrance to the WTP and contains a gasketed lid designed to prevent intrusion of liquids or debris.

Based on record drawings, the footprint of the clearwell is 439 square feet, which at the maximum operating depth of 6.25 feet results in a volume of 20,520 gallons.

The WTP utilizes two identical transfer pumps to move water from the clearwell to the chorine contact basin and pump operation is rotated for each pumping cycle. Each transfer pump is a 20 hp, 60 Hz, 1,760 rpm, Peerless vertical turbine pump with a listed capacity of 1,400 gpm at 43 feet TDH. The pumps operate at full speed and flow (1,400 gpm), and cycle on and off depending on the water level within the clearwell.

The clearwell contains a pressure transducer that reads and records the water level. When the water level within the clearwell rises to the upper setpoint, one transfer pump will energize. There is a 3-foot operating range within the clearwell based on the upper water level setpoint of 6'-3" and the lower water level setpoint of 3'-3". If the high alarm water level setpoint (7'-2") in the clearwell is reached, the filter system will shut down to avoid additional filling of the clearwell. High level indication/alarm is provided by an Autocon Selectrol 3500 mercury switch. The clearwell also contains an overflow pipe with an elevation of 8'-0" above the floor. This overflow pipe will deliver water by gravity back to Lake Whatcom.

Chlorine Disinfectant Injection System

The WTP utilizes a gas chlorine injection system to provide disinfectant chemicals to the filtered water. This disinfectant provides the necessary chlorine residual to meet the concentration and contact time (CT) requirements set forth by DOH. Commercially prepared chlorine gas is delivered to the WTP in 150-pound cylinders and stored within a separate room inside the WTP. Two active cylinders and two spare cylinders are maintained onsite at all times. The active cylinders are stored on a scale, and specialized gas regulators and flow meters provide the desired gas flow. The chlorine supply to Filters 1 and 2, Filters 3 and 4, and the flocculation tank are all controlled separately using individual flow regulators and meters.

Chlorine gas is mixed with a sidestream of filtered water creating a hypochlorite solution that is then injected to the piping between the filter units and the clearwell. Additionally, a small amount of chlorine solution is injected to the first chamber of the flocculation tank, which helps prevent algal growth on the filter media. Because the WTP operates at a single flow rate, the chlorine system is adjusted manually as needed and does not include automated flow control.

The chlorine room at the WTP contains two chlorine gas sensors, which will warn operations staff of a potential leak so that appropriate ventilation and safety procedures can be followed.

Chlorine Contact Basin

Filtered water is pumped from the clearwell via the transfer pumps to the chlorine contact basin (CCB). The CCB was constructed in 1994 and is a circular, baffled, welded steel reservoir located adjacent to the Finished Water Pump Building. Design information for the CCB is summarized in Table 1-4.

TABLE 1-4

Sudden Valley WTP Chlorine Contact Basin Design Criteria Summary

Parameter	Value
Year Constructed	1994
Type	Welded steel
Shape	Circular
Height (ft)	25
Diameter (ft)	40
Base elevation (ft)	336.0
Overflow elevation (ft)	360.0
Volume (gal)	225,000
Gallons per foot	9,400
Inlet/Outlet	10-inch Perforated Riser

Water enters the CCB via a diffuser riser at one end and flows in a serpentine fashion between three steel baffles to the outlet diffuser. The inlet diffuser consists of a 10-inch diameter PVC pipe with 25, 2-inch diameter holes drilled at approximately 9.25-inches on center. The outlet diffuser riser consists of a 10-inch diameter PVC pipe with 50, 2-inch diameter holes drilled at approximately 9.25-inches on center. These risers act to promote consistent flow throughout the full depth of the water column from the inlet to the outlet. The CCB has both exterior and interior coatings. The CCB is inspected every 5 years, was most recently inspected in 2017 by H_2O Solutions, LLC.

The CCB utilizes a single, mercury level switch for high level alarm within the tank; however, the District plans to install a redundant alarm sometime in 2020. The switch communicates the alarm signal to the WTP PLC, which relays the alarm to WTP staff. Water level (depth) is measured using a pressure transmitter. Access to the CCB is provided by two 36-inch diameter manways located on opposite sides of the tank at ground level, as well as a 24-inch access hatch on the roof of the tank.

In 2016, Gray & Osborne conducted a formal tracer analysis on the District's CT system, which included the chlorine gas injection system and CCB. Surface water systems in Washington must provide a minimum level of CT to protect water quality and ensure disinfection of treated water. CT is the product of the chlorine residual (C) and the residence time within the contact basin (T). The residence time used for calculating CT is a function of the flow through the basin, minimum volume within the contact basin, and the baffling efficiency of the basin. The study conducted on the CCB at the WTP in 2016 showed a baffling efficiency of 0.3, which is less than the theoretical value of 0.7 that the WTP had previously been using. As a result of the tracer study, the WTP staff have made several operational changes in order to ensure that they consistently provide suitable disinfection of treated water leaving the WTP. One of these operational changes was to maintain a maximum allowable flow through the plant of 1,000 gpm while a second operational change was to increase the target chlorine residual dose from 0.8 to a minimum of 1.0 mg/L.

Finished Water Pumping

Four finished water pumps pump water from the CCB to either the Division 7 or the Division 22 Reservoirs. These pumps are energized and/or de-energized based on the water levels within these reservoirs. The pumps are located in the Finished Water Pump Building adjacent to the CCB. This building also contains electrical equipment for the pumps, a small laundry facility, network and surveillance equipment, as well as the auxiliary generator for the WTP. The building also contains two adjoining public restrooms (mens and womens) available for use by beach/park patrons. At the time of our onsite assessment, the restrooms had been closed for the winter and were inaccessible.

The four pumps are served by a common 10-inch intake header with two pumps providing flow to the Division 7 Reservoir and two pumps providing flow to the Division 22 Reservoirs. The Division 7 Reservoir pumps are 100 hp, 60 Hz, 1,780 rpm, vertical centrifugal pumps with a design point of 700 gpm at 445 feet TDH. The Division 22 Reservoir pumps are 150 hp, 60 Hz, 1,780 rpm, vertical centrifugal pumps with a design point of 700 gpm at 608 TDH. Each pump is connected to a discharge flow control valve that regulates the discharge flow and pressure to the distribution system. Flow from each set of pumps is monitored by a flow meter. Instantaneous and total flow are measured by the meter and displayed and recorded on the WTP's SCADA system.

Chemical Dosing Systems

The WTP utilizes two chemicals in its treatment system in addition to chlorine disinfectant. The first is potassium aluminum sulfate (alum), which is a common coagulant used in water treatment processes. Alum is stored within a 1,900-gallon polyethylene storage tank with a diameter of 6.2 feet and a height of 8.5 feet. The storage tank supplies a diaphragm chemical metering pump, which injects the alum in to the raw water piping upstream of the flocculation tank. The alum chemical feed pump is a Pulsatron E Series with a listed capacity of 44 gpd and a maximum pressure of 100 psi.

Alum is delivered by a commercial vendor approximately every 3 months. The vendor connects a hose from the delivery vehicle to the tank inlet camlock fitting and pumps the alum solution into the tank.

The second chemical utilized at the WTP is soda ash for pH control. Soda ash is mixed and stored in a 1,200-gallon, open top, welded steel tank with a diameter of 5.6 feet and a height of 6 feet. The tank includes a shaft driven mixer as well as a polycarbonate hinged access lid. WTP staff must prepare the soda ash solution as needed by manually adding 50-pound bags of dry soda ash to the tank. Bags of dry soda ash are delivered to the WTP where staff transfer the bags to a rolling cart which is used to transport them to their various temporary storage locations within the WTP. When ready to use, the staff haul the bags up a small platform and manually dump them into the soda ash storage tank. Filtered water is then added to the tank in the appropriate volume to create the working solution. This filtered water supply includes a totalizing flow meter used to track the flow. Approximately 16 to 20 bags of soda ash are mixed approximately every 11 to 12 days to create the dosing solution. Soda ash is injected to the filtered water between the filters and the clearwell.

Soda ash solution is delivered from the storage tank to the injection location via a Pulsatron E Series diaphragm metering pump with a listed capacity of 600 gpd and a maximum pressure of 30 psi. The chemical metering pump is located near the top level of the soda ash storage tank in order to reduce potential for crystallization within the check valve and to reduce the risk of siphoning.

Both the soda ash and alum feed pumps are manually calibrated on a daily basis using a graduated cylinder near the injection location. Based on the daily calibration, the dose rate from the pumps is modified and/or the WTP staff performs maintenance on the pumps/piping to address flow issues.

Auxiliary Power Systems

The WTP utilizes a 450-kW diesel-powered auxiliary generator to provide standby power in the event of a loss of power to the WTP. This generator also provides auxiliary power to the Afternoon Beach Sewer Pump Station, which is located approximately 300 feet northwest of the Finished Water Pump Building. The generator, installed in 2014, is located inside the Finished Water Pump Building and diesel fuel is provided to the tank via an above grade diesel storage tank located between the Finished Water Pump Building and the CCB. The generator can provide power for the complete WTP facility and sewer pump station for up to 96 hours.

Instrumentation

The WTP uses various instruments and equipment to monitor and control the overall treatment process. A description of the key components used by the WTP is provided below.

<u>Flow Meters</u>

Information on the flow meters utilized at the WTP are summarized in Table 1-5.

TABLE 1-5

Sudden Valley WTP Flow Meter Summary

Meter Name	Location	Type(1)	Make/Model
Raw Water	Grade level near WTP entrance	Magnetic, FL	Toshiba LF400
Filter Outlet	Downstream of each filter outlet	Magnetic, FL	Badger Primo
Backwash	Vertical pipe on south wall of WTP	Magnetic, FL	Badger Primo
Division 7 Finished Water	Finished water pump building	Magnetic, FL	Endress & Hauser Promag 500
Division 22 Finished Water	Finished water pump building	Magnetic, FL	Badger Primo Advanced U

(1) FL = flanged connections, MJ = mechanical joint connections, TD = threaded connections.

<u>Turbidimeters</u>

The WTP staff recently replaced all of their existing HACH 1720E inline turbidimeters with new HACH 5300 laser turbidimeters in 2018 and 2019. As required by DOH, turbidity is measured for the raw water, at each filter, and for the combined filter effluent. These data are displayed at the SCADA system and are also tracked and logged for reporting purposes.

<u>Chlorine Analyzers</u>

The WTP staff replaced their previous chlorine analyzers with HACH CL17 analytical equipment in 2018.

<u>Temperature/pH Analyzers</u>

pH and temperature are measured using standard probes procured from HACH. Both raw and finished water pH and temperature are measured via a flow-cell and probe assembly. The equipment is calibrated and maintained on a regular basis.

<u>Streaming Current Monitors</u>

The WTP maintains a streaming current monitor which is designed to assist with determining the coagulant dose prior to flocculation. WTP staff use the streaming current monitor to identify large scale changes in water chemistry that may impact coagulant dose, but they do not use the equipment to optimize their coagulant dose on a daily or weekly basis. The system collects a sample of raw water after coagulant addition and typically, the streaming current monitor is used only to identify an overfeed condition.

<u>Pressure Transducers</u>

The WTP utilizes a Keller Level Rat pressure transducer sensor within the clearwell.

The CCB also utilizes a pressure transducer to measure the water level (depth) within the tank.

<u>Float Switches</u>

The WTP utilizes float switches within the flocculation tank and mercury based level switches within the clearwell and the CCB. These switches provide a high alarm in the event that the water levels in the tanks rise above the high level setpoint. These switches were installed in 1994 with construction of the WTP.

CHAPTER 2

WTP CONDITION ASSESSMENT

INTRODUCTION

On, February 12, 2020, engineers from Gray & Osborne visited the Sudden Valley WTP to perform a condition assessment of the existing facilities. Russell Porter P.E., Aaron Pease P.E., Myron Basden P.E./S.E., Keith Stewart P.E., and Perry McKay from Gray and Osborne met District WTP operator Kevin Cook and electrician Ken Zangari onsite at the WTP.

Mr. Cook described the treatment equipment and provided operations and technical information on all facets of the treatment plant. After becoming familiar with the WTP facilities, the assessment team split up and performed assessments on all of the facilities with a specific focus on their area of expertise. The following sections include a summary of the issues identified by each discipline at our condition assessment.

TREATMENT/PROCESS CONDITION ASSESSMENT

The process condition assessment included all of the components and processes used to generate potable water at the WTP including equipment, operations, maintenance, chemicals, and monitoring and controls. Information was collected from on-site observations, discussions with operations staff regarding system performance, and previous experience at the WTP through the completion of other projects. The treatment equipment was described previously, and the assessments below correlate to the areas described in these previous sections.

WTP MAIN BUILDING

Intake Piping

- The intake piping is inspected every 5 years and was most recently inspected in 2017 by H_2O Solutions, LLC. The inspection revealed no significant damage or deterioration of intake structure and piping between the intake and the shoreline. Furthermore, the report had no recommendations for additional modifications.

- Check valves between the shoreline and the WTP have recently been modified/replaced and are in good condition.

- Inspection of the below grade raw water intake piping between the shoreline and the WTP was not included in this assessment; however, WTP staff believe that the piping is in good condition.

- Within the WTP Main Building, raw water piping is coated 10-inch diameter ductile iron materials and overall is in good condition.

  While the total installed raw water pump capacity is 2,800 gpm (1,400 gpm per pump), the typical and maximum flow rate through the filters is 700 gpm, and 1,000 gpm, respectively. The fluid velocities within the 10-inch raw water piping at 700 gpm and 1,000 gpm are 2.9 feet per second (fps) and 4.0 fps, respectively. Both of these values are within the recommended velocity range for municipal treatment systems (2 to 8 fps) and, as such, appear to maintain sufficient capacity. To maintain fluid velocities below the recommended maximum value of 8.0 fps, flow through the intake piping should not exceed 1,950 gpm. This value is above the Sudden Valley water right value of 1,526 gpm and as such, it is doubtful that the raw water intake piping would ever need to be upsized to serve the current facility.

Raw Water Pumps

- Both raw water pumps were installed in 1992 and although the pumps are in good condition, function as designed, and the motor for Raw Water Pump 1 was replaced in 2002, the pumps are approaching the end of their useful life.

- The floor in the raw water pump pit does not slope to the sump in all directions and allows for localized ponding and sediment accumulation. The presence of these sediments, especially when wet, creates slippery and dirty conditions within the pit.

- Although a supplementary raw water connection is available at grade level downstream of the existing raw water pumps, the WTP does not possess a suitable auxiliary raw water pump in the event that both raw water pumps are out of service.

- Signage indicating that the raw water pump pit is considered a confined space is not currently provided.

  Because of the potential for entrapment and the single ingress/egress ladder, the raw water pump pit should be considered a confined space and confined space entry procedures should be followed whenever entering.

- Lowering piping, fittings, or equipment into the pump pit is difficult due to restricted access in that area. No portable hoist was observed, and access for a mobile hoist is restricted by existing piping and chemical storage. The lack of a hoist will make lowering heavy piping and fittings into the raw water pit difficult.

Raw Water Flow Meter

- The existing raw water flow meter has a listed range between 100 to 2,000 gpm and has sufficient capacity to operate under the maximum allowable flows through the WTP.

- The raw water flow meter is different from the remaining flow meters utilized in the WTP, which increases the number of spare and replacement parts required for maintenance.

- The meter is old and no longer supported by Toshiba nor is this meter commonly used in the municipal surface water treatment industry.

Flocculation

- The flocculation tank contains piping directly above the tank walls and interior space which will make removal/modifications to this piping and/or the flocculation tank difficult. Corrosion was noted on this piping and its current location may promote corrosion on the upper lip of the flocculation tank wall.

  One of these items is a tube-style high level alarm and sensor. This style of equipment is old and prone to sticking.

- Access to the full circumference of the flocculation tank is poor and restricted by the chemical dosing systems, raw water inlet pipe, and overhead water piping and electrical conduit.

- The flocculation tank appears to be undersized for the typical operational flow.

  Flocculation basins are typically designed using two criteria: hydraulic retention time and mixing energy. Assuming a sidewater depth of 7.5 feet, the operational volume of the flocculation basin is approximately 8,000 gallons. Given the typical flow through the WTP of 700 gpm, this results in a hydraulic retention time of 11.4 minutes (8,000 gallons/700 gpm), which is significantly lower than the design recommendation of 30 to 45 minutes for baffled channel contact flocculation basins (*Integrated Design and Operation of Water Treatment Facilities, S. Kawamura, 2000*). To achieve the recommended retention time of 30 minutes, flow through the flocculation tank should be reduced to 270 gpm or the flocculation tank volume should be increased to 21,000 gallons.

The mixing energy is calculated using the hydraulic retention time and the headloss through the basin. Assuming a range of headlosses between 0.5 to 2.0 feet, the mixing energy is between 37 - 74 s^{-1}, respectively. The recommendation for mixing energy in baffled channel contact flocculation basins is 55 - 10 s^{-1} (*Kawamura, 2000*). As such, it appears that the existing flocculation tank at the WTP provides more mixing energy than recommended for ideal flocculation of entrained particles. Providing extra mixing energy will reduce the effectiveness of floc creation prior to filtration.

Rapid Rate Media Filters

- Discussions with the WTP staff suggest that the backwash sequence is successful at cleaning the filters. There is no apparent long-term decrease in filter run times, and the filtration performance appears to be consistent immediately following a backwash. During our site visit, two backwash sequences were observed and our observations agree with WTP's description of the backwash system and its performance.

- Access to the filter discharge piping and fittings is limited and restricted due to the presence and the location of the equalization trough.

- Access to each filter platform is provided by only a single, vertical ladder. This represents a safety risk in the event that the existing ladder becomes obstructed or blocked.

- Media depth, consistency, and particle size breakdown were not investigated during the assessment. Discussions with WTP staff indicate that the filter media performance is good. WTP staff add additional anthracite on an annual basis to bring the total depth of anthracite (top layer) back up to the original design depth (Table 1-3).

- The underdrain system was not accessible during the WTP assessment; however, WTP staff believe that the underdrain system is in good condition.

- Discussions with WTP operations staff indicate that typical filter run times have remained stable for several years.

  Backwash flow and volume appears to be within the design range identified in the O&M manual. The backwash cycle appears to sufficiently remove trapped sediments.

Typical mixed media backwash flows are between 10 to 20 gpm/sf (*Integrated Design and Operation of Water Treatment Facilities, S. Kawamura, 2000*). At the WTP, current backwash flow is approximately 1,300 gpm, or 20.6 gpm/sf (1,300 gpm/63 sf), which is at the maximum recommended range noted above.

The backwash water is currently stored in a wastewater holding tank adjacent to the WTP. When the tank is full, the wastewater is pumped to the gravity sewer by up to two submersible pumps and then is conveyed to the City of Bellingham Post Point WWTF for treatment. This process is expensive and cumbersome for the District and their staff. The District has indicated that costs for backwash disposal to the WWTF have increased in recent years and has expressed a desire to modify this system if possible to minimize the volume of water sent to the City's municipal sewer system.

- The maximum allowable filter rate for multi-media direct filtration units is 6.0 gpm/sf. Given the total filter area for all four filters of 252 sf, and a typical flow rate of 700 gpm, the current filtration rate at the WTP is approximately 2.8 gpm/sf, which is below the maximum allowable value. Using the existing filter units, the WTP could filter up to 1,510 gpm – which is very nearly the current Sudden Valley instantaneous water right of 1,526 gpm (Table 1-1) – and still meet the maximum filtration rate requirement.

  WTP staff have indicated that they are interested in investigating the possibility of utilizing a mono-media filtration system in an attempt to improve filter run times. This may be feasible; however, it should be noted that the maximum allowable filtration rate (6.0 gpm/sf) would be reduced to 3.0 gpm/sf per Washington Administrative Code (WAC) 246-290-654. Given the current filter surface area, this would reduce the maximum filtration flow through the WTP to 755 gpm, which is above the current typical operational flow, but below the historical maximum operational flow of 1,000 gpm. This reduced flow rate also does not appear to be large enough to meet projected ADD and MDD for the South Shore System as shown in Table 1-2.

Clearwell

- The clearwell appears to be in good condition, although a thorough investigation was not possible as part of this assessment since the WTP was in operation during the site visit.

- The existing transfer pumps appear to be in good condition. However, the pumps were installed in 1992, are nearly 30 years old, and are approaching the end of their useful life.

- There is staining on the concrete walls within the clearwell. The presence of stains can hide other, more serious defects and detracts from the aesthetic appearance of the clearwell.

- The single access hatch represents a source of contamination to the filtered water. The hatch is adjacent to the path travelled by soda ash chemicals and is a potential source of contamination for spilled liquids.

- The hatch represents a trip hazard for WTP staff and is not highlighted or indicated by high visibility colors.

- The clearwell is considered a confined space; however, no signage or other information noting the access restrictions was noted in the vicinity or on the lid.

- Confined space entry equipment was not noted onsite.

Chlorine Disinfectant Injection System

- The chlorine disinfection system appears to be functioning as desired. Piping, tubing, and equipment appear to be in good condition.

- Gaseous chlorine presents some level of risk to WTP operations staff in the event of a leak, and a significant safety risk in the event of a fire or explosion.

  While the existing chlorine gas disinfection facilities likely meet building code requirements in place at the time of their construction, the current chlorine gas storage facilities do not appear to meet current building code requirements.

  The 2015 International Building Code defines the Maximum Allowable Quantities of hazardous materials that can be stored or used within a facility without triggering specific design and construction criteria. Gaseous chlorine is considered both an oxidizing gas (a physical hazard) and a toxic gas (a health hazard) and as such, the maximum allowable quantity is 150 pounds as a liquefied gas, or 810 cubic feet at NTP as a gas (both of which correspond to a single 150-pound cylinder). Several exceptions allow this maximum allowable quantity to be increased by 100 percent in buildings equipped with an approved automatic sprinkler system and by an additional 100 percent when approved storage cabinets are used. Therefore, in a building with a sprinkler system and if all the chlorine gas is stored within approved cabinets, a total of 600 pounds of chlorine gas, or four 150-pound cylinders can be used before triggering a hazardous, H-3 occupancy. A building with an H-3 occupancy is required to have several additional safety and building protection systems including additional planning documents, ventilation system requirements, gas cabinets, smoke detection and alarm systems, emergency power supplies, and emergency alarm systems, among other requirements.

Any significant modifications to the chlorine disinfectant injection system would require that the system be modified to meet current building code requirements for the use and storage of chlorine gas.

Additional code requirements regarding chlorine use and storage are provided in Appendix E.

- Flow directions and labels for chlorine flow meters are not sufficiently labeled which may cause confusion for staff.

- Spare chlorine cylinders are not labeled sufficiently as spares, or as empty/full which may cause confusion for staff and insufficient gas redundancy.

- The coating system in the chlorine room has failed in areas and shows signs of significant fatigue in other areas.

- The spare gaseous chlorine cylinders have only one safety restraint chain near the top of the cylinder. Two chains, one near the top and another near the bottom should be provided for cylinder storage and security.

- Active gaseous chlorine cylinders are secured with a single, loose chain to the scale stanchion, which is bolted to the scale, which in turn is bolted to the floor. This arrangement will not sufficiently secure the active cylinders during a seismic event.

Chemical Dosing Systems

- Material Safety Data Sheets (MSDS) files were not inspected during this assessment. MSDS files were recently updated and are located above the existing laboratory workspace.

- The existing chemical storage facilities for alum and soda ash do not appear to violate the maximum allowable chemical quantities identified by International Building, Fire, or Mechanical Codes.

- The alum storage tank is old, beyond its useful life of 15 to 17 years, and shows signs of degradation.

- Alum is provided by a commercial vendor, and WTP staff have noted that this process is cumbersome and requires two individuals to prevent overflow since there is no direct line of sight between the parking lot and storage tank.

- Alum tank does not contain electronic level sensing equipment which can help staff identify when additional solution is needed.

- Alum dosing is manually calibrated on a daily basis, which is cumbersome and messy for WTP staff. Calibration is performed at the injection location requiring fittings to be loosened and reconnected each time a calibration is performed.

- The WTP maintains sufficient spare pumps/parts for the alum diaphragm metering pump.

- The soda ash storage tank is mislabeled as “Caustic Soda” (Sodium Hydroxide).

- The soda ash storage tank appears to be in good condition and does not show significant signs of coating damage or fatigue.

- The soda ash mixer appears to be in poor condition, is highly corroded, and is likely beyond its useful life.

- Soda ash solution must be prepared manually by WTP staff, and bags of soda ash must be moved at least three times between delivery and mixing. This process is cumbersome and exposes the staff to chemicals and heavy lifting requirements.

- The soda ash tank can only be accessed via a single, small access platform. This platform and its coating system show signs of fatigue. The platform limits access to the soda ash tank and other facilities due to its size and location.

- The location of the soda ash system likely contributes to corrosion and degradation of the electrical equipment within the WTP building.

Instrumentation

- The WTP utilizes several various flow meters for flow measurement. This makes maintaining spare parts more difficult and requires specialized knowledge for each type of meter.

- The WTP does not maintain spare flow meters for each type of unit utilized, which reduces the overall WTP reliability in the event that one of the meters fails.

- The WTP recently upgraded to HACH TC5300 turbidity meters units for measurement of raw, filtered, and finished water turbidity. The staff is pleased with the level of performance and the ease of maintenance associated with this equipment and the equipment is in good condition.

- The WTP recently upgraded to HACH CL17 chlorine analyzers. The staff is pleased with the level of performance and the ease of maintenance associated with this equipment and the equipment is in good condition.

- The WTP utilizes HACH equipment for temperature and pH monitors. The WTP monitors the temperature and pH of raw water, filtered water, and finished water. The staff is pleased with the level of performance and the ease of maintenance associated with this equipment and the equipment is in good condition.

- The WTP maintains streaming current monitoring equipment but does not currently utilize this equipment for coagulant/flocculant optimization. The staff is pleased with the level of performance and the ease of maintenance associated with this equipment and the equipment is in good condition.

- The existing clearwell level switch is out of date and utilizes mercury, which is not suitable for use with potable water.

FINISHED WATER PUMP BUILDING

Finished Water Pumping

- The finished water pumps appear to be in good condition. However, the pumps were installed in 1992, are nearly 30 years old, and are approaching the end of their useful life.

- The District does not currently maintain spare finished water pumps and/or motors, which reduces the overall level of redundancy if one or more of the pumps or motors should fail.

- The WTP cannot run more than two finished water pumps concurrently. Discussions with the WTP staff suggest that this is due to the high in-rush and amperage draw for the finished water pumps.

- The finished water pumps have not been flow tested within the last 10 years to verify their performance.

- Access to all sides of each finished water pump is somewhat restricted by the piping arrangement within the building.

- Pressure gauges have not been tested or certified within the last 5 years, which reduces the confidence in their ability to accurately read the system pressure.

CHLORINE CONTACT BASIN

- A full and complete investigation of the CCB was not conducted as part of this assessment because the WTP was in operation during the site visit.

  The tank was most recently inspected by certified divers in 2017 by H_2O Solutions, LLC. The inspection revealed no significant damage or deterioration for the suction and its components. Furthermore, the report had no recommendations for additional modifications.

- As mentioned previously, the District recently completed a tracer study investigation on its CT system – which included the CCB. The results of this investigation found that the theoretical baffling efficiency (0.7) used to estimate the CT for the system was higher than the empirically determined baffling efficiency of 0.3.

  As a result of that study, DOH set the maximum allowable flow through the WTP at 1,000 gpm. Since that directive, WTP staff have reduced the flow through the WTP to 700 gpm and increased the target chlorine residual value to a minimum of 1.0 mg/L. These changes have worked well and help ensure that the WTP provides sufficient disinfection for its treated water; however, this reduced operational flow will inhibit the WTP's ability to meet projected ADD and MDD demands for the South Shore water system

STRUCTURAL CONDITION ASSESSMENT

The structural assessment included the WTP Main Building, the Finished Water Pump Building, items within these two buildings, and the CCB. Information was collected from on-site observations as well as available original drawings for the existing structures. The structural assessment included a review of the condition of structural members, notes of any items not complying with current building code, preliminary seismic review, and potential structural modifications that may provide benefit for operation of the plant. The building code used for this evaluation is the 2015 International Building Code (IBC). The preliminary seismic evaluation was completed using Tier 1 checklists from ASCE 41 *Seismic Evaluation and Retrofit of Existing Buildings*.

WTP MAIN BUILDING

The WTP Main Building is a one-story building consists of precast concrete tee beams overlain by 4-inch concrete topping slab at the roof. The tee beams are supported at the perimeter of the building by cast-in-place concrete walls. The building is built into a hillside so its walls are partially to fully buried below grade except at the entrance on the north side of the building. The north wall with the entrance is a glass and metal framed "storefront" façade. According to record drawings, the roof structure has 3-ply built up roofing, overlain by 2 inches of sand, overlain by up to 18 inches of soil fill. Below are specific items noted during the assessment.

- In general, the concrete structure is in good condition. No major cracks or spalling were found. In isolated locations, reinforcement on the underside of the precast concrete tee beams is exposed and shows signs of minor corrosion that does not appear to have impacted the strength of the beams.

- According to record drawings, the topping slab over the tee beams is only 2-inches thick at the perimeter. It increases to 4-inches thick at the center of the roof to provide an external slope to promote drainage. The flanges of the tee beams are also relatively thin, tapering down to 1.5-inches thick at the ends of the flange. While the flanges and topping slab could not be directly observed in the field due to the presence of plant matter and soil cover, it appears all components of the structure conform with the record drawings. According to the original record drawings, the roof was designed for 40 pounds per square foot (psf) live load and a maximum soil depth of 18 inches. Based on our investigation of the record drawings, the roof is not expected to be capable of supporting loads from added items such as equipment or tanks without installing structural retrofits.

- Miscellaneous structural steel supports such as pipe, conduit, and equipment supports are corroded. In some cases, the corrosion is severe enough that the strength of the support has been reduced.

- There are several steel tanks inside the building. The steel is coated with paint and in some areas the paint has failed leading to corrosion of the steel. Specifically, corrosion was noted on the flocculation tank, the distribution trough, and Filters 1 and 2. There is also some minor signs of corrosion on the roof of the clearwell. The corrosion does not appear to be advanced enough to affect the structural integrity of the tanks.

- Various segments of piping and its associated fittings show minor signs of corrosion. This corrosion tends to be located at joints, fasteners, or edges which is typical for piping within a moist environment. The observed level of corrosion does not appear to have affected the integrity of the piping and/or fittings.

- A preliminary Tier 1 seismic evaluation was performed for the building. The Tier 1 evaluation is a checklist that allows quick screening of the building for significant seismic deficiencies. For the purpose of this evaluation, the building is categorized as a Type C2 with concrete shear walls and stiff diaphragm. The checklist did not find any major seismic deficiencies in the building, with only one minor item flagged by the checklist, namely the vertical rebar anchoring connection at the perimeter walls. A copy of the checklist is provided in Appendix C.

- Many of the interior tanks and miscellaneous items supported from the building structure do not appear to have adequate seismic anchorage and/or bracing. These items are at risk of experiencing excessive movement and damage during a design-level earthquake. Interior tanks appear to be unanchored to the floor. Piping connections to the tanks do not appear to have flexible connections, which puts them at risk of damage if tanks move laterally during a design-level earthquake.

FINISHED WATER PUMP BUILDING

This one story building was constructed in 1992 and consists of prefabricated wood trusses at the roof supported by CMU walls at the perimeter of the building. Below are specific items noted during the assessment.

- In general, the prefabricated wood trusses and CMU walls were found to be in good condition. No water damage was found.

- Electrical conduit in the attic had only occasional bracing that did not appear to be adequate for the design-level earthquake. Insufficient bracing increases the risk of electrical failures after a design-level earthquake.

- A preliminary Tier 1 seismic evaluation was performed for this building. For the purpose of this evaluation, the building is categorized as a Type RM1 with reinforced masonry bearing walls and flexible diaphragm. The checklist found two seismic deficiencies of concern. The first deficiency concerns the transfer of horizontal shear forces from the roof diaphragm to the CMU wall at the south side of the building. The cantilevered roof over the exterior porch on the south side of the building does not appear to have a load path to transfer forces from the roof diaphragm to the CMU wall. There is a risk of damage or partial roof collapse in the design-level earthquake. The second deficiency is insufficient out-of-plane anchorage of the top of CMU walls to the roof diaphragm which results in some risk of damage to the wall and roof if the top of the wall moves away from the intended bearing point of the roof trusses during a design-level earthquake.

CHLORINE CONTACT BASIN

The CCB was described previously, but is a welded, coated, steel tank located just south of the Finished Water Pump Building that provides contact time for chlorinated filtered water from the clearwell.

- The exterior coating system on the CCB shows many localized areas of damage and/or failure. Corrosion of the steel wall is evident at these locations. Previous areas of corrosion have been addressed by WTP staff through surface preparation and spot coating repair.

- The interior coating system of the CCB appears to be in fair condition and shows only minor signs of corrosion at select areas (edges) within the tank.

- A seismic vulnerability assessment was completed in 2016 and had two significant recommendations for the CCB. First, the report stated that the concrete ringwall foundation should be retrofitted to increase uplift resistance during the design-level earthquake. Secondly, flexible piping connections were recommended to reduce the risk of damage that would result in emptying of the reservoir. Otherwise the report did not find deficiencies regarding the steel shell or anchorages to the foundation.

ARCHITECTURAL CONDITION ASSESSMENT

The architectural assessment included the WTP Main Building and the Finished Water Pump Building. Information was collected from on-site observations as well as original drawings for the existing structures. The assessment included a review of the condition of non-mechanical building systems and workspaces and compliance with current codes. The code used for this evaluation is the 2015 International Building Code (IMC).

GENERAL ARCHITECTURAL

The WTP has sufficient building access restrictions, but the property has minimal site security measures. Both the WTP Building and Finished Water Pump Building are secured with door locks. The CCB is secured with a padlocked ladder guard to prevent access to the tank. The generator fuel tank is secured behind a wood slat fence and gate secured with a padlock. The WTP does not contain any site fencing.

Camera surveillance is provided at the WTP Building and the CCB; however, this system is not used for alarming due to the high volume of nuisance alarms caused by wildlife and visitors to the adjacent Afternoon Beach Park.

WTP MAIN BUILDING

- This building includes a small water quality lab area that is comprised of approximately 10 linear feet of base cabinets and countertop. Within the countertop is a 24-inch sample sink that receives flow streams of filtered water and finished water for water quality sampling and analysis. The remainder of the available countertop area is utilized for water quality analysis instruments and as the plant operator's work station for computer access and required monthly reporting. The WTP's Human Machine Interface (HMI) computer is located here and is housed within one of the base cabinets with a shelf above the countertop holding two monitors.

  The location of this work station near the sink and lab area places the computer equipment and necessary paperwork/files at greater risk for damage.

- This building includes a small bathroom along the west wall. The bathroom includes a toilet and a utility sink along with some open wall shelving for storage of janitorial supplies. Hot water is supplied to the utility sink via a mini-tank style Bosch water heater located within the closet adjacent to the bathroom. The water heater appears to be less than 5 years old.

  The bathroom is functional but shows typical signs of deterioration associated with use and age including some light moisture damage, paint deterioration, staining, and poor lighting.

- Additional filter media is currently stored south of Filters 3 and 4 between the filter tank and the building wall. While neat and organized, this location significantly restricts access to all sides of the filters for inspection and/or maintenance. This location also makes access to the filter media bags cumbersome for WTP staff.

- The facility includes an emergency eye and face wash station located on a wall adjacent to the lab area and an emergency drench shower located on the northeast corner of the Filter 3 and 4 vessel. Emergency eyewash and shower equipment is now regulated through the plumbing code by ANSI/ISEA Z358.1 - American National Standard for Emergency

Eyewash and Shower Equipment. This standard not only includes requirements for the fixtures, but also water supply to the fixtures and access to the fixtures within a facility. Eye and face wash stations should be located to be accessed in no more than 10 seconds by a user and should provide uninterrupted flow of 3.0 gpm for 15 minutes. Drench showers should also be located to be reached within 10 seconds and should provide uninterrupted flow of 20 gpm for 15 minutes. The access pathways to both types of emergency fixtures should be free and clear of obstructions and the water supply should be tempered to a temperature between 60 degrees F and 100 degrees F. In addition, emergency fixtures should also be activated weekly to ensure flow and should be tested and certified annually.

Given the location of the existing equipment within the Main Building, neither the eyewash or drench shower is in compliance with the access requirements of ANSI Z358.1. Flow and temperature for these units were not tested during the site visit, but given the date of their installation, they may not meet current flow or temperature requirements. In addition, the supply to both of these fixtures is not tempered and therefore does not meet the temperature requirements.

- There is evidence of moisture weeping through the east wall directly above the electrical gear for the raw water pumps as indicated by some rust staining down the wall at the beam-to-wall interface. It does not appear this location has leaked in the recent past and there was no apparent direct water damage to the electrical gear.

- There is evidence of moisture weeping through the east wall near the second beam to the south of the raw water pump electrical gear (MCC 3). This location had some shiny or reflective spots, indicative of a wet surface during this assessment.

- There is evidence of moisture weeping through the aluminum storefront entrance area predominantly at the easterly interface where the aluminum framing meets the concrete wall. There is staining down this wall, down the vertical framing along the wall, at the floor, and on the adjacent wall around the corner to the east. This moisture appears to be coming from outside within the entrance alcove.

- The existing aluminum storefront window entrance alcove restricts the ability to move supplies and equipment in and out. The existing aluminum-framed, glass door is 42-inches wide; however, for deliveries of chemicals on pallets and other supplies for the WTP, a double door or an overhead coiling door would be preferred.

In addition, any major work to the facility to replace or repair equipment, tanks, etc. would require that the storefront system be disassembled.

- At the concrete slab roof overhang above the alcove there was moisture staining coming in from the leading edge as well as at several locations along the joint between the concrete walls and slab extending above. In addition, it appears an attempt to seal some of these joints may have been done in the past as evidenced by some seams of white caulk.

- Some of portions of the facility's floors appear to be continually wet, particularly between the tanks and filters. The concrete floor is painted and is in good condition; however, the standing water on portions of this makes the flooring slippery and represents a potential safety hazard.

- The front and side exterior faces of the structure are covered with significant growth. This growth appears to be English Ivy and overhangs the building roof on three sides. While it is apparent this growth allows for significant camouflaging of the structure from the roadway, it does impede inspections of the structure, waterproofing systems, and roof drainage. In addition, roots from organic growth can be tenacious, can deteriorate waterproofing systems, and can work their way into structural joints potentially causing damage.

- Similar to the exterior wall faces, the roof is overgrown with plant life and also includes some large woody debris that has blown and/or fallen down on to the roof from the adjacent woods.

- Chlorine room access door and frame show signs of corrosion and the coating system is showing signs of fatigue.

- The building does not currently utilize an effective smoke or fire alarm system.

FINISHED WATER PUMP BUILDING

- The downspout on the northeast corner of the building has a leak in a joint near the soffit causing enough of a splash at grade that the cedar siding appeared to be constantly wet. The continuous presence of moisture will deteriorate the siding in this area.

- The roof and siding appear to be in good condition.

- Each end of this building includes a light well (skylight) framed through the attic with domed skylights. These areas are subject to water damage if not maintained, cleaned, and inspected on a regular basis.

- The building does not currently utilize an effective smoke or fire alarm system.

MECHANICAL CONDITION ASSESSMENT

The mechanical/HVAC assessment included the WTP Main Building and the Finished Water Pump Building. Information was collected from on-site observations as well as original drawings for the existing structures. The assessment included review of the condition of mechanical heating/cooling equipment, dehumidifiers, ventilation equipment, and compliance with current mechanical codes, namely, the 2015 International Mechanical Code (IMC).

WTP MAIN BUILDING

- This building includes a single, ceiling-hung, electric air handling unit that supplies the space with ventilation and heating and is controlled by a programmable Honeywell thermostat located within a ventilated lockbox. The internal fan has a capacity of up to 1,900 cubic feet per minute (cfm) at approximately 0.3 inches of water column (in-WC) and the heating coil has a capacity of 16 kW. This unit has a mixing box with a fixed bypass damper that allows control of the amount of outside air that is brought in and the amount of inside air that is recirculated. This unit is over 10 years old and was rebuilt in 2018 due to corrosion of the electric heating coils. In its current conditions, this unit appears to have many years of service life remaining. The unit includes a filter box with 2-inch pleated filters; however, the filters were not accessible at the time of the assessment.

  When outside air ventilation is being provided, a discharge relief louver ducted through the Chlorine Gas Room allows exhaust air to leave the space. Plant operators indicate that there are no issues or concerns with heat capacity or ventilation; however, it was noted the electric heat is expensive to operate during winter months.

  Heating and ventilating equipment is in good condition with years of service life remaining.

- This building also includes two, stand-alone industrial dehumidifiers. Each has a rated capacity of 195 pints of water removal per day at 80 degrees F and 60-percent humidity. These units include 2-inch MERV 8 pleated filters. Plant operators note that since the installation of these dehumidifiers, interior moisture control has significantly improved and has not posed an issue in recent years.

  The dehumidifiers are in good condition with years of service life remaining.

- Air flow through the Chlorine Gas Room is provided via an intake louver installed within the door and an exhaust fan with a 12" x 12" louvered gravity backdraft damper. The operable louvers of the gravity backdraft damper are partially restricted by plant growth on the building exterior.

FINISHED WATER PUMP BUILDING

- This facility includes a 40,000 btu/hr, natural gas unit heater in the southeast corner, and generator louvers which remain closed unless the generator is in operation. These components are in excellent condition with years of service life remaining.

- There appears to be a small exhaust leak in a pipe joint where the generator exhaust connects into the underside of the silencer. A portion of the insulation blanketing was stained with black soot.

ELECTRICAL CONDITION ASSESSMENT

The electrical assessment included the WTP Main Building and Finished Water Pump Building. Information was collected from on-site observations, discussions with WTP treatment staff, as well as original drawings for the existing structures. The electrical assessment included a review of the condition of existing equipment, use of the existing equipment, compliance with current electrical codes (NEC 2020), and potential modifications that may benefit the operation of the plant.

The existing utility service includes a pad mounted 300 kVA, 480/277 VAC (360 full load amps) three phase electrical transformer. This transformer is owned and managed by Puget Sound Energy and has PSE identification number 462999-164283. This service feeds a 480 VAC motor control center (MCC 1) located in the Finished Water Pump Building through a 600-amp main circuit breaker, also located in the Finished Water Pump Building. MCC 1 is generator-backed by a 600-amp rated automatic transfer switch and 450kW (~680 amp) generator. MCC 1 also provides a 150-amp 480/277 VAC feed to the treatment building, which distributes power from its own MCCs (MCC 2 and MCC 3). The generator in the Finished Water Pump Building also serves the nearby Afternoon Beach Sewer Pump Station which has its own utility feed.

GENERAL ELECTRICAL

- An overarching concern is the size of the utility transformer and its ability to provide power to the WTP. As stated above the transformer has the capacity to provide 360 amps but the facility is designed to distribute 600 amps. The load study from the 1992 WTP Upgrade Improvements Project indicates a peak requirement of 449 amps, suggesting that the existing transformer is not sized to fully power the complete operation of the WTP for an extended period of time.

- Occupational Health and Safety Association (OSHA) mandates that electrical distribution equipment, that is likely to require service while energized, be labeled with arc flash protection labels indicating the safe working distances and the correct personal protective equipment (PPE) required. The existing electrical distribution equipment in both the WTP Main Building and Finished Water Pump Building does not currently have these labels.

- The auxiliary power generation system is new and is in excellent condition. The system is tested for approximately 30 minutes each week in accordance with the manufacturer's recommendations.

- Based on previous observations by District staff, buried conduits and/or conductors show signs of corrosion and are likely in fair/poor condition.

WTP MAIN BUILDING

At the WTP Main Building, the power enters MCC 2 which is located on the west wall and contains the clearwell transfer pumps, a panelboard, and HVAC power. MCC 2 feeds MCC 3, which is located on the east side of the WTP Main Building and contains the motor starters for the raw water pumps.

- MCC 2 is in fair/poor condition and is a GE 8000 series product which is no longer manufactured or supported with spare components.

- The original circuit breakers in MCC 2 are approaching the end of their recommended service life.

- There is a concrete pad for a previously utilized transmission pump in front of MCC 2, which violates the NEC clear space requirement for this MCC. According to the NEC, at least 42 inches of clear space are required.

- MCC 3 is a Square D Series 6 MCC which is a currently supported product line. The unit is in fair/poor condition, most likely due to its proximity to bags of soda ash. This close proximity to chemicals and water metering equipment makes the equipment more susceptible to corrosion, degradation, and places the equipment at a greater risk for failure. The panel cover shows signs of corrosion. Although the MCC interior was not inspected as part of this assessment because the WTP was in operation, WTP staff have noted that the interior components of MCC 3 exhibit signs of corrosion.

- The electrical equipment in the chorine room includes outlets and conduit and is in excellent condition primarily due to the use of PVC-RGS conduit within the space. Several existing conduits in this room are uncapped, allowing chlorine gas fumes to enter the associated panelboard, and subsequently, the WTP Main Building.

- In several locations, electrical conduit is mounted to the floor of the building. This installation location creates a tripping hazard and makes transportation of heavy items using wheeled carts or hand trucks more difficult.

- On the wall immediately south of MCC 2 there are two panels leftover from the control panel improvements project. These panels are not labeled but are a blue panel manufactured by S&B with several unused level displays, and a grey panel manufactured by QCC immediately to its right. These two panels contain field wiring that run to the main control panel for the WTP, which is designated as MCP 1. Using a control panel as a pulling point and/or junction box is not allowed by the NEC.

- There are several additional panelboards and control panels not currently used for their original design function. These panels take up valuable wall space, create confusion and difficulty in tracing wires and cables, and provide the opportunity for additional violations of current and future electrical code requirements.

- MCC 2 and the panelboards immediately following the existing 208/240V transformer do not utilize surge protection devices (SPD). SPD's help protect the electrical equipment from damage due to in-rush currents and inconsistencies in the electrical service during both normal operation and when starting up after a loss of power.

FINISHED WATER PUMP BUILDING

- MCC 1 is old and has reached the end of its recommended service life. The motor control center's product line (GE 8000 series) is no longer manufactured and in 2017 GE sold this portion of its business to Allen Bradley (ABB). ABB does offer support but the availability of new components is questionable and will continue to become more difficult with each passing year.

- The existing motor starters for the finished water pumps are auto-transformers which is an outdated technology.

- The original circuit breakers are near the end of their recommended service life.

- The generator is approximately 6 years old; however, the adjacent washing machine infringes upon the minimum required clear space around the generator. Per the NEC Article 110, a minimum of 42 inches is required in front of equipment operating at 600 V or less which is likely to require examination, adjustment, servicing, or maintenance while energized.

- The external fuel tank is less than 5 horizontal feet from the eave of the building. The 2015 International Fire Code (IFC) #5704 stipulates that diesel fuel tanks of that size must be at least 5 feet from building eaves.

- This building utilizes fluorescent light fixtures, which are outdated and inefficient.

- MCC 1 and the panelboards immediately following the existing 208/240V transformer do not utilize surge protection devices (SPD). SPD's help protect the electrical equipment from damage due to inrush currents and inconsistencies in the electrical service during both normal operation and when starting up after a loss of power.

- All of the conduits between the Main Building and the Finished Water Pump Building are routed through a common 3-foot hand hole. This hand hole contains low voltage conductors, high voltage conductors, 24VDC signal cables, and ethernet cables. Current NEC does not permit both low and high voltage cables to occupy the same space.

TELEMETRY/SCADA

The existing supervisory control and data accusation (SCADA) system consists of a computer-based HMI that communicates with a programmable logic controller (PLC) in the WTP. HMI software is the iFIX platform. In addition to monitoring and controlling activities at the WTP, the PLC also communicates with, and monitors the Division 7 and Division 22 Reservoirs directly via leased phone lines. Discussions with operations staff indicate that the Comcast broadband connection from the WTP to the internet for remote monitoring is generally reliable; however, there is already work in progress to add a local copy of the alarming software (WIN 911) across the water system in case of the loss of communication at the site. The existing SCADA system allows the operations staff to operate the WTP automatically based on the real time water system demand.

- In general, the District is pleased with both the reliability and performance of the SCADA system. Typically, WTP staff have a monthly call with their integrator (QCC Inc.) to discuss any issues and possible improvements. This proactive approach helps to ensure that the system is maintained in good working order.

- The process control panels in the water treatment building were updated in 2012 to an Allen Bradley CompactLogix PLC based system and have had very few modifications since that time. MCP-1 (located on the west wall of the WTP Main Building) acts as the master while MCP-2 (east wall of the WTP Main Building) acts as a remote I/O base. Both these panels are in good condition. MCP-2 does not appear to have suffered from the corrosive environment despite being adjacent to the MCC 3.

CHAPTER 3

TREATMENT IMPROVEMENTS

INTRODUCTION

This chapter presents recommendations for modifications or actions based on the assessment observations noted in Chapter 2 for each discipline. The recommendations are divided into high-priority and recommended improvements. For each discipline as well as each building at the WTP, high-priority improvements are listed first, followed by recommended improvements.

In addition to the improvements recommended as a result of our assessment, the lists of recommendations below also include items noted during preparation of the most recent Water System Plan completed by Wilson Engineering in 2018 as well as the WTP Sanitary Survey completed by DOH in March 2020.

High priority improvements should be addressed within 5 years in order to help ensure the integrity of the existing facilities as well as WTP operations. Recommended improvements should be addressed within 5 to 15 years and would provide additional convenience and efficiency to the WTP operations staff and would help ensure the long-term longevity of the WTP structure and components.

TREATMENT/PROCESS RECOMMENDATIONS

HIGH PRIORITY IMPROVEMENTS

WTP Main Building

- Replace the existing clearwell level alarm switch to one that does not utilize mercury.

- Replace the existing CCB level alarm switch to one that does not utilize mercury.

- Address issues with existing chlorine disinfection system.

    - In addition to the condition assessment provided as part of this project, perform an alternatives analysis to determine whether disinfection with chorine gas continues to be the best alternative for use at the WTP. While gaseous chlorine is a viable method for disinfection of potable water – especially for small-scale water treatment facilities – many municipalities choose to disinfect using liquid sodium hypochlorite or other liquid based chemicals due to the inherent safety risks of chlorine gas. The alternatives analysis should investigate options such as continuing gas chlorination, disinfection with bulk sodium hypochlorite, and disinfection through onsite hypochlorite generation, and should evaluate these alternatives in the context of other process improvements that may be desired.

- If an alternative technology is desired, then proceed with the design and implementation of the desired technology.

- If continued use of gas chlorination is desired, then complete the following modifications and any recommendations provided in the alternatives analysis:

1. Assess ventilation system and air exchange.

2. Revise labels for chlorine solution tubing.

3. Remove existing coatings, prepare surfaces, and provide new coating system for interior walls.

4. Add additional chain restraint system for spare cylinders approximately 18-inches from the floor.

5. Revise scale orientation to allow for an additional chain restraint to active cylinders approximately 18 inches from the floor.

6. Remove existing coatings, prepare surfaces, and provide new coating system for existing door (interior and exterior sides).

7. Address existing chlorination system issues such as safety systems (fire, sprinkler, alarming, etc.), maximum storage allowances through the installation of Chlortainers and removal of spare cylinders, indicators and alarms, and storage containers in accordance with the codes listed in Appendix E.

- Address shortcomings with the existing alum system.

  - If modifications to other systems at the WTP will allow for relocation of the alum tank, we recommend that the following modifications be completed at the final tank location. Otherwise, the following recommendations could be completed for the existing alum tank location.

1. Replace existing alum storage tank with new HDPE full draining tank. New tank should be double containment style for safety against leaks/spills.

2. Provide relocated alum fill connection to allow for easier delivery of chemical and easier observation of tank level during filling.

3. Provide level sensing equipment and/or external sight gauge for alum tank.

4. Install alum duplex chemical metering pump skid.

5. Compile and update MSDS files for all chemicals used at the WTP and store this information at the existing laboratory workspace.

6. As recommended by the DOH Sanitary Survey (Appendix D), prepare and file standard alum chemical quality specifications and standard delivery procedures for review prior to/during chemical delivery.

- Address shortcomings with the existing soda ash system.

  - For continued use of the existing soda ash mixing/storage tank, we recommend that the following modifications be completed at the final tank location.

    1. Drain, clean, remove the existing coating, prepare and recoat the existing alum tank.

    2. Install level markings on the interior of the tank to facilitate easier chemical addition and filling.

    3. Revise tank and platform orientation to provide for easier access by staff with chemicals.

    4. Replace existing soda ash mixer.

    5. Provide common soda ash duplex chemical metering pump skid.

    - If modifications to the other chemical systems, equipment, or layout of the WTP Main Building will allow for relocation of the soda ash tank, we recommend that a new, similarly sized, HDPE soda ash tank be provided in the desired location.

- Address shortcomings with existing backwash system.

    - In addition to the condition assessment provided as part of this project, perform an alternatives analysis for the existing backwash storage and pumping system. While the current backwash method and settling tank is sufficient for WTP operation, the process is expensive due to costs associated with pumping large volumes of water to the City of Bellingham municipal sewer system. The alternatives analysis should investigate methods to optimize the backwash process and reduce operating costs such as discharging backwash supernatant back to Lake Whatcom, installing a larger settling tank, or utilizing backwash recycle storage and pumping equipment. These alternatives should be evaluated in the context of other process improvements that may be desired.

RECOMMENDED IMPROVEMENTS

WTP Main Building

- Address shortcomings with raw water pumping area and equipment.

    - Complete raw water pump performance testing.

      Depending on the results of this performance test, repair, rehabilitate, replace, or procure spare equipment for each pump and/or pump motor as required.

    - Purchase/procure an auxiliary/portable raw water pump for connection to the auxiliary WTP inlet. Alternatively, a spare raw water pump may be purchased to replace one of the existing raw water pumps in the event that it fails.

- Procure a spare backwash flow meter.

    - In conjunction with this recommendation, it may be useful to centralize the flow meters using a common manufacturer or model number. This will provide commonality of operation and will allow a common supply of spare parts to be used for all of the meters.

- Address shortcomings with the existing flocculation tank.

    - For continued use of the existing flocculation tank, the existing coating system should be addressed as described in the structural recommendations section.

    - If a larger tank that will provide the minimum recommended residence time of 30 minutes is desired, the above modifications can be omitted and the tank can be replaced with a new, 21,000-gallon tank.

      A tank with the same footprint as the existing tank would need to be approximately 21 feet tall (including 1-foot of freboard), which is taller than the existing 13-foot ceiling in the WTP Main Building. Given the maximum tank height of 10.5 feet (to allow for access) including 1-foot of freeboard, a 21,000-gallon tank would have a diameter of approximately 19.5 feet. This size tank will not fit within the existing WTP Main Building footprint without significant other modifications. As such, it is anticipated that modifications to the flocculation tank will be done in conjunction with a larger WTP modifications project and/or remodel effort.

      It should be noted that although a new, larger tank would bring the residence time and mixing energy values closer to theoretical design values, the current flocculation tank does not inhibit the WTP from meeting the current performance requirements.

- Regrade and resurface the raw water pump pit floor to promote good drainage to the sump area and prevent the accumulation of sediments.

- Procure confined space access equipment dedicated to the WTP.

- Relocate existing small diameter piping at the flocculation tank so that piping and conduit located within the tank footprint is minimized.

- Furnish and install additional ladder access to the east side of Filter 1 and 2 and to the west side of Filter 3 and 4.

- Revise CT calculations to include the clearwell volume and an assumed baffling efficiency of 0.1.

- Provide high visibility painting or indicators for the clearwell access hatch.

- Complete transfer pump performance testing.

  Depending on the results of this performance test, repair, rehabilitate, replace, or procure spare equipment for each pump and/or pump motor as required.

- Drain and clean the clearwell.

- Provide additional "Operator in Trouble" motion sensors and alarm systems.

- Replace existing tube-style high level alarm in the flocculation tank.

Finished Water Pump Building

- Replace/test existing finished water pressure gauges.

- Complete finished water pump performance testing.

  Depending on the results of this performance test, repair, rehabilitate, replace, or procure spare equipment for each pump and/or pump motor as required.

- Procure spare finished water pump motor.

- Provide additional “Operator in Trouble” motion sensors and alarm systems.

STRUCTURAL RECOMMENDATIONS

HIGH PRIORITY IMPROVEMENTS

WTP Main Building

- Replace corroded steel supports for miscellaneous items such as conduit, piping, and equipment.

- If the existing floc tank is to be reused, prepare and coat both the interior and exterior of these tanks to prevent additional loss of metal. Preparation should be a minimum of SSPC-SP10 and coatings should be NSF61 approved for use with potable water. Fill the existing void space below the tank with high-strength grout.

- If the existing Filter 1 and 2 is to be reused, prepare and coat the lower 2 feet of the vessel to prevent additional loss of metal. Preparation should be a minimum of SSPC-SP3 or SSPC-SP11 and coatings should be NSF61 approved for use with potable water.

- Perform a detailed structural evaluation of seismic anchorage and bracing of interior components including, but not limited to, anchorage of interior tanks, flexible connections of piping, bracing of piping and conduit, wall-mounted electrical transformers, anchorage and bracing of miscellaneous equipment. A detailed structural evaluation was completed for the District's reservoirs in 2016, but was not completed for the WTP Main Building or Finished Water Pump Building.

- Furnish and install seismic bracing and flexible connections for tanks and other key equipment as identified by the seismic evaluation.

Finished Water Pump Building

- Add additional seismic bracing to electrical conduit in the attic to meet the demands of the design-level earthquake.

- Perform a detailed structural analysis and develop seismic retrofit design to address the deficiencies identified by the Tier 1 evaluation regarding the connection between the roof diaphragm and top of CMU wall. Implement the modifications to the Finished Water Pump Building structure as recommended from the detailed structural seismic evaluation.

RECOMMENDED IMPROVEMENTS

WTP Main Building

- Prepare existing exposed rebar on concrete ceiling to SSPC-11 Standards and coat the exposed metal with appropriate, high quality commercial primer/paint system.

Chlorine Contact Basin

- Perform a formal coating inspection on the interior and exterior of the CCB.

  This inspection should be conducted by a consultant specializing in the testing and inspection of potable water storage facility coating systems. The inspector should be NACE Certified and the coating assessment should include pull tests, metal thickness inspection, a formal visual assessment of the coating system, and any other recommended testing that will assess the viability of the coating system and/or integrity of the steel tank.

- Develop a plan for treatment and disinfection operations during the time period that the CCB is offline for maintenance.

  Pending the results of the coating inspection recommended above, the CCB will require both interior and exterior coating system improvements. During this time period, which can last up to 3 months, the CCB will be unavailable for use and a system should be devised for how disinfection of filtered water will be provided.

ARCHITECTURAL RECOMMENDATIONS

HIGH PRIORITY IMPROVEMENTS

WTP Main Building

- Address the risk for corruption of the electronic equipment at the existing work counter by relocating the electrical equipment to another area of the WTP.

  One alternative to complete this recommendation is to convert the totality of the existing counter space to laboratory and wet-work (sampling, analysis, etc.) and relocate the computer work station. It is anticipated this will be done in conjunction with a larger WTP modifications project and/or remodel effort.

- Remove the soil cover and associated plant growth down to the cast concrete curb that is likely at the base of the existing chain link fence. In addition, heavy, woody debris should be removed from the roof on an annual basis.

- Remove ivy and other plant vegetative growth from building exterior.

- Replace and/or revise the existing safety shower and eyewash systems to be in compliance with ANSI Z358.1.

- Add an effective smoke and fire alarm system. The system should be in accordance with IFC requirements and should include heat/rise and smoke detection systems, and egress pull stations should be linked to the existing SCADA system to notify District staff that an alarm has been activated.

Finished Water Pump Building

- Remove any debris and clean existing roof on an annual basis.

- Add an effective smoke and fire alarm system. The system should be in accordance with IFC requirements and should include heat/rise and smoke detection systems, and egress pull stations should be linked to the existing SCADA system to notify District staff that an alarm has been activated.

RECOMMENDED IMPROVEMENTS

General Architecture

- Investigate alternatives to provide additional site security measures such as fencing, restricted access gates, and cameras. The investigation should address the District's tolerance for risk, public safety, park access, and desired level of security, all in conjunction with other measures and large-scale modifications proposed for the WTP.

WTP Main Building

- Address deteriorating conditions in the restroom. Modifications should include replacement of damaged drywall, new paint, and new fixtures.

- Remove heavy, woody debris from the roof on an annual basis.

- Address wall weeping on the east wall above MCC 3.

- Address leakage at existing storefront windows and above the windows on concrete alcove. This may be addressed by removing damaged or deficient seals and replacing with new materials.

- Address pooling of water on WTP floor to avoid potential hazards. This may be addressed by grinding or grooving the floor to promote drainage to the existing trench, and then recoating the modifications.

- Revise the existing storefront window arrangement to allow for a new, wider door that will facilitate easier delivery of pallets or other large items. It is anticipated this is done in conjunction with a larger plant modifications project and/or remodel effort.

- Relocate stored filter media to another area of the facility, or a new facility in order to provide unhindered access to all sides of Filters 3 and 4. It is anticipated this is done in conjunction with a larger plant modifications project and/or remodel effort.

- Relocate stored/extra/damaged materials in the SE corner of the building to another area of the facility, or to a new facility in order to provide unhindered access to all sides of Filters 1 and 2. It is anticipated this is done in conjunction with a larger plant modifications project and/or remodel effort.

MECHANICAL RECOMMENDATIONS

HIGH PRIORITY IMPROVEMENTS

WTP Main Building

- Investigate current heating schedule and equipment to optimize it for plant operation, staff comfort, protection of equipment, energy efficiency, and cost.

RECOMMENDED IMPROVEMENTS

General Mechanical

- Perform an energy audit to identify the primary source of energy consumption and heat loss.

  This audit should be conducted by Puget Sound Energy or another subconsultant familiar with the function and use of a treatment facility and experienced in providing comprehensive energy audit assessments. The audit should include all components of both the WTP Main Building and Finished Water Pump Building and should identify ways the WTP can reduce its energy footprint and operational costs.

Finished Water Pump Building

- Complete repairs to leak in the generator exhaust piping.

ELECTRICAL RECOMMENDATIONS

HIGH PRIORITY IMPROVEMENTS

General Electrical

- Combine all plant records into a new and complete electrical record set that incorporates all the changes made into a single current as-built for power distribution and controls.

- Perform a complete audit of the electrical system to focus on the electrical reliability of the circuit breakers and fuses in the MCCs as well as safety and code compliance.

  This work is typically completed by a consultant specializing in electrical analysis and various companies perform this work including Vertiv, Eaton's electrical engineering services group, and Siemen's electrical services group.

  This audit should accomplish the following tasks:

  - Identify any deficiencies with the physical condition or operation of electrical distribution equipment that could not be investigated as part of this assessment. This would include buried conduits and/or conductors. Coordinated outages to portions of the WTP facility will be required.

  - Coordinate the circuit breakers and/or list the modifications required to selectively coordinate the system,

  - Provide OSHA compliant labeling for arc and shock hazards, and

  - Identify available fault current at key points in the system and identify which devices to not have sufficient withstand ratings,

  - Recommend a schedule for the replacement of the original circuit breakers.

- Perform an electrical analysis to review the peak demand usage from historical utility bills to evaluate how well the PSE installed transformer is able to meet the facility's needs.

WTP Main Building

- Remove all chemical storage and metering pump equipment from the vicinity of MCC 2 and MCC 3. While the NEC requires at least 42-inches of clear space, 8 to 10 feet is often provided as "good practice" to help protect electrical equipment.

- Install surge protection devices (SPDs) at the first panelboards after the transformer.

- Replace MCC 2 with new equipment including motor starters, circuit breakers, surge protection devices, and VFD load filters.

- Replace MCC 3 with new equipment to address existing component corrosion.

Finished Water Pump Building

- Replace MCC 1 with new equipment including motor starters, circuit breakers, surge protection devices, and VFD load filters.

- Install surge protection devices (SPDs) at the first panelboard downstream of the wall mounted transformer.

RECOMMENDED IMPROVEMENTS

WTP Main Building

- Replace florescent lighting with LED lighting. This replacement should provide a small reduction in energy consumption but will require significantly less maintenance than current light fixtures.

- Replace AC UPS backed systems with DC UPS backed systems for increased reliability.

- Consolidate small panelboards and/or panelboards that are not currently used for their original design intent into fewer panels to provide a simpler, more streamlined distribution system. Address any open conduits to these panels through removal of capping.

- Reroute floor mounted electrical conduits to the walls and/or ceiling in order to eliminate tripping hazard.

- Reroute field wiring within the blue / grey panels manufactured by S&B and QCC through a different pathway, then remove the panel(s) if possible. Alternatively, the panels could be made into junction boxes by removing any remaining control apparatus as well as any connections associated with door mounted devices.

- Assess the likelihood of installing a third transfer pump at the WTP. If a third pump is not likely, remove the existing transfer pump pad and anchors to provide code-compliant clear space in front of MCC 2.

Finished Water Pump Building

- Replace florescent lighting with LED lighting. This replacement should provide a small reduction in energy consumption but will require significantly less maintenance than current light fixtures.

- Continue to test the auxiliary generator under load on a regular basis to ensure that it will successfully provide the necessary power to operate the entire facility. On an annual basis provide a full loading test on the generator using a load bank.

- Investigate options for relocation of existing generator fuel tank.

SUMMARY

Table 3-1 below provides a modification summary, discipline, and location for the High Priority Improvements. Table 3-2 provides this information for the Recommended Improvements. It is important to note that while the recommended improvements are not explicitly and immediately required, they are recommended in order to ensure the longevity of the existing facilities and their ability to provide the desired level of filtration and output.

TABLE 3-1

Sudden Valley WTP High Priority Modifications Summary

Modification	Location[(1)]	Discipline[(2)]
Conduct chlorine disinfection system alternatives analysis	MB	P
Chlorine gas system modifications	MB	P
Alum storage and metering pump system modifications	MB	P
Soda Ash storage and metering pump system modifications	MB	P
Conduct backwash system alternatives analysis	MB	P
Replace existing clearwell and CCB level switches	MB	P
Replace corroded steel supports	MB	S
Prepare and coat steel tanks (Floc, Soda Ash, and Filters 1/2)	MB	S
Install seismic bracing for electrical conduit, electrical equipment, and treatment equipment	MB/FPB	S
Complete detailed structural evaluation	MB/FPB	S
Relocate existing laboratory electrical equipment	MB	A
Remove soil cover, vegetation growth, and organic debris from building exterior and roof	MB	A
Provide water upgrades to safety shower and eyewash	MB	A
Add fire and smoke alarm system	MB/FPB	A
Investigate current heating schedule	MB/FPB	M
Combine all existing plant records into a single as-built planset	MB/FPB	E
Complete a comprehensive electrical system audit	MB/FPB	E
Remove chemicals and metering equipment away from MCCs	MB	E
Review historical peak demand electrical consumption	MB/FPB	E
Replace MCC1 and MCC2 with new, current technology	MB/FPB	E
Replace MCC3 to address panel and interior component corrosion	MB	E

(1) MB = WTP Main Building. FPB = Finished Water Pump Building. CCB = Chlorine Contact Basin.

(2) P = Process, S = Structural, A = Architectural, M = Mechanical, and E = Electrical.

TABLE 3-2

Sudden Valley WTP Recommended Modifications Summary

Modification	Location(1)	Discipline(2)
Modify/repair existing flocculation tank	MB	P
Provide new grout floor within raw water pump pit	MB	P
Drain and clean the clearwell	MB	P
Procure spare backwash flow meter	MB	P
Procure dedicated confined space equipment for the WTP	MB	P
Install additional access ladder to Filters 1 and 2 and Filters 3 and 4	MB	P
Revise CT calculations to include clearwell and BE of 0.1	MB	P
Revise piping and conduit above flocculation tank	MB	P
Provide additional Operator In Trouble alarming equipment	MB/FPB	P
Replacing existing tube-style level alarm at flocculation tank	MB	P
Procure a spare finished water pump motor	FPB	P
Replace existing pressure gauges	FPB	P
Improve the visibility of the existing clearwell hatch	MB	P
Complete a performance test of the raw water, transfer, and finished water pumps	MB/FPB	P
Prepare and coat exposed ceiling rebar	MB	S
Address deficiencies found in 2016 seismic report	CCB	S
Perform formal CCB coating inspection	CCB	S
Address deteriorating conditions in restroom	MB	A
Investigate additional site security measures	MB/FPB	A
Remove heavy organic debris from roof	FPB	A
Repair wall seepage above MCC3	MB	A
Repair seepage/leaks at storefront window assemblies	MB	A
Modify floor to promote drainage to existing trench drain	MB	A
Revise existing storefront window to provide larger door opening	MB	A
Relocate stored filter media and other supplies equipment	MB	A
Conduct energy and heat audit	MB/FPB	M
Repair crack in generator exhaust piping	FPB	M
Conduct annual load testing for existing generator	FPB	E
Replace existing fluorescent light fixtures with LED equipment	MB/FPB	E
Replace AC backed system with DC backed systems	MB/FPB	E
Consolidate existing electrical panelboards	MB/FPB	E
Reroute floor mounted electrical conduit	MB/FPB	E
Reroute field wiring within grey/blue wall mounted panels	MB	E
Modify transfer pump pad based on long-term operations strategy	MB	E
Fuel tank relocation investigation	FPB	E

(1) MB = WTP Main Building. FPB = Finished Water Pump Building. CCB = Chlorine Contact Basin.

(2) P = Process, S = Structural, A = Architectural, M = Mechanical, and E = Electrical.

APPENDIX A

EXISTING FACILITY PHOTOGRAPHS

A1: Sudden Valley WTP

From Left to Right:
East WTP façade. WTP façade. West WTP façade.

A2: Raw Water Pumps

Clockwise from Upper Left:
Raw Water Pump 1 (gold) and 2 (blue). Sediment accumulation on the floor. Raw Water Pump suction piping.

A3: Raw Water Flow Meter and Piping

From Left to Right:

Raw Water Pump discharge piping including Raw Water Flow Meter and Alum injection. Flocculation tank inlet.

A4: Flocculation Tank

Clockwise from Top:
Flocculation Tank corrosion. Flocculation Tank outlet and access ladder. Flocculation Tank priming piping.

A5: Filter Equalization Trough

From Left to Right:
Filters 1 and 2 (foreground), Equalization Trough, and Filters 3 and 4 (background). Equalization trough.

A6: Filters 1 and 2

Clockwise from Left:
Filters 1 and 2 with backwash waste trough. Filters 1 and 2. Filters 1 and 2 backwash waste trough and handrail.

A7: Filters 3 and 4

Clockwise from Left:

Filters 3 and 4. Filters 3 and 4 tank and connecting piping. Filters 3 and 4 backwash waste trough.

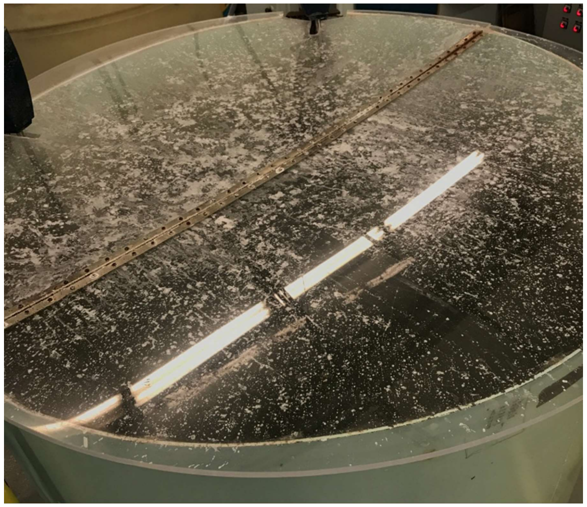
A8: Filtered Water Piping

From Left to Right:
Filters 1 and 2 connecting piping.
Filters 3 and 4 connecting piping.

A9: Alum Dosing Equipment

From Left to Right:
Existing Alum tank. Existing soda ash (left) and alum (right) chemical metering pumps.

A10: Soda Ash Dosing Equipment



Clockwise from Upper Left:
Soda Ash tank and loading platform. Soda ash (left) and alum (right) chemical metering pumps. Soda ash tank hinged access lid.

A11: Clearwell

From Left to Right:
Clearwell interior with staining. Clearwell access lid and ladder.

A12: Clearwell Transfer Pumps

From Left to Right:
Clearwell transfer pumps and connecting piping. Clearwell transfer pumps and discharge piping.

A13: Instrumentation

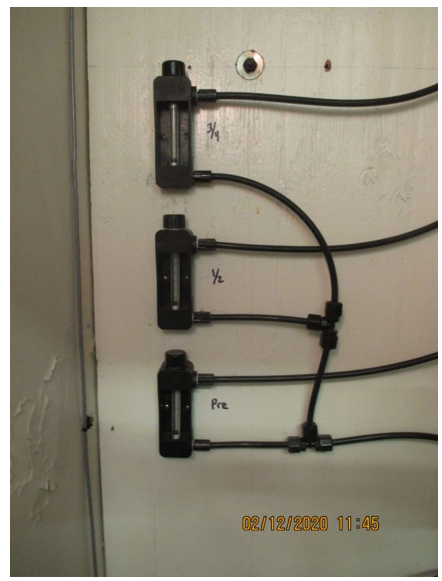
Clockwise from Upper Left:

Raw water quality instrumentation. Finished water quality instrumentation. Raw water flow meter. Finished water quality instrumentation.

A14: Existing Workstation

From Left to Right:
West side of workstation – electrical equipment. East side of workstation – water quality sampling and analysis.

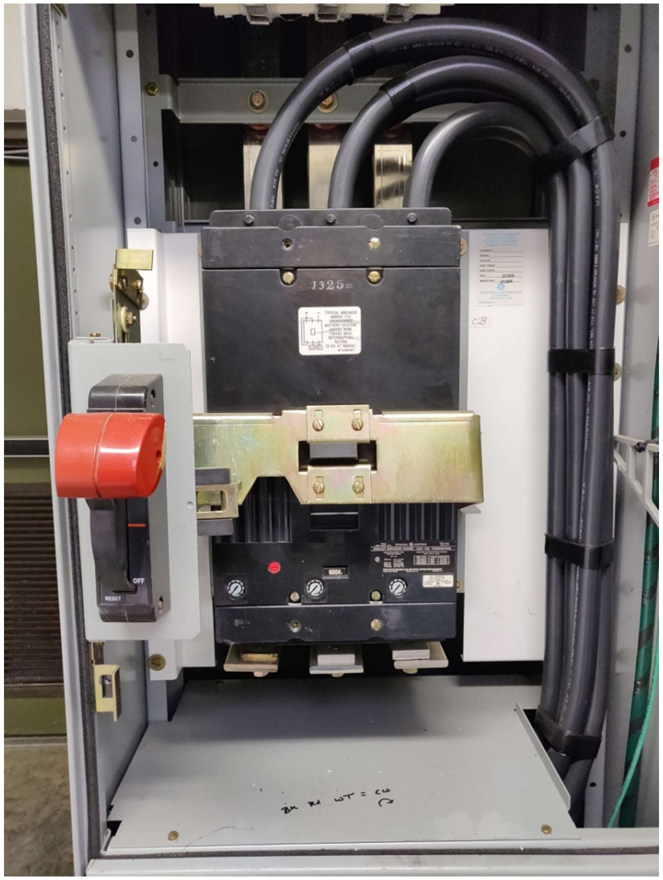
A15: Chlorine Gas Equipment



Clockwise from Upper Left:

Active chlorine gas cylinders and scale. Scale assembly. Gas disinfection flow meters. Chlorine Gas Room exhaust louver

A16: Motor Control Center 1 (MCC1)



From Left to Right:
Finished Water Pump Building MCC 1. Service disconnect.

A17: Motor Control Center 2 (MCC2)

From Left to Right:

WTP Main Building MCC 2. MCC 2.

<u>**A18: Motor Control Center 3 (MCC3)**</u>

Photographed:
WTP Main Building MCC 3.

A19: Finished Water Pump Building

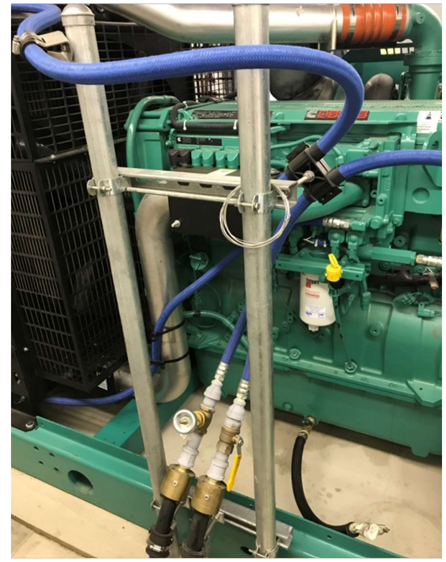
Photographed:
Finished Water Pump Building north façade.

A20: Finished Water Pumps

From Left to Right:

Finished water pumps and suction piping. Finished water pumps and discharge piping.

A21: Auxiliary Generator



Clockwise from Left:
Auxiliary generator with washing machine and intake louver (background). Auxiliary generator. Auxiliary generator.

A22: External Generator Diesel Fuel Tank

From Left to Right:
Auxiliary generator diesel fuel tank. Auxiliary genitor diesel fuel tank and Finished Water Pump Building south façade.

A23: Chlorine Contact Basin (CCB)

Clockwise from Upper Left:
CCB algae and corrosion. CCB with west manway. CCB interior access ladder. CCB external sight gauge. CCB east wall.

APPENDIX B

DAILY MONITORING REPORT INFORMATION

Health

Water Treatment Plant Monthly Report Form

Month: 1 Year: 2018

PWS ID: 959101
Source ID: S01
PWS Name: Lake Whatcom Water & Sewer Dist
Source Name: Lake Whatcom
County: Whatcom
Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled
1	494.0	11.87	39.9	6.0	54.9	n/a	n/a	63.9	n/a	n/a	n/a	0.48	n/a
2	595.0	14.36	39.7	9.0	66.4	n/a	n/a	77.4	n/a	n/a	n/a	0.39	n/a
3	470.9	11.26	40.2	7.0	52.1	n/a	n/a	60.7	n/a	n/a	n/a	0.47	n/a
4	498.9	11.99	39.3	8.0	55.4	n/a	n/a	64.6	n/a	n/a	n/a	0.47	n/a
5	488.6	11.65	39.5	6.0	53.9	n/a	n/a	62.8	n/a	n/a	n/a	0.53	n/a
6	518.1	12.40	39.4	8.0	57.3	n/a	n/a	66.8	n/a	n/a	n/a	0.56	n/a
7	501.7	11.99	39.8	6.0	55.4	n/a	n/a	64.6	n/a	n/a	n/a	0.57	n/a
8	519.9	12.55	39.3	9.0	58.0	n/a	n/a	67.6	n/a	n/a	n/a	0.50	n/a
9	527.5	12.61	39.3	5.0	58.3	n/a	n/a	68.0	n/a	n/a	n/a	0.59	n/a
10	436.0	10.47	39.2	8.0	48.4	n/a	n/a	56.4	n/a	n/a	n/a	0.62	n/a
11	478.6	11.42	39.1	6.0	52.8	n/a	n/a	61.5	n/a	n/a	n/a	0.53	n/a
12	483.0	11.57	40.1	7.0	53.5	n/a	n/a	62.3	n/a	n/a	n/a	0.56	n/a
13	477.0	11.38	39.2	8.0	52.6	n/a	n/a	61.3	n/a	n/a	n/a	0.57	n/a
14	564.7	13.53	39.5	9.0	62.5	n/a	n/a	72.9	n/a	n/a	n/a	0.63	n/a
15	423.9	10.12	38.7	9.0	46.8	n/a	n/a	54.5	n/a	n/a	n/a	0.57	n/a
16	545.5	13.08	39.4	8.0	60.5	n/a	n/a	70.5	n/a	n/a	n/a	0.49	n/a
17	458.1	10.94	39.3	8.0	50.6	n/a	n/a	59.0	n/a	n/a	n/a	0.55	n/a
18	522.6	12.49	38.8	5.0	57.8	n/a	n/a	67.3	n/a	n/a	n/a	0.38	n/a
19	470.4	11.24	39.1	7.0	51.9	n/a	n/a	60.5	n/a	n/a	n/a	0.43	n/a
20	433.8	10.36	39.1	8.0	47.9	n/a	n/a	55.8	n/a	n/a	n/a	0.41	n/a
21	531.7	12.70	39.3	7.0	58.7	n/a	n/a	68.4	n/a	n/a	n/a	0.60	n/a
22	506.2	12.12	39.0	8.0	56.0	n/a	n/a	65.3	n/a	n/a	n/a	0.58	n/a
23	493.3	11.79	39.2	7.0	54.5	n/a	n/a	63.5	n/a	n/a	n/a	0.58	n/a
24	459.5	10.99	39.1	7.0	50.8	n/a	n/a	59.2	n/a	n/a	n/a	0.67	n/a
25	471.7	11.28	39.1	8.0	52.1	n/a	n/a	60.8	n/a	n/a	n/a	0.55	n/a
26	502.7	12.01	40.2	6.0	55.5	n/a	n/a	64.7	n/a	n/a	n/a	0.50	n/a
27	463.9	11.09	38.9	7.0	51.3	n/a	n/a	59.8	n/a	n/a	n/a	0.66	n/a
28	532.9	12.74	39.2	8.0	58.9	n/a	n/a	68.6	n/a	n/a	n/a	0.57	n/a
29	493.7	11.79	38.8	10.0	54.5	n/a	n/a	63.5	n/a	n/a	n/a	0.60	n/a
30	491.0	11.74	38.7	6.0	54.3	n/a	n/a	63.3	n/a	n/a	n/a	0.63	n/a
31	499.5	11.9	39.0	8.0	55.2	n/a	n/a	64.3	n/a	n/a	n/a	0.64	n/a
Total	15354	367.5	1,218	229.0	1,698.6	0.0	0.0	1,980.1	0.0	0.0	0.0		
Avg	495	11.9	39.30	7.4	54.8			63.9				0.54	

Date	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin
1	0.04				0.05	0.04	0.04	0	0.05	91.0	6.4	7.6	7.4	n/a	n/a	n/a
2	0.05			0.05	0.04	0.04	0.05	0	0.05	88.3	6.4	7.6	7.4	n/a	n/a	n/a
3				0.05	0.04	0.04	0.04	0	0.05	90.7	6.3	7.6	7.4	n/a	n/a	n/a
4				0.05	0.04	0.04	0.04	0	0.05	90.8	6.2	7.6	7.4	n/a	n/a	n/a
5				0.06	0.04	0.05	0.05	0	0.06	90.5	6.3	7.5	7.3	n/a	n/a	n/a
6	0.05			0.05	0.04	0.05	0.05	0	0.05	91.6	6.3	7.5	7.3	n/a	n/a	n/a
7				0.05	0.04	0.04	0.04	0	0.05	92.5	6.3	7.5	7.3	n/a	n/a	n/a
8	0.04			0.05	0.04	0.04	0.04	0	0.05	91.4	6.3	7.5	7.3	n/a	n/a	n/a
9	0.05			0.05	0.04	0.04	0.05	0	0.05	92.4	6.3	7.5	7.3	n/a	n/a	n/a
10				0.05	0.03	0.04	0.04	0	0.05	93.6	6.2	7.6	7.3	n/a	n/a	n/a
11				0.05	0.04	0.04	0.04	0	0.05	91.9	6.1	7.6	7.2	n/a	n/a	n/a
12				0.05	0.04	0.04	0.04	0	0.05	92.3	6.2	7.5	7.3	n/a	n/a	n/a
13				0.05	0.04	0.04	0.04	0	0.05	92.4	6.2	7.5	7.3	n/a	n/a	n/a
14	0.05			0.05	0.04	0.04	0.05	0	0.05	92.8	6.2	7.5	7.4	n/a	n/a	n/a
15				0.05	0.04	0.05	0.05	0	0.05	91.8	6.3	7.5	7.4	n/a	n/a	n/a
16	0.05			0.05	0.03	0.04	0.04	0	0.05	91.3	6.3	7.5	7.4	n/a	n/a	n/a
17				0.06	0.04	0.04	0.05	0	0.06	91.5	6.3	7.5	7.3	n/a	n/a	n/a
18	0.04			0.05	0.04	0.05	0.05	0	0.05	88.2	6.3	7.5	7.4	n/a	n/a	n/a
19				0.06	0.04	0.05	0.05	0	0.06	88.2	6.3	7.5	7.3	n/a	n/a	n/a
20				0.05	0.03	0.04	0.04	0	0.05	90.3	6.3	7.5	7.3	n/a	n/a	n/a
21	0.04			0.06	0.04	0.04	0.05	0	0.06	92.5	6.2	7.5	7.3	n/a	n/a	n/a
22	0.04			0.05	0.03	0.04	0.04	0	0.05	93.1	6.2	7.5	7.3	n/a	n/a	n/a
23				0.05	0.04	0.04	0.04	0	0.05	92.6	6.1	7.5	7.3	n/a	n/a	n/a
24				0.05	0.04	0.05	0.05	0	0.05	93.0	6.1	7.5	7.3	n/a	n/a	n/a
25				0.05	0.04	0.04	0.04	0	0.05	92.0	6.0	7.6	7.3	n/a	n/a	n/a
26	0.03			0.05	0.04	0.04	0.04	0	0.05	92.0	0.0	7.6	7.3	n/a	n/a	n/a
27				0.05	0.04	0.05	0.05	0	0.05	92.9	6.1	7.6	7.4	n/a	n/a	n/a
28	0.05			0.06	0.04	0.04	0.05	0	0.06	91.7	6.1	7.6	7.5	n/a	n/a	n/a
29				0.06	0.04	0.04	0.05	0	0.06	92.2	6.1	7.6	7.4	n/a	n/a	n/a
30	0.04			0.06	0.03	0.04	0.04	0	0.06	93.2	6.1	7.6	7.4	n/a	n/a	n/a
31				0.05	0.03	0.03	0.04	0	0.05	94.3	6.1	7.6	7.4	n/a	n/a	n/a
Total								0								
Avg							0.04			91.7	6.0	7.5	7.3			

Total number of CFE samples analyzed for month: N = 105

Total number of CFE samples exceeding 0.3 NTU: E = 0

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verfication of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y Max variation (NTU) 0.03

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Date of last filter inspection 5/3/2017 # filters with more than 10 percent media loss 0

Report Submitted By Kevin Cook Signature

DOH Form #331-023-F (Excel version)

Health

Water Treatment Plant Monthly Report Form

Month: 2 Year: 2018

PWS ID: 959101 PWS Name: Lake Whatcom Water & Sewer Dist County: Whatcom

Source ID: S01 Source Name: Lake Whatcom Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled
1	432.1	10.34	38.9	8.0	47.8	n/a	n/a	55.7	n/a	n/a	n/a	0.74	n/a
2	515.1	12.33	39.0	10.0	57.0	n/a	n/a	66.4	n/a	n/a	n/a	0.70	n/a
3	502.6	12.01	38.6	6.0	55.5	n/a	n/a	64.7	n/a	n/a	n/a	0.72	n/a
4	531.1	12.71	39.2	7.0	58.8	n/a	n/a	68.5	n/a	n/a	n/a	0.63	n/a
5	545.0	13.09	39.2	7.0	60.5	n/a	n/a	70.5	n/a	n/a	n/a	1.36	n/a
6	496.9	11.89	39.0	10.0	54.9	n/a	n/a	64.0	n/a	n/a	n/a	1.01	n/a
7	418.8	10.09	38.7	8.0	46.7	n/a	n/a	54.4	n/a	n/a	n/a	1.36	n/a
8	541.6	13.06	39.8	7.0	60.4	n/a	n/a	70.4	n/a	n/a	n/a	0.86	n/a
9	532.6	12.73	39.1	5.0	58.9	n/a	n/a	68.6	n/a	n/a	n/a	0.84	n/a
10	524.2	12.69	38.8	8.0	58.7	n/a	n/a	68.4	n/a	n/a	n/a	1.00	n/a
11	510.3	12.27	39.2	6.0	56.7	n/a	n/a	66.1	n/a	n/a	n/a	1.01	n/a
12	565.1	13.78	40.0	8.0	63.7	n/a	n/a	74.3	n/a	n/a	n/a	1.11	n/a
13	530.0	12.71	39.7	7.0	58.7	n/a	n/a	68.5	n/a	n/a	n/a	0.84	n/a
14	517.9	12.41	39.5	7.0	57.3	n/a	n/a	66.8	n/a	n/a	n/a	0.71	n/a
15	484.8	11.63	39.7	7.0	53.7	n/a	n/a	62.6	n/a	n/a	n/a	0.78	n/a
16	512.6	12.26	39.4	9.0	56.7	n/a	n/a	66.0	n/a	n/a	n/a	0.66	n/a
17	532.1	12.73	39.4	7.0	58.8	n/a	n/a	68.6	n/a	n/a	n/a	0.70	n/a
18	515.7	12.36	39.5	8.0	57.1	n/a	n/a	66.6	n/a	n/a	n/a	0.72	n/a
19	615.2	14.81	39.1	9.0	68.5	n/a	n/a	79.8	n/a	n/a	n/a	0.67	n/a
20	477.3	11.41	39.4	7.0	52.7	n/a	n/a	61.5	n/a	n/a	n/a	0.80	n/a
21	440.4	10.55	40.5	6.0	48.8	n/a	n/a	56.8	n/a	n/a	n/a	0.96	n/a
22	472.2	11.29	39.5	6.0	52.2	n/a	n/a	60.8	n/a	n/a	n/a	0.90	n/a
23	492.9	11.79	40.2	8.0	54.5	n/a	n/a	63.5	n/a	n/a	n/a	0.55	n/a
24	424.5	10.14	39.7	5.0	46.9	n/a	n/a	54.6	n/a	n/a	n/a	0.59	n/a
25	522.2	12.51	40.2	7.0	57.8	n/a	n/a	67.4	n/a	n/a	n/a	0.51	n/a
26	507.4	12.15	39.9	6.0	56.2	n/a	n/a	65.5	n/a	n/a	n/a	0.51	n/a
27	468.4	11.20	39.8	6.0	51.8	n/a	n/a	60.4	n/a	n/a	n/a	0.87	n/a
28	472.6	11.41	39.9	6.0	52.7	n/a	n/a	61.5	n/a	n/a	n/a	0.56	n/a
29						n/a	n/a		n/a	n/a	n/a		n/a
30						n/a	n/a		n/a	n/a	n/a		n/a
31						n/a	n/a		n/a	n/a	n/a		n/a
Total	14102	338.3	1,105	201.0	1,564.0	0.0	0.0	1,823.1	0.0	0.0	0.0		
Avg	504	12.1	39.46	7.2	55.9			65.1				0.81	

Date	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin
1				0.05	0.03	0.04	0.04	0	0.05	94.6	6.1	7.5	7.4	n/a	n/a	n/a
2	0.04			0.06	0.04	0.04	0.05	0	0.06	93.6	6.1	7.5	7.3	n/a	n/a	n/a
3	0.04			0.06	0.03	0.04	0.04	0	0.06	94.1	6.1	7.5	7.0	n/a	n/a	n/a
4	0.04			0.06	0.04	0.04	0.05	0	0.06	92.9	6.2	7.5	7.4	n/a	n/a	n/a
5	0.04			0.05	0.04	0.04	0.04	0	0.05	96.9	6.1	7.6	7.4	n/a	n/a	n/a
6				0.05	0.04	0.04	0.04	0	0.05	95.7	6.2	7.5	7.3	n/a	n/a	n/a
7				0.05	0.04	0.04	0.04	0	0.05	96.8	6.2	7.4	7.3	n/a	n/a	n/a
8	0.04			0.05	0.04	0.04	0.04	0	0.05	95.1	6.1	7.5	7.3	n/a	n/a	n/a
9			0.05	0.03	0.03	0.03	0.04	0	0.05	95.8	6.1	7.6	7.4	n/a	n/a	n/a
10	0.04			0.05	0.04	0.04	0.04	0	0.05	95.7	6.2	7.6	7.4	n/a	n/a	n/a
11			0.06	0.04	0.03	0.03	0.04	0	0.06	96.0	6.2	7.6	7.4	n/a	n/a	n/a
12	0.04			0.05	0.04	0.05	0.05	0	0.05	96.0	6.1	7.6	7.4	n/a	n/a	n/a
13	0.03			0.05	0.05	0.05	0.05	0	0.05	94.7	6.0	7.6	7.4	n/a	n/a	n/a
14	0.03			0.05	0.03	0.04	0.04	0	0.05	94.7	6.0	7.6	7.3	n/a	n/a	n/a
15				0.05	0.04	0.04	0.04	0	0.05	94.5	6.0	7.6	7.3	n/a	n/a	n/a
16	0.05			0.05	0.04	0.04	0.05	0	0.05	93.2	5.9	7.6	7.4	n/a	n/a	n/a
17	0.04			0.05	0.04	0.04	0.04	0	0.05	93.9	5.9	7.6	7.4	n/a	n/a	n/a
18	0.04			0.05	0.03	0.03	0.04	0	0.05	94.8	5.8	7.7	7.5	n/a	n/a	n/a
19	0.04			0.05	0.04	0.04	0.04	0	0.05	93.6	5.8	7.7	7.5	n/a	n/a	n/a
20				0.05	0.03	0.03	0.04	0	0.05	95.4	5.7	7.7	7.5	n/a	n/a	n/a
21					0.05	0.04	0.05	0	0.05	95.3	5.4	7.8	7.5	n/a	n/a	n/a
22	0.05				0.05	0.04	0.05	0	0.05	94.8	5.7	7.3	7.5	n/a	n/a	n/a
23				0.05	0.03	0.04	0.04	0	0.05	92.7	5.6	7.3	7.5	n/a	n/a	n/a
24				0.05	0.04	0.05	0.05	0	0.05	92.1	5.6	7.3	7.5	n/a	n/a	n/a
25	0.05			0.05	0.04	0.04	0.05	0	0.05	91.1	5.6	7.3	7.5	n/a	n/a	n/a
26	0.04			0.05	0.04	0.04	0.04	0	0.05	91.6	5.6	7.3	7.5	n/a	n/a	n/a
27	0.05				0.05	0.03	0.04	0	0.05	95.0	5.6	7.3	7.4	n/a	n/a	n/a
28	0.04				0.05	0.04	0.04	0	0.05	92.3	5.4	7.6	7.3	n/a	n/a	n/a
29									0.00					n/a	n/a	n/a
30									0.00					n/a	n/a	n/a
31									0.00					n/a	n/a	n/a
Total								0								
Avg							0.04			94.4	5.9	7.5	7.4			

Total number of CFE samples analyzed for month: N = 100

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection: 5/3/2017 # filters with more than 10 percent media loss: 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verfication of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y Max variation (NTU) 0.03

Report Submitted By: Kevin Cook Signature:

DOH Form #331-023-F (Excel version)

Water Treatment Plant Monthly Report Form

Health

Month: 3 | Year: 2018

PWS ID: 959101 | PWS Name: Lake Whatcom Water & Sewer Dist | County: Whatcom
Source ID: S01 | Source Name: Lake Whatcom | Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin
1	504.5	12.06	39.6	6.0	55.7	n/a	n/a	65.0	n/a	n/a	n/a	0.59	n/a	0.04			0.05	0.03	0.03	0.04	0	0.05	93.6	5.4	7.5	7.2	n/a	n/a	n/a
2	491.1	11.79	40.0	6.0	54.5	n/a	n/a	63.5	n/a	n/a	n/a	0.54	n/a				0.05	0.04	0.04	0.04	0	0.05	92.0	5.4	7.5	7.3	n/a	n/a	n/a
3	464.9	11.10	39.4	8.0	51.3	n/a	n/a	59.8	n/a	n/a	n/a	0.54	n/a				0.05	0.03	0.03	0.04	0	0.05	93.1	5.5	7.4	7.3	n/a	n/a	n/a
4	442.1	10.67	39.5	8.0	49.3	n/a	n/a	57.5	n/a	n/a	n/a	0.56	n/a				0.05	0.03	0.03	0.04	0	0.05	93.5	5.4	7.4	7.3	n/a	n/a	n/a
5	608.7	14.88	39.8	9.0	68.8	n/a	n/a	80.2	n/a	n/a	n/a	0.53	n/a	0.04			0.05	0.04	0.04	0.04	0	0.05	92.0	5.5	7.4	7.2	n/a	n/a	n/a
6	481.7	11.53	39.7	6.0	53.3	n/a	n/a	62.1	n/a	n/a	n/a	0.53	n/a				0.05	0.04	0.04	0.04	0	0.05	91.7	5.5	7.4	7.1	n/a	n/a	n/a
7	481.0	11.51	39.5	7.0	53.2	n/a	n/a	62.0	n/a	n/a	n/a	0.57	n/a				0.05	0.04	0.04	0.04	0	0.05	92.4	5.5	7.4	7.2	n/a	n/a	n/a
8	447.3	10.73	44.6	7.0	49.6	n/a	n/a	57.8	n/a	n/a	n/a	0.53	n/a				0.05	0.04	0.04	0.04	0	0.05	91.8	5.5	7.4	7.2	n/a	n/a	n/a
9	507.6	12.13	40.0	7.0	56.1	n/a	n/a	65.4	n/a	n/a	n/a	0.52	n/a	0.05			0.05	0.03	0.04	0.04	0	0.05	91.8	5.5	7.4	7.2	n/a	n/a	n/a
10	500.4	11.98	39.0	8.0	55.4	n/a	n/a	64.5	n/a	n/a	n/a	0.48	n/a				0.05	0.04	0.05	0.05	0	0.05	90.3	5.5	7.4	7.2	n/a	n/a	n/a
11	511.8	12.25	39.1	8.0	56.6	n/a	n/a	66.0	n/a	n/a	n/a	0.49	n/a	0.05			0.05	0.03	0.04	0.04	0	0.05	91.4	5.5	7.4	7.2	n/a	n/a	n/a
12	538.3	12.95	43.0	9.0	59.9	n/a	n/a	69.8	n/a	n/a	n/a	0.51	n/a	0.04			0.05	0.03	0.03	0.04	0	0.05	92.7	5.6	7.4	7.2	n/a	n/a	n/a
13	477.6	11.46	39.3	8.0	53.0	n/a	n/a	61.8	n/a	n/a	n/a	0.48	n/a				0.05	0.04	0.03	0.04	0	0.05	91.6	5.7	7.4	7.4	n/a	n/a	n/a
14	462.1	11.10	39.2	7.0	51.3	n/a	n/a	59.8	n/a	n/a	n/a	0.53	n/a				0.04	0.04	0.04	0.04	0	0.04	92.4	5.6	7.3	7.4	n/a	n/a	n/a
15	475.4	11.39	38.9	8.0	52.6	n/a	n/a	61.4	n/a	n/a	n/a	0.48	n/a				0.04	0.06	0.05	0.05	0	0.06	89.6	5.7	7.4	7.4	n/a	n/a	n/a
16	454.7	10.89	39.1	7.0	50.3	n/a	n/a	58.7	n/a	n/a	n/a	0.53	n/a				0.04	0.04	0.03	0.04	0	0.04	93.0	5.7	7.4	7.4	n/a	n/a	n/a
17	490.6	11.73	38.9	7.0	54.2	n/a	n/a	63.2	n/a	n/a	n/a	0.49	n/a				0.04	0.04	0.03	0.04	0	0.04	92.5	5.6	7.3	7.4	n/a	n/a	n/a
18	504.7	12.10	39.1	8.0	55.9	n/a	n/a	65.2	n/a	n/a	n/a	0.49	n/a	0.03			0.04	0.04	0.04	0.04	0	0.04	92.3	5.8	7.3	7.5	n/a	n/a	n/a
19	578.2	13.87	38.8	8.0	64.1	n/a	n/a	74.7	n/a	n/a	n/a	0.48	n/a	0.05			0.04	0.03	0.02	0.04	0	0.05	92.7	5.7	7.4	7.4	n/a	n/a	n/a
20	482.0	11.51	39.0	8.0	53.2	n/a	n/a	62.0	n/a	n/a	n/a	0.48	n/a				0.04	0.03	0.03	0.03	0	0.04	93.0	5.7	7.3	7.3	n/a	n/a	n/a
21	474.0	11.34	38.9	6.0	52.4	n/a	n/a	61.1	n/a	n/a	n/a	0.45	n/a				0.04	0.04	0.04	0.04	0	0.04	91.1	5.8	7.3	7.3	n/a	n/a	n/a
22	478.7	11.45	39.1	7.0	52.9	n/a	n/a	61.7	n/a	n/a	n/a	0.52	n/a				0.04	0.04	0.04	0.04	0	0.04	92.3	5.6	7.3	7.4	n/a	n/a	n/a
23	457.3	10.92	39.9	5.0	50.5	n/a	n/a	58.8	n/a	n/a	n/a	0.89	n/a				0.03	0.03	0.04	0.03	0	0.04	96.3	5.7	7.3	7.4	n/a	n/a	n/a
24	474.9	11.34	39.8	7.0	52.4	n/a	n/a	61.1	n/a	n/a	n/a	0.87	n/a				0.04	0.03	0.04	0.04	0	0.04	95.8	5.8	7.3	7.3	n/a	n/a	n/a
25	522.5	12.50	38.9	8.0	57.8	n/a	n/a	67.4	n/a	n/a	n/a	0.91	n/a	0.04			0.04	0.03	0.04	0.04	0	0.04	95.9	6.0	7.3	7.3	n/a	n/a	n/a
26	526.5	12.68	39.1	7.0	58.6	n/a	n/a	68.3	n/a	n/a	n/a	0.42	n/a				0.05	0.03	0.03	0.04	0	0.05	91.4	5.7	7.2	7.3	n/a	n/a	n/a
27	465.2	11.11	39.0	6.0	51.4	n/a	n/a	59.9	n/a	n/a	n/a	0.44	n/a				0.04	0.03	0.03	0.03	0	0.04	92.4	5.8	7.2	7.3	n/a	n/a	n/a
28	494.4	11.85	38.8	8.0	54.8	n/a	n/a	63.9	n/a	n/a	n/a	0.61	n/a				0.05	0.03	0.02	0.03	0	0.05	94.5	6.0	7.2	7.3	n/a	n/a	n/a
29	442.6	10.56	39.2	7.0	48.8	n/a	n/a	56.9	n/a	n/a	n/a	0.49	n/a				0.06	0.03	0.03	0.04	0	0.06	91.9	6.0	7.2	7.3	n/a	n/a	n/a
30	470.4	11.27	38.7	5.0	52.1	n/a	n/a	60.7	n/a	n/a	n/a	0.46	n/a				0.06	0.04	0.04	0.05	0	0.06	89.9	6.1	7.2	7.3	n/a	n/a	n/a
31	423.4	10.1	38.8	7.0	46.8	n/a	n/a	54.6	n/a	n/a	n/a	0.40	n/a				0.06	0.03	0.04	0.04	0	0.06	89.1	6.2	7.2	7.1	n/a	n/a	n/a
Total	15137	362.8	1,226	223.0	1,676.9	0.0	0.0	1,954.7	0.0	0.0	0.0										0								
Avg	488	11.7	39.54	7.2	54.1			63.1				0.54								0.04			92.4	5.7	7.3	7.3			

Total number of CFE samples analyzed for month: N = 101

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in) — Anthracite: 18" | Sand: 9" | Garnet: 9"

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection: 5/3/2017

filters with more than 10 percent media loss: 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verfication of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y

Max variation (NTU): 0.04

Report Submitted By: Kevin Cook

Signature:

DOH Form #331-023-F (Excel version)

Health

Water Treatment Plant Monthly Report Form

Month: 4 Year: 2018

PWS ID: 959101 | PWS Name: Lake Whatcom Water & Sewer Dist | County: Whatcom
Source ID: S01 | Source Name: Lake Whatcom | Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin
1	544.2	13.13	39.5	9.0	60.7	n/a	n/a	70.8	n/a	n/a	n/a	0.43	n/a	0.04			0.06	0.03	0.03	0.04	0	0.06	90.8	6.0	7.1	7.2	n/a	n/a	n/a
2	517.3	12.43	38.8	11.0	57.4	n/a	n/a	67.0	n/a	n/a	n/a	0.50	n/a	0.03			0.05	0.03	0.04	0.04	0	0.05	92.5	6.0	7.2	7.3	n/a	n/a	n/a
3	446.9	10.69	38.8	6.0	49.4	n/a	n/a	57.6	n/a	n/a	n/a	0.45	n/a				0.04	0.03	0.03	0.03	0	0.04	92.5	5.9	7.1	7.3	n/a	n/a	n/a
4	503.8	12.02	38.8	5.0	55.6	n/a	n/a	64.8	n/a	n/a	n/a	0.38	n/a				0.05	0.04	0.04	0.04	0	0.05	88.6	6.3	7.1	7.2	n/a	n/a	n/a
5	489.5	11.70	39.0	8.0	54.1	n/a	n/a	63.0	n/a	n/a	n/a	0.41	n/a				0.05	0.03	0.03	0.04	0	0.05	91.0	6.2	7.1	7.1	n/a	n/a	n/a
6	443.5	10.62	38.7	6.0	49.1	n/a	n/a	57.2	n/a	n/a	n/a	0.40	n/a				0.04	0.02	0.03	0.03	0	0.04	92.5	6.3	7.1	7.1	n/a	n/a	n/a
7	481.9	11.49	38.9	5.0	53.1	n/a	n/a	61.9	n/a	n/a	n/a	0.41	n/a				0.03	0.03	0.03	0.03	0	0.03	92.6	5.9	7.0	7.3	n/a	n/a	n/a
8	484.6	11.57	38.6	7.0	53.5	n/a	n/a	62.3	n/a	n/a	n/a	0.43	n/a				0.05	0.03	0.03	0.04	0	0.05	91.4	6.0	7.0	7.3	n/a	n/a	n/a
9	527.8	12.61	39.0	8.0	58.3	n/a	n/a	67.9	n/a	n/a	n/a	0.41	n/a	0.03			0.05	0.02	0.03	0.03	0	0.05	92.1	6.4	7.0	7.2	n/a	n/a	n/a
10	540.9	12.93	39.5	7.0	59.8	n/a	n/a	69.7	n/a	n/a	n/a	0.45	n/a	0.03			0.05	0.03	0.02	0.03	0	0.05	92.7	6.3	6.9	7.3	n/a	n/a	n/a
11	416.6	9.96	38.8	7.0	46.1	n/a	n/a	53.7	n/a	n/a	n/a	0.50	n/a				0.04	0.03	0.03	0.03	0	0.04	93.3	6.1	7.0	7.3	n/a	n/a	n/a
12	547.6	13.09	38.5	8.0	60.5	n/a	n/a	70.5	n/a	n/a	n/a	0.53	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	93.9	6.4	7.0	7.4	n/a	n/a	n/a
13	484.5	11.58	39.0	8.0	53.5	n/a	n/a	62.4	n/a	n/a	n/a	0.55	n/a				0.05	0.03	0.03	0.04	0	0.05	93.3	6.2	7.0	7.4	n/a	n/a	n/a
14	499.7	12.05	39.1	7.0	55.7	n/a	n/a	64.9	n/a	n/a	n/a	0.50	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	93.5	6.4	7.1	7.3	n/a	n/a	n/a
15	481.0	11.49	38.7	6.0	53.1	n/a	n/a	61.9	n/a	n/a	n/a	0.52	n/a				0.05	0.04	0.04	0.04	0	0.05	91.6	6.6	7.1	7.2	n/a	n/a	n/a
16	555.8	13.28	39.1	8.0	61.4	n/a	n/a	71.6	n/a	n/a	n/a	0.40	n/a	0.04			0.05	0.03	0.04	0.04	0	0.05	90.0	6.1	7.1	7.2	n/a	n/a	n/a
17	580.8	13.90	38.9	7.0	64.2	n/a	n/a	74.9	n/a	n/a	n/a	0.42	n/a	0.04			0.05	0.03	0.04	0.04	0	0.05	90.5	6.2	7.0	7.3	n/a	n/a	n/a
18	530.4	12.68	38.8	9.0	58.6	n/a	n/a	68.3	n/a	n/a	n/a	0.44	n/a	0.04			0.05	0.03	0.03	0.04	0	0.05	91.5	6.6	7.1	7.3	n/a	n/a	n/a
19	473.0	11.29	38.6	8.0	52.2	n/a	n/a	60.8	n/a	n/a	n/a	0.47	n/a				0.05	0.03	0.03	0.04	0	0.05	92.3	6.8	7.1	7.3	n/a	n/a	n/a
20	462.5	11.04	38.6	6.0	51.0	n/a	n/a	59.5	n/a	n/a	n/a	0.46	n/a				0.05	0.03	0.04	0.04	0	0.05	91.3	6.4	7.1	7.3	n/a	n/a	n/a
21	495.1	11.81	49.5	7.0	54.6	n/a	n/a	63.6	n/a	n/a	n/a	0.44	n/a				0.05	0.03	0.03	0.04	0	0.05	91.7	6.4	7.1	7.3	n/a	n/a	n/a
22	562.7	13.43	40.3	9.0	62.1	n/a	n/a	72.4	n/a	n/a	n/a	0.47	n/a	0.03			0.05	0.02	0.03	0.03	0	0.05	93.1	6.8	7.1	7.4	n/a	n/a	n/a
23	494.6	11.81	39.5	9.0	54.6	n/a	n/a	63.6	n/a	n/a	n/a	0.52	n/a				0.05	0.03	0.03	0.04	0	0.05	92.9	6.6	7.1	7.4	n/a	n/a	n/a
24	508.4	12.14	38.4	7.0	56.1	n/a	n/a	65.4	n/a	n/a	n/a	0.64	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	94.9	6.4	7.0	7.3	n/a	n/a	n/a
25	492.5	11.76	38.5	7.0	54.4	n/a	n/a	63.4	n/a	n/a	n/a	0.79	n/a				0.04	0.03	0.03	0.03	0	0.04	95.8	6.4	7.0	7.3	n/a	n/a	n/a
26	495.3	11.82	38.6	8.0	54.6	n/a	n/a	63.7	n/a	n/a	n/a	0.95	n/a				0.04	0.03	0.04	0.04	0	0.04	96.1	6.7	7.0	7.3	n/a	n/a	n/a
27	474.5	11.33	38.7	8.0	52.4	n/a	n/a	61.1	n/a	n/a	n/a	0.97	n/a				0.04	0.03	0.04	0.04	0	0.04	96.2	6.4	7.0	7.3	n/a	n/a	n/a
28	488.6	11.66	38.7	7.0	53.9	n/a	n/a	62.8	n/a	n/a	n/a	1.19	n/a				0.04	0.03	0.02	0.03	0	0.04	97.5	6.5	6.9	7.3	n/a	n/a	n/a
29	493.4	11.78	38.7	7.0	54.4	n/a	n/a	63.4	n/a	n/a	n/a	1.17	n/a				0.04	0.02	0.03	0.03	0	0.04	97.4	6.7	6.9	7.3	n/a	n/a	n/a
30	571.1	13.63	38.7	8.0	63.0	n/a	n/a	73.5	n/a	n/a	n/a	0.38	n/a	0.04			0.05	0.02	0.02	0.03	0	0.05	91.4	6.5	6.9	7.3	n/a	n/a	n/a
31						n/a	n/a		n/a	n/a	n/a		n/a									0.00					n/a	n/a	n/a
Total	15089	360.7	1,177	223.0	1,667.3	0.0	0.0	1,943.5	0.0	0.0	0.0										0								
Avg	503	12.0	39.24	7.4	55.6			64.8				0.55								0.04			92.8	6.3	7.0	7.3			

Total number of CFE samples analyzed for month: N = 102

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection 5/3/2017 # filters with more than 10 percent media loss 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verfication of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y Max variation (NTU) 0.04

Report Submitted By Kevin Cook Signature

DOH Form #331-023-F (Excel version)

Water Treatment Plant Monthly Report Form

Washington State Department of Health

Month: 5 Year: 2018

PWS ID:
Source ID: S01
PWS Name: Lake Whatcom Water & Sewer Dist
Source Name: Lake Whatcom
County: Whatcom
Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs): Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU: Raw	Settled
1	473.0	11.29	37.7	7.0	52.2	n/a	n/a	60.8	n/a	n/a	n/a	0.338	n/a
2	484.7	11.57	36.9	6.0	53.5	n/a	n/a	62.4	n/a	n/a	n/a	0.331	n/a
3	528.5	12.61	40.6	7.0	58.3	n/a	n/a	68.0	n/a	n/a	n/a	0.316	n/a
4	457.4	10.92	38.7	7.0	50.5	n/a	n/a	58.8	n/a	n/a	n/a	0.353	n/a
5	379.3	9.06	39.0	7.0	41.9	n/a	n/a	48.8	n/a	n/a	n/a	0.407	n/a
6	702.1	16.74	39.1	8.0	77.4	n/a	n/a	90.2	n/a	n/a	n/a	0.481	n/a
7	548.6	13.10	38.6	9.0	60.5	n/a	n/a	70.6	n/a	n/a	n/a	0.342	n/a
8	456.5	10.89	39.8	8.0	50.4	n/a	n/a	58.7	n/a	n/a	n/a	0.305	n/a
9	556.3	13.27	38.6	8.0	61.4	n/a	n/a	71.5	n/a	n/a	n/a	0.368	n/a
10	510.4	12.18	38.5	9.0	56.3	n/a	n/a	65.6	n/a	n/a	n/a	0.305	n/a
11	487.1	11.63	38.6	6.0	53.8	n/a	n/a	62.7	n/a	n/a	n/a	0.361	n/a
12	527.3	12.58	38.4	6.0	58.2	n/a	n/a	67.8	n/a	n/a	n/a	0.338	n/a
13	581.8	13.89	38.9	8.0	64.2	n/a	n/a	74.8	n/a	n/a	n/a	0.329	n/a
14	572.8	13.67	38.7	9.0	63.2	n/a	n/a	73.6	n/a	n/a	n/a	0.315	n/a
15	580.1	13.84	38.5	9.0	64.0	n/a	n/a	74.6	n/a	n/a	n/a	0.389	n/a
16	562.7	13.43	38.6	7.0	62.1	n/a	n/a	72.3	n/a	n/a	n/a	0.3	n/a
17	578.2	13.81	38.5	7.0	63.8	n/a	n/a	74.4	n/a	n/a	n/a	0.31	n/a
18	492.5	11.74	38.3	7.0	54.3	n/a	n/a	63.3	n/a	n/a	n/a	0.27	n/a
19	537.2	12.82	38.2	7.0	59.3	n/a	n/a	69.1	n/a	n/a	n/a	0.30	n/a
20	569.8	13.60	39.0	9.0	62.9	n/a	n/a	73.3	n/a	n/a	n/a	0.36	n/a
21	592.4	14.13	38.6	9.0	65.3	n/a	n/a	76.2	n/a	n/a	n/a	0.39	n/a
22	591.5	14.11	38.4	9.0	65.2	n/a	n/a	76.0	n/a	n/a	n/a	0.39	n/a
23	603.6	14.40	38.4	8.0	66.6	n/a	n/a	77.6	n/a	n/a	n/a	0.24	n/a
24	546.0	13.03	38.2	9.0	60.2	n/a	n/a	70.2	n/a	n/a	n/a	0.28	n/a
25	539.0	12.86	38.2	8.0	59.5	n/a	n/a	69.3	n/a	n/a	n/a	0.30	n/a
26	545.0	13.00	38.5	8.0	60.1	n/a	n/a	70.0	n/a	n/a	n/a	0.44	n/a
27	590.4	14.09	38.5	10.0	65.1	n/a	n/a	75.9	n/a	n/a	n/a	0.42	n/a
28	639.5	15.26	38.4	10.0	70.5	n/a	n/a	82.2	n/a	n/a	n/a	0.43	n/a
29	644.3	15.41	38.7	8.0	71.2	n/a	n/a	83.0	n/a	n/a	n/a	0.24	n/a
30	545.8	13.03	38.6	7.0	60.2	n/a	n/a	70.2	n/a	n/a	n/a	0.30	n/a
31	573.2	13.7	38.8	7.0	63.2	n/a	n/a	73.7	n/a	n/a	n/a	0.29	n/a
Total	16997	405.6	1,197	244.0	1,875.0	0.0	0.0	2,185.6	0.0	0.0	0.0		
Avg	548	13.1	38.60	7.9	60.5			70.5				0.34	

Date	Combined Filter Effluent Turbidity 4 hour sample NTU: 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C: Raw	pH: Raw	pH: Final	Total Alkalinity mg/L as CaCO3: Raw	Total Alkalinity mg/L as CaCO3: Fin	Calcium Hardness mg/L as CaCO3 Fin
1				0.05	0.02	0.02	0.03	0	0.05	91.1	6.6	6.9	7.3	n/a	n/a	n/a
2				0.05	0.02	0.02	0.03	0	0.05	90.9	6.6	6.8	7.3	n/a	n/a	n/a
3	0.02			0.05	0.03	0.03	0.03	0	0.05	89.7	6.6	6.7	7.2	n/a	n/a	n/a
4				0.04	0.03	0.04	0.04	0	0.04	89.6	6.9	6.7	7.2	n/a	n/a	n/a
5				0.04	0.03	0.03	0.03	0	0.04	91.8	6.7	6.7	7.2	n/a	n/a	n/a
6	0.02	0.04		0.04	0.03	0.03	0.03	0	0.04	93.3	6.6	6.7	7.2	n/a	n/a	n/a
7	0.03			0.05	0.02	0.02	0.03	0	0.05	91.2	7.0	6.7	7.2	n/a	n/a	n/a
8				0.05	0.03	0.03	0.04	0	0.05	88.0	6.6	6.7	7.2	n/a	n/a	n/a
9	0.03			0.04	0.04	0.04	0.04	0	0.04	89.8	6.6	6.8	7.2	n/a	n/a	n/a
10	0.03			0.04	0.03	0.03	0.03	0	0.04	89.3	6.8	6.7	7.3	n/a	n/a	n/a
11				0.04	0.03	0.03	0.03	0	0.04	90.8	6.8	6.6	7.2	n/a	n/a	n/a
12	0.03			0.05	0.03	0.03	0.04	0	0.05	89.6	6.8	6.6	7.2	n/a	n/a	n/a
13	0.03			0.05	0.03	0.03	0.04	0	0.05	89.4	7.1	6.6	7.2	n/a	n/a	n/a
14	0.03			0.03	0.02	0.03	0.03	0	0.03	91.3	7.0	6.6	7.2	n/a	n/a	n/a
15	0.03			0.04	0.03	0.03	0.03	0	0.04	91.6	7.1	6.6	7.2	n/a	n/a	n/a
16	0.03			0.05	0.02	0.02	0.03	0	0.05	89.1	6.7	7.1	7.0	n/a	n/a	n/a
17	0.03			0.05	0.02	0.02	0.03	0	0.05	90.2	6.8	7.2	7.0	n/a	n/a	n/a
18				0.05	0.03	0.04	0.04	0	0.05	85.3	6.8	7.1	7.3	n/a	n/a	n/a
19	0.05			0.05	0.03	0.04	0.04	0	0.05	85.9	6.8	7.2	7.3	n/a	n/a	n/a
20	0.04			0.05	0.03	0.04	0.04	0	0.05	88.8	7.1	7.1	7.3	n/a	n/a	n/a
21	0.04			0.05	0.03	0.03	0.04	0	0.05	90.4	7.1	7.1	7.2	n/a	n/a	n/a
22	0.04			0.05	0.03	0.03	0.04	0	0.05	90.5	6.8	7.2	7.3	n/a	n/a	n/a
23	0.03			0.05	0.04	0.04	0.04	0	0.05	83.4	6.9	7.1	7.3	n/a	n/a	n/a
24	0.05			0.05	0.04	0.04	0.05	0	0.05	83.8	6.8	7.1	7.3	n/a	n/a	n/a
25	0.04			0.05	0.03	0.03	0.04	0	0.05	87.6	6.7	7.1	7.3	n/a	n/a	n/a
26	0.03			0.05	0.03	0.04	0.04	0	0.05	91.4	6.9	7.1	7.3	n/a	n/a	n/a
27	0.04			0.05	0.03	0.03	0.04	0	0.05	91.2	6.7	7.1	7.3	n/a	n/a	n/a
28	0.03			0.05	0.03	0.03	0.04	0	0.05	91.9	6.9	7.1	7.4	n/a	n/a	n/a
29	0.04			0.05	0.04	0.05	0.05	0	0.05	81.4	7.0	7.3	7.4	n/a	n/a	n/a
30	0.05			0.05	0.03	0.03	0.04	0	0.05	86.7	6.7	7.3	7.3	n/a	n/a	n/a
31	0.03			0.05	0.03	0.03	0.04	0	0.05	87.8	6.8	7.3	7.3	n/a	n/a	n/a
Total								0								
Avg							0.04			89.1	6.8	6.9	7.3			

Total number of CFE samples analyzed for month: N = 118

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verfication of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y Max variation (NTU) 0.03

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Date of last filter inspection 5/3/2017

filters with more than 10 percent media loss 0

Report Submitted By: Kevin Cook

Signature:

DOH Form #331-023-F (Excel version)

Water Treatment Plant Monthly Report Form

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

PWS ID:
Source ID: S01
PWS Name: Lake Whatcom Water & Sewer Dist
Source Name: Lake Whatcom
Month: 6 Year: 2018
County: Whatcom
Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs)								Turbidity NTU		Combined Filter Effluent Turbidity 4 hour sample NTU							No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C	pH		Total Alkalinity mg/L as CaCO3		Calcium Hardness mg/L as CaCO3 Fin
				Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Raw	Settled	1st	2nd	3rd	4th	5th	6th	Avg				Raw	Raw	Final	Raw	Fin	
1	570.7	13.62	38.7	8.0	62.9	n/a	n/a	73.4	n/a	n/a	n/a	0.326	n/a	0.02			0.05	0.04	0.04	0.04	0	0.05	88.5	6.8	7.3	7.3	n/a	n/a	n/a
2	570.6	13.61	38.9	8.0	62.9	n/a	n/a	73.3	n/a	n/a	n/a	0.333	n/a	0.04			0.05	0.03	0.03	0.04	0	0.05	88.7	6.7	7.2	7.3	n/a	n/a	n/a
3	537.6	12.83	38.7	9.0	59.3	n/a	n/a	69.1	n/a	n/a	n/a	0.441	n/a	0.03			0.04	0.04	0.04	0.04	0	0.04	91.5	6.7	7.3	7.2	n/a	n/a	n/a
4	592.3	14.19	39.6	8.0	65.6	n/a	n/a	76.5	n/a	n/a	n/a	0.289	n/a	0.04			0.04	0.03	0.04	0.04	0	0.04	87.0	7.0	7.3	7.2	n/a	n/a	n/a
5	530.1	12.64	39.0	8.0	58.4	n/a	n/a	68.1	n/a	n/a	n/a	0.261	n/a	0.05			0.04	0.04	0.04	0.04	0	0.05	83.7	7.0	7.2	7.4	n/a	n/a	n/a
6	546.5	13.04	39.0	7.0	60.3	n/a	n/a	70.3	n/a	n/a	n/a	0.263	n/a	0.02			0.04	0.03	0.03	0.03	0	0.04	88.6	6.7	7.2	7.4	n/a	n/a	n/a
7	575.3	13.73	38.9	8.0	63.5	n/a	n/a	74.0	n/a	n/a	n/a	0.226	n/a	0.04			0.04	0.03	0.03	0.04	0	0.04	84.5	7.1	7.2	7.3	n/a	n/a	n/a
8	474.4	11.33	38.8	7.0	52.4	n/a	n/a	61.0	n/a	n/a	n/a	0.242	n/a				0.04	0.02	0.02	0.03	0	0.04	89.0	6.8	7.2	7.3	n/a	n/a	n/a
9	561.5	13.40	38.4	8.0	61.9	n/a	n/a	72.2	n/a	n/a	n/a	0.255	n/a	0.02			0.04	0.02	0.02	0.03	0	0.04	90.2	6.7	7.3	7.4	n/a	n/a	n/a
10	589.6	14.06	38.6	7.0	65.0	n/a	n/a	75.8	n/a	n/a	n/a	0.276	n/a	0.02			0.05	0.02	0.02	0.03	0	0.05	90.0	6.7	7.3	7.4	n/a	n/a	n/a
11	497.6	11.88	37.2	10.0	54.9	n/a	n/a	64.0	n/a	n/a	n/a	0.305	n/a	0.02			0.05	0.03	0.03	0.03	0	0.05	89.3	6.8	7.2	7.4	n/a	n/a	n/a
12	546.0	13.03	38.5	8.0	60.2	n/a	n/a	70.2	n/a	n/a	n/a	0.218	n/a	0.02			0.05	0.02	0.03	0.03	0	0.05	86.2	7.0	7.3	7.4	n/a	n/a	n/a
13	484.3	11.56	38.3	6.0	53.4	n/a	n/a	62.3	n/a	n/a	n/a	0.241	n/a				0.03	0.03	0.03	0.03	0	0.03	87.6	7.0	7.3	7.4	n/a	n/a	n/a
14	475.6	11.35	38.3	6.0	52.5	n/a	n/a	61.1	n/a	n/a	n/a	0.253	n/a				0.04	0.03	0.03	0.03	0	0.04	86.8	6.9	7.2	7.4	n/a	n/a	n/a
15	517.2	12.35	38.7	7.0	57.1	n/a	n/a	66.5	n/a	n/a	n/a	0.492	n/a	0.03			0.04	0.03	0.02	0.03	0	0.04	93.9	6.7	7.3	7.4	n/a	n/a	n/a
16	583.4	13.92	37.8	9.0	64.4	n/a	n/a	75.0	n/a	n/a	n/a	0.229	n/a	0.02			0.04	0.03	0.04	0.03	0	0.04	85.8	6.9	7.3	7.4	n/a	n/a	n/a
17	614.1	14.64	39.2	11.0	67.7	n/a	n/a	78.9	n/a	n/a	n/a	0.198	n/a	0.04			0.04	0.03	0.02	0.03	0	0.04	83.6	6.9	7.3	7.4	n/a	n/a	n/a
18	714.4	17.06	38.2	10.0	78.9	n/a	n/a	91.9	n/a	n/a	n/a	0.231	n/a	0.02			0.04	0.03	0.03	0.03	0	0.04	87.0	6.9	7.3	7.4	n/a	n/a	n/a
19	633.0	15.09	37.9	9.0	69.8	n/a	n/a	81.3	n/a	n/a	n/a	0.198	n/a	0.03			0.04	0.03	0.02	0.03	0	0.04	84.8	7.0	7.3	7.4	n/a	n/a	n/a
20	629.4	15.00	37.8	9.0	69.3	n/a	n/a	80.8	n/a	n/a	n/a	0.201	n/a	0.03			0.04	0.03	0.02	0.03	0	0.04	85.1	6.9	7.2	7.3	n/a	n/a	n/a
21	618.0	14.73	37.7	8.0	68.1	n/a	n/a	79.4	n/a	n/a	n/a	0.192	n/a	0.03			0.04	0.03	0.02	0.03	0	0.04	84.4	6.9	7.2	7.3	n/a	n/a	n/a
22	603.2	14.38	38.1	9.0	66.4	n/a	n/a	77.5	n/a	n/a	n/a	0.333	n/a	0.03			0.05	0.03	0.03	0.04	0	0.05	89.5	6.8	7.2	7.3	n/a	n/a	n/a
23	552.7	13.18	37.7	8.0	60.9	n/a	n/a	71.0	n/a	n/a	n/a	0.207	n/a	0.03			0.05	0.02	0.03	0.03	0	0.05	84.3	7.0	7.2	7.4	n/a	n/a	n/a
24	646.5	15.41	38.0	7.0	71.2	n/a	n/a	83.0	n/a	n/a	n/a	0.202	n/a	0.03			0.05	0.03	0.03	0.04	0	0.05	82.7	7.1	7.3	7.4	n/a	n/a	n/a
25	661.5	15.77	38.0	8.0	72.9	n/a	n/a	85.0	n/a	n/a	n/a	0.215	n/a	0.03			0.05	0.03	0.03	0.04	0	0.05	83.7	7.3	7.2	7.4	n/a	n/a	n/a
26	538.1	12.83	38.0	8.0	59.3	n/a	n/a	69.1	n/a	n/a	n/a	0.226	n/a	0.03			0.05	0.03	0.04	0.04	0	0.05	83.4	7.3	7.2	7.3	n/a	n/a	n/a
27	538.1	12.83	38.1	8.0	59.3	n/a	n/a	69.1	n/a	n/a	n/a	0.212	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	84.7	7.2	7.4	7.3	n/a	n/a	n/a
28	588.6	14.04	38.0	9.0	64.9	n/a	n/a	75.6	n/a	n/a	n/a	0.186	n/a	0.04			0.04	0.03	0.03	0.04	0	0.04	81.2	6.9	7.3	7.3	n/a	n/a	n/a
29	550.6	13.13	39.2	9.0	60.7	n/a	n/a	70.7	n/a	n/a	n/a	0.309	n/a	0.05			0.04	0.03	0.03	0.04	0	0.05	87.9	7.1	7.2	7.3	n/a	n/a	n/a
30	539.0	12.85	38.3	8.0	59.4	n/a	n/a	69.2	n/a	n/a	n/a	0.312	n/a	0.05			0.04	0.03	0.03	0.04	0	0.05	88.0	7.1	7.1	7.3	n/a	n/a	n/a
31						n/a	n/a		n/a	n/a	n/a		n/a									0.00					n/a	n/a	n/a
Total	17080	407.5	1,152	245.0	1,883.4	0.0	0.0	2,195.4	0.0	0.0	0.0										0								
Avg	569	13.6	38.40	8.2	62.8			73.2				0.26								0.03			86.7	6.9	7.2	7.3			

Total number of CFE samples analyzed for month: N = 117

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in): Anthracite 18" Sand 9" Garnet 9"

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection: 5/3/2017

\# filters with more than 10 percent media loss: 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verfication of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y

Max variation (NTU): 0.03

Report Submitted By: Kevin Cook

Signature:

DOH Form #331-023-F (Excel version)

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

Water Treatment Plant Monthly Report Form

Month: 7 Year: 2018

PWS II

Source ID: S01

PWS Name: Lake Whatcom Water & Sewer Dist

Source Name: Lake Whatcom

County: Whatcom

Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin
1	508.1	12.11	38.2	6.0	56.0			65.2				0.224		0.06			0.04	0.03	0.03	0.04	0	0.06	82.1	7.3	7.1	7.2			
2	628.3	14.99	38.6	9.0	69.3			80.7				0.189		0.04			0.05	0.04	0.03	0.04	0	0.05	78.8	6.7	7.1	7.2			
3	535.8	12.78	38.7	8.0	59.1			68.8				0.291		0.04			0.04	0.03	0.03	0.04	0	0.04	88.0	6.8	7.1	7.2			
4	613.8	14.64	38.7	8.0	67.7			78.9				0.187		0.05			0.04	0.03	0.03	0.04	0	0.05	79.9	7.1	7.0	7.2			
5	631.3	15.05	38.6	9.0	69.6			81.1				0.233		0.06			0.04	0.03	0.03	0.04	0	0.06	82.8	6.9	7.0	7.2			
6	646.1	15.40	38.4	8.0	71.2			83.0				0.390		0.05			0.05	0.03	0.03	0.04	0	0.05	89.7	7.0	7.0	7.2			
7	544.9	13.00	38.4	8.0	60.1			70.0				0.178		0.06			0.06	0.05	0.03	0.05	0	0.06	71.9	7.0	7.2	7.2			
8	620.6	14.80	38.7	8.0	68.4			79.7				0.170		0.06			0.06	0.05	0.04	0.05	0	0.06	69.1	7.4	7.6	7.2			
9	676.3	16.12	38.3	8.0	74.5			86.9				0.157		0.03	0.06		0.04	0.03	0.04	0.04	0	0.06	74.5	7.1	7.6	7.2			
10	540.5	12.89	38.2	7.0	59.6			69.4				0.149		0.04			0.03	0.03	0.03	0.03	0	0.04	78.2	7.2	7.4	7.2			
11	615.1	14.66	39.7	7.0	67.8			79.0				0.309		0.03			0.04	0.03	0.03	0.03	0	0.04	89.5	7.1	7.2	7.2			
12	625.2	14.91	38.2	8.0	68.9			80.3				0.340		0.03			0.04	0.02	0.03	0.03	0	0.04	91.2	7.5	7.0	7.3			
13	641.0	15.29	38.6	9.0	70.7			82.4				0.272		0.03			0.04	0.02	0.04	0.03	0	0.04	88.1	6.8	7.0	7.3			
14	691.2	16.48	37.8	8.0	76.2			88.8				0.170		0.05		0.04	0.02	0.03	0.03	0.03	0	0.05	80.0	7.0	7.0	7.2			
15	699.4	16.69	38.0	10.0	77.1			89.9				0.176		0.03		0.04	0.02	0.02	0.02	0.03	0	0.04	85.2	7.2	6.9	7.2			
16	819.7	19.81	38.6	11.0	91.6			106.8				0.185		0.02		0.03	0.04	0.04	0.04	0.03	0	0.04	81.6	7.2	7.4	7.2			
17	691.9	16.51	38.8	10.0	76.3			89.0				0.256		0.04		0.04	0.03	0.03	0.04	0.04	0	0.04	85.9	7.2	7.2	7.2			
18	753.8	18.08	38.4	10.0	83.6			97.4				0.211		0.05	0.03		0.03	0.05	0.05	0.04	0	0.05	80.1	6.9	7.3	7.2			
19	639.4	15.25	38.6	9.0	70.5			82.2				0.167		0.06			0.04	0.02	0.03	0.04	0	0.06	77.5	7.1	7.1	7.2			
20	642.9	15.33	38.4	9.0	70.9			82.6				0.176		0.03			0.03	0.02	0.02	0.03	0	0.03	85.8	7.0	7.1	7.2			
21	698.9	16.66	39.0	10.0	77.0			89.8				0.194		0.03		0.03	0.02	0.02	0.02	0.02	0	0.03	87.6	7.3	7.1	7.2			
22	869.2	21.14	39.2	12.0	97.7			113.9				0.242		0.03	0.03	0.04	0.02	0.03	0.03	0.03	0	0.04	87.6	6.7	7.3	7.2			
23	735.8	17.95	38.9	10.0	83.0			96.7				0.164		0.04	0.04		0.03	0.03	0.03	0.03	0	0.04	79.3	7.0	7.3	7.2			
24	708.6	16.94	38.6	10.0	78.3			91.3				0.174		0.04	0.04		0.03	0.03	0.03	0.03	0	0.04	80.5	7.1	7.2	7.2			
25	749.8	17.92	39.0	10.0	82.8			96.6				0.226		0.04	0.04		0.03	0.03	0.03	0.03	0	0.04	85.0	7.2	7.1	7.1			
26	774.6	18.54	38.8	11.0	85.7			99.9				0.207		0.03	0.04		0.03	0.02	0.03	0.03	0	0.04	85.5	7.1	7.1	7.1			
27	771.5	18.42	38.7	10.0	85.1			99.2				0.213		0.03	0.03		0.03	0.03	0.04	0.03	0	0.04	85.0	7.2	7.1	7.1			
28	755.7	18.02	38.7	11.0	83.3			97.1				0.220		0.04		0.03	0.03	0.03	0.03	0.03	0	0.04	85.5	7.0	6.9	7.2			
29	815.9	19.56	38.6	10.0	90.4			105.4				0.211		0.03		0.04	0.03	0.03	0.03	0.03	0	0.04	84.8	6.7	7.0	7.1			
30	734.6	17.86	38.2	12.0	82.5			96.2				0.208		0.03		0.03	0.02	0.03	0.03	0.03	0	0.03	86.5	7.3	7.1	7.2			
31	743.4	18.0	38.2	11.0	83.4			97.2				0.32		0:03		0.03	0.02	0.02	0.02	0.02	0	0.03	92.4	7.2	7.1	7.2			
Total	21123	505.8	1,196	287.0	2,338.1			2,725.4													0								
Avg	681	16.3	38.58	9.3	75.4			87.9				0.22								0.03			83.2	7.1	7.2	7.2			

Total number of CFE samples analyzed for month: N = 142

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in) Anthracite: 18" Sand: 9" Garnet: 9"

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection: 5/3/2017

filters with more than 10 percent media loss: 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verfication of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y

Max variation (NTU): 0.04

Report Submitted By: Kevin Cook

Signature:

DOH Form #331-023-F (Excel version)

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

Water Treatment Plant Monthly Report Form

Month 8 Year 2018

PWS ID

Source ID S01

PWS Name: Lake Whatcom Water & Sewer Dist

Source Name: Lake Whatcom

County: Whatcom

Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled
1	687.6	16.40	39.5	9.0	75.8	n/a	n/a	88.4	n/a	n/a	n/a	0.163	n/a
2	626.2	14.93	38.2	9.0	69.0	n/a	n/a	80.4	n/a	n/a	n/a	0.167	n/a
3	663.7	15.84	38.3	9.0	73.2	n/a	n/a	85.4	n/a	n/a	n/a	0.113	n/a
4	649.4	15.53	38.4	10.0	71.8	n/a	n/a	83.7	n/a	n/a	n/a	0.239	n/a
5	734.4	17.51	38.7	11.0	80.9	n/a	n/a	94.4	n/a	n/a	n/a	0.163	n/a
6	874.2	21.00	38.8	11.0	97.1	n/a	n/a	113.2	n/a	n/a	n/a	0.139	n/a
7	738.1	17.71	38.6	10.0	81.9	n/a	n/a	95.4	n/a	n/a	n/a	0.360	n/a
8	757.9	18.17	38.3	10.0	84.0	n/a	n/a	97.9	n/a	n/a	n/a	0.157	n/a
9	680.6	16.27	38.4	10.0	75.2	n/a	n/a	87.7	n/a	n/a	n/a	0.181	n/a
10	784.7	18.94	38.6	10.0	87.5	n/a	n/a	102.0	n/a	n/a	n/a	0.189	n/a
11	665.0	15.89	39.3	10.0	73.4	n/a	n/a	85.6	n/a	n/a	n/a	0.206	n/a
12	672.9	16.07	37.9	10.0	74.3	n/a	n/a	86.6	n/a	n/a	n/a	0.187	n/a
13	671.2	16.05	38.7	10.0	74.2	n/a	n/a	86.5	n/a	n/a	n/a	0.215	n/a
14	729.6	17.44	38.2	10.0	80.6	n/a	n/a	94.0	n/a	n/a	n/a	0.284	n/a
15	698.9	16.73	38.7	10.0	77.3	n/a	n/a	90.2	n/a	n/a	n/a	0.265	n/a
16	684.0	16.32	38.4	9.0	75.4	n/a	n/a	87.9	n/a	n/a	n/a	0.139	n/a
17	636.6	15.24	38.6	10.0	70.4	n/a	n/a	82.1	n/a	n/a	n/a	0.107	n/a
18	775.0	18.64	38.2	10.0	86.2	n/a	n/a	100.4	n/a	n/a	n/a	0.168	n/a
19	781.3	18.90	39.1	11.0	87.4	n/a	n/a	101.8	n/a	n/a	n/a	0.174	n/a
20	803.5	19.37	40.0	10.0	89.5	n/a	n/a	104.4	n/a	n/a	n/a	0.165	n/a
21	676.3	16.18	38.5	10.0	74.8	n/a	n/a	87.2	n/a	n/a	n/a	0.179	n/a
22	731.3	17.54	38.5	11.0	81.1	n/a	n/a	94.5	n/a	n/a	n/a	0.174	n/a
23	624.4	14.89	38.6	10.0	68.8	n/a	n/a	80.2	n/a	n/a	n/a	0.146	n/a
24	678.3	16.18	39.1	9.0	74.8	n/a	n/a	87.2	n/a	n/a	n/a	0.152	n/a
25	613.2	14.62	39.1	9.0	67.6	n/a	n/a	78.8	n/a	n/a	n/a	0.215	n/a
26	607.3	14.48	38.5	9.0	66.9	n/a	n/a	78.0	n/a	n/a	n/a	0.213	n/a
27	651.9	15.55	39.2	9.0	71.9	n/a	n/a	83.8	n/a	n/a	n/a	0.142	n/a
28	591.7	14.11	38.5	8.0	65.2	n/a	n/a	76.0	n/a	n/a	n/a	0.136	n/a
29	613.5	14.63	38.6	9.0	67.6	n/a	n/a	78.8	n/a	n/a	n/a	0.202	n/a
30	588.2	14.02	39.2	7.0	64.8	n/a	n/a	75.6	n/a	n/a	n/a	0.186	n/a
31	564.4	13.5	38.5	6.0	62.2	n/a	n/a	72.5	n/a	n/a	n/a	0.19	n/a
Total	21255	508.6	1,199	296.0	2,351.0	0.0	0.0	2,740.4	0.0	0.0	0.0		
Avg	686	16.4	38.67	9.5	75.8			88.4				0.18	

Date	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin
1	0.05		0.03	0.04	0.04	0.04	0.04	0	0.05	75.5	7.3	6.8	7.2	n/a	n/a	n/a
2	0.04			0.03	0.04	0.04	0.04	0	0.04	77.5	7.4	7.1	7.2	n/a	n/a	n/a
3	0.04			0.04	0.05	0.05	0.05	0	0.05	60.2	7.4	7.2	7.2	n/a	n/a	n/a
4	0.05			0.05	0.05	0.05	0.05	0	0.05	79.1	7.3	7.3	7.2	n/a	n/a	n/a
5	0.05	0.06		0.05	0.04	0.04	0.05	0	0.06	70.6	7.2	7.1	7.2	n/a	n/a	n/a
6	0.04	0.04	0.05	0.02	0.03	0.03	0.04	0	0.05	74.8	7.2	7.3	7.2	n/a	n/a	n/a
7	0.04		0.04	0.02	0.03	0.03	0.03	0	0.04	91.1	7.3	7.1	7.2	n/a	n/a	n/a
8	0.04		0.04	0.02	0.02	0.02	0.03	0	0.04	82.2	7.1	7.3	7.2	n/a	n/a	n/a
9	0.03		0.04	0.04	0.02	0.03	0.03	0	0.04	82.3	7.2	7.1	7.2	n/a	n/a	n/a
10	0.03	0.03		0.04	0.03	0.03	0.03	0	0.04	83.1	7.2	7.2	7.2	n/a	n/a	n/a
11	0.03			0.04	0.02	0.03	0.03	0	0.04	85.4	7.1	7.1	7.2	n/a	n/a	n/a
12	0.03		0.04	0.02	0.02	0.02	0.03	0	0.04	86.1	7.4	7.1	7.3	n/a	n/a	n/a
13	0.02	0.02		0.04	0.02	0.02	0.02	0	0.04	88.8	7.4	7.1	7.2	n/a	n/a	n/a
14	0.04	0.04		0.04	0.03	0.04	0.04	0	0.04	86.6	6.9	7.2	7.2	n/a	n/a	n/a
15	0.05		0.04	0.02	0.03	0.04	0.04	0	0.05	86.4	7.3	7.1	7.2	n/a	n/a	n/a
16	0.06		0.04	0.06	0.04	0.04	0.05	0	0.06	65.5	7.2	7.1	7.2	n/a	n/a	n/a
17	0.04			0.04	0.04	0.04	0.04	0	0.04	62.6	7.3	7.1	7.2	n/a	n/a	n/a
18	0.04	0.04		0.04	0.04	0.04	0.04	0	0.04	76.2	7.3	7.2	7.2	n/a	n/a	n/a
19	0.04	0.04		0.04	0.04	0.04	0.04	0	0.04	77.0	7.3	7.1	7.2	n/a	n/a	n/a
20	0.03	0.03		0.04	0.03	0.03	0.03	0	0.04	80.6	7.2	7.1	7.2	n/a	n/a	n/a
21	0.03	0.03		0.04	0.02	0.02	0.03	0	0.04	84.4	7.1	7.1	7.3	n/a	n/a	n/a
22	0.02	0.03		0.04	0.04	0.04	0.03	0	0.04	80.5	7.5	7.0	7.3	n/a	n/a	n/a
23	0.04			0.04	0.05	0.05	0.05	0	0.05	69.2	7.3	7.1	7.3	n/a	n/a	n/a
24	0.06	0.06		0.04	0.03	0.03	0.04	0	0.06	71.1	7.2	7.1	7.3	n/a	n/a	n/a
25	0.03			0.04	0.03	0.03	0.03	0	0.04	84.9	7.5	7.0	7.3	n/a	n/a	n/a
26	0.04			0.04	0.03	0.04	0.04	0	0.04	82.4	7.4	7.1	7.2	n/a	n/a	n/a
27	0.04			0.04	0.05	0.06	0.05	0	0.06	66.5	7.3	7.1	7.2	n/a	n/a	n/a
28	0.06			0.04	0.02	0.03	0.04	0	0.06	72.4	7.2	7.1	7.2	n/a	n/a	n/a
29	0.04			0.04	0.02	0.02	0.03	0	0.04	85.1	7.5	7.0	7.2	n/a	n/a	n/a
30	0.03			0.04	0.03	0.03	0.03	0	0.04	82.5	7.5	7.1	7.2	n/a	n/a	n/a
31	0.03			0.03	0.03	0.03	0.03	0	0.03	84.3	7.4	7.2	7.2	n/a	n/a	n/a
Total								0								
Avg							0.04			78.5	7.3	7.1	7.2			

Total number of CFE samples analyzed for month: N = 143

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection 5/3/2017

filters with more than 10 percent media loss 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y

Max variation (NTU) 0.04

Report Submitted By Kevin Cook

Signature

DOH Form #331-023-F (Excel version)

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

Water Treatment Plant Monthly Report Form

Month: 9 | Year: 2018

PWS ID:
PWS Name: Lake Whatcom Water & Sewer Dist
County: Whatcom
Source ID: S01
Source Name: Lake Whatcom
Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs): Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU: Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU: 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C: Raw	pH: Raw	Final	Total Alkalinity mg/L as CaCO3: Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin
1	607.7	14.49	38.3	8.0	67.0			78.1				0.185		0.03			0.04	0.03	0.07	0.04	0	0.07	77.0	7.2	7.3	7.2			
2	633.5	15.13	38.3	8.0	69.9			81.5				0.157		0.06			0.03	0.04	0.07	0.05	0	0.07	68.2	7.4	7.3	7.2			
3	648.6	15.47	38.3	9.0	71.5			83.4				0.185		0.04			0.04	0.03	0.03	0.04	0	0.04	81.1	7.0	7.3	7.2			
4	712.2	17.08	38.5	8.0	78.9			92.0				0.201		0.03	0.03		0.04	0.02	0.02	0.03	0	0.04	86.1	7.1	7.3	7.2			
5	697.8	16.75	38.6	9.0	77.4			90.3				0.222		0.02	0.02		0.04	0.02	0.02	0.02	0	0.04	89.2	7.5	7.2	7.2			
6	593.3	14.15	38.3	8.0	65.4			76.2				0.225		0.02			0.04	0.03	0.02	0.03	0	0.04	87.8	7.4	7.2	7.2			
7	506.4	12.09	38.3	8.0	55.9			65.1				0.155		0.03			0.04	0.04	0.06	0.04	0	0.06	72.6	7.4	7.2	7.2			
8	547.0	13.04	38.3	6.0	60.3			70.2				0.216					0.05	0.04	0.03	0.04	0	0.05	81.5	7.6	7.1	7.2			
9	610.3	14.69	38.4	9.0	67.9			79.1				0.237		0.03			0.04	0.06	0.03	0.04	0	0.06	83.1	7.6	7.1	7.2			
10	640.5	15.28	39.8	8.0	70.6			82.3				0.254		0.04			0.04	0.03	0.03	0.04	0	0.04	86.2	7.3	7.1	7.1			
11	525.1	12.52	38.1	8.0	57.9			67.5				0.178		0.04			0.04	0.03	0.03	0.04	0	0.04	80.3	7.3	7.1	7.2			
12	509.5	12.15	52.0	8.0	56.2			65.5				0.207		0.06			0.04	0.03	0.03	0.04	0	0.06	80.7	7.5	7.1	7.2			
13	525.2	12.53	40.2	8.0	57.9			67.5				0.306		0.03			0.04	0.02	0.02	0.03	0	0.04	91.0	7.5	7.1	7.2			
14	499.2	11.90	39.8	8.0	55.0			64.1				0.196					0.04	0.03	0.03	0.03	0	0.04	83.0	7.5	7.0	7.2			
15	564.2	13.46	40.0	7.0	62.2			72.5				0.172		0.03			0.04	0.03	0.03	0.03	0	0.04	81.1	7.4	7.1	7.2			
16	490.5	11.69	39.7	7.0	54.1			63.0				0.178					0.04	0.02	0.02	0.03	0	0.04	85.0	7.5	7.0	7.2			
17	604.4	14.42	40.3	9.0	66.6			77.7				0.244		0.03			0.04	0.06	0.03	0.04	0	0.06	83.6	7.0	7.1	7.2			
18	515.3	12.29	39.3	9.0	56.8			66.2				0.252		0.04			0.04	0.03	0.03	0.04	0	0.04	86.1	7.2	7.1	7.2			
19	496.7	11.84	39.0	7.0	54.7			63.8				0.268					0.04	0.03	0.03	0.03	0	0.04	87.6	7.7	7.0	7.2			
20	495.0	11.81	39.4	7.0	54.6			63.6				0.322					0.04	0.03	0.03	0.03	0	0.04	89.6	7.6	7.0	7.2			
21	503.7	12.01	40.1	8.0	55.5			64.7				0.161		0.03			0.04	0.02	0.02	0.03	0	0.04	82.9	7.4	7.0	7.2			
22	475.3	11.34	39.2	8.0	52.4			61.1				0.167					0.04	0.02	0.02	0.03	0	0.04	84.0	7.3	7.0	7.2			
23	617.0	14.71	39.4	9.0	68.0			79.3				0.168		0.03			0.04	0.03	0.04	0.04	0	0.04	79.2	7.0	7.0	7.2			
24	696.4	16.61	39.4	10.0	76.8			89.5				0.202		0.04		0.04	0.03	0.03	0.03	0.03	0	0.04	83.2	7.1	7.0	7.2			
25	685.6	16.35	39.5	9.0	75.6			88.1				0.191		0.03		0.04	0.03	0.03	0.04	0.03	0	0.04	82.2	7.7	6.9	7.2			
26	499.4	11.92	39.9	8.0	55.1			64.2				0.214					0.04	0.03	0.04	0.04	0	0.04	82.9	7.4	7.0	7.2			
27	490.9	11.70	39.8	7.0	54.1			63.0				0.222					0.04	0.02	0.02	0.03	0	0.04	88.0	7.4	6.9	7.2			
28	538.8	12.85	39.9	9.0	59.4			69.3				0.192		0.02			0.04	0.03	0.03	0.03	0	0.04	84.4	7.4	6.9	7.2			
29	472.7	11.27	39.7	6.0	52.1			60.7				0.207		0.03			0.04	0.02	0.02	0.03	0	0.04	86.7	7.7	6.9	7.2			
30	522.4	12.47	39.4	8.0	57.7			67.2				0.235		0.02			0.04	0.03	0.03	0.03	0	0.04	87.2	7.5	6.9	7.2			
31																						0.00							
Total	16925	404.0	1,189	241.0	1,867.4			2,176.8													0								
Avg	564	13.5	39.64	8.0	62.2			72.6				0.21								0.03			83.4	7.4	7.1	7.2			

Total number of CFE samples analyzed for month: N = 116
Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in) — Anthracite: 18" | Sand: 9" | Garnet: 9"

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection: 5/3/2017

filters with more than 10 percent media loss: 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y

Max variation (NTU): 0.05

Report Submitted By: Kevin Cook

Signature:

DOH Form #331-023-F (Excel version)

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

Water Treatment Plant Monthly Report Form

Month: 10 Year: 2018

PWS ID: PWS Name: Lake Whatcom Water & Sewer Dist County: Whatcom
Source ID: S01 Source Name: Lake Whatcom Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled
1	497.7	11.88	39.8	8.0	54.9	n/a	n/a	64.0	n/a	n/a	n/a	0.278	n/a
2	580.8	13.85	39.4	6.0	64.0	n/a	n/a	74.6	n/a	n/a	n/a	0.196	n/a
3	523.3	12.48	39.5	6.0	57.7	n/a	n/a	67.3	n/a	n/a	n/a	0.187	n/a
4	532.9	12.71	40.4	7.0	58.7	n/a	n/a	68.5	n/a	n/a	n/a	0.181	n/a
5	455.2	10.86	39.4	7.0	50.2	n/a	n/a	58.5	n/a	n/a	n/a	0.249	n/a
6	483.9	11.54	39.7	7.0	53.3	n/a	n/a	62.2	n/a	n/a	n/a	0.198	n/a
7	549.3	13.10	40.1	8.0	60.6	n/a	n/a	70.6	n/a	n/a	n/a	0.278	n/a
8	613.8	14.64	40.1	8.0	67.7	n/a	n/a	78.9	n/a	n/a	n/a	0.218	n/a
9	515.9	12.31	39.3	7.0	56.9	n/a	n/a	66.3	n/a	n/a	n/a	0.179	n/a
10	517.6	12.34	40.2	7.0	57.1	n/a	n/a	66.5	n/a	n/a	n/a	0.232	n/a
11	506.9	12.09	39.6	7.0	55.9	n/a	n/a	65.1	n/a	n/a	n/a	0.221	n/a
12	498.9	11.90	39.6	7.0	55.0	n/a	n/a	64.1	n/a	n/a	n/a	0.222	n/a
13	466.8	11.13	39.7	6.0	51.4	n/a	n/a	60.0	n/a	n/a	n/a	0.318	n/a
14	587.0	14.00	40.8	9.0	64.7	n/a	n/a	75.5	n/a	n/a	n/a	0.268	n/a
15	534.6	12.75	39.8	8.0	58.9	n/a	n/a	68.7	n/a	n/a	n/a	0.185	n/a
16	507.2	12.10	40.0	8.0	55.9	n/a	n/a	65.2	n/a	n/a	n/a	0.189	n/a
17	509.7	12.15	39.6	7.0	56.2	n/a	n/a	65.5	n/a	n/a	n/a	0.209	n/a
18	472.8	11.28	39.4	7.0	52.1	n/a	n/a	60.8	n/a	n/a	n/a	0.221	n/a
19	497.8	11.87	39.7	7.0	54.9	n/a	n/a	64.0	n/a	n/a	n/a	0.243	n/a
20	523.9	12.49	39.5	7.0	57.7	n/a	n/a	67.3	n/a	n/a	n/a	0.256	n/a
21	536.9	12.80	39.8	7.0	59.2	n/a	n/a	69.0	n/a	n/a	n/a	0.259	n/a
22	527.4	12.58	40.4	9.0	58.2	n/a	n/a	67.8	n/a	n/a	n/a	0.231	n/a
23	478.7	11.42	39.4	6.0	52.8	n/a	n/a	61.5	n/a	n/a	n/a	0.241	n/a
24	496.1	11.83	40.2	6.0	54.7	n/a	n/a	63.7	n/a	n/a	n/a	0.201	n/a
25	425.2	10.14	39.5	8.0	46.9	n/a	n/a	54.6	n/a	n/a	n/a	0.236	n/a
26	471.7	11.25	40.2	5.0	52.0	n/a	n/a	60.6	n/a	n/a	n/a	0.170	n/a
27	595.8	14.26	39.5	8.0	65.9	n/a	n/a	76.8	n/a	n/a	n/a	0.204	n/a
28	492.4	11.74	39.5	7.0	54.3	n/a	n/a	63.3	n/a	n/a	n/a	0.422	n/a
29	560.0	13.36	39.9	8.0	61.8	n/a	n/a	72.0	n/a	n/a	n/a	0.289	n/a
30	492.0	11.73	39.9	7.0	54.2	n/a	n/a	63.2	n/a	n/a	n/a	0.278	n/a
31	499.2	11.9	39.8	6.0	55.1	n/a	n/a	64.2	n/a	n/a	n/a	0.27	n/a
Total	15951	380.5	1,234	221.0	1,758.9	0.0	0.0	2,050.2	0.0	0.0	0.0		
Avg	515	12.3	39.80	7.1	56.7			66.1				0.24	

Date	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	0.03				0.04	0.03	0.03	0	0.04	88.0	7.4	6.9	7.2	n/a	n/a	n/a	
2	0.03			0.03	0.02	0.03	0.03	0	0.03	86.0	7.0	6.9	7.2	n/a	n/a	n/a	
3	0.03			0.04	0.03	0.04	0.04	0	0.04	81.3	7.2	7.1	7.2	n/a	n/a	n/a	
4	0.04			0.04	0.02	0.02	0.03	0	0.04	83.4	7.6	7.1	7.1	n/a	n/a	n/a	
5				0.04	0.02	0.02	0.03	0	0.04	89.3	7.6	7.1	7.1	n/a	n/a	n/a	
6				0.04	0.03	0.03	0.03	0	0.04	83.2	7.2	7.2	7.2	n/a	n/a	n/a	
7	0.03			0.04	0.03	0.03	0.03	0	0.04	88.3	7.5	7.1	7.1	n/a	n/a	n/a	
8	0.04			0.04	0.03	0.03	0.04	0	0.04	83.9	7.5	7.1	7.1	n/a	n/a	n/a	
9	0.03			0.04	0.03	0.03	0.03	0	0.04	81.8	7.2	7.1	7.1	n/a	n/a	n/a	
10	0.03			0.04	0.03	0.03	0.03	0	0.04	86.0	7.3	7.0	7.1	n/a	n/a	n/a	
11	0.03			0.04	0.02	0.03	0.03	0	0.04	86.4	7.3	7.1	7.2	n/a	n/a	n/a	
12				0.04	0.03	0.03	0.03	0	0.04	85.0	7.3	7.1	7.2	n/a	n/a	n/a	
13				0.04	0.03	0.03	0.03	0	0.04	89.5	7.1	7.1	7.2	n/a	n/a	n/a	
14	0.03			0.04	0.03	0.03	0.03	0	0.04	87.9	7.1	7.2	7.2	n/a	n/a	n/a	
15	0.04			0.04	0.03	0.03	0.04	0	0.04	81.1	7.4	7.1	7.2	n/a	n/a	n/a	
16	0.03			0.04	0.04	0.04	0.04	0	0.04	80.2	7.3	7.1	7.2	n/a	n/a	n/a	
17	0.04			0.04	0.03	0.03	0.04	0	0.04	83.3	7.4	7.1	7.2	n/a	n/a	n/a	
18				0.04	0.03	0.03	0.03	0	0.04	84.9	7.4	7.1	7.2	n/a	n/a	n/a	
19				0.05	0.03	0.03	0.04	0	0.05	84.9	7.4	7.1	7.2	n/a	n/a	n/a	
20	0.03			0.05	0.03	0.03	0.04	0	0.05	86.3	7.3	7.1	7.1	n/a	n/a	n/a	
21	0.03			0.05	0.03	0.03	0.04	0	0.05	86.5	7.3	7.1	7.1	n/a	n/a	n/a	
22	0.03			0.05	0.03	0.03	0.04	0	0.05	84.8	7.3	7.1	7.1	n/a	n/a	n/a	
23				0.05	0.03	0.03	0.04	0	0.05	84.8	7.3	7.1	7.1	n/a	n/a	n/a	
24				0.05	0.03	0.03	0.04	0	0.05	81.8	7.4	7.1	7.1	n/a	n/a	n/a	
25				0.05	0.03	0.04	0.04	0	0.05	83.1	7.3	7.1	7.1	n/a	n/a	n/a	
26				0.04	0.03	0.03	0.03	0	0.04	80.4	7.1	7.0	7.1	n/a	n/a	n/a	
27	0.03			0.05	0.02	0.03	0.03	0	0.05	84.1	7.0	7.1	7.1	n/a	n/a	n/a	
28				0.04	0.02	0.02	0.03	0	0.04	93.7	7.3	7.1	7.1	n/a	n/a	n/a	
29	0.03			0.05	0.03	0.04	0.04	0	0.05	87.0	7.3	7.0	7.1	n/a	n/a	n/a	
30				0.04	0.03	0.03	0.03	0	0.04	88.0	7.7	7.0	7.1	n/a	n/a	n/a	
31				0.04	0.04	0.04	0.04	0	0.04	85.2	7.3	7.1	7.1	n/a	n/a	n/a	
Total								0									
Avg							0.03			85.2	7.3	7.1	7.1				

Total number of CFE samples analyzed for month: N = 110 Total number of CFE samples exceeding 0.3 NTU: E = 0

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y Max variation (NTU) 0.03

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Date of last filter inspection 5/3/2017 # filters with more than 10 percent media loss 0

Report Submitted By Kevin Cook Signature

DOH Form #331-023-F (Excel version)

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

Water Treatment Plant Monthly Report Form

Month: 11 Year: 2018

PWS ID:
PWS Name: Lake Whatcom Water & Sewer Dist
County: Whatcom
Source ID: S01
Source Name: Lake Whatcom
Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin
1	464.5	11.08	40.1	6.0	51.2	n/a	n/a	59.7	n/a	n/a	n/a	0.211	n/a				0.04	0.03	0.03	0.03	0	0.04	84.2	7.0	7.1	7.1	n/a	n/a	n/a
2	480.0	11.46	39.1	6.0	53.0	n/a	n/a	61.7	n/a	n/a	n/a	0.091	n/a				0.04	0.04	0.05	0.04	0	0.05	52.4	6.9	7.1	7.1	n/a	n/a	n/a
3	467.0	11.13	39.1	7.0	51.5	n/a	n/a	60.0	n/a	n/a	n/a	0.313	n/a				0.05	0.03	0.04	0.04	0	0.05	87.2	6.8	7.1	7.1	n/a	n/a	n/a
4	491.5	11.73	39.4	8.0	58.8	n/a	n/a	68.6	n/a	n/a	n/a	0.481	n/a				0.05	0.02	0.02	0.03	0	0.05	93.8	7.0	7.2	7.1	n/a	n/a	n/a
5	468.8	11.23	39.2	9.0	51.9	n/a	n/a	60.5	n/a	n/a	n/a	0.642	n/a				0.05	0.03	0.03	0.04	0	0.05	94.3	7.1	7.1	7.1	n/a	n/a	n/a
6	440.7	10.52	39.4	6.0	48.6	n/a	n/a	56.7	n/a	n/a	n/a	0.562	n/a				0.05	0.02	0.03	0.03	0	0.05	94.1	7.4	7.0	7.1	n/a	n/a	n/a
7	540.7	12.90	79.8	8.0	59.6	n/a	n/a	69.5	n/a	n/a	n/a	0.324	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	90.0	7.2	7.1	7.1	n/a	n/a	n/a
8	582.6	13.89	40.3	8.0	64.2	n/a	n/a	74.9	n/a	n/a	n/a	0.220	n/a	0.02			0.05	0.03	0.03	0.03	0	0.05	85.2	7.6	7.1	7.1	n/a	n/a	n/a
9	479.5	11.45	39.7	5.0	52.9	n/a	n/a	61.7	n/a	n/a	n/a	0.216	n/a				0.05	0.03	0.03	0.04	0	0.05	83.0	8.0	7.1	7.1	n/a	n/a	n/a
10	449.4	10.71	40.5	8.0	49.5	n/a	n/a	57.7	n/a	n/a	n/a	0.242	n/a				0.06	0.03	0.03	0.04	0	0.06	83.5	7.4	7.1	7.1	n/a	n/a	n/a
11	588.6	14.06	39.7	9.0	65.0	n/a	n/a	75.7	n/a	n/a	n/a	0.405	n/a	0.04			0.06	0.03	0.03	0.04	0	0.06	90.1	7.6	7.1	7.1	n/a	n/a	n/a
12	557.4	13.33	39.9	7.0	61.6	n/a	n/a	71.8	n/a	n/a	n/a	0.494	n/a	0.03			0.06	0.03	0.04	0.04	0	0.06	91.9	7.7	7.2	7.2	n/a	n/a	n/a
13	498.2	11.99	39.8	5.0	55.4	n/a	n/a	64.6	n/a	n/a	n/a	0.307	n/a	0.03			0.05	0.03	0.04	0.04	0	0.05	87.8	7.4	7.2	7.1	n/a	n/a	n/a
14	398.4	9.72	39.8	7.0	44.9	n/a	n/a	52.4	n/a	n/a	n/a	0.303	n/a				0.05	0.03	0.03	0.04	0	0.05	87.9	8.5	7.1	7.1	n/a	n/a	n/a
15	399.0	9.53	39.7	5.0	44.0	n/a	n/a	51.3	n/a	n/a	n/a	0.274	n/a				0.04	0.02	0.03	0.03	0	0.04	89.1	7.2	7.4	7.1	n/a	n/a	n/a
16	431.7	10.33	40.2	6.0	47.7	n/a	n/a	55.6	n/a	n/a	n/a	0.224	n/a				0.03	0.03	0.05	0.04	0	0.05	83.6	7.3	7.1	7.1	n/a	n/a	n/a
17	803.8	19.50	80.7	13.0	90.2	n/a	n/a	105.1	n/a	n/a	n/a	0.466	n/a		0.04	0.03	0.05	0.04	0.05	0.04	0	0.05	91.0	7.5	7.1	7.1	n/a	n/a	n/a
18	743.9	17.79	121.5	12.0	82.2	n/a	n/a	95.9	n/a	n/a	n/a	0.464	n/a		0.05	0.04	0.04	0.05	0.06	0.05	0	0.06	89.7	7.1	7.1	7.1	n/a	n/a	n/a
19	648.0	15.70	82.3	8.0	72.6	n/a	n/a	84.6	n/a	n/a	n/a	0.494	n/a	0.04			0.04	0.04	0.05	0.04	0	0.05	91.4	9.4	7.2	7.2	n/a	n/a	n/a
20	761.8	18.72	82.4	11.0	86.5	n/a	n/a	100.8	n/a	n/a	n/a	0.535	n/a	0.03	0.02		0.05	0.05	0.05	0.04	0	0.05	92.5	9.1	7.3	7.2	n/a	n/a	n/a
21	748.4	17.90	40.3	12.0	82.7	n/a	n/a	96.4	n/a	n/a	n/a	0.500	n/a	0.06	0.04		0.05	0.04	0.04	0.05	0	0.06	90.8	7.4	7.1	7.1	n/a	n/a	n/a
22	476.2	11.76	40.0	6.0	54.4	n/a	n/a	63.4	n/a	n/a	n/a	0.437	n/a				0.05	0.04	0.04	0.04	0	0.05	90.1	8.3	7.2	7.1	n/a	n/a	n/a
23	408.1	10.06	41.1	5.0	46.5	n/a	n/a	54.2	n/a	n/a	n/a	0.327	n/a				0.05	0.04	0.04	0.04	0	0.05	86.7	8.3	7.2	7.1	n/a	n/a	n/a
24	381.7	9.25	80.8	11.0	42.7	n/a	n/a	49.8	n/a	n/a	n/a	0.572	n/a				0.06	0.05	0.05	0.05	0	0.06	90.7	9.0	7.2	7.2	n/a	n/a	n/a
25	784.3	19.21	81.5	11.0	88.8	n/a	n/a	103.5	n/a	n/a	n/a	0.520	n/a	0.05	0.04		0.06	0.04	0.04	0.05	0	0.06	91.2	8.9	7.3	7.2	n/a	n/a	n/a
26	828.1	20.21	41.9	6.0	93.4	n/a	n/a	108.9	n/a	n/a	n/a	0.283	n/a	0.05	0.06	0.07	0.06	0.03	0.04	0.05	0	0.07	81.7	6.4	7.3	7.1	n/a	n/a	n/a
27	379.6	9.28	40.0	7.0	42.9	n/a	n/a	50.0	n/a	n/a	n/a	0.444	n/a				0.05	0.03	0.03	0.04	0	0.05	91.7	9.1	7.2	7.1	n/a	n/a	n/a
28	450.3	11.32	46.3	6.0	52.3	n/a	n/a	61.0	n/a	n/a	n/a	0.431	n/a				0.06	0.03	0.04	0.04	0	0.06	89.9	8.6	7.3	7.2	n/a	n/a	n/a
29	404.2	9.99	41.2	6.0	46.2	n/a	n/a	53.8	n/a	n/a	n/a	0.512	n/a				0.06	0.03	0.03	0.04	0	0.06	92.2	9.4	7.3	7.2	n/a	n/a	n/a
30	592.5	14.19	81.2	12.0	65.6	n/a	n/a	76.4	n/a	n/a	n/a	0.464	n/a			0.05	0.05	0.03	0.03	0.04	0	0.05	91.4	8.9	7.2	7.3	n/a	n/a	n/a
31						n/a	n/a		n/a	n/a	n/a		n/a									0.00					n/a	n/a	n/a
Total	16149	389.9	1,577	236.0	1,807.1	0.0	0.0	2,106.4	0.0	0.0	0.0										0								
Avg	538	13.0	52.56	7.9	60.2			70.2				0.39								0.04			88.0	7.9	7.2	7.1			

Total number of CFE samples analyzed for month: N = 110

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in) Anthracite 18" Sand 9" Garnet [illegible]

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection 5/3/2017 # filters with more than 10 percent media loss 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y Max variation (NTU) 0.05

Report Submitted By Kevin Cook

Signature

DOH Form #331-023-F (Excel version)

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

Water Treatment Plant Monthly Report Form

Month: 12 Year: 2018

PWS ID:
Source ID: S01
PWS Name: Lake Whatcom Water & Sewer Dist
Source Name: Lake Whatcom
County: Whatcom
Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin
1	616.8	15.41	41.0	6.0	71.2	n/a	n/a	83.0	n/a	n/a	n/a	0.508	n/a	0.04			0.05	0.04	0.03	0.04	0	0.05	92.1	8.5	7.2	7.2	n/a	n/a	n/a
2	418.0	10.36	41.3	6.0	47.9	n/a	n/a	55.8	n/a	n/a	n/a	0.477	n/a				0.06	0.04	0.03	0.04	0	0.06	90.9	8.9	7.4	7.2	n/a	n/a	n/a
3	604.5	14.49	80.9	11.0	67.0	n/a	n/a	78.1	n/a	n/a	n/a	0.494	n/a			0.03	0.04	0.06	0.04	0.04	0	0.06	91.4	8.0	7.6	7.3	n/a	n/a	n/a
4	491.5	11.73	41.5	7.0	67.5	n/a	n/a	78.7	n/a	n/a	n/a	0.429	n/a	0.04			0.06	0.03	0.03	0.04	0	0.06	90.7	7.4	7.5	7.3	n/a	n/a	n/a
5	428.0	10.61	40.5	7.0	49.0	n/a	n/a	57.2	n/a	n/a	n/a	0.446	n/a			0.07	0.03	0.03		0.04	0	0.07	90.3	6.8	7.3	7.3	n/a	n/a	n/a
6	447.0	11.05	40.9	6.0	51.1	n/a	n/a	59.5	n/a	n/a	n/a	0.418	n/a			0.07	0.03	0.03		0.04	0	0.07	89.6	6.3	7.7	7.3	n/a	n/a	n/a
7	438.6	10.90	40.9	7.0	50.4	n/a	n/a	58.7	n/a	n/a	n/a	0.424	n/a				0.07	0.03	0.03	0.04	0	0.07	89.8	6.4	7.6	7.3	n/a	n/a	n/a
8	441.3	10.91	41.3	7.0	50.4	n/a	n/a	58.8	n/a	n/a	n/a	0.400	n/a				0.07	0.04	0.04	0.05	0	0.07	87.5	7.2	7.4	7.3	n/a	n/a	n/a
9	621.8	15.09	83.4	14.0	69.8	n/a	n/a	81.3	n/a	n/a	n/a	0.437	n/a			0.04	0.04	0.07	0.04	0.05	0	0.07	89.1	7.5	7.3	7.2	n/a	n/a	n/a
10	766.2	19.08	41.9	9.0	88.2	n/a	n/a	102.8	n/a	n/a	n/a	0.485	n/a	0.04	0.04		0.07	0.04	0.04	0.05	0	0.07	90.5	7.9	7.4	7.2	n/a	n/a	n/a
11	494.7	12.11	41.1	8.0	56.0	n/a	n/a	65.2	n/a	n/a	n/a	0.359	n/a			0.07	0.04	0.04	0.04	0.05	0	0.07	86.8	6.5	7.4	7.1	n/a	n/a	n/a
12	462.3	11.58	41.4	8.0	53.5	n/a	n/a	62.4	n/a	n/a	n/a	0.431	n/a				0.07	0.03	0.04	0.05	0	0.07	89.2	6.3	7.4	7.2	n/a	n/a	n/a
13	507.4	12.54	41.2	7.0	58.0	n/a	n/a	67.6	n/a	n/a	n/a	0.392	n/a			0.05	0.04	0.04	0.04	0.04	0	0.05	89.2	6.4	7.3	7.2	n/a	n/a	n/a
14	382.2	9.33	41.8	7.0	43.1	n/a	n/a	50.2	n/a	n/a	n/a	0.427	n/a				0.05	0.03	0.03	0.04	0	0.05	91.4	7.5	7.4	7.2	n/a	n/a	n/a
15	535.7	13.40	41.3	7.0	62.0	n/a	n/a	72.2	n/a	n/a	n/a	0.409	n/a	0.03			0.05	0.03	0.03	0.04	0	0.05	91.4	7.6	7.4	7.2	n/a	n/a	n/a
16	484.3	11.87	41.1	6.0	54.9	n/a	n/a	64.0	n/a	n/a	n/a	0.435	n/a	0.04				0.05	0.04	0.04	0	0.05	90.0	7.3	7.4	7.3	n/a	n/a	n/a
17	694.3	16.80	82.3	13.0	77.6	n/a	n/a	90.5	n/a	n/a	n/a	0.466	n/a	0.04			0.06	0.03	0.04	0.04	0	0.06	90.9	7.2	7.3	7.3	n/a	n/a	n/a
18	456.7	10.98	40.3	6.0	50.7	n/a	n/a	59.1	n/a	n/a	n/a	0.472	n/a				0.06	0.03	0.03	0.04	0	0.06	91.5	7.4	7.4	7.3	n/a	n/a	n/a
19	480.5	11.63	40.3	7.0	53.8	n/a	n/a	62.7	n/a	n/a	n/a	0.377	n/a				0.05	0.03	0.03	0.04	0	0.05	90.3	7.3	7.4	7.3	n/a	n/a	n/a
20	428.7	10.33	41.1	8.0	47.8	n/a	n/a	55.7	n/a	n/a	n/a	0.370	n/a				0.05	0.03	0.03	0.04	0	0.05	90.1	6.9	7.5	7.2	n/a	n/a	n/a
21	477.7	11.58	40.2	7.0	53.5	n/a	n/a	62.4	n/a	n/a	n/a	0.407	n/a				0.06	0.03	0.04	0.04	0	0.06	89.4	7.2	7.4	7.2	n/a	n/a	n/a
22	475.1	11.55	39.9	7.0	53.4	n/a	n/a	62.2	n/a	n/a	n/a	0.366	n/a				0.06	0.03	0.03	0.04	0	0.06	89.1	7.0	7.4	7.3	n/a	n/a	n/a
23	548.8	13.51	40.5	10.0	62.5	n/a	n/a	72.8	n/a	n/a	n/a	0.429	n/a	0.03			0.06	0.03	0.04	0.04	0	0.06	90.7	6.9	7.3	7.3	n/a	n/a	n/a
24	492.8	11.92	40.8	8.0	55.1	n/a	n/a	64.2	n/a	n/a	n/a	0.387	n/a				0.06	0.03	0.04	0.04	0	0.06	88.8	7.0	7.4	7.3	n/a	n/a	n/a
25	544.6	13.58	40.8	9.0	62.8	n/a	n/a	73.2	n/a	n/a	n/a	0.442	n/a	0.04			0.06	0.03	0.03	0.04	0	0.06	91.0	7.0	7.5	7.4	n/a	n/a	n/a
26	525.3	12.93	41.2	9.0	59.8	n/a	n/a	69.7	n/a	n/a	n/a	0.375	n/a	0.03			0.06	0.03	0.04	0.04	0	0.06	89.3	6.9	7.5	7.3	n/a	n/a	n/a
27	542.8	13.26	41.0	8.0	61.3	n/a	n/a	71.5	n/a	n/a	n/a	0.368	n/a	0.04			0.06	0.03	0.03	0.04	0	0.06	89.1	6.8	7.4	7.3	n/a	n/a	n/a
28	508.1	12.21	40.9	7.0	56.4	n/a	n/a	65.8	n/a	n/a	n/a	0.370	n/a	0.03			0.05	0.03	0.03	0.04	0	0.05	90.5	6.8	7.5	7.3	n/a	n/a	n/a
29	484.7	11.62	40.6	8.0	53.7	n/a	n/a	62.6	n/a	n/a	n/a	0.488	n/a				0.05	0.03	0.04	0.04	0	0.05	91.8	6.7	7.4	7.3	n/a	n/a	n/a
30	578.1	13.90	41.2	8.0	64.2	n/a	n/a	74.9	n/a	n/a	n/a	0.385	n/a	0.04			0.05	0.04	0.04	0.04	0	0.05	89.0	6.7	7.5	7.3	n/a	n/a	n/a
31	487.3	11.7	40.5	6.0	54.0	n/a	n/a	63.0	n/a	n/a	n/a	0.36	n/a				0.05	0.04	0.04	0.04	0	0.05	87.9	6.7	7.5	7.3	n/a	n/a	n/a
Total	15866	387.9	1,393	244.0	1,806.5	0.0	0.0	2,105.8	0.0	0.0	0.0										0								
Avg	512	12.5	44.94	7.9	58.3			67.9				0.42								0.04			90.0	7.1	7.4	7.3			

Total number of CFE samples analyzed for month: N = 109

Total number of CFE samples exceeding 0.3 NTU: E = 0

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y Max variation (NTU) 0.04

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Date of last filter inspection 5/3/2017 # filters with more than 10 percent media loss 0

Report Submitted By Kevin Cook Signature

DOH Form #331-023-F (Excel version)

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

Water Treatment Plant Monthly Report Form

Month: 1 Year: 2019

PWS ID:
Source ID: S01
PWS Name: Lake Whatcom Water & Sewer Dist
Source Name: Lake Whatcom
County: Whatcom
Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	539.2	13.05	40.4	7.0	60.3			70.3				0.281		0.03			0.05	0.03	0.03	0.04	0	0.05	87.5	6.6	7.5	7.4				
2	538.0	12.99	40.8	9.0	60.1			70.0				0.315		0.03			0.04	0.03	0.03	0.03	0	0.04	89.7	6.5	7.5	7.4				
3	500.3	11.95	40.6	7.0	55.3			64.4				0.394					0.06	0.03	0.03	0.04	0	0.06	89.8	6.5	7.5	7.3				
4	492.2	11.76	40.7	7.0	54.3			63.3				0.370					0.06	0.03	0.03	0.04	0	0.06	89.2	6.6	7.4	7.3				
5	483.6	11.54	40.8	7.0	53.4			62.2				0.405					0.05	0.03	0.03	0.04	0	0.05	90.9	6.6	7.4	7.4				
6	611.0	14.71	40.4	9.0	68.0			79.3				0.455		0.04			0.06	0.03	0.03	0.04	0	0.06	91.2	[illegible]	7.4	7.4				
7	499.7	11.95	40.6	6.0	55.2			64.4				0.440					0.05	0.03	0.03	0.04	0	0.05	91.7	6.4	7.5	7.4				
8	496.9	11.90	40.3	6.0	55.0			64.1				0.403					0.06	0.03	0.03	0.04	0	0.06	90.1	6.4	7.5	7.4				
9	479.6	11.44	40.3	6.0	52.9			61.6				0.274					0.05	0.03	0.03	0.04	0	0.05	86.6	6.4	7.4	7.4				
10	455.7	10.89	40.2	7.0	50.3			58.7				0.396					0.06	0.03	0.03	0.04	0	0.06	89.9	6.4	7.4	7.4				
11	515.9	12.31	41.1	7.0	56.9			66.3				0.362					0.05	0.03	0.03	0.04	0	0.05	89.9	6.4	7.6	7.4				
12	493.1	11.80	40.7	8.0	54.5			63.6				0.350					0.06	0.03	0.04	0.04	0	0.06	87.6	6.4	7.7	7.4				
13	543.9	12.98	40.3	7.0	60.0			69.9				0.352				0.06	0.03	0.03	0.03	0.04	0	0.06	89.3	6.4	7.6	7.4				
14	474.1	11.34	40.2	7.0	52.4			61.1				0.327					0.04	0.02	0.02	0.03	0	0.04	91.8	6.3	7.6	7.4				
15	441.2	10.54	40.6	6.0	48.7			56.8				0.341					0.05	0.03	0.03	0.04	0	0.05	89.2	6.4	7.5	7.3				
16	516.5	12.32	40.9	8.0	57.0			66.4				0.222		0.04			0.05	0.04	0.05	0.05	0	0.05	79.7	6.3	7.4	7.4				
17	458.2	10.94	40.1	6.0	50.6			59.0				0.312					0.05	0.03	0.04	0.04	0	0.05	87.2	6.4	7.4	7.3				
18	483.2	11.54	40.5	6.0	53.3			62.2				0.331					0.06	0.03	0.03	0.04	0	0.06	87.9	6.3	7.4	7.3				
19	462.5	11.04	40.8	8.0	51.0			59.5				0.181					0.06	0.03	0.03	0.04	0	0.06	77.9	6.4	7.4	7.3				
20	445.1	10.64	40.9	7.0	49.2			57.3				0.364					0.06	0.03	0.03	0.04	0	0.06	89.0	6.3	7.5	7.3				
21	539.5	12.91	40.4	6.0	59.7			69.5				0.290				0.05	0.04	0.05	0.05	0.05	0	0.05	83.6	6.3	7.4	7.3				
22	523.7	12.61	40.8	9.0	58.3			67.9				0.324		0.06			0.05	0.03	0.03	0.04	0	0.06	86.9	6.2	7.4	7.3				
23	463.1	11.06	40.6	7.0	51.1			59.6				0.307					0.05	0.03	0.03	0.04	0	0.05	88.1	6.2	7.4	7.3				
24	469.3	11.20	40.2	7.0	51.8			60.3				0.366					0.05	0.03	0.03	0.04	0	0.05	90.0	6.3	7.3	7.3				
25	467.5	11.16	40.9	6.0	51.6			60.1				0.408					0.05	0.03	0.03	0.04	0	0.05	91.0	6.3	7.3	7.3				
26	510.3	12.19	40.3	7.0	56.3			65.7				0.398		0.03			0.05	0.03	0.03	0.04	0	0.05	91.2	6.3	7.3	7.3				
27	513.9	12.28	40.6	7.0	56.7			66.1				0.400		0.03			0.05	0.03	0.03	0.04	0	0.05	91.3	6.3	7.3	7.4				
28	504.3	12.04	40.4	9.0	55.7			64.9				0.311		0.03			0.05	0.03	0.04	0.04	0	0.05	87.9	6.3	7.3	7.4				
29	486.7	11.61	41.2	8.0	53.7			62.6				0.325					0.05	0.03	0.03	0.04	0	0.05	88.7	6.1	7.3	7.4				
30	454.3	10.85	40.1	6.0	50.2			58.5				0.315					0.05	0.03	0.03	0.04	0	0.05	88.4	6.2	7.3	7.3				
31	475.5	11.4	40.2	8.0	52.5			61.2				0.33					0.05	0.02	0.03	0.03	0	0.05	90.0	6.2	7.3	7.3				
Total	15338	366.9	1,256	221.0	1,695.9			1,976.8													0									
Avg	495	11.8	40.52	7.1	54.7			63.8				0.34								0.04			88.5	6.4	7.4	7.4				

Total number of CFE samples analyzed for month: N = 103

Total number of CFE samples exceeding 0.3 NTU: E = 0

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y

Max variation (NTU) 0.04

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Date of last filter inspection 5/3/2017

filters with more than 10 percent media loss 0

Report Submitted By: Kevin Cook

Signature: [signature]

2-4-19

DOH Form #331-023-F (Excel version)

Date Printed: 2/1/2019

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

Water Treatment Plant Monthly Report Form

Month: 2 Year: 2019

PWS ID:

Source ID: S01

PWS Name: Lake Whatcom Water & Sewer Dist

Source Name: Lake Whatcom

County: Whatcom

Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	484.2	11.56	40.5	9.0	53.5	n/a	n/a	62.3	n/a	n/a	n/a	0.314	n/a				0.05	0.03	0.03	0.04	0	0.05	88.3	6.2	7.3	7.3	n/a	n/a	n/a	
2	493.5	11.78	40.3	8.0	54.5	n/a	n/a	63.5	n/a	n/a	n/a	0.426	n/a				0.05	0.03	0.04	0.04	0	0.05	90.6	6.2	7.3	7.3	n/a	n/a	n/a	
3	501.1	11.96	40.4	9.0	55.3	n/a	n/a	64.4	n/a	n/a	n/a	0.194	n/a				0.04	0.03	0.04	0.04	0	0.04	81.1	6.0	7.4	7.4	n/a	n/a	n/a	
4	497.9	11.89	40.4	7.0	55.0	n/a	n/a	64.1	n/a	n/a	n/a	0.200	n/a				0.05	0.03	0.04	0.04	0	0.05	80.0	5.2	7.7	7.4	n/a	n/a	n/a	
5	416.6	9.96	40.1	7.0	46.1	n/a	n/a	53.7	n/a	n/a	n/a	0.221	n/a				0.05	0.04	0.06	0.05	0	0.06	77.4	5.0	7.7	7.4	n/a	n/a	n/a	
6	520.5	12.43	40.7	7.0	57.4	n/a	n/a	66.9	n/a	n/a	n/a	0.259	n/a	0.03			0.05	0.03	0.03	0.04	0	0.05	86.5	5.8	7.5	7.3	n/a	n/a	n/a	
7	505.8	12.09	41.1	10.0	55.9	n/a	n/a	65.2	n/a	n/a	n/a	0.206	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	84.2	5.7	7.5	7.3	n/a	n/a	n/a	
8	517.0	12.35	41.8	6.0	57.1	n/a	n/a	66.6	n/a	n/a	n/a	0.283	n/a	0.04			0.05	0.03	0.03	0.04	0	0.05	86.7	5.8	7.4	7.3	n/a	n/a	n/a	
9	539.2	12.87	41.2	6.0	59.5	n/a	n/a	69.4	n/a	n/a	n/a	0.215	n/a	0.04			0.05	0.03	0.03	0.04	0	0.05	82.6	5.7	7.5	7.4	n/a	n/a	n/a	
10	518.0	12.38	41.6	8.0	57.2	n/a	n/a	66.7	n/a	n/a	n/a	0.224	n/a	0.04			0.05	0.03	0.03	0.04	0	0.05	83.3	5.6	7.5	7.4	n/a	n/a	n/a	
11	529.9	12.66	41.0	9.0	58.5	n/a	n/a	68.2	n/a	n/a	n/a	0.255	n/a	0.03			0.06	0.03	0.04	0.04	0	0.06	84.3	5.6	7.5	7.4	n/a	n/a	n/a	
12	478.3	11.43	41.4	7.0	52.8	n/a	n/a	61.6	n/a	n/a	n/a	0.274	n/a				0.05	0.03	0.03	0.04	0	0.05	86.6	5.5	7.5	7.4	n/a	n/a	n/a	
13	513.7	12.27	41.1	8.0	56.7	n/a	n/a	66.1	n/a	n/a	n/a	0.234	n/a	0.04			0.04	0.03	0.03	0.04	0	0.04	85.0	4.8	7.7	7.4	n/a	n/a	n/a	
14	522.2	12.47	41.2	8.0	57.6	n/a	n/a	67.2	n/a	n/a	n/a	0.246	n/a	0.03			0.05	0.03	0.03	0.04	0	0.05	85.8	4.8	7.7	7.4	n/a	n/a	n/a	
15	507.1	12.11	41.4	8.0	56.0	n/a	n/a	65.3	n/a	n/a	n/a	0.240	n/a	0.03			0.05	0.03	0.03	0.04	0	0.05	85.4	5.4	7.3	7.3	n/a	n/a	n/a	
16	527.9	12.61	41.5	9.0	58.3	n/a	n/a	68.0	n/a	n/a	n/a	0.221	n/a	0.03			0.05	0.03	0.04	0.04	0	0.05	83.0	5.4	7.3	7.3	n/a	n/a	n/a	
17	523.7	12.51	41.1	7.0	57.8	n/a	n/a	67.4	n/a	n/a	n/a	0.298	n/a	0.04			0.05	0.02	0.02	0.03	0	0.05	89.1	5.4	7.4	7.3	n/a	n/a	n/a	
18	522.7	12.48	41.1	7.0	57.7	n/a	n/a	67.3	n/a	n/a	n/a	0.239	n/a	0.02			0.04	0.02	0.02	0.03	0	0.04	89.5	5.2	7.5	7.3	n/a	n/a	n/a	
19	532.6	12.73	41.6	10.0	58.8	n/a	n/a	68.6	n/a	n/a	n/a	0.231	n/a	0.03			0.04	0.02	0.02	0.03	0	0.04	88.1	5.4	7.4	7.3	n/a	n/a	n/a	
20	342.4	8.23	42.3	9.0	38.1	n/a	n/a	44.4	n/a	n/a	n/a	0.237	n/a	0.02			0.05		0.02	0.03	0	0.05	87.3	5.5	7.4	7.3	n/a	n/a	n/a	
21	616.3	14.72	52.4	9.0	68.0	n/a	n/a	79.3	n/a	n/a	n/a	0.314	n/a	0.02			0.05	0.02	0.02	0.03	0	0.05	91.2	4.7	7.5	7.3	n/a	n/a	n/a	
22	486.8	11.62	41.1	6.0	53.7	n/a	n/a	62.6	n/a	n/a	n/a	0.375	n/a				0.04	0.03	0.03	0.03	0	0.04	91.1	5.7	7.1	7.4	n/a	n/a	n/a	
23	447.3	10.67	41.6	6.0	49.3	n/a	n/a	57.5	n/a	n/a	n/a	0.311	n/a				0.04	0.03	0.03	0.03	0	0.04	89.3	5.7	7.1	7.4	n/a	n/a	n/a	
24	541.8	12.94	41.4	8.0	59.8	n/a	n/a	69.7	n/a	n/a	n/a	0.337	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	90.4	5.7	7.1	7.4	n/a	n/a	n/a	
25	522.1	12.48	41.0	7.0	57.7	n/a	n/a	67.2	n/a	n/a	n/a	0.360	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	91.0	5.3	7.3	7.3	n/a	n/a	n/a	
26	532.2	12.70	41.1	7.0	58.7	n/a	n/a	68.4	n/a	n/a	n/a	0.231	n/a	0.04			0.05	0.03	0.03	0.04	0	0.05	83.8	5.3	7.3	7.4	n/a	n/a	n/a	
27	446.7	10.67	41.2	7.0	49.3	n/a	n/a	57.5	n/a	n/a	n/a	0.219	n/a				0.05	0.03	0.03	0.04	0	0.05	83.3	5.1	7.3	7.2	n/a	n/a	n/a	
28	486.9	11.64	41.3	7.0	53.8	n/a	n/a	62.7	n/a	n/a	n/a	0.201	n/a				0.05	0.03	0.04	0.04	0	0.05	80.1	5.3	7.3	7.3	n/a	n/a	n/a	
29						n/a	n/a		n/a	n/a	n/a		n/a									0.00					n/a	n/a	n/a	
30						n/a	n/a		n/a	n/a	n/a		n/a									0.00					n/a	n/a	n/a	
31						n/a	n/a		n/a	n/a	n/a		n/a									0.00					n/a	n/a	n/a	
Total	14074	336.2	1,163	216.0	1,554.2	0.0	0.0	1,811.7	0.0	0.0	0.0										0									
Avg	503	12.0	41.52	7.7	55.5			64.7				0.26								0.04			85.9	5.5	7.4	7.3				

Total number of CFE samples analyzed for month: N = 101

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection 5/3/2017

filters with more than 10 percent media loss 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y

Max variation (NTU) 0.04

Report Submitted By Kevin Cook

Signature

DOH Form #331-023-F (Excel version)

Date Printed: 3/4/2019

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

Water Treatment Plant Monthly Report Form

PWS ID

Source ID: S01

PWS Name: Lake Whatcom Water & Sewer Dist

Source Name: Lake Whatcom

Month: 3 Year: 2019

County: Whatcom

Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	486.1	11.60	41.2	7.0	53.6			62.5				0.15					0.05	0.03	0.04	0.04	0	0.05	73.3	4.7	7.5	7.4				
2	492.4	11.77	41.0	7.0	54.4			63.4				0.20					0.05	0.03	0.03	0.04	0	0.05	81.7	5.2	7.3	7.4				
3	502.6	11.99	41.0	7.0	55.4			64.6				0.16					0.05	0.03	0.04	0.04	0	0.05	75.0	5.2	7.3	7.4				
4	533.5	12.77	41.4	8.0	59.0			68.8				0.14		0.04			0.05	0.03	0.03	0.04	0	0.05	73.2	5.1	7.4	7.4				
5	442.6	10.56	41.1	8.0	48.8			56.9				0.14					0.05	0.04	0.03	0.04	0	0.05	71.4	5.2	7.4	7.4				
6	507.4	12.11	41.0	5.0	56.0			65.3				0.16		0.04			0.05	0.03	0.03	0.04	0	0.05	76.6	5.0	7.4	7.4				
7	445.6	10.64	42.5	5.0	49.2			57.3				0.19					0.05	0.03	0.04	0.04	0	0.05	78.9	5.0	7.5	7.3				
8	468.5	11.19	41.5	7.0	51.7			60.3				0.21					0.05	0.04	0.05	0.05	0	0.05	77.8	5.0	7.5	7.1				
9	482.1	11.51	41.8	8.0	53.2			62.0				0.23					0.05	0.03	0.03	0.04	0	0.05	84.1	5.0	7.5	7.3				
10	512.7	12.25	41.5	6.0	56.6			66.0				0.22		0.05			0.05	0.03	0.03	0.04	0	0.05	81.8	5.0	7.5	7.3				
11	505.7	12.09	40.9	6.0	55.9			65.1				0.24		0.03			0.05	0.03	0.04	0.04	0	0.05	84.4	5.1	7.5	7.4				
12	445.7	10.65	40.6	8.0	49.2			57.4				0.34					0.05	0.03	0.03	0.04	0	0.05	89.2	5.0	7.5	7.4				
13	520.9	12.43	40.8	7.0	57.5			67.0				0.21		0.04			0.05	0.03	0.04	0.04	0	0.05	81.0	5.0	7.5	7.4				
14	476.4	11.38	41.3	5.0	52.6			61.3				0.23					0.05	0.03	0.04	0.04	0	0.05	82.6	5.0	7.5	7.4				
15	469.6	11.21	40.9	7.0	51.8			60.4				0.32					0.05	0.03	0.04	0.04	0	0.05	87.5	5.1	7.5	7.4				
16	547.9	13.09	41.0	7.0	60.5			70.6				0.32		0.04			0.05	0.03	0.04	0.04	0	0.05	87.5	5.2	7.5	7.4				
17	488.9	11.68	40.9	6.0	54.0			62.9				0.33					0.05	0.03	0.03	0.04	0	0.05	88.9	5.1	7.4	7.3				
18	535.4	12.79	40.7	8.0	59.1			68.9				0.34		0.04			0.04	0.03	0.03	0.04	0	0.04	89.7	5.2	7.4	7.3				
19	503.5	12.02	40.7	8.0	55.5			64.7				0.31		0.03			0.04	0.03	0.03	0.03	0	0.04	89.5	5.2	7.4	7.3				
20	467.0	11.16	40.9	8.0	51.6			60.2				0.31					0.05	0.03	0.03	0.04	0	0.05	88.2	5.2	7.5	7.3				
21	490.4	11.70	40.7	7.0	54.1			63.0				0.27					0.05	0.04	0.04	0.04	0	0.05	84.0	5.2	7.4	7.3				
22	461.4	11.02	40.7	7.0	50.9			59.4				0.30					0.05	0.03	0.03	0.04	0	0.05	87.8	5.3	7.4	7.3				
23	484.4	11.56	40.6	7.0	53.4			62.3				0.32					0.04	0.03	0.03	0.03	0	0.04	89.6	5.2	7.4	7.3				
24	537.8	12.84	41.2	8.0	59.4			69.2				0.32		0.03			0.05	0.04	0.04	0.04	0	0.05	87.5	5.4	7.4	7.3				
25	530.1	12.65	40.3	7.0	58.5			68.2				0.29		0.04			0.05	0.03	0.03	0.04	0	0.05	87.1	5.2	7.4	7.3				
26	444.1	10.61	40.5	7.0	49.1			57.2				0.31					0.05	0.04	0.04	0.04	0	0.05	86.0	5.2	7.4	7.3				
27	460.9	10.99	44.3	8.0	50.8			59.2				0.31					0.04	0.03	0.03	0.03	0	0.04	89.2	5.6	7.3	7.3				
28	507.7	12.14	40.3	7.0	56.1			65.4				0.29		0.04			0.05	0.03	0.03	0.04	0	0.05	87.1	5.3	7.3	7.3				
29	435.8	10.39	40.7	6.0	48.0			56.0				0.30					0.05	0.03	0.03	0.04	0	0.05	87.8	5.3	7.3	7.3				
30	507.4	12.11	40.4	8.0	56.0			65.2				0.28		0.03			0.05	0.03	0.03	0.04	0	0.05	87.5	5.3	7.3	7.3				
31	493.6	11.8	40.1	9.0	54.5			63.5				0.29					0.04	0.03	0.03	0.03	0	0.04	88.7	5.4	7.3	7.3				
Total	15188	362.7	1,272	219.0	1,676.5			1,954.3													0									
Avg	490	11.7	41.04	7.1	54.1			63.0				0.26								0.04			84.0	5.2	7.4	7.3				

Total number of CFE samples analyzed for month: N = 105

Total number of CFE samples exceeding 0.3 NTU: E = 0

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y

Max variation (NTU) 0.02

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Date of last filter inspection 3/27/2019

filters with more than 10 percent media loss 0

Report Submitted By: Kevin Cook

Signature

DOH Form #331-023-F (Excel version)

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

Water Treatment Plant Monthly Report Form

Month: 4 Year: 2019

PWS ID:
Source ID: S01
PWS Name: Lake Whatcom Water & Sewer Dist
Source Name: Lake Whatcom
County: Whatcom
Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	479.2	11.48	40.2	9.0	53.1			61.8				0.31					0.05	0.03	0.03	0.04	0	0.05	88.2	5.4	7.3	7.3				
2	494.2	11.78	39.4	6.0	54.5			63.5				0.29					0.05	0.03	0.03	0.04	0	0.05	87.1	5.8	7.1	7.3				
3	448.6	10.71	39.9	6.0	49.5			57.7				0.31					0.05	0.03	0.03	0.04	0	0.05	88.0	5.7	7.2	7.2				
4	408.4	9.74	39.6	7.0	45.0			52.5				0.31					0.05	0.03	0.03	0.04	0	0.05	88.3	6.1	7.2	2.4				
5	483.2	11.53	40.1	6.0	53.3			62.1				0.28					0.05	0.03	0.04	0.04	0	0.05	85.8	5.7	6.9	7.3				
6	457.5	10.94	40.0	7.0	50.6			58.9				0.34					0.05	0.03	0.03	0.04	0	0.05	89.3	5.9	6.9	7.2				
7	494.4	11.79	39.7	6.0	54.5			63.5				0.29					0.04	0.03	0.03	0.03	0	0.04	88.4	6.1	6.9	7.2				
8	509.1	12.17	39.8	8.0	56.3			65.6				0.29		0.03			0.04	0.03	0.03	0.03	0	0.04	88.6	5.9	6.9	7.2				
9	454.3	10.84	39.8	5.0	50.2			58.4				0.27					0.04	0.03	0.03	0.03	0	0.04	87.5	5.6	10.1	7.2				
10	480.1	11.46	40.9	7.0	53.0			61.8				0.30					0.04	0.04	0.05	0.04	0	0.05	85.7	6.1	10.0	7.2				
11	535.2	12.75	40.1	6.0	58.9			68.7				0.30				0.04	0.03	0.04	0.04	0.04	0	0.04	87.6	6.2	7.3	7.2				
12	509.4	12.18	40.1	8.0	56.3			65.6				0.29		0.04			0.03	0.04	0.04	0.04	0	0.04	87.0	5.9	7.3	7.3				
13	468.8	11.18	40.5	9.0	51.7			60.2				0.28					0.04	0.03	0.04	0.04	0	0.04	86.9	5.6	7.3	7.2				
14	571.0	13.65	40.2	8.0	63.1			73.6				0.33		0.04			0.05	0.04	0.04	0.04	0	0.05	87.2	6.2	7.2	7.2				
15	496.0	11.88	40.2	5.0	54.9			64.0				0.29					0.05	0.03	0.04	0.04	0	0.05	86.0	5.8	7.2	7.2				
16	449.2	10.73	40.2	7.0	49.6			57.8				0.30					0.04	0.03	0.04	0.04	0	0.04	87.9	5.7	7.3	7.2				
17	463.4	11.07	40.3	10.0	51.2			59.6				0.33					0.04	0.03	0.04	0.04	0	0.04	88.7	5.8	7.3	7.2				
18	459.2	10.99	40.2	6.0	50.8			59.2				0.29					0.04	0.03	0.03	0.03	0	0.04	88.5	6.2	7.4	7.3				
19	419.2	9.99	66.8	5.0	46.2			53.8				0.30					0.04	0.03	0.04	0.04	0	0.04	87.7	6.2	7.2	7.2				
20	581.6	13.91	39.7	9.0	64.3			75.0				0.28		0.04			0.05	0.03	0.04	0.04	0	0.05	85.8	6.1	7.3	7.2				
21	546.6	13.03	39.8	8.0	60.2			70.2				0.32		0.05			0.04	0.04	0.05	0.05	0	0.05	85.7	5.9	7.2	7.2				
22	544.2	12.98	39.8	7.0	60.0			70.0				0.30		0.05			0.04	0.03	0.03	0.04	0	0.05	87.5	6.0	7.3	7.1				
23	446.3	10.65	40.4	5.0	49.2			57.4				0.30					0.04	0.03	0.04	0.04	0	0.04	87.8	6.2	7.1	7.2				
24	475.1	11.33	39.9	7.0	52.4			61.1				0.28					0.04	0.03	0.03	0.03	0	0.04	88.2	6.5	7.1	7.1				
25	493.6	11.77	40.9	6.0	54.4			63.4				0.35					0.03	0.03	0.04	0.03	0	0.04	90.5	6.1	7.0	7.2				
26	480.8	11.48	40.1	10.0	53.0			61.8				0.45					0.04	0.03	0.04	0.04	0	0.04	91.8	6.2	7.1	7.2				
27	452.0	10.78	40.0	6.0	49.8			58.1				0.29					0.03	0.03	0.03	0.03	0	0.03	89.8	6.3	7.2	7.2				
28	539.4	12.87	40.0	8.0	59.5			69.4				0.31		0.04			0.04	0.03	0.03	0.04	0	0.04	88.9	6.2	7.0	7.2				
29	523.3	12.48	40.0	7.0	57.7			67.2				0.30		0.05			0.04	0.04	0.04	0.04	~~0~~	0.05	86.0	6.4	7.1	7.2				
30	489.3	11.68	42.1	6.0	54.0			62.9									0.04	0.03	0.04	0.04	0	0.00		6.5	7.1	(3.50				
31																						0.00								
Total	14652	349.8	1,231	210.0	1,617.0			1,884.9													0									
Avg	488	11.7	41.02	7.0	53.9			62.8				0.31								0.04			87.8	6.0	7.4	6.7				

Total number of CFE samples analyzed for month: N = 99 120
Total number of CFE samples exceeding 0.3 NTU: E = 0
Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%
Number of days CFE exceeded 1.0 NTU this month: 0
Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N
Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y
Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y
Max variation (NTU) 0.02
DOH Form #331-023-F (Excel version)

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"
Date of last filter inspection 3/27/2019
filters with more than 10 percent media loss 0
Report Submitted By Kevin Cook
Signature

Revised on 5/20/19

Date Printed: 5/1/2019

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

Water Treatment Plant Monthly Report Form

Month: 5 Year: 2019

PWS II | PWS Name: Lake Whatcom Water & Sewer Dist | County: Whatcom
Source ID: S01 | Source Name: Lake Whatcom | Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs): Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU: Raw	Settled
1	538.7	12.85	43.4	9.0	59.4	n/a	n/a	69.2	n/a	n/a	n/a	0.307	n/a
2	475.8	11.34	40.0	9.0	52.4	n/a	n/a	61.1	n/a	n/a	n/a	0.313	n/a
3	515.5	12.32	39.6	8.0	57.0	n/a	n/a	66.4	n/a	n/a	n/a	0.306	n/a
4	473.3	11.28	39.8	7.0	52.1	n/a	n/a	60.8	n/a	n/a	n/a	0.303	n/a
5	520.1	12.41	40.2	9.0	57.4	n/a	n/a	66.9	n/a	n/a	n/a	0.300	n/a
6	606.2	14.49	39.9	10.0	67.0	n/a	n/a	78.1	n/a	n/a	n/a	0.303	n/a
7	530.8	12.66	40.1	8.0	58.5	n/a	n/a	68.2	n/a	n/a	n/a	0.299	n/a
8	527.2	12.58	39.9	7.0	58.2	n/a	n/a	67.8	n/a	n/a	n/a	0.303	n/a
9	560.6	13.38	39.8	8.0	61.8	n/a	n/a	72.1	n/a	n/a	n/a	0.281	n/a
10	551.3	13.15	40.9	10.0	60.8	n/a	n/a	70.9	n/a	n/a	n/a	0.294	n/a
11	603.9	14.40	39.6	9.0	66.6	n/a	n/a	77.6	n/a	n/a	n/a	0.304	n/a
12	626.0	14.99	39.8	9.0	69.3	n/a	n/a	80.7	n/a	n/a	n/a	0.316	n/a
13	568.3	13.62	52.4	9.0	62.9	n/a	n/a	73.4	n/a	n/a	n/a	0.268	n/a
14	524.2	12.51	39.8	7.0	57.8	n/a	n/a	67.4	n/a	n/a	n/a	0.269	n/a
15	515.5	12.30	39.6	6.0	56.8	n/a	n/a	66.3	n/a	n/a	n/a	0.259	n/a
16	521.8	12.45	39.8	7.0	57.5	n/a	n/a	67.1	n/a	n/a	n/a	0.36	n/a
17	549.4	13.16	39.9	8.0	60.8	n/a	n/a	70.9	n/a	n/a	n/a	0.36	n/a
18	542.2	12.94	39.9	7.0	59.8	n/a	n/a	69.7	n/a	n/a	n/a	0.32	n/a
19	539.1	12.87	40.2	8.0	59.5	n/a	n/a	69.4	n/a	n/a	n/a	0.49	n/a
20	646.9	15.63	40.2	9.0	72.3	n/a	n/a	84.2	n/a	n/a	n/a	0.30	n/a
21	534.9	12.80	39.9	8.0	59.2	n/a	n/a	69.0	n/a	n/a	n/a	0.26	n/a
22	476.6	11.37	39.7	6.0	52.6	n/a	n/a	61.3	n/a	n/a	n/a	0.23	n/a
23	538.8	12.86	40.8	8.0	59.4	n/a	n/a	69.3	n/a	n/a	n/a	0.27	n/a
24	475.2	11.34	40.4	8.0	52.4	n/a	n/a	61.1	n/a	n/a	n/a	0.23	n/a
25	646.9	15.53	40.2	10.0	71.8	n/a	n/a	83.7	n/a	n/a	n/a	0.25	n/a
26	496.6	11.86	40.0	7.0	54.8	n/a	n/a	63.9	n/a	n/a	n/a	0.23	n/a
27	583.6	13.93	40.3	8.0	64.4	n/a	n/a	75.1	n/a	n/a	n/a	0.21	n/a
28	609.8	14.63	40.1	8.0	67.6	n/a	n/a	78.8	n/a	n/a	n/a	0.24	n/a
29	517.3	12.36	39.8	6.0	57.1	n/a	n/a	66.6	n/a	n/a	n/a	0.22	n/a
30	540.4	12.97	39.9	8.0	60.0	n/a	n/a	69.9	n/a	n/a	n/a	0.22	n/a
31	590.7	14.1	40.0	9.0	65.3	n/a	n/a	76.1	n/a	n/a	n/a	0.24	n/a
Total	16948	405.1	1,256	250.0	1,872.5	0.0	0.0	2,182.7	0.0	0.0	0.0		
Avg	547	13.1	40.51	8.1	60.4			70.4				0.29	

Date	Combined Filter Effluent Turbidity 4 hour sample NTU: 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Total Alkalinity Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	0.04			0.04	0.04	0.04	0.04	0	0.04	87.0	6.6	7.2	7.3	n/a	n/a	n/a	
2				0.04	0.03	0.03	0.03	0	0.04	89.4	6.6	7.1	7.3	n/a	n/a	n/a	
3	0.04			0.04	0.04	0.04	0.04	0	0.04	86.9	6.2	7.1	7.2	n/a	n/a	n/a	
4				0.05	0.04	0.04	0.04	0	0.05	85.7	6.0	6.9	7.2	n/a	n/a	n/a	
5	0.05			0.04	0.03	0.04	0.04	0	0.05	86.7	6.1	7.0	7.2	n/a	n/a	n/a	
6	0.04			0.04	0.03	0.04	0.04	0	0.04	87.6	6.8	7.3	7.2	n/a	n/a	n/a	
7	0.04			0.04	0.03	0.04	0.04	0	0.04	87.5	6.8	7.3	7.2	n/a	n/a	n/a	
8	0.04			0.04	0.03	0.03	0.04	0	0.04	88.4	6.3	7.3	7.2	n/a	n/a	n/a	
9	0.03			0.04	0.03	0.04	0.04	0	0.04	87.5	6.4	7.2	7.2	n/a	n/a	n/a	
10	0.04			0.04	0.03	0.04	0.04	0	0.04	87.2	6.2	7.2	7.2	n/a	n/a	n/a	
11	0.04			0.04	0.03	0.03	0.04	0	0.04	88.5	6.5	7.2	7.2	n/a	n/a	n/a	
12	0.04			0.04	0.04	0.05	0.04	0	0.05	86.6	6.5	7.3	7.2	n/a	n/a	n/a	
13	0.05			0.04	0.04	0.04	0.04	0	0.05	84.1	6.3	7.2	7.2	n/a	n/a	n/a	
14	0.04			0.04	0.03	0.04	0.04	0	0.04	86.1	6.3	7.1	7.2	n/a	n/a	n/a	
15	0.04			0.04	0.04	0.04	0.04	0	0.04	84.6	6.7	7.0	7.1	n/a	n/a	n/a	
16	0.04			0.04	0.04	0.04	0.04	0	0.04	88.8	6.6	7.1	7.2	n/a	n/a	n/a	
17	0.04			0.04	0.03	0.03	0.04	0	0.04	90.2	6.4	7.1	7.2	n/a	n/a	n/a	
18	0.03			0.04	0.04	0.04	0.04	0	0.04	88.2	6.4	7.0	7.2	n/a	n/a	n/a	
19	0.05			0.04	0.04	0.04	0.04	0	0.05	91.3	6.5	7.0	7.2	n/a	n/a	n/a	
20	0.05			0.04	0.03	0.04	0.04	0	0.05	86.7	6.4	7.2	7.2	n/a	n/a	n/a	
21	0.04			0.04	0.04	0.04	0.04	0	0.04	84.7	6.4	7.2	7.1	n/a	n/a	n/a	
22				0.04	0.03	0.04	0.04	0	0.04	84.0	6.9	7.1	7.1	n/a	n/a	n/a	
23	0.04			0.04	0.04	0.04	0.04	0	0.04	85.1	6.6	7.0	7.1	n/a	n/a	n/a	
24				0.04	0.03	0.04	0.04	0	0.04	84.3	6.6	7.1	7.2	n/a	n/a	n/a	
25	0.05			0.04	0.03	0.03	0.04	0	0.05	84.9	6.3	7.2	7.2	n/a	n/a	n/a	
26				0.04	0.04	0.05	0.04	0	0.05	80.8	6.0	7.1	7.1	n/a	n/a	n/a	
27	0.05			0.04	0.03	0.03	0.04	0	0.05	82.5	6.5	7.2	7.1	n/a	n/a	n/a	
28	0.03			0.04	0.03	0.04	0.04	0	0.04	85.2	6.4	7.2	7.3	n/a	n/a	n/a	
29	0.04			0.04	0.03	0.04	0.04	0	0.04	82.7	6.4	7.1	7.2	n/a	n/a	n/a	
30	0.04			0.04	0.03	0.04	0.04	0	0.04	83.3	6.8	7.2	7.2	n/a	n/a	n/a	
31	0.04			0.03	0.03	0.04	0.04	0	0.04	85.4	6.5	7.1	7.2	n/a	n/a	n/a	
Total								0									
Avg							0.04			86.2	6.5	7.1	7.2				

Total number of CFE samples analyzed for month: N = 119
Total number of CFE samples exceeding 0.3 NTU: E = 0
Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%
Number of days CFE exceeded 1.0 NTU this month: 0
Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N
Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y
Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y — Max variation (NTU): 0.02

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Filter media design specs (in): Anthracite 18" Sand 9" Garnet 9"
Date of last filter inspection: 3/27/2019 — # filters with more than 10 percent media loss: 0
Report Submitted By: Kevin Cook — Signature:

DOH Form #331-023-F (Excel version)

Date Printed: 6/3/2019

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

Water Treatment Plant Monthly Report Form

Month: 6 Year: 2019

PWS ID:
Source ID: S01

PWS Name: Lake Whatcom Water & Sewer Dist
Source Name: Lake Whatcom

County: Whatcom
Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled
1	555.5	13.25	40.3	7.0	61.2	n/a	n/a	71.4	n/a	n/a	n/a	0.224	n/a
2	673.4	16.20	39.9	9.0	74.9	n/a	n/a	87.3	n/a	n/a	n/a	0.215	n/a
3	692.2	16.75	39.8	9.0	77.4	n/a	n/a	90.3	n/a	n/a	n/a	0.209	n/a
4	587.4	14.08	40.9	9.0	65.1	n/a	n/a	75.9	n/a	n/a	n/a	0.200	n/a
5	616.7	14.77	40.1	7.0	68.3	n/a	n/a	79.6	n/a	n/a	n/a	0.228	n/a
6	520.4	12.40	39.6	10.0	57.3	n/a	n/a	66.8	n/a	n/a	n/a	0.218	n/a
7	599.0	14.30	39.2	8.0	66.1	n/a	n/a	77.1	n/a	n/a	n/a	0.301	n/a
8	534.7	12.75	39.2	7.0	58.9	n/a	n/a	68.7	n/a	n/a	n/a	0.259	n/a
9	642.6	15.36	39.7	10.0	71.0	n/a	n/a	82.8	n/a	n/a	n/a	0.246	n/a
10	673.0	16.10	39.6	11.0	74.4	n/a	n/a	86.7	n/a	n/a	n/a	0.267	n/a
11	640.8	15.38	39.5	11.0	71.1	n/a	n/a	82.9	n/a	n/a	n/a	0.266	n/a
12	675.4	16.19	39.6	11.0	74.8	n/a	n/a	87.2	n/a	n/a	n/a	0.308	n/a
13	609.9	14.63	39.5	10.0	67.6	n/a	n/a	78.8	n/a	n/a	n/a	0.362	n/a
14	668.3	16.04	39.2	9.0	74.2	n/a	n/a	86.4	n/a	n/a	n/a	0.242	n/a
15	560.2	13.35	40.2	7.0	61.7	n/a	n/a	71.9	n/a	n/a	n/a	0.278	n/a
16	716.6	17.16	39.5	10.0	79.3	n/a	n/a	92.4	n/a	n/a	n/a	0.216	n/a
17	662.8	16.04	39.3	8.0	74.2	n/a	n/a	86.4	n/a	n/a	n/a	0.253	n/a
18	605.8	14.48	38.9	8.0	66.9	n/a	n/a	78.0	n/a	n/a	n/a	0.248	n/a
19	627.1	14.98	39.9	7.0	69.2	n/a	n/a	80.7	n/a	n/a	n/a	0.264	n/a
20	585.5	14.01	40.2	8.0	64.8	n/a	n/a	75.5	n/a	n/a	n/a	0.235	n/a
21	571.3	13.63	40.1	10.0	63.0	n/a	n/a	73.4	n/a	n/a	n/a	0.216	n/a
22	630.5	15.08	40.3	9.0	69.7	n/a	n/a	81.3	n/a	n/a	n/a	0.216	n/a
23	548.6	13.09	39.8	9.0	60.5	n/a	n/a	70.6	n/a	n/a	n/a	0.194	n/a
24	647.0	15.47	40.2	8.0	71.5	n/a	n/a	83.4	n/a	n/a	n/a	0.196	n/a
25	550.9	13.13	40.9	8.0	60.7	n/a	n/a	70.8	n/a	n/a	n/a	0.202	n/a
26	648.7	15.49	41.4	9.0	71.6	n/a	n/a	83.5	n/a	n/a	n/a	0.250	n/a
27	566.9	13.51	40.2	8.0	62.5	n/a	n/a	72.8	n/a	n/a	n/a	0.216	n/a
28	560.7	13.37	40.4	8.0	61.8	n/a	n/a	72.0	n/a	n/a	n/a	0.207	n/a
29	501.8	11.96	40.3	6.0	55.3	n/a	n/a	64.4	n/a	n/a	n/a	0.261	n/a
30	627.2	14.98	40.2	8.0	69.3	n/a	n/a	80.7	n/a	n/a	n/a	0.242	n/a
31						n/a	n/a		n/a	n/a	n/a		n/a
Total	18301	437.9	1,198	259.0	2,024.4	0.0	0.0	2,359.7	0.0	0.0	0.0		
Avg	610	14.6	39.94	8.6	67.5			78.7				0.24	

Date	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	0.06			0.04	0.03	0.03	0.04	0	0.06	82.1	6.5	7.0	7.2	n/a	n/a	n/a	
2	0.04	0.04		0.03	0.04	0.04	0.04	0	0.04	82.3	6.3	7.0	7.3	n/a	n/a	n/a	
3	0.05	0.05		0.04	0.04	0.04	0.04	0	0.05	78.9	6.3	7.2	7.3	n/a	n/a	n/a	
4	0.04			0.04	0.03	0.03	0.04	0	0.04	82.5	6.5	7.0	7.3	n/a	n/a	n/a	
5	0.04			0.04	0.03	0.03	0.04	0	0.04	84.6	6.5	7.0	7.2	n/a	n/a	n/a	
6	0.04			0.04	0.03	0.03	0.04	0	0.04	83.9	6.8	7.2	7.2	n/a	n/a	n/a	
7	0.03			0.03	0.03	0.04	0.03	0	0.04	89.2	6.8	7.2	7.2	n/a	n/a	n/a	
8	0.05			0.04	0.04	0.04	0.04	0	0.05	83.6	6.7	7.2	7.2	n/a	n/a	n/a	
9	0.05			0.04	0.04	0.04	0.04	0	0.05	82.7	6.5	7.2	7.2	n/a	n/a	n/a	
10	0.05	0.05		0.04	0.03	0.03	0.04	0	0.05	85.0	6.6	7.3	7.2	n/a	n/a	n/a	
11	0.03			0.04	0.02	0.02	0.03	0	0.04	89.7	6.8	7.2	7.2	n/a	n/a	n/a	
12	0.03	0.03		0.04	0.02	0.03	0.03	0	0.04	90.3	6.8	7.3	7.2	n/a	n/a	n/a	
13	0.03			0.04	0.03	0.04	0.04	0	0.04	90.3	6.7	7.2	7.2	n/a	n/a	n/a	
14	0.04	0.04		0.04	0.03	0.04	0.04	0	0.04	84.3	6.8	7.3	7.2	n/a	n/a	n/a	
15	0.04			0.04	0.03	0.03	0.04	0	0.04	87.4	6.6	7.2	7.0	n/a	n/a	n/a	
16	0.04	0.04		0.04	0.03	0.03	0.04	0	0.04	83.3	6.4	7.3	7.1	n/a	n/a	n/a	
17	0.04	0.05		0.04	0.04	0.05	0.04	0	0.05	82.6	6.3	7.3	7.1	n/a	n/a	n/a	
18	0.05			0.04	0.03	0.03	0.04	0	0.05	84.9	6.7	7.2	7.0	n/a	n/a	n/a	
19	0.03			0.04	0.03	0.04	0.04	0	0.04	86.7	6.9	7.2	7.0	n/a	n/a	n/a	
20	0.04			0.04	0.03	0.03	0.04	0	0.04	85.1	6.8	7.2	7.2	n/a	n/a	n/a	
21	0.04			0.04	0.02	0.03	0.03	0	0.04	85.0	6.9	7.1	7.3	n/a	n/a	n/a	
22	0.03			0.04	0.03	0.03	0.03	0	0.04	85.0	6.7	7.0	7.2	n/a	n/a	n/a	
23	0.03			0.04	0.03	0.04	0.04	0	0.04	82.0	6.8	7.0	7.2	n/a	n/a	n/a	
24	0.04			0.04	0.02	0.03	0.03	0	0.04	83.4	6.9	7.0	7.2	n/a	n/a	n/a	
25	0.03			0.04	0.02	0.03	0.03	0	0.04	85.1	6.5	7.0	7.2	n/a	n/a	n/a	
26	0.03			0.04	0.04	0.04	0.04	0	0.04	85.0	7.2	7.0	7.2	n/a	n/a	n/a	
27	0.05			0.04	0.03	0.04	0.04	0	0.05	81.5	7.0	7.0	7.2	n/a	n/a	n/a	
28	0.04			0.04	0.02	0.02	0.03	0	0.04	85.5	7.0	6.9	7.2	n/a	n/a	n/a	
29				0.04	0.03	0.04	0.04	0	0.04	86.0	7.3	6.9	7.2	n/a	n/a	n/a	
30	0.04			0.04	0.03	0.04	0.04	0	0.04	84.5	6.9	6.9	7.2	n/a	n/a	n/a	
31									0.00					n/a	n/a	n/a	
Total								0									
Avg							0.04			84.8	6.7	7.1	7.2				

Total number of CFE samples analyzed for month: N = 126

Total number of CFE samples exceeding 0.3 NTU: E = 0

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y Max variation (NTU) 0.04

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Date of last filter inspection 3/27/2019 # filters with more than 10 percent media loss 0

Report Submitted By Kevin Cook Signature

DOH Form #331-023-F (Excel version)

Date Printed: 7/2/2019

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

Water Treatment Plant Monthly Report Form

Month: 7 Year: 2019

PWS ID:
PWS Name: Lake Whatcom Water & Sewer Dist
County: Whatcom
Source ID: S01
Source Name: Lake Whatcom
Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs): Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU: Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU: 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C: Raw	pH: Raw	pH: Final	Total Alkalinity mg/L as CaCO3: Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	688.8	16.58	40.2	8.0	76.6	n/a	n/a	89.3	n/a	n/a	n/a	0.264	n/a	0.04	0.04		0.04	0.03	0.02	0.03	0	0.04	87.1	6.8	7.0	7.2	n/a	n/a	n/a	
2	581.6	13.90	39.9	10.0	64.3	n/a	n/a	74.9	n/a	n/a	n/a	0.266	n/a	0.02			0.04	0.03	0.03	0.03	0	0.04	88.7	6.8	7.0	7.2	n/a	n/a	n/a	
3	595.6	14.19	39.8	9.0	65.6	n/a	n/a	76.5	n/a	n/a	n/a	0.287	n/a	0.04			0.04	0.04	0.04	0.04	0	0.04	86.1	7.0	6.9	7.2	n/a	n/a	n/a	
4	568.5	13.56	39.7	8.0	62.7	n/a	n/a	73.0	n/a	n/a	n/a	0.318	n/a	0.04			0.04	0.04	0.04	0.04	0	0.04	87.4	7.1	6.9	7.2	n/a	n/a	n/a	
5	603.8	14.42	40.4	9.0	66.7	n/a	n/a	77.7	n/a	n/a	n/a	0.300	n/a	0.05			0.04	0.03	0.03	0.04	0	0.05	87.5	6.8	6.9	7.2	n/a	n/a	n/a	
6	589.1	14.04	40.1	8.0	64.9	n/a	n/a	75.7	n/a	n/a	n/a	0.327	n/a	0.04			0.04	0.03	0.03	0.04	0	0.04	89.3	6.9	6.9	7.2	n/a	n/a	n/a	
7	573.8	13.68	40.4	8.0	63.2	n/a	n/a	73.7	n/a	n/a	n/a	0.348	n/a	0.04			0.04	0.04	0.04	0.04	0	0.04	88.5	7.1	6.9	7.1	n/a	n/a	n/a	
8	625.8	14.96	40.3	9.0	69.1	n/a	n/a	80.6	n/a	n/a	n/a	0.242	n/a	0.05			0.04	0.03	0.04	0.04	0	0.05	83.5	6.9	7.0	7.2	n/a	n/a	n/a	
9	589.3	14.05	40.2	9.0	64.9	n/a	n/a	75.7	n/a	n/a	n/a	0.261	n/a	0.04			0.04	0.03	0.04	0.04	0	0.04	85.6	7.1	7.1	7.2	n/a	n/a	n/a	
10	574.6	13.69	40.8	10.0	63.3	n/a	n/a	73.8	n/a	n/a	n/a	0.204	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	84.1	7.0	7.2	7.2	n/a	n/a	n/a	
11	524.9	12.51	40.3	8.0	57.8	n/a	n/a	67.4	n/a	n/a	n/a	0.215	n/a	0.04			0.04	0.03	0.04	0.04	0	0.04	82.6	6.7	7.1	7.1	n/a	n/a	n/a	
12	516.5	12.31	40.3	9.0	56.9	n/a	n/a	66.3	n/a	n/a	n/a	0.228	n/a	0.04			0.04	0.03	0.04	0.04	0	0.04	83.6	6.9	7.0	7.1	n/a	n/a	n/a	
13	557.5	13.29	39.8	8.0	61.4	n/a	n/a	71.6	n/a	n/a	n/a	0.209	n/a	0.05			0.04	0.03	0.03	0.04	0	0.05	82.1	6.9	7.0	7.2	n/a	n/a	n/a	
14	570.6	13.60	40.1	10.0	62.9	n/a	n/a	73.3	n/a	n/a	n/a	0.225	n/a	0.04			0.03	0.03	0.03	0.03	0	0.04	85.6	6.9	6.9	7.1	n/a	n/a	n/a	
15	622.5	14.85	40.0	9.0	68.7	n/a	n/a	80.0	n/a	n/a	n/a	0.205	n/a	0.03			0.04	0.03	0.04	0.04	0	0.04	82.9	7.1	6.9	7.1	n/a	n/a	n/a	
16	828.4	20.10	41.2		92.9	n/a	n/a	108.3	n/a	n/a	n/a	0.220	n/a	0.04	0.05	0.04	0.03	0.03	0.04	0.04	0	0.05	82.6	6.9	7.3	7.1	n/a	n/a	n/a	
17	580.8	13.87	40.3	8.0	64.1	n/a	n/a	74.7	n/a	n/a	n/a	0.234	n/a	0.04			0.04	0.03	0.03	0.04	0	0.04	85.0	6.9	7.2	7.1	n/a	n/a	n/a	
18	544.3	12.98	39.9	9.0	60.0	n/a	n/a	69.9	n/a	n/a	n/a	0.224	n/a	0.05			0.04	0.03	0.03	0.04	0	0.05	83.3	6.8	7.1	7.1	n/a	n/a	n/a	
19	485.5	11.57	40.2	8.0	53.5	n/a	n/a	62.3	n/a	n/a	n/a	0.206	n/a				0.04	0.02	0.03	0.03	0	0.04	85.4	6.9	7.1	7.1	n/a	n/a	n/a	
20	676.3	16.12	40.0	7.0	74.5	n/a	n/a	86.8	n/a	n/a	n/a	0.228	n/a	0.04	0.04		0.04	0.03	0.04	0.04	0	0.04	83.3	7.1	7.1	7.1	n/a	n/a	n/a	
21	599.2	14.29	39.8	8.0	66.0	n/a	n/a	77.0	n/a	n/a	n/a	0.263	n/a	0.04			0.04	0.03	0.04	0.04	0	0.04	85.7	7.0	7.1	7.1	n/a	n/a	n/a	
22	678.6	16.29	41.0	9.0	75.3	n/a	n/a	87.8	n/a	n/a	n/a	0.262	n/a	0.04	0.05		0.04	0.03	0.04	0.04	0	0.05	84.7	6.8	7.0	7.1	n/a	n/a	n/a	
23	599.5	14.29	40.3	10.0	66.1	n/a	n/a	77.0	n/a	n/a	n/a	0.207	n/a	0.04			0.04	0.03	0.04	0.04	0	0.04	81.9	6.8	7.1	7.2	n/a	n/a	n/a	
24	601.9	14.43	40.0	9.0	66.7	n/a	n/a	77.8	n/a	n/a	n/a	0.228	n/a	0.04			0.04	0.03	0.03	0.04	0	0.04	84.6	7.1	7.0	7.1	n/a	n/a	n/a	
25	619.8	14.77	40.3	9.0	68.3	n/a	n/a	79.6	n/a	n/a	n/a	0.229	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	85.8	7.0	6.9	7.0	n/a	n/a	n/a	
26	760.1	18.30	40.9	10.0	84.6	n/a	n/a	98.6	n/a	n/a	n/a	0.263	n/a	0.04	0.05		0.04	0.04	0.05	0.04	0	0.05	83.3	7.0	6.9	7.0	n/a	n/a	n/a	
27	683.4	16.33	40.2	7.0	75.5	n/a	n/a	88.0	n/a	n/a	n/a	0.294	n/a	0.05			0.04	0.03	0.03	0.04	0	0.05	87.2	7.0	7.0	7.2	n/a	n/a	n/a	
28	549.1	13.09	40.0	8.0	60.5	n/a	n/a	70.5	n/a	n/a	n/a	0.412	n/a	0.04			0.04	0.04	0.04	0.04	0	0.04	90.3	7.0	6.9	7.2	n/a	n/a	n/a	
29	636.4	15.26	40.1	11.0	70.5	n/a	n/a	82.2	n/a	n/a	n/a	0.222	n/a	0.05			0.04	0.04	0.04	0.04	0	0.05	80.9	7.4	7.6	7.2	n/a	n/a	n/a	
30	643.9	15.43	40.6	9.0	71.3	n/a	n/a	83.1	n/a	n/a	n/a	0.205	n/a	0.04			0.04	0.03	0.03	0.04	0	0.04	82.9	7.0	6.8	6.8	n/a	n/a	n/a	
31	622.7	14.9	40.1	10.0	69.0	n/a	n/a	80.4	n/a	n/a	n/a	0.194	n/a	0.04			0.04	0.04	0.04	0.04	0	0.04	79.4	7.2	7.3	7.1	n/a	n/a	n/a	
Total	18893	451.7	1,247	264.0	2,087.7	0.0	0.0	2,433.6	0.0	0.0	0.0										0									
Avg	609	14.6	40.23	8.8	67.3			78.5				0.25								0.04			84.9	7.0	7.0	7.1				

Total number of CFE samples analyzed for month: N = 129
Total number of CFE samples exceeding 0.3 NTU: E = 0
Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%
Number of days CFE exceeded 1.0 NTU this month: 0
Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N
Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y
Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y
Max variation (NTU) 0.03

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"
Date of last filter inspection 3/27/2019 # filters with more than 10 percent media loss 0
Report Submitted By Kevin Cook Signature

DOH Form #331-023-F (Excel version)

Date Printed: 8/8/2019

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

Water Treatment Plant Monthly Report Form

Month: 8 Year: 2019

PWS ID: | PWS Name: Lake Whatcom Water & Sewer Dist | County: Whatcom
Source ID: S01 | Source Name: Lake Whatcom | Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled
1	620.9	14.86	40.7	9.0	68.7			80.1				0.234	
2	596.9	14.36	39.8	7.0	66.4			77.4				0.366	
3	515.5	12.38	39.7	9.0	57.2			66.7				0.244	
4	638.7	15.27	39.7	8.0	70.6			82.3				0.359	
5	664.1	15.98	40.1	10.0	73.9			86.1				0.296	
6	599.5	14.49	40.2	10.0	67.0			78.1				0.279	
7	679.7	16.42	39.9	10.0	75.9			88.5				0.327	
8	510.4	12.35	39.9	8.0	57.1			66.5				0.379	
9	675.6	16.23	40.1	9.0	75.0			87.5				0.292	
10	581.6	13.92	40.9	9.0	64.3			75.0				0.322	
11	561.4	13.44	39.8	9.0	62.1			72.4				0.318	
12	546.1	13.08	39.5	9.0	60.5			70.5				0.246	
13	573.3	13.71	40.4	8.0	63.4			73.8				0.250	
14	622.9	14.89	40.3	7.0	68.8			80.2				0.304	
15	586.2	14.07	40.2	10.0	65.0			75.8				0.313	
16	634.5	15.18	50.1	10.0	70.2			81.8				0.301	
17	602.3	14.45	39.8	9.0	66.8			77.8				0.333	
18	607.9	14.59	40.0	10.0	67.4			78.6				0.318	
19	628.6	15.14	41.3	8.0	70.0			81.6				0.259	
20	618.5	14.79	39.8	6.0	68.4			79.7				0.268	
21	575.5	13.82	39.9	9.0	63.9			74.5				0.311	
22	476.6	11.43	40.0	8.0	52.8			61.6				0.253	
23	610.0	14.60	39.7	8.0	67.5			78.7				0.364	
24	489.0	11.74	39.7	8.0	54.3			63.3				0.283	
25	598.4	14.35	39.8	10.0	66.3			77.3				0.244	
26	595.2	14.24	40.2	8.0	65.8			76.7				0.285	
27	601.5	14.47	39.9	9.0	66.9			77.9				0.294	
28	646.8	15.51	40.2	9.0	71.7			83.6				0.318	
29	559.7	13.45	41.6	10.0	62.2			72.5				0.292	
30	655.2	15.70	40.6	10.0	72.6			84.6				0.031	
31	539.0	12.9	40.1	8.0	59.7			69.6				0.303	
Total	18412	441.8	1,254	272.0	2,042.2			2,380.6					
Avg	594	14.3	40.45	8.8	65.9			76.8				0.29	

Date	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	0.05			0.04	0.03	0.03	0.04	0	0.05	84.9	7.4	7.5	7.2				
2	0.03			0.03	0.03	0.03	0.03	0	0.03	91.8	7.1	7.4	7.2				
3	0.04			0.03	0.03	0.03	0.03	0	0.04	86.7	7.5	7.2	7.3				
4	0.04			0.04	0.04	0.04	0.04	0	0.04	88.9	7.6	7.1	7.3				
5	0.05			0.04	0.03	0.03	0.04	0	0.05	87.3	7.0	7.6	7.3				
6	0.04			0.04	0.03	0.04	0.04	0	0.04	86.6	7.1	7.0	7.3				
7	0.04		0.04	0.04	0.03	0.03	0.04	0	0.04	89.0	6.9	6.9	7.4				
8	0.03			0.04	0.04	0.05	0.04	0	0.05	89.4	7.1	6.9	7.4				
9	0.06	0.06		0.04	0.03	0.03	0.04	0	0.06	84.9	7.2	6.7	7.4				
10	0.03			0.04	0.03	0.04	0.04	0	0.04	89.1	7.3	6.8	7.3				
11	0.03			0.04	0.02	0.02	0.03	0	0.04	91.4	7.4	6.7	7.4				
12	0.03			0.04	0.03	0.04	0.04	0	0.04	85.8	7.3	6.7	7.3				
13	0.04			0.04	0.03	0.03	0.04	0	0.04	86.0	7.8	6.7	7.1				
14	0.03			0.04	0.04	0.04	0.04	0	0.04	87.7	7.6	6.6	7.1				
15	0.05			0.04	0.03	0.04	0.04	0	0.05	87.2	7.2	6.8	7.5				
16	0.05			0.04	0.03	0.04	0.04	0	0.05	86.7	7.2	6.7	7.4				
17	0.04			0.04	0.03	0.04	0.04	0	0.04	88.7	7.1	6.6	7.4				
18	0.04			0.04	0.02	0.03	0.03	0	0.04	89.8	7.8	6.7	7.4				
19	0.03			0.04	0.03	0.03	0.03	0	0.04	87.5	5.9	8.4	7.4				
20	0.03			0.04	0.03	0.03	0.03	0	0.04	87.9	7.1	6.9	7.4				
21	0.04			0.04	0.03	0.03	0.04	0	0.04	88.7	6.5	7.7	7.4				
22				0.04	0.03	0.03	0.03	0	0.04	86.8	6.6	7.3	7.1				
23	0.05			0.04	0.03	0.03	0.04	0	0.05	89.7	7.1	7.2	7.1				
24				0.04	0.03	0.03	0.03	0	0.04	88.2	6.9	7.1	7.4				
25	0.04			0.04	0.02	0.03	0.03	0	0.04	86.7	7.0	7.2	7.4				
26	0.03			0.04	0.03	0.03	0.03	0	0.04	88.6	6.9	7.3	7.4				
27	0.04			0.04	0.03	0.03	0.04	0	0.04	88.1	7.0	7.3	7.4				
28	0.03			0.04	0.03	0.04	0.04	0	0.04	89.0	6.8	7.2	7.4				
29	0.04			0.04	0.03	0.03	0.04	0	0.04	88.0	6.6	7.2	7.4				
30	0.03			0.05	0.06	0.06	0.05	0	0.06	(61,290	6.6	7.1	7.4				
31	0.06			0.05	0.03	0.03	0.04	0	0.06	86.0	6.7	7.0	7.5				
Total								0									
Avg							0.04			83.1	7.1	7.1	7.3				

Total number of CFE samples analyzed for month: N = 124 Total number of CFE samples exceeding 0.3 NTU: E = 0

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y Max variation (NTU) 0.04

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Date of last filter inspection 3/27/2019 # filters with more than 10 percent media loss 0

Report Submitted By Kevin Cook Signature

DOH Form #331-023-F (Excel version)

Date Printed: 9/3/2019

Washington State Department of Health

Water Treatment Plant Monthly Report Form

Month: 9 Year: 2019

PWS ID: | PWS Name: Lake Whatcom Water & Sewer Dist | County: Whatcom
Source ID: S01 | Source Name: Lake Whatcom | Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	626.5	15.06	40.3	8.0	69.6	n/a	n/a	81.1	n/a	n/a	n/a	0.294	n/a	0.04			0.05	0.04	0.06	0.05	0	0.06	83.8	6.8	7.1	7.5	n/a	n/a	n/a	
2	616.0	14.83	40.2	8.0	68.5	n/a	n/a	79.9	n/a	n/a	n/a	0.331	n/a	0.06			0.05	0.03	0.04	0.05	0	0.06	86.4	6.7	7.1	7.3	n/a	n/a	n/a	
3	626.5	15.09	57.2	10.0	69.8	n/a	n/a	81.3	n/a	n/a	n/a	0.285	n/a	0.04			0.05	0.03	0.04	0.04	0	0.05	86.0	6.8	7.1	7.2	n/a	n/a	n/a	
4	595.4	14.50	45.1	9.0	67.0	n/a	n/a	78.1	n/a	n/a	n/a	0.274	n/a	0.03			0.04	0.03	0.04	0.04	0	0.04	87.2	6.6	7.1	7.2	n/a	n/a	n/a	
5	561.6	13.49	56.7	7.0	62.4	n/a	n/a	72.7	n/a	n/a	n/a	0.278	n/a	0.04			0.04	0.03	0.04	0.04	0	0.04	86.5	6.8	7.0	7.3	n/a	n/a	n/a	
6	630.7	15.46	40.4	13.0	71.5	n/a	n/a	83.3	n/a	n/a	n/a	0.253	n/a	0.04			0.04	0.02	0.02	0.03	0	0.04	88.1	6.6	7.1	7.4	n/a	n/a	n/a	
7	547.3	13.15	40.1	7.0	60.8	n/a	n/a	70.8	n/a	n/a	n/a	0.287	n/a	0.04			0.04	0.03	0.04	0.04	0	0.04	86.9	6.4	7.1	7.4	n/a	n/a	n/a	
8	549.8	13.33	40.2	10.0	61.6	n/a	n/a	71.8	n/a	n/a	n/a	0.274	n/a	0.04			0.04	0.04	0.04	0.04	0	0.04	85.4	6.4	7.1	7.4	n/a	n/a	n/a	
9	620.7	14.92	41.3	7.0	69.0	n/a	n/a	80.4	n/a	n/a	n/a	0.290	n/a	0.04			0.03	0.03	0.03	0.03	0	0.04	88.8	6.8	7.1	7.4	n/a	n/a	n/a	
10	417.8	10.05	40.2	8.0	46.5	n/a	n/a	54.2	n/a	n/a	n/a	0.315	n/a				0.04	0.03	0.03	0.03	0	0.04	89.4	6.8	7.1	7.3	n/a	n/a	n/a	
11	579.4	13.93	40.6	9.0	64.4	n/a	n/a	75.0	n/a	n/a	n/a	0.414	n/a	0.06			0.04	0.03	0.04	0.04	0	0.06	89.7	7.0	7.0	7.3	n/a	n/a	n/a	
12	550.6	13.23	45.7	8.0	61.2	n/a	n/a	71.3	n/a	n/a	n/a	0.286	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	88.6	6.9	7.0	7.3	n/a	n/a	n/a	
13	504.8	12.10	40.9	7.0	55.9	n/a	n/a	65.2	n/a	n/a	n/a	0.361	n/a	0.03			0.04	0.03	0.04	0.04	0	0.04	90.3	6.7	7.0	7.3	n/a	n/a	n/a	
14	492.3	11.81	42.5	8.0	54.6	n/a	n/a	63.6	n/a	n/a	n/a	0.281	n/a				0.04	0.03	0.03	0.03	0	0.04	88.1	7.2	7.0	7.3	n/a	n/a	n/a	
15	567.7	13.64	41.2	9.0	63.1	n/a	n/a	73.5	n/a	n/a	n/a	0.404	n/a	0.03			0.04	0.03	0.04	0.04	0	0.04	91.3	6.8	6.9	7.3	n/a	n/a	n/a	
16	488.0	11.73	41.4	7.0	54.2	n/a	n/a	63.2	n/a	n/a	n/a	0.444	n/a				0.05	0.02	0.02	0.03	0	0.05	93.2	6.6	6.8	7.3	n/a	n/a	n/a	
17	505.0	12.11	41.5	6.0	56.0	n/a	n/a	65.3	n/a	n/a	n/a	0.296	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	89.0	0.0	8.1	7.2	n/a	n/a	n/a	
18	522.0	12.51	41.4	7.0	57.8	n/a	n/a	67.4	n/a	n/a	n/a	0.272	n/a	0.03			0.04	0.03	0.04	0.04	0	0.04	87.1	6.6	8.1	7.2	n/a	n/a	n/a	
19	501.1	12.01	41.4	6.0	55.5	n/a	n/a	64.7	n/a	n/a	n/a	0.268	n/a	0.04			0.04	0.03	0.04	0.04	0	0.04	86.0	7.3	7.4	7.4	n/a	n/a	n/a	
20	470.6	11.29	41.6	6.0	52.2	n/a	n/a	60.8	n/a	n/a	n/a	0.259	n/a				0.05	0.06	0.03	0.05	0	0.06	82.0	7.7	7.2	7.4	n/a	n/a	n/a	
21	502.0	12.03	41.5	6.0	55.6	n/a	n/a	64.8	n/a	n/a	n/a	0.263	n/a	0.03			0.04	0.02	0.03	0.03	0	0.04	88.6	7.8	7.1	7.4	n/a	n/a	n/a	
22	539.5	12.92	41.4	7.0	59.7	n/a	n/a	69.6	n/a	n/a	n/a	0.261	n/a	0.03			0.05	0.04	0.04	0.04	0	0.05	84.7	8.1	6.9	7.4	n/a	n/a	n/a	
23	529.6	12.70	41.1	8.0	58.7	n/a	n/a	68.4	n/a	n/a	n/a	0.259	n/a	0.04			0.04	0.03	0.04	0.04	0	0.04	85.5	7.9	6.7	7.4	n/a	n/a	n/a	
24	481.1	11.54	42.4	8.0	53.4	n/a	n/a	62.2	n/a	n/a	n/a	0.252	n/a				0.04	0.02	0.03	0.03	0	0.04	88.1	7.9	6.7	7.3	n/a	n/a	n/a	
25	485.2	11.64	41.2	8.0	53.8	n/a	n/a	62.7	n/a	n/a	n/a	0.226	n/a				0.04	0.03	0.03	0.03	0	0.04	85.3	7.9	6.6	7.3	n/a	n/a	n/a	
26	482.1	11.56	41.5	6.0	53.5	n/a	n/a	62.3	n/a	n/a	n/a	0.308	n/a				0.04	0.03	0.04	0.04	0	0.04	88.1	7.5	6.9	7.3	n/a	n/a	n/a	
27	471.0	11.30	41.4	6.0	52.2	n/a	n/a	60.9	n/a	n/a	n/a	0.241	n/a				0.04	0.03	0.03	0.03	0	0.04	86.2	8.1	6.9	7.3	n/a	n/a	n/a	
28	477.4	11.45	41.5	7.0	52.9	n/a	n/a	61.7	n/a	n/a	n/a	0.294	n/a				0.04	0.03	0.03	0.03	0	0.04	88.7	7.5	6.9	7.4	n/a	n/a	n/a	
29	533.5	12.79	41.6	8.0	59.1	n/a	n/a	68.9	n/a	n/a	n/a	0.244	n/a	0.03			0.05	0.03	0.04	0.04	0	0.05	84.6	7.7	6.7	7.4	n/a	n/a	n/a	
30	643.8	15.77	41.7	10.0	72.9	n/a	n/a	85.0	n/a	n/a	n/a	0.242	n/a	0.04			0.04	0.02	0.04	0.04	0	0.04	85.5	7.9	7.3	7.4	n/a	n/a	n/a	
31						n/a	n/a		n/a	n/a	n/a		n/a									0.00					n/a	n/a	n/a	
Total	16119	387.9	1,275	234.0	1,793.2	0.0	0.0	2,090.2	0.0	0.0	0.0										0									
Avg	537	12.9	42.51	7.8	59.8			69.7				0.29								0.04			87.3	6.9	7.1	7.3				

Total number of CFE samples analyzed for month: N = 111

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection 3/27/2019 # filters with more than 10 percent media loss 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verfication of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y Max variation (NTU) 0.04

Report Submitted By Kevin Cook Signature

DOH Form #331-023-F (Excel version)

Date Printed: 10/1/2019

Health

Water Treatment Plant Monthly Report Form

Month: 10 Year: 2019

PWS II: | PWS Name: Lake Whatcom Water & Sewer Dist | County: Whatcom

Source ID: S01 | Source Name: Lake Whatcom | Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	561.7	13.54	41.9	7.0	62.6	n/a	n/a	72.9	n/a	n/a	n/a	0.253	n/a	0.03			0.04	0.03	0.03	0.03	0	0.04	87.2	8.0	6.9	7.4	n/a	n/a	n/a	
2	579.9	13.92	41.9	9.0	64.4	n/a	n/a	75.0	n/a	n/a	n/a	0.243	n/a	0.03			0.04	0.03	0.04	0.04	0	0.04	85.6	7.9	6.9	7.4	n/a	n/a	n/a	
3	548.4	13.17	42.7	10.0	60.9	n/a	n/a	71.0	n/a	n/a	n/a	0.242	n/a	0.04			0.05	0.03	0.04	0.04	0	0.05	83.5	7.9	7.0	7.4	n/a	n/a	n/a	
4	601.6	14.68	42.0	8.0	67.8	n/a	n/a	79.1	n/a	n/a	n/a	0.233	n/a	0.05			0.05	0.02	0.02	0.04	0	0.05	85.0	7.9	6.9	7.4	n/a	n/a	n/a	
5	583.3	14.10	42.1	8.0	65.2	n/a	n/a	76.0	n/a	n/a	n/a	0.224	n/a	0.02			0.05	0.03	0.04	0.04	0	0.05	84.4	7.7	6.9	7.4	n/a	n/a	n/a	
6	644.3	15.57	41.8	8.0	72.0	n/a	n/a	83.9	n/a	n/a	n/a	0.255	n/a	0.04			0.05	0.04	0.02	0.04	0	0.05	85.3	7.8	6.8	7.3	n/a	n/a	n/a	
7	651.7	15.90	41.6	10.0	73.5	n/a	n/a	85.7	n/a	n/a	n/a	0.301	n/a	0.02			0.05	0.03	0.04	0.04	0	0.05	88.4	8.1	7.0	7.1	n/a	n/a	n/a	
8	603.1	14.78	42.0	8.0	68.3	n/a	n/a	79.6	n/a	n/a	n/a	0.252	n/a	0.04			0.05	0.04	0.03	0.04	0	0.05	84.1	7.9	7.0	7.1	n/a	n/a	n/a	
9	578.5	14.01	41.9	10.0	64.7	n/a	n/a	75.5	n/a	n/a	n/a	0.241	n/a	0.04			0.05	0.03	0.04	0.04	0	0.05	83.4	7.5	6.9	7.3	n/a	n/a	n/a	
10	519.9	12.46	41.9	8.0	57.6	n/a	n/a	67.1	n/a	n/a	n/a	0.246	n/a	0.03			0.05	0.03	0.04	0.04	0	0.05	84.8	7.5	6.9	7.3	n/a	n/a	n/a	
11	465.2	11.16	41.9	7.0	51.6	n/a	n/a	60.1	n/a	n/a	n/a	0.298	n/a				0.04	0.03	0.04	0.04	0	0.04	87.7	8.2	6.9	7.3	n/a	n/a	n/a	
12	472.8	11.35	42.7	8.0	52.5	n/a	n/a	61.2	n/a	n/a	n/a	0.239	n/a				0.04	0.03	0.04	0.04	0	0.04	84.7	8.0	6.9	7.3	n/a	n/a	n/a	
13	529.0	12.69	41.4	8.0	58.6	n/a	n/a	68.4	n/a	n/a	n/a	0.246	n/a	0.04			0.04	0.04	0.04	0.04	0	0.04	83.7	7.7	6.9	7.3	n/a	n/a	n/a	
14	719.5	17.63	42.4	9.0	81.5	n/a	n/a	95.0	n/a	n/a	n/a	0.261	n/a	0.05	0.06		0.04	0.03	0.04	0.04	0	0.06	83.1	7.7	7.0	7.4	n/a	n/a	n/a	
15	471.8	11.32	42.0	7.0	52.3	n/a	n/a	61.0	n/a	n/a	n/a	0.250	n/a				0.04	0.03	0.03	0.03	0	0.04	86.7	7.9	7.0	7.4	n/a	n/a	n/a	
16	481.7	11.56	41.8	7.0	53.4	n/a	n/a	62.3	n/a	n/a	n/a	0.237	n/a				0.04	0.03	0.04	0.04	0	0.04	84.5	7.7	7.4	7.3	n/a	n/a	n/a	
17	464.5	11.21	42.0	7.0	51.8	n/a	n/a	60.4	n/a	n/a	n/a	0.301	n/a				0.04	0.03	0.04	0.04	0	0.04	87.8	8.0	7.3	7.3	n/a	n/a	n/a	
18	466.0	11.20	41.7	6.0	51.8	n/a	n/a	60.3	n/a	n/a	n/a	0.269	n/a				0.05	0.03	0.04	0.04	0	0.05	85.1	7.3	7.2	7.4	n/a	n/a	n/a	
19	497.0	11.91	41.9	7.0	55.1	n/a	n/a	64.2	n/a	n/a	n/a	0.287	n/a				0.04	0.03	0.03	0.03	0	0.04	88.4	7.6	7.2	7.3	n/a	n/a	n/a	
20	530.0	12.69	41.9	9.0	58.7	n/a	n/a	68.4	n/a	n/a	n/a	0.276	n/a	0.02			0.04	0.04	0.05	0.04	0	0.05	86.4	7.6	7.0	7.3	n/a	n/a	n/a	
21	392.0	9.46	41.9	6.0	43.7	n/a	n/a	51.0	n/a	n/a	n/a	0.292	n/a				0.04	0.03	0.04	0.04	0	0.04	87.4	8.3	7.2	7.3	n/a	n/a	n/a	
22	455.7	11.22	41.7	7.0	51.9	n/a	n/a	60.5	n/a	n/a	n/a	0.571	n/a	0.05				0.05	0.03	0.04	0	0.05	92.4	8.2	7.3	7.3	n/a	n/a	n/a	
23	599.9	14.33	42.0	8.0	66.2	n/a	n/a	77.2	n/a	n/a	n/a	0.808	n/a	0.03			0.04	0.02	0.02	0.03	0	0.04	96.6	7.8	7.0	7.3	n/a	n/a	n/a	
24	507.2	12.09	42.7	8.0	55.9	n/a	n/a	65.1	n/a	n/a	n/a	0.761	n/a	0.04			0.04	0.03	0.03	0.04	0	0.04	95.4	8.3	7.1	7.2	n/a	n/a	n/a	
25	447.2	10.70	42.3	9.0	49.5	n/a	n/a	57.7	n/a	n/a	n/a	1.800	n/a				0.05	0.03	0.03	0.04	0	0.05	98.0	8.1	7.2	7.3	n/a	n/a	n/a	
26	436.6	10.41	41.8	6.0	48.1	n/a	n/a	56.1	n/a	n/a	n/a	0.686	n/a				0.05	0.03	0.03	0.04	0	0.05	94.7	7.2	7.4	7.3	n/a	n/a	n/a	
27	523.3	12.73	42.0	7.0	58.9	n/a	n/a	68.6	n/a	n/a	n/a	0.707	n/a	0.03			0.05	0.03	0.03	0.04	0	0.05	95.0	7.9	7.6	7.3	n/a	n/a	n/a	
28	539.8	13.26	42.2	8.0	61.3	n/a	n/a	71.5	n/a	n/a	n/a	0.657	n/a	0.03			0.05	0.03	0.04	0.04	0	0.05	94.3	7.8	7.4	7.1	n/a	n/a	n/a	
29	456.5	11.00	42.0	7.0	50.8	n/a	n/a	59.3	n/a	n/a	n/a	0.688	n/a				0.05	0.03	0.03	0.04	0	0.05	94.7	7.7	7.4	7.1	n/a	n/a	n/a	
30	427.2	10.19	42.1	6.0	47.1	n/a	n/a	54.9	n/a	n/a	n/a	0.707	n/a				0.05	0.03	0.03	0.04	0	0.05	94.8	10.2	6.5	7.3	n/a	n/a	n/a	
31	427.1	10.20	42.2	6.0	47.1	n/a	n/a	55.0	n/a	n/a	n/a	0.565	n/a				0.05	0.04	0.04	0.04	0	0.05	92.3	10.9	6.9	7.3	n/a	n/a	n/a	
Total	16182	390.4	1,302	239.0	1,804.7	0.0	0.0	2,103.7	0.0	0.0	0.0										0									
Avg	522	12.6	42.01	7.7	58.2			67.9				0.43								0.04			88.6	8.0	7.1	7.3				

Total number of CFE samples analyzed for month: N = 111

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in) | Anthracite 18" | Sand 9" | Garnet 9"

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection: 3/27/2019 | # filters with more than 10 percent media loss: 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y | Max variation (NTU) 0.04

Report Submitted By: Kevin Cook | Signature:

DOH Form #331-023-F (Excel version)

Date Printed: 11/6/2019

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

Water Treatment Plant Monthly Report Form

Month: 11 Year: 2019

PWS ID:
Source ID: S01
PWS Name: Lake Whatcom Water & Sewer Dist
Source Name: Lake Whatcom
County: Whatcom
Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs) Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU Raw	Settled
1	455.3	10.87	42.3	6.0	[illegible]	n/a	n/a	58.6	n/a	n/a	n/a	0.542	n/a
2	451.0	10.81	42.4	7.0	[illegible]	n/a	n/a	58.2	n/a	n/a	n/a	0.660	n/a
3	535.2	13.17	42.2	8.0	60.9	n/a	n/a	70.9	n/a	n/a	n/a	0.533	n/a
4	483.4	11.96	45.2	9.0	55.3	n/a	n/a	64.4	n/a	n/a	n/a	0.536	n/a
5	471.4	11.53	43.4	7.0	53.3	n/a	n/a	62.1	n/a	n/a	n/a	0.494	n/a
6	428.8	10.27	41.5	7.0	47.5	n/a	n/a	55.3	n/a	n/a	n/a	0.435	n/a
7	432.7	10.33	40.1	8.0	47.8	n/a	n/a	55.7	n/a	n/a	n/a	0.703	n/a
8	377.7	9.00	40.5	8.0	41.6	n/a	n/a	48.5	n/a	n/a	n/a	0.481	n/a
9	505.1	12.43	41.0	8.0	57.5	n/a	n/a	67.0	n/a	n/a	n/a	0.464	n/a
10	487.8	12.11	41.1	6.0	56.0	n/a	n/a	65.2	n/a	n/a	n/a	0.431	n/a
11	439.1	10.74	40.9	8.0	49.6	n/a	n/a	57.8	n/a	n/a	n/a	0.501	n/a
12	525.3	12.68	41.0	8.0	58.6	n/a	n/a	68.3	n/a	n/a	n/a	0.363	n/a
13	475.4	11.42	40.9	8.0	[illegible]	n/a	n/a	61.5	n/a	n/a	n/a	0.462	n/a
14	398.0	9.58	42.1	7.0	[illegible]	n/a	n/a	51.6	n/a	n/a	n/a	0.377	n/a
15	504.9	12.28	41.7	6.0	56.8	n/a	n/a	66.2	n/a	n/a	n/a	0.333	n/a
16	494.4	11.81	42.8	7.0	54.6	n/a	n/a	63.6	n/a	n/a	n/a	0.387	n/a
17	490.3	12.03	41.1	7.0	[illegible]	n/a	n/a	64.8	n/a	n/a	n/a	0.389	n/a
18	465.2	11.43	41.3	8.0	[illegible]	n/a	n/a	61.6	n/a	n/a	n/a	0.381	n/a
19	442.8	10.92	41.0	9.0	50.5	n/a	n/a	58.8	n/a	n/a	n/a	0.377	n/a
20	477.6	11.62	41.8	8.0	53.7	n/a	n/a	62.6	n/a	n/a	n/a	0.307	n/a
21	429.8	10.49	40.9	7.0	[illegible]	n/a	n/a	56.5	n/a	n/a	n/a	0.344	n/a
22	478.1	11.81	41.3	6.0	[illegible]	n/a	n/a	63.7	n/a	n/a	n/a	0.370	n/a
23	408.8	9.78	41.4	6.0	45.2	n/a	n/a	52.7	n/a	n/a	n/a	0.572	n/a
24	497.1	12.10	41.5	6.0	55.9	n/a	n/a	65.2	n/a	n/a	n/a	0.307	n/a
25	515.8	12.81	41.0	10.0	[illegible]	n/a	n/a	69.0	n/a	n/a	n/a	0.319	n/a
26	449.3	11.06	41.4	9.0	[illegible]	n/a	n/a	59.6	n/a	n/a	n/a	0.311	n/a
27	462.2	11.44	42.4	8.0	52.9	n/a	n/a	61.6	n/a	n/a	n/a	0.346	n/a
28	441.3	10.86	40.2	7.0	50.2	n/a	n/a	58.5	n/a	n/a	n/a	0.390	n/a
29	753.1	17.99	77.7	13.0	[illegible]	n/a	n/a	96.9	n/a	n/a	n/a	1.012	n/a
30	446.4	10.67	39.2	9.0	[illegible]	n/a	n/a	57.5	n/a	n/a	n/a	0.984	n/a
31						n/a	n/a		n/a	n/a	n/a		n/a
Total	14223	346.0	1,281	231.0	1,599.3	0.0	0.0	1,864.2	0.0	0.0	0.0		
Avg	474	11.5	42.72	7.7	53.3			62.1				0.47	

Date	Combined Filter Effluent Turbidity 4 hour sample NTU 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C Raw	pH Raw	pH Final	Total Alkalinity mg/L as CaCO3 Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1				0.05	0.02	0.03	0.03	0	0.05	93.8	8.1	7.5	7.3	n/a	n/a	n/a	
2				0.05	0.03	0.04	0.04	0	0.05	93.9	8.3	7.6	7.3	n/a	n/a	n/a	
3	0.04			0.05	0.03	0.03	0.04	0	0.05	93.0	8.2	7.5	7.4	n/a	n/a	n/a	
4				0.04	0.03	0.03	0.03	0	0.04	93.8	8.5	7.5	7.4	n/a	n/a	n/a	
5				0.04	0.04	0.04	0.04	0	0.04	91.9	8.6	7.5	7.4	n/a	n/a	n/a	
6				0.05	0.03	0.04	0.04	0	0.05	90.8	8.3	7.3	7.4	n/a	n/a	n/a	
7				0.06	0.03	0.03	0.04	0	0.06	94.3	8.4	7.4	7.4	n/a	n/a	n/a	
8				0.06	0.03	0.03	0.04	0	0.06	91.7	8.6	7.3	7.5	n/a	n/a	n/a	
9	0.04			0.05	0.03	0.04	0.04	0	0.05	91.4	8.2	7.3	7.5	n/a	n/a	n/a	
10				0.06	0.04	0.04	0.05	0	0.06	89.2	8.0	7.4	7.5	n/a	n/a	n/a	
11				0.05	0.04	0.04	0.04	0	0.05	91.4	9.0	7.5	7.5	n/a	n/a	n/a	
12	0.04			0.05	0.03	0.04	0.04	0	0.05	89.0	7.7	7.6	7.3	n/a	n/a	n/a	
13				0.06	0.03	0.03	0.04	0	0.06	91.3	8.0	7.5	7.3	n/a	n/a	n/a	
14				0.05	0.03	0.03	0.04	0	0.05	90.3	9.1	7.4	7.3	n/a	n/a	n/a	
15	0.04			0.05	0.04	0.05	0.05	0	0.05	86.5	7.9	7.4	7.4	n/a	n/a	n/a	
16				0.05	0.03	0.04	0.04	0	0.05	89.7	7.4	7.2	7.3	n/a	n/a	n/a	
17	0.04			0.05	0.05	0.03	0.04	0	0.05	89.1	8.9	7.3	7.3	n/a	n/a	n/a	
18				0.05	0.03	0.04	0.04	0	0.05	89.5	8.5	7.3	7.5	n/a	n/a	n/a	
19				0.05	0.03	0.03	0.04	0	0.05	90.3	8.5	7.5	0.0	n/a	n/a	n/a	
20				0.06	0.03	0.04	0.04	0	0.06	85.9	8.3	7.4	7.2	n/a	n/a	n/a	
21				0.06	0.03	0.03	0.04	0	0.06	88.4	8.9	7.3	7.2	n/a	n/a	n/a	
22				0.06	0.04	0.03	0.04	0	0.06	88.3	9.5	7.7	7.5	n/a	n/a	n/a	
23			0.07	0.06	0.04	0.04	0.05	0	0.07	90.8	9.2	7.3	7.5	n/a	n/a	n/a	
24			0.06	0.06	0.04	0.04	0.05	0	0.06	83.7	9.8	7.4	7.5	n/a	n/a	n/a	
25			0.06	0.04	0.03	0.03	0.04	0	0.06	87.5	9.4	7.5	7.3	n/a	n/a	n/a	
26				0.06	0.05	0.03	0.05	0	0.06	85.0	9.6	7.6	7.6	n/a	n/a	n/a	
27				0.06	0.05	0.04	0.05	0	0.06	85.5	8.6	8.1	7.6	n/a	n/a	n/a	
28				0.06	0.03	0.03	0.04	0	0.06	89.7	9.3	7.4	7.6	n/a	n/a	n/a	
29		0.05	0.04	0.05	0.04	0.04	0.04	0	0.05	95.7	9.0	7.3	7.5	n/a	n/a	n/a	
30				0.06	0.06	0.04	0.05	0	0.06	94.6	9.2	7.4	7.5	n/a	n/a	n/a	
31									0.00					n/a	n/a	n/a	
Total								0									
Avg							0.04			90.2	8.6	7.5	7.2				

Total number of CFE samples analyzed for month: N = 100

Total number of CFE samples exceeding 0.3 NTU: E = 0

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y

Max variation (NTU) 0.05

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Date of last filter inspection 3/27/2019 # filters with more than 10 percent media loss 0

Report Submitted By Kevin Cook

Signature

DOH Form #331-023-F (Excel version)

Date Printed: 12/3/2019

Washington State Department of Health

Environmental Public Health, Office of Drinking Water

Water Treatment Plant Monthly Report Form

Month: 12 Year: 2019

PWS ID:

Source ID: S01

PWS Name: Lake Whatcom Water & Sewer Dist

Source Name: Lake Whatcom

County: Whatcom

Plant ID: Southshore

Cells and Columns with Blue Headings are intended for data provided by user

Date	Water Treated in 1000 gals	Total Hours of Operation	Filter Backwash Total in 1000 gal	Chemicals Used (lbs): Chlorine	Alum	Polymer	Filter Aid	Soda Ash	Ozone			Turbidity NTU: Raw	Settled
1	537.5	13.17	39.3	8.0	60.9	n/a	n/a	71.0	n/a	n/a	n/a	0.381	n/a
2	480.8	11.69	39.9	5.0	54.0	n/a	n/a	63.0	n/a	n/a	n/a	0.322	n/a
3	432.8	10.41	40.4	7.0	48.1	n/a	n/a	56.1	n/a	n/a	n/a	0.324	n/a
4	477.3	11.51	40.2	5.0	53.2	n/a	n/a	62.0	n/a	n/a	n/a	0.297	n/a
5	437.3	10.61	40.2	8.0	49.0	n/a	n/a	57.2	n/a	n/a	n/a	0.318	n/a
6	447.7	10.78	40.1	7.0	49.8	n/a	n/a	58.1	n/a	n/a	n/a	0.694	n/a
7	460.0	11.02	40.2	7.0	50.9	n/a	n/a	59.4	n/a	n/a	n/a	0.483	n/a
8	490.5	11.80	40.6	7.0	54.5	n/a	n/a	63.6	n/a	n/a	n/a	0.514	n/a
9	455.4	11.00	40.2	11.0	50.8	n/a	n/a	59.3	n/a	n/a	n/a	0.279	n/a
10	456.0	10.90	40.1	6.0	50.4	n/a	n/a	58.7	n/a	n/a	n/a	0.320	n/a
11	398.2	9.50	41.3	6.0	43.9	n/a	n/a	51.2	n/a	n/a	n/a	0.326	n/a
12	488.2	11.71	40.1	5.0	54.1	n/a	n/a	63.1	n/a	n/a	n/a	0.350	n/a
13	445.9	10.69	40.5	7.0	49.4	n/a	n/a	57.6	n/a	n/a	n/a	0.331	n/a
14	449.7	10.73	39.9	7.0	49.6	n/a	n/a	57.8	n/a	n/a	n/a	0.354	n/a
15	511.5	12.23	39.9	7.0	56.5	n/a	n/a	65.9	n/a	n/a	n/a	0.392	n/a
16	443.0	10.59	40.5	9.0	49.0	n/a	n/a	57.1	n/a	n/a	n/a	0.399	n/a
17	434.7	10.37	39.9	6.0	47.9	n/a	n/a	55.9	n/a	n/a	n/a	0.300	n/a
18	446.3	10.66	40.1	7.0	49.3	n/a	n/a	57.4	n/a	n/a	n/a	0.301	n/a
19	481.4	11.56	40.3	8.0	53.4	n/a	n/a	62.3	n/a	n/a	n/a	0.313	n/a
20	497.0	12.09	40.4	7.0	55.9	n/a	n/a	65.1	n/a	n/a	n/a	0.324	n/a
21	480.4	11.61	40.3	8.0	53.7	n/a	n/a	62.6	n/a	n/a	n/a	0.338	n/a
22	576.8	14.14	39.8	9.0	65.4	n/a	n/a	76.2	n/a	n/a	n/a	0.620	n/a
23	559.9	13.71	40.3	9.0	63.4	n/a	n/a	73.8	n/a	n/a	n/a	0.365	n/a
24	507.8	12.25	40.8	8.0	56.6	n/a	n/a	66.0	n/a	n/a	n/a	0.333	n/a
25	451.4	10.80	55.2	7.0	49.9	n/a	n/a	58.2	n/a	n/a	n/a	0.327	n/a
26	490.8	11.74	38.6	7.0	54.3	n/a	n/a	63.3	n/a	n/a	n/a	0.357	n/a
27	453.9	10.88	40.0	8.0	50.3	n/a	n/a	58.6	n/a	n/a	n/a	0.350	n/a
28	483.6	11.56	40.3	7.0	53.4	n/a	n/a	62.3	n/a	n/a	n/a	0.335	n/a
29	521.2	12.58	39.9	9.0	58.2	n/a	n/a	67.8	n/a	n/a	n/a	0.350	n/a
30	412.4	9.83	40.3	7.0	45.4	n/a	n/a	53.0	n/a	n/a	n/a	0.389	n/a
31	524.6	12.56	40.7	8.0	58.1	n/a	n/a	67.7	n/a	n/a	n/a	0.338	n/a
Total	14734	354.7	1,260	227.0	1,639.4	0.0	0.0	1,911.0	0.0	0.0	0.0		
Avg	475	11.4	40.65	7.3	52.9			61.6				0.37	

Date	Combined Filter Effluent Turbidity 4 hour sample NTU: 1st	2nd	3rd	4th	5th	6th	Avg	No of Samples > 0.3 NTU	Max CFE Turbidity NTU	% NTU Reduction (See Note 1)	Temp C: Raw	pH: Raw	pH: Final	Total Alkalinity mg/L as CaCO3: Raw	Fin	Calcium Hardness mg/L as CaCO3 Fin	Remarks
1	0.04			0.06	0.06	0.04	0.05	0	0.06	86.9	9.0	7.4	7.5	n/a	n/a	n/a	
2				0.06	0.04	0.04	0.05	0	0.06	85.5	8.8	7.3	7.5	n/a	n/a	n/a	
3				0.06	0.03	0.04	0.04	0	0.06	86.6	8.7	7.4	7.5	n/a	n/a	n/a	
4				0.06	0.04	0.04	0.05	0	0.06	84.3	8.8	7.5	7.5	n/a	n/a	n/a	
5				0.06	0.03	0.04	0.04	0	0.06	86.4	8.4	8.3	7.5	n/a	n/a	n/a	
6				0.06	0.04	0.05	0.05	0	0.06	92.8	8.4	8.2	7.5	n/a	n/a	n/a	
7				0.06	0.04	0.04	0.05	0	0.06	90.3	8.7	7.5	7.5	n/a	n/a	n/a	
8				0.06	0.03	0.03	0.04	0	0.06	92.2	8.8	7.3	7.4	n/a	n/a	n/a	
9				0.06	0.04	0.04	0.05	0	0.06	83.3	8.8	7.6	7.4	n/a	n/a	n/a	
10				0.06	0.04	0.08	0.06	0	0.08	81.3	8.5	7.7	7.4	n/a	n/a	n/a	
11				0.06	0.04	0.05	0.05	0	0.06	84.7	8.6	7.5	7.4	n/a	n/a	n/a	
12				0.06	0.04	0.05	0.05	0	0.06	85.7	8.5	7.4	7.4	n/a	n/a	n/a	
13				0.06	0.04	0.04	0.05	0	0.06	85.9	8.4	7.5	7.4	n/a	n/a	n/a	
14				0.06	0.03	0.04	0.04	0	0.06	87.8	8.5	7.3	7.4	n/a	n/a	n/a	
15	0.04			0.06	0.03	0.04	0.04	0	0.06	89.2	8.3	7.4	7.4	n/a	n/a	n/a	
16				0.06	0.04	0.04	0.05	0	0.06	88.3	8.3	7.0	7.3	n/a	n/a	n/a	
17				0.06	0.04	0.05	0.05	0	0.06	83.3	8.0	7.9	7.3	n/a	n/a	n/a	
18				0.06	0.05	0.04	0.05	0	0.06	83.4	7.7	7.3	7.3	n/a	n/a	n/a	
19				0.06	0.04	0.04	0.05	0	0.06	85.1	7.6	7.1	7.2	n/a	n/a	n/a	
20			0.06	0.03	0.04	0.04	0.04	0	0.06	86.9	8.2	7.2	7.5	n/a	n/a	n/a	
21				0.07	0.06	0.04	0.06	0	0.07	83.2	8.0	7.1	7.4	n/a	n/a	n/a	
22	0.04			0.05	0.06	0.03	0.05	0	0.06	92.7	8.0	7.2	7.4	n/a	n/a	n/a	
23	0.03			0.06	0.03	0.04	0.04	0	0.06	89.0	7.9	7.3	7.4	n/a	n/a	n/a	
24	0.04			0.05	0.04	0.04	0.04	0	0.05	87.2	8.1	7.1	7.3	n/a	n/a	n/a	
25				0.05	0.03	0.03	0.04	0	0.05	88.8	8.1	6.9	7.3	n/a	n/a	n/a	
26				0.06	0.04	0.04	0.05	0	0.06	86.9	7.6	7.4	7.3	n/a	n/a	n/a	
27				0.05	0.04	0.04	0.04	0	0.05	87.6	7.6	6.9	7.3	n/a	n/a	n/a	
28				0.05	0.05	0.04	0.05	0	0.05	86.1	7.6	7.2	7.3	n/a	n/a	n/a	
29	0.05			0.05	0.04	0.04	0.05	0	0.05	87.1	7.6	7.1	7.4	n/a	n/a	n/a	
30				0.05	0.05	0.03	0.04	0	0.05	88.9	7.3	6.8	7.3	n/a	n/a	n/a	
31	0.04			0.06	0.03	0.03	0.04	0	0.06	88.2	7.3	6.6	7.3	n/a	n/a	n/a	
Total								0									
Avg							0.05			87.0	8.2	7.3	7.4				

Total number of CFE samples analyzed for month: N = 101

Total number of CFE samples exceeding 0.3 NTU: E = 0

NOTE 1: Percent turbidity reduction for each day of operation: PTR = [(Raw NTU)-(Avg CFE NTU)]x(100)/(Raw NTU)

Satisfactory turbidity performance is 95% or greater. Performance determination: [1-(E/N)]x100 = 100.0%

Number of days CFE exceeded 1.0 NTU this month: 0

Filter media design specs (in) Anthracite 18" Sand 9" Garnet 9"

Did the CFE continuous monitoring fail to operate for more than five (5) consecutive days during this month? Y/N: N

Date of last filter inspection: 3/27/2019

filters with more than 10 percent media loss: 0

Did you monitor the effluent turbidity of each individual filter on a continuous basis? Y/N: Y

Weekly grab sample verification of on-line turbidimeters per WAC 246-290-638 (4)? Y/N: Y

Max variation (NTU): 0.05

Report Submitted By: Kevin Cook

Signature:

DOH Form #331-023-F (Excel version)

Date Printed: 1/3/2020

APPENDIX C

TIER 1 SEISMIC ANALYSIS CHECKLIST

APPENDIX C
SUMMARY DATA SHEET

BUILDING DATA

Building Name: Treatment Plant Bldg   Date: 2/12/2020
Building Address: LWSD - Sudden Valley
Latitude: ______   Longitude: ______   By: MJB
Year Built: ______   Year(s) Remodeled: ______   Original Design Code: ______
Area (sf): ______   Length (ft): ______   Width (ft): ______
No. of Stories: ______   Story Height: ______   Total Height: ______

USE ☐ Industrial ☐ Office ☐ Warehouse ☐ Hospital ☐ Residential ☐ Educational ☐ Other: ______

CONSTRUCTION DATA

Gravity Load Structural System: Conc walls @ perimeter
Exterior Transverse Walls: conc walls   Openings? ______
Exterior Longitudinal Walls: Conc walls   Openings? ______
Roof Materials/Framing: precast conc "T" girders
Intermediate Floors/Framing: conc slab over clear well
Ground Floor: conc slab on grade
Columns: N/A   Foundation: ______
General Condition of Structure: good
Levels Below Grade? clear well
Special Features and Comments: ______

LATERAL-FORCE-RESISTING SYSTEM

	Longitudinal	Transverse
System:	shear wall	(see longitudinal)
Vertical Elements:	conc wall	
Diaphragms:	conc slab	
Connections:	rebar	

EVALUATION DATA

BSE-1N Spectral Response Accelerations: S_{Ds} = ______ S_{D1} = ______
Soil Factors: Class = ______ F_a = ______ F_v = ______
BSE-1E Spectral Response Accelerations: S_{XS} = ______ S_{X1} = ______
Level of Seismicity: ______   Performance Level: ______
Building Period: T = ______
Spectral Acceleration: S_a = ______
Modification Factor: $C_mC_1C_2$ = ______   Building Weight: W = ______
Pseudo Lateral Force: V= $C_mC_1C_2S_aW$= ______

BUILDING CLASSIFICATION: ______

REQUIRED TIER 1 CHECKLISTS	Yes	No
Basic Configuration Checklist	☐	☐
Building Type ______ Structural Checklist	☐	☐
Nonstructural Component Checklist	☐	☐

FURTHER EVALUATION REQUIREMENT: ______

Project: LWSD Location: Treatment Plant BLDG

Completed by: MJB Date: 2/12/20

16.10IO IMMEDIATE OCCUPANCY STRUCTURAL CHECKLIST FOR BUILDING TYPES C2: CONCRETE SHEAR WALLS WITH STIFF DIAPHRAGMS AND C2A: CONCRETE SHEAR WALLS WITH FLEXIBLE DIAPHRAGMS

Very Low Seismicity

Seismic-Force-Resisting System

C NC N/A U COMPLETE FRAMES: Steel or concrete frames classified as secondary components form a complete vertical-load-carrying system. (Commentary: Sec. A.3.1.6.1. Tier 2: Sec. 5.5.2.5.1)

C NC N/A U REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.2.1.1. Tier 2: Sec. 5.5.1.1)

C NC N/A U SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.5.3.3, is less than the greater of 100 lb/in.^{2} or $2\sqrt{f_c'}$. (Commentary: Sec. A.3.2.2.1. Tier 2: Sec. 5.5.3.1.1)

C NC N/A U REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction. The spacing of reinforcing steel is equal to or less than 18 in. (Commentary: Sec. A.3.2.2.2. Tier 2: Sec. 5.5.3.1.3)

Connections

C NC N/A U WALL ANCHORAGE AT FLEXIBLE DIAPHRAGMS: Exterior concrete or masonry walls that are dependent on flexible diaphragms for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.5.3.7. (Commentary: Sec. A.5.1.1. Tier 2: Sec. 5.7.1.1)

C NC N/A U TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of loads to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms. (Commentary: Sec. A.5.2.1. Tier 2: Sec. 5.7.2)

C NC N/A U FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation, and the dowels are able to develop the lesser of the strength of the walls or the uplift capacity of the foundation. (Commentary: Sec. A.5.3.5. Tier 2: Sec. 5.7.3.4)

Foundation System

C NC N/A U DEEP FOUNDATIONS: Piles and piers are capable of transferring the lateral forces between the structure and the soil. (Commentary: Sec. A.6.2.3)

C NC N/A U SLOPING SITES: The difference in foundation embedment depth from one side of the building to another shall not exceed one story high. (Commentary: Sec. A.6.2.4)

Low, Moderate, and High Seismicity: Complete the Following Items in Addition to the Items for Very Low Seismicity.

Seismic-Force-Resisting System

C NC N/A U DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components and are compliant with the following items: COLUMN-BAR SPLICES, BEAM-BAR SPLICES, COLUMN-TIE SPACING, STIRRUP SPACING, and STIRRUP AND TIE HOOK in the Immediate Occupancy Structural Checklist for Building Type C1. (Commentary: Sec. A.3.1.6.2. Tier 2: Sec. 5.5.2.5.2)

C NC N/A U FLAT SLABS: Flat slabs or plates not part of seismic-force-resisting system have continuous bottom steel through the column joints. (Commentary: Sec. A.3.1.6.3. Tier 2: Sec. 5.5.2.5.3)

C NC N/A U COUPLING BEAMS: The stirrups in coupling beams over means of egress are spaced at or less than *d*/2 and are anchored into the confined core of the beam with hooks of 135 degrees or more. The ends of both walls to which the coupling beam is attached are supported at each end to resist vertical loads caused by overturning. Coupling beams have the capacity in shear to develop the uplift capacity of the adjacent wall. (Commentary: Sec.A.3.2.2.3. Tier 2: Sec. 5.5.3.2.1)

C NC N/A U OVERTURNING: All shear walls have aspect ratios less than 4-to-1. Wall piers need not be considered. (Commentary: Sec. A.3.2.2.4. Tier 2: Sec. 5.5.3.1.4)

C NC N/A U CONFINEMENT REINFORCING: For shear walls with aspect ratios greater than 2-to-1, the boundary elements are confined with spirals or ties with spacing less than $8d_b$. (Commentary: Sec. A.3.2.2.5. Tier 2: Sec. 5.5.3.2.2) # 4 CONT @ 33" OC

C NC N/A U WALL REINFORCING AT OPENINGS: There is added trim reinforcement around all wall openings with a dimension greater than three times the thickness of the wall. (Commentary: Sec. A.3.2.2.6. Tier 2: Sec. 5.5.3.1.5)

C NC N/A U WALL THICKNESS: Thicknesses of bearing walls are not less than 1/25 the unsupported height or length, whichever is shorter, nor less than 4 in. (Commentary: Sec. A.3.2.2.7. Tier 2: Sec. 5.5.3.1.2)

Connections

C NC N/A U UPLIFT AT PILE CAPS: Pile caps shall have top reinforcement, and piles are anchored to the pile caps; the pile cap reinforcement and pile anchorage are able to develop the tensile capacity of the piles. (Commentary: Sec. A.5.3.8.Tier 2: Sec. 5.7.3.5)

Diaphragms (Flexible or Stiff)

C NC N/A U DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. (Commentary: Sec. A.4.1.1. Tier 2: Sec. 5.6.1.1)

C NC N/A U OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 15% of the wall length. (Commentary: Sec. A.4.1.4. Tier 2: Sec. 5.6.1.3)

C NC N/A U PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities. (Commentary: Sec. A.4.1.7. Tier 2: Sec. 5.6.1.4)

C NC N/A U DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension. (Commentary: Sec. A.4.1.8. Tier 2: Sec. 5.6.1.5)

Flexible Diaphragms

C NC N/A U CROSS TIES: There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2)

C NC N/A U STRAIGHT SHEATHING: All straight sheathed diaphragms have aspect ratios less than 1-to-1 in the direction being considered. (Commentary: Sec.A.4.2.1. Tier 2: Sec. 5.6.2)

C NC N/A U SPANS: All wood diaphragms with spans greater than 12 ft consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)

C NC N/A U DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft and aspect ratios less than or equal to 3-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2)

C NC N/A U NONCONCRETE FILLED DIAPHRAGMS: Untopped metal deck diaphragms or metal deck diaphragms with fill other than concrete consist of horizontal spans of less than 40 ft and have aspect ratios less than 4-to-1. (Commentary: Sec. A.4.3.1. Tier 2: Sec. 5.6.3)

C NC N/A U OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)

APPENDIX C
SUMMARY DATA SHEET

BUILDING DATA

Building Name: LWSD - Pump Building Date: 2/12/20
Building Address: Sudden Valley
Latitude: ______ Longitude: ______ By: ______
Year Built: ______ Year(s) Remodeled: ______ Original Design Code: ______
Area (sf): ______ Length (ft): ______ Width (ft): ______
No. of Stories: ______ Story Height: ______ Total Height: ______

USE ☐ Industrial ☐ Office ☐ Warehouse ☐ Hospital ☐ Residential ☐ Educational ☐ Other: ______

CONSTRUCTION DATA

Gravity Load Structural System: Prefab wood truss
Exterior Transverse Walls: cmu Openings? ______
Exterior Longitudinal Walls: cmu Openings? ______
Roof Materials/Framing: ______
Intermediate Floors/Framing: N/A
Ground Floor: slab on grade
Columns: N/A Foundation: ______
General Condition of Structure: good
Levels Below Grade? no
Special Features and Comments: ______

LATERAL-FORCE-RESISTING SYSTEM

	Longitudinal	Transverse
System:	Reinf. cmu	
Vertical Elements:	Cmu walls	
Diaphragms:	wood sheathing	
Connections:	anchor bolts	

EVALUATION DATA

BSE-1N Spectral Response Accelerations: S_{Ds} = ______ S_{D1} = ______
Soil Factors: Class = ______ F_a = ______ F_v = ______
BSE-1E Spectral Response Accelerations: S_{XS} = ______ S_{X1} = ______
Level of Seismicity: ______ Performance Level: ______
Building Period: T = ______
Spectral Acceleration: S_a = ______
Modification Factor: $C_mC_1C_2$ = ______ Building Weight: W = ______
Pseudo Lateral Force: V= $C_mC_1C_2S_aW$= ______

BUILDING CLASSIFICATION: ______

REQUIRED TIER 1 CHECKLISTS	**Yes**	**No**
Basic Configuration Checklist	☐	☐
Building Type ______ Structural Checklist	☐	☐
Nonstructural Component Checklist	☐	☐

FURTHER EVALUATION REQUIREMENT: ______

Project: Lw5D

Location: Pump Building

Completed by: MJB

Date: 2/12/20

16.15IO IMMEDIATE OCCUPANCY STRUCTURAL CHECKLIST FOR BUILDING TYPES RM1: REINFORCED MASONRY BEARING WALLS AND RM1A: REINFORCED MASONRY BEARING WALLS WITH STIFF DIAPHRAGMS

Very Low Seismicity

Seismic-Force-Resisting System

C NC N/A U REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.2.1.1. Tier 2: Sec. 5.5.1.1)

C NC N/A U SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.5.3.3, is less than 70 lb/in.^{2}. (Commentary: Sec. A.3.2.4.1. Tier 2: Sec. 5.5.3.1.1)

C NC N/A U REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in., and all vertical bars extend to the top of the walls. (Commentary: Sec. A.3.2.4.2. Tier 2: Sec. 5.5.3.1.3)

Connections

C NC N/A U WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers. (Commentary: Sec. A.5.1.2. Tier 2: Sec. 5.7.1.3)

C NC N/A U TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms. (Commentary: Sec. A.5.2.1. Tier 2: Sec. 5.7.2)

C NC N/A U FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation, and the dowels are able to develop the lesser of the strength of the walls or the uplift capacity of the foundation. (Commentary: Sec. A.5.3.5. Tier 2: Sec. 5.7.3.4)

C NC N/A U GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support. (Commentary: Sec. A.5.4.1. Tier 2: Sec. 5.7.4.1)

C NC N/A U WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections shall have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.5.3.7. (Commentary: Sec. A.5.1.1. Tier 2: Sec. 5.7.1.1)

Stiff Diaphragms

C NC N/A U TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab. (Commentary: Sec. A.4.5.1. Tier 2: Sec. 5.6.4)

C NC N/A U TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements. (Commentary: Sec. A.5.2.3. Tier 2: Sec. 5.7.2)

Foundation System

C NC N/A U DEEP FOUNDATIONS: Piles and piers are capable of transferring the lateral forces between the structure and the soil. (Commentary: Sec. A.6.2.3)

C NC N/A U SLOPING SITES: The difference in foundation embedment depth from one side of the building to another shall not exceed one story high. (Commentary: Sec. A.6.2.4)

Low, Moderate, and High Seismicity: Complete the Following Items in Addition to the Items for Very Low Seismicity.

Seismic-Force-Resisting System

C NC N/A U REINFORCING AT WALL OPENINGS: All wall openings that interrupt rebar have trim reinforcing on all sides. (Commentary: Sec. A.3.2.4.3. Tier 2: Sec. 5.5.3.1.5)

C NC N/A U PROPORTIONS: The height-to-thickness ratio of the shear walls at each story is less than 30. (Commentary: Sec. A.3.2.4.4. Tier 2: Sec. 5.5.3.1.2)

Diaphragms (Stiff or Flexible)

C NC N/A U OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 15% of the wall length. (Commentary: Sec. A.4.1.4. Tier 2: Sec. 5.6.1.3)

C NC N/A U OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 4 ft long. (Commentary: Sec. A.4.1.6. Tier 2: Sec. 5.6.1.3)

C NC N/A U PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities. (Commentary: Sec. A.4.1.7. Tier 2: Sec. 5.6.1.4)

C NC N/A U DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension. (Commentary: Sec. A.4.1.8. Tier 2: Sec. 5.6.1.5)

Flexible Diaphragms

C NC N/A U CROSS TIES: There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2)

C NC N/A U STRAIGHT SHEATHING: All straight sheathed diaphragms have aspect ratios less than 1-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2)

C NC N/A U SPANS: All wood diaphragms with spans greater than 12 ft consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)

C NC ~~N/A~~ U DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft and aspect ratios less than or equal to 3-to-1. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2) X

C NC N/A U NONCONCRETE FILLED DIAPHRAGMS: Untopped metal deck diaphragms or metal deck diaphragms with fill other than concrete consist of horizontal spans of less than 40 ft and have aspect ratios less than 4-to-1. (Commentary: Sec. A.4.3.1. Tier 2: Sec. 5.6.3)

C NC N/A U OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)

Connections

C NC N/A U STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. before engagement of the anchors. (Commentary: Sec. A.5.1.4. Tier 2: Sec. 5.7.1.2)

APPENDIX D

WSDOH 2020 SANITARY SURVEY

State of Washington
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310 • Kent Washington 98032-2388

March 31, 2020

KEVIN COOK - OPERATOR
LWWSD – SOUTH SHORE WS
1220 LAKEWAY DRIVE
BELLINGHAM WA 98229

Subject: LWWSD – South Shore (ID #95910)
Whatcom County
Surface Water Treatment Plant Survey

Dear Mr. Cook:

This letter is written in follow up to our distribution and treatment plant surveys of the LWWSD – South Shore water system. We carried out both surveys on March 2, 2020. I would like to thank you, Jason, and Brent for taking the time to meet and show Jolyn and me around the plant.

The purpose of the sanitary survey program is to improve and strengthen department and utility communication, as well as to help improve and ensure the reliability and sanitary integrity of water system facilities and programs.

LWWSD South Shore is clearly a well-managed and operated plant. There are eight treatment plant operators at varying points in their careers, with well over a hundred cumulative years of experience at LWWSD. All operators are certified and trained as WTPO2s, above and beyond the DOH minimum requirement for South Shore. The operators know the plant well and answered all of our questions either by memory or by looking them up in easily accessible documentation. One result of this strong operations and management is LWWSD's 19 years of turbidity optimization, an impressive accomplishment that we hope the District is proud of. Great work!

In addition, the District has several planning efforts that go well beyond DOH's requirements. Some of the plans that we discussed at the survey included emergency planning, succession planning, a 20-year technical review, and a level of service plan. Steve Hulsman and I were participated in your emergency response table top exercise a couple of years ago. The event was professionally run by an outside consultant, and included a transparent look into the District's goals, strengths, and weaknesses in emergency response. You examined your emergency procedures and how they interfaced with government agencies. At the survey you mentioned a follow up emergency planning event. These efforts show LWWSD's interest in the future of the water system and its ability to provide outstanding service to customers.

I enclosed a copy of the Field Data Sheet and the Distribution Survey Report that we used during the survey to organize our findings. Please review these reports and let me know if anything is inaccurate.

Treatment Plant Findings and recommendations

We did not identify any significant deficiencies or findings in the treatment plant.

Please consider the following recommendations for follow-up action:

1. **Please follow up with me to update your CT assumptions.** Our past analysis concluded that the outflow from the CT tanks was 600-780 GPM (on average each hour). I understand that you now have

the ability to measure the flows from the transmission pumps out of the CT tank and that the average hourly flow is 700 GPM (not 600 to 780 GPM). I will need to see your flow data and update our CT assumptions to more accurately reflect the flow coming out of the tank.

2. **I recommend developing specifications for bulk chemical deliveries and verifying that all bulk deliveries of liquid alum meet your specifications.** I sent an electronic copy of a presentation on chemical receiving SOPs and strategy.

3. While the operators measure the anthracite level in the filters every week or two, they don't currently record this data. Recording your tasks as an operator makes them real, gives you the ability to look back at them, and turns your actions into data that may be useful at some point. **Please log these measurements to document that you are doing them, and to capture any unexpected changes.** It is feasible to measure and record anthracite levels quarterly at a minimum, but if you're doing it every two weeks record it. More frequent anthracite level measurements would align with the high quality operations at LWWSD. Write it down and keep a record of it.

4. **I recommend that LWWSD do routine (weekly) field alkalinity tests to detect corrosion control issues resulting from alum use.** If this cannot be done with your existing equipment, you can purchase the simplified field test kit from Hach (model AL-AP) or a similar device.

5. **Determine if the 'black stuff' that we saw in the bottom of the clearwell is filter media.**

6. I sent an electronic copy of the EPA filter surveillance manual. **Consider including this in the District's filter maintenance program.**

7. While your raw water quality has been very good for a long time, we have seen raw water turbidities change rapidly and unexpectedly. It this case, it is helpful to be prepared to troubleshoot and investigate potential solutions. **I recommend purchasing jar test equipment and learning how to use it, in case of an emergency raw water quality change.**

8. Evergreen Rural Water of Washington (ERWOW) has an apprenticeship program that may be helpful if you are interested in getting new operators certified. It's a two year program that combines experience and coursework. To learn more about the program: https://www.erwow.org/ApprenticeshipProgram/ABOUTTHEPROGRAM.aspx.

Distribution Findings and Recommendations:

Significant findings and deficiencies must be addressed (either fixed or provide a schedule) within 30 days of the date of the report.

Significant Deficiencies:

9. All of LWWSD's tanks need a cap on the travel wire casing. Please install caps on all 5 travel wire casings and send photos. **3-18-20 COMPLETE**

Significant Findings:

10. Please send photos of the hatch, intact gasket, vent and intact 24 mesh screen taken on the top of each tank within the last year. **3-18-20 COMPLETE**

Observations and Recommendations:

11. While all of your tank photos look good and I did not observe any direct openings, the Geneva Tank's gasket on the hatch appears to be separating at the corner and **will likely to be fixed/replaced in the near future.**

12. We discussed the requirement to have an air gap or a minimum of 34 Feet of vertical distance between the invert of the tank's overflow pipe outlet and the top of the vault where the overflow drains. This eliminates the potential for a cross connection. In a letter from Bill Hunter in May, 2016, he verifies >34 feet of vertical distance between the overflow outlet and the rim of the flap valve. The 34 feet of vertical distance needs to be from the overflow outlet to the top of the vault that the overflow drains into. Please verify that there is a minimum of 34 feet between the overflow outlet (invert) and the top of the vault on the Division 7 and Division 30 tanks. **3-18-2020 EMAIL, COMPLETE**

    "The measurement from the top of the vault to the top of the reservoir overflow at division 7 reservoir and division 30 reservoir are 34'8" and 41'6" respectively, both of the reservoirs do exceed the 34' elevation requirement."

The Drinking Water Regulations require that all Group A public water systems have a sanitary survey every 3-5 years. In order to receive credit for the survey, a sanitary survey fee must be paid, as provided by WAC 246-290-990 (3)(iv). Enclosed is an invoice for $1122.00. 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 to: **DOH, Revenue Section, P.O. Box 1099, Olympia, WA 98507-1099.**

Please give me a call at 253/395-6761 if you have any questions or concerns.

Sincerely,

Laura McLaughlin, PE
Regional Engineer
NW Drinking Water Operations

Enclosures: sent electronically to Kevin Cook

- Main Break fact sheet
- USEPA Filter Surveillance Manual
- Chemical Receiving Procedures

cc: Laurette Rasmussen – Whatcom County Health Department
Justin Clary – LWWSD General Manager
Bill Hunter – LWWSD District Engineer
Brent Winters – LWWSD O&M Manager
Jolyn Leslie, Brian Boye - DOH

State of Washington
DEPARTMENT OF HEALTH
NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310 • Kent Washington 98032-2388

DISTRIBUITON SYSTEM INSPECTION / SANITARY SURVEY REPORT
Date: March 2, 2020

LWWSD – SOUTH SHORE Whatcom County (ID #95910)

Persons Attending:
Kevin Cook, Justin Clary, Jason Dahlstrom, Brent Winters – LWWSD
Jolyn Leslie, Laura McLaughlin – DOH

Purpose: Routine Sanitary Survey of Distribution System

SYSTEM SUMMARY / FINDINGS

Last distribution survey: March 30, 2016

Issues from last survey (distribution related only):

- The CT calculation is based on actual tank level and a maximum flow through the plant of 700 gpm. However, peak flow for CT should be based on the maximum flow either into or out of the contact tank, whichever is greater. Since you currently do not have flow meters on the booster pump stations out of the contact tank, you may want to consider adding flow meters. This could be included/considered in your next WSP update. **2020 UPDATE:** The inflow to the WTP is consistently throttled to 700 GPM (instantaneous). The outflow from the WTP (inflow to the CT tank) has an *hourly average* flow of 700 GPM (to match the inflow to the plant). If either the inflow or outflow from the WTP malfunctioned the filter high or low alarms would sound. The WTP provides the buffer needed to prevent surcharging or draining the filters. The outflow of the CT tank is pumped by two transmission pumps with a combined instantaneous flow of 1570 GPM. They run these transmission pumps for 25 to 26 minutes each hour, which translates to 700 GPM.
- Consider testing for alkalinity to get an idea of baseline (once/month for a year) levels. This sampling is not required by the regulations, but may provide some useful operational information. **2020 UPDATE: Still needed. See comments.**
- With the target finished water pH now set at 7.2 – 7.4, this should help decrease total trihalomethanes (TTHM). Higher pH generally corresponds to higher TTHM levels. It will be interesting to see this year's sample results. **2020 UPDATE:** Currently targeting 7.2-7.4 pH.

Approval status:	Existing Connects	=	3884
	Eng Capacity	=	3935
	Total Lots	=	
System Type:	Group A – Community		

WATER QUALITY HISTORY:

Bacteriological	:	10 samples/month, satisfactory for past 2+ years
Nitrate	:	ND – 0.7 mg/l
Exceed MCL?	:	None

GENERAL SYSTEM DESCRIPTION

The Lake Whatcom Water and Sewer District holds a large service area that completely surrounds Lake Whatcom except for an area at the northwest end that is served by the City of Bellingham. The South Shore system is made up of the District's Geneva and Sudden Valley service areas and sits on the south shore of the lake. All source water comes from Lake Whatcom and is treated in the Sudden Valley WTP. A connection to the Bellingham distribution system, which used to supply the Geneva service area, is maintained as an emergency back-up source. The system currently serves just under 3884 total connections with a full-time residential population of 10,028.

Four distribution storage reservoirs serve the combined Geneva – Sudden Valley service area and each tank has separate inlet/outlet piping. There are eight separate pressure zones plus four sub-zones in the Sudden Valley area while the Geneva area is divided into two pressure zones. The various pressure zones are interconnected by 4 sets of booster pumps and many PRV stations.

SOURCES:

S01 – Lake Whatcom (surface water source)
Source not inspected/included as part of this survey.

TREATMENT:

Purpose: Surface Water Treatment (filtration and disinfection)
Treatment plant not inspected/included as part of this survey.

STORAGE:

There are currently 5 storage reservoirs, including the new tank at the Division 22 site. The only reservoirs that can be bypassed for maintenance are the Geneva reservoir (by using our emergency source with the city of Bellingham) and either of the two reservoirs located at the division 22 reservoir site. The other storage reservoirs do not have a bypass and cannot be easily removed from service without potentially causing some areas of the system to be without water.

They are all cleaned/inspected every 5 years by divers, and were last inspected in 2017.

The overflow outlets are also currently under consideration for modification to bring the outlets above ground with the appropriate air gap as the Sudden Valley reservoirs all drain directly to sewer manholes. Tanks had cameras and intrusion alarms. **The operators provided pictures of the hatches and vents on all reservoirs by email.**

During the survey we inspected/visited these reservoirs:

- 500,000 gallon Division 22 Reservoir A - has air gap on overflow, reconfigured since last survey.
- 626,000 gallon Division 22 Reservoir B – new tank since last survey, has air gap on overflow.
- 1,000,000 gallon Division 7 Reservoir
- 500,000 gal Geneva Reservoir – installed air gap on overflow since last survey.

During the survey we did not inspect/visit these reservoirs:

- 150,000 gal Division 30 Reservoir

DISTRIBUTION:

There are eight separate pressure zones plus four sub-zones in the Sudden Valley area while the Geneva area is divided into two pressure zones. The various pressure zones are interconnected by 4 sets of booster pumps and about 50 PRVs. The system schematic shows the complexity and variability of the zones with many able to serve and be served by a number of different zones.

MANAGEMENT & OPERATIONS:

Water System Plan	Approved 10-3-2018, valid through 10-3-2028
WFI Update	Updated in 1/2020, No changes needed
Water Quality Monitoring Schedule	20 Lead/copper samples due in 2022 (standard 3-year)
Coliform Monitoring Plan	10 samples/month; use coliform monitoring plan – generally sample 2/week every week
DBP Monitoring Plan	Reduced annual monitoring
Consumer Confidence Report	Kevin pulls this information together
Operating Permit	Green
Overall Design Approval	Yes
Capital Improvements Planned?	Following annual CIP plan and priorities. Plan to demo their old, unused tank, install telemetry and meter from Sudden Valley to Geneva.
Certified Operator	Kevin Cook, WTPO2, WDM2 – treatment plant Jason Dahlstrom, WTPO1 – distribution Plus 4-5 other operators that can step in. The district-wide succession plan is scheduled to be updated this year.
O&M Manual	Use Cartegraph and have invested in the program in the past year to include asset management. They also use it to help schedule O&M tasks.
Flushing Program	Annual, rolling system so that part of system is flushed every year – don't use unidirectional flushing
Valve Exercise/PRV Maint.	Valve exercise every other year; district performs maintenance on all 50 PRVs every year – check pressures and clean any PRVs with problems.
Routine practice for main repair	Use industry standard – maintain positive pressure, have their own vactor truck. See attached publication that describes language and response for each type of main break.
Water Use Efficiency Program	Yes
Individual Customer Meters	Yes
Distribution System Leakage	2015 3-yr ave = 5.3% , 2014 3-yr ave = 10.3% Leakage improved a lot in 2019.
Cross Connect Program	Rich Munson is the program coordinator; all district-owned devices are tested by contractor. They also have 8 certified CCS's on staff as well.
Watershed Protection Program	Participate in Lake Whatcom area/County efforts of protection/study of the lake and watershed. They are currently carrying out a study on the effects of septic systems on Lake Whatcom's quality, partially funded by DOH. They will be able to compare results to a past study.
Emergency Response Plan	Yes, operators take turns being on-call during weekends

E.coli Response Plan	Yes. They are starting to implement Shake Alert, and have partial living quarters for operators to stay onsite in an emergency.
Power/water outages	Dedicated generators at some sites, most have automatic transfer switches, also 5 portable generators. The treatment plant has a generator that is exercised weekly.
Financial Viability Program	Yes, annual budget approved by commissioners; good reserve account; full rate study is conducted every 5 years, partial study every 2.5 years. The board sets the rates.
Management Structure	Special purpose district; 5 commissioners, elected to 6-year terms
Complaints	None on file since last survey; have tracking system

Washington State Department of **Health**
Environmental Health Programs
Office of Drinking Water

Sanitary Survey of Rapid Rate Filter Plant

Field Data Sheet

System Name **LWWSD – South Shore**	I.D. Number **95910**	Date **3/2/2020**	Evaluation By **Laura McLaughlin Jolyn Leslie**

Operator(s) Present **Kevin Cook Jason Dahlstrom, Brent Winters**	WTPO# **007626**	Certification Level **WTPO2**	Title **WTP Lead Operator**	Phone Number **360.296.4574**

Identify lead operator/WTP supervisor above.
Is lead operator new since the last survey? ☐ Yes ☒ No
Does this person sign the reports? ☒ Yes ☐ No Present during the survey? ☒ Yes ☐ No

Source Water & Watershed Information *(Review Watershed Risk Report from Surface Water Database (SWDB); Gather information needed if incomplete) Intake: Protection provided to Intake facilities; adequate screening; adjustable levels of withdrawal; pumped or gravity (reliability concerns)? Frequency and location of raw water turbidity and fecal coliform samples.*

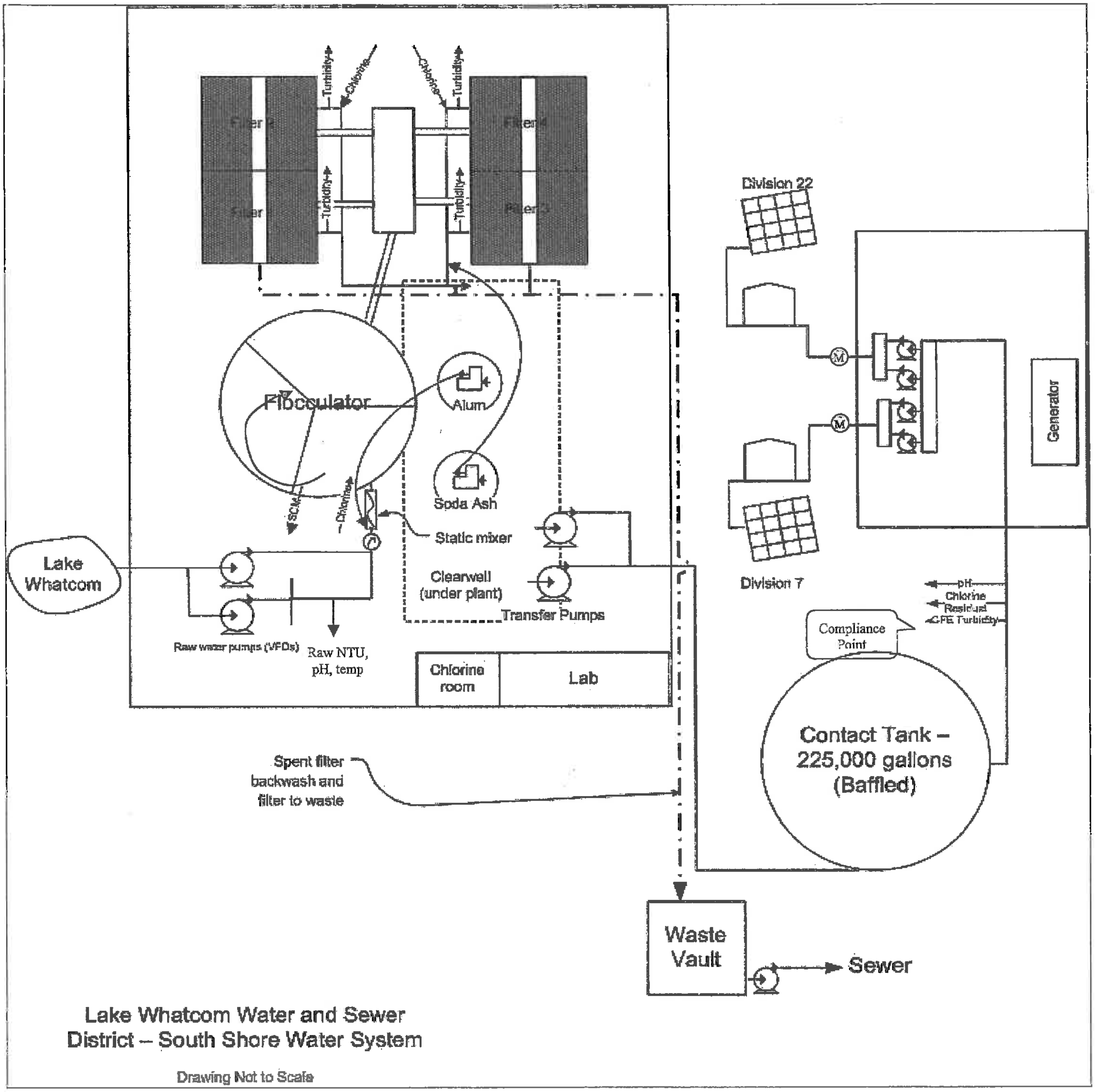
All source water comes from Lake Whatcom and is treated at the Sudden Valley WTP, which is located on the southern half of Lake Whatcom on the southwest shore. Lake Whatcom has pockets of moderate to high density residential development (generally on the north end of the lake), as well as areas that are not developed (generally on the south end of the lake). The lake is used for recreational purposes with swimming and motor boat usage. The peak capacity of the WTP is 1000 gpm and it currently operates 7 days per week at 700 gpm. The plant is started manually by operators each day and runs until the tanks are filled.

S01 – Lake Whatcom:
- **The intake is located in the upper basin of Lake Whatcom approximately 315 feet off shore and 70 feet deep. The intake is a 4-foot diameter pipe approximately 1-2 feet off the lake bottom with screened openings on both ends. The screen openings are ¼"-⅜". The intake is routinely inspected by divers.**
- **The raw water pumps have variable speed drives, which allow the filter plant to run continuously with only one or two starts per day.**

Raw Water Testing:
- **Raw water turbidity is sampled at the treatment plant inlet (after raw water pumps) and uses a Hach TU5300 – see schematic for location.**
- **Raw water fecal coliform samples are collected at treatment plant inlet on a monthly basis. Mean <1/100 ml; Max 1.1/100 ml; only 4 detections in last 24 months at 1.1 CFUs/100 mL. LT2 monitoring is complete and the system remains classified in bin 1 – no additional treatment required for *Cryptosporidium.***
- **The raw water quality generally has very low turbidities (less than 1 NTU).**

Susceptibility
- **Reviewed the Watershed Microbial Risk Rating Form – this source has a score of 13 and is rated at Moderate risk.**

Plant Schematic *– Use schematic from Comprehensive Performance Evaluation (CPE) report, if available; Show actual compliance monitoring locations for Combined Filter Effluent (CFE) turbidity, Concentration of Residual x Time of Contact (CT), and residuals at entry point to Distribution System (DS); Place arrow and letter at chemical addition points and identify in tables below.*



Chemical Addition - Coagulant(s), Filter Aid(s), pH Adjustment, Pre-Cl_2 /Rapid Mix:

Chemical		Location	Dose	Chemical		Location	Dose
Alum	☒	Before floc basin	27.3 ppm	Soda Ash	☐		
Ferric Cl/SO_4	☐			Caustic Soda	☐		
PACl	☐			Lime	☐		
CAPolymer:	☐			Pre Chlorine	☒	Into floc basin	0.15-0.22 ppm
CAPolymer:	☐			Potassium Perm	☐		
FAPolymer:	☐			Other:	☐		

All chemical used in the WTP NSF Standard 60 Approved: ☒ Yes ☐ No If not, which ones?____________

Note: PACl = Polyaluminum Chloride; CAP = Coagulant Aid Polymer; FAP = Filter Aid Polymer; Insert name(s).
Liquid alum is delivered in bulk. Recommend to verify that deliveries are within system-established specifications.

Operations program complete & up-to-date per WAC 246-290-654(5)? ☒ Yes ☐ No
How are dosages determined; how are they controlled? (Jar tests, Visual floc formation, streaming current monitor, historical, monitoring data, etc.); what turbidity variation triggers a change? (Compare monthly chemical usage to dosage.) Bulk storage? Day tanks?

They use a combination of tools to determine chemical dosages including raw water turbidity readings, individual filter turbidity reading, combined filter turbidity readings, bench top turbidity reading verification, visual floc analysis, steaming current meter readings as well as historical data. The water treatment plant is equipped with a 1700 gallon alum storage tank. The alum meets the AWWA standard B403-93. The water treatment plant has a 1500 gallon soda ash storage tank. The soda ash meets the AWWA standard B201-92. The water treatment plant has a dual automatic switchover 150# chlorine gas feed system (150# cylinder online that if it was to empty a backup tank will automatically open to supply chlorine) with 2 full 150# chlorine cylinders stored for back up in case of a supply chain issue. Since their raw water is extremely stable, (pH, temperature, and very low turbidity levels), their chemical dosages rarely need adjustments.

A streaming current monitor (pulls sample from first floc chamber) is read, but not used for alum dosing, SCM readings vary widely from -180 to -1000 – optimal range from ~0 to -30.

For all plants that use alum, we recommend testing finished water alkalinity at least weekly. Alkalinity in the Pacific Northwest is generally very low in surface water and alum can reduce the levels to a point where it can be problematic for corrosion control. We recommend that alkalinity be at least 20 mg/l as $CaCO_3$. This can be done onsite along with a paired lab sample on a quarterly basis.

Rapid Mix Type: Static Mixer ☒ Mechanical Mixers ☐ Injection Mixers ☐ In-line Blender Mixers ☐

Mixing Energy (G or GT): Undetermined

Operational?

In-line static mixer after alum injection and prior to flocculator. The system does not use, nor does it have the equipment on hand for jar testing. We recommend purchasing equipment and learning how to use it. Calibrate it to your plant. A number of other plants recently have needed to use jar testing to help make plant adjustments due to changes in raw water quality.

Flocculation:

Flocculator Type: **NONE** ☐ Hydraulic ☒ Mechanical ☐ Number of basins: ________

Target Mixing Energy (G or GT): Undetermined

Appearance of floc; tapered energy input?

Circular basin with 3 compartments.

Sedimentation/Clarification:

NONE (Direct Filtration) ☒ Horizontal-flow rectangular ☐ Tube Settlers ☐ Dissolved Air Flotation ☐
Adsorption Clarifier ☐ Horizontal-flow round ☐ Inclined-plate ☐ Other ______ ☐

Filtration:

Single Media ☐ Dual Media ☐ Mixed Media ☒ Pressure Filter ☐ Deep Bed Mono-media ☐
Media Type: Sand ☒ Anthracite ☒ Garnet ☒ Other: ______ ☐
Media Design Depth: 9" Sand, 9" Garnet (two sizes, 4.5" each), 18" anthracite

Filter Dimensions: Length: 8'-0" Width: 9'-2" Total Area: 293.2 sq ft
Max. plant flow rate: 1,000 gpm (typically operates @700 gpm max) Filter Rate: 3.4 gpm/sq ft (2.4 gpm/sf @700 gpm)

Filter #	Current Media Depth/s (in)	Last Measured (Date)	Replenished (Date)
1	17-18 inches	3/23/20	March, 2019
2	17-18 inches	3/23/20	March, 2019
3	17-18 inches	3/23/20	March, 2019
4	17-18 inches	3/23/20	March, 2019

Filter maintenance program? Yes; *Describe program and any filter maintenance activities.*

Their annual filter maintenance program includes changing the surface washer nozzles, inspecting the top of the filters, scraping the top layer of fines off of the filters, and adding 2-6 bags of anthracite so that there are 2.5 inches between the water surface and anthracite. Filter media is also measured regularly throughout the year after backwashes by taking a measurement from the bottom of the surface washers to the top of the anthracite in the filter bed. Kevin measures this every week or two, but does not log it because it changes very little (see recommendation). The last filter rebuild/media change was in the late-2000s and is targeted for approximately every 10 years, so is likely due soon.

Individual Filter Turbidimeters Calibration Date: 2/5/20
Combined Filter Effluent Turbidimeter Calibration Date: 2/5/20

Backwash criteria: manual/time – once/run (typically 10-15 hours, daily) Rate: 17.8 gpm/sq ft

Backwash to: Lagoon ☐ Lagoon To Raw Water ☐ Plant intake ☐ Sanitary Sewer ☒

Filter-to-waste: ☒ Yes ☐ No Time: 15 min Stopped at: (Manually controlled) typically @0.05 ntu

Condition of media (mounding, cracking, mudballs); when replaced; Control of filter rate and backwash rate; Variability of filter rate; Turbidimeters properly operating? Numbers reported when plant is running? Models of turbidimeters: continuous and benchtop; filter to waste (FTW) at all start-ups or after backwash (BW)? Recycle backwash water, thickener supernatant, or sludge dewatering process liquid? Where to? Request to see required records.

The media appeared to be in good condition, no mounding, cracking or mudballs present. The filter rate is controlled by the inlet flow rate and typically operates at a constant rate of 700 gpm.
The plant is shut-down during backwash so there is no risk of surging the other active filters and filters are backwashed sequentially. Backwash rate throughout is constant (1,300 gpm/filter). Backwash sequence is:

- **Surface wash (4 minutes)**
- **Backwash with surface wash (2.5 minutes)**
- **Backwash only (5 minutes)**
- **Filter to waste until turbidity is less than 0.05 NTU and declining**

Each filter has a Hach TU5300 turbidimeter and SC200 controller (shared between two filters). The combined filter effluent turbidimeter is also a Hach TU5300 and SC200 controller – the sample point is from the pipe leaving the contact tank (the piping going in to the clearwell under the plant makes it difficult to get a true CFE reading).

All chemical standards were within the expiration dates. Feed pump calibrations are performed daily using a graduated cylinder. Online chlorine analyzers and pH probes are calibrated/verified daily, all online turbidimeters are verified weekly.

Chemical Addition – Disinfection:

Chemical		Location	Dose	Chemical		Location	Dose
Gas Chlorine	☒	Combined after filters 1/2 & 3/4	1.2 ppm	UV	☐		
NaOCl	☐			Ozone	☐		
$Ca(OCl)_2$	☐			Chloramines	☐		
ClO_2	☐			Other:	☐		

Contact Tank Dimensions: Diameter: 40' Depth: 16.5 Minimum (24' total)

Parameter Monitored	Location	When/ Frequency
pH	Out of contact tank	Continuous
Temperature	Out of contact tank	Continuous
Disinfectant Residual	Out of contact tank	Continuous
Peak Hourly Flow (PHF)	*Currently reading raw flow entering plant as peak hourly flow	Continuous
Other:		

Redundancy of equipment; Contact time (T) evaluation – how derived, variable or constant; How is Peak Hourly Flow (PHF) determined – compare to value used for T in CT calcs; Check CT Summary Report in database, complete as necessary (If CT summary Report is not available, review CT determination in system files); Clearwell vents and screens; Calibration of pH meters and disinfectant residual monitors

There are two tanks at the plant – the clearwell (25,000 gal) is located underneath the plant building but is not used for CT; the contact tank (225,000 gal) is adjacent to the treatment building and is a welded steel tank with baffles.

***The CT calculation is based on the peak flow to the plant, which the operator reported is equal to the flow leaving the contact tank. CT calculation was updated as a result of the tracer study by Gray & Osborne as part of our state-wide contract. Minimum contact tank level is measured/recorded on a daily basis. For the CT calculation, the contact tank level should never go below 16.5', though tank level rarely goes below 17.0'**

Contact time is variable and is based on tank level, 0.3 baffling factor, and peak hour flow of 700 gpm (they no longer use a constant time of 108 minutes). Two booster pump stations pump out of the contact basin (up to Division 7 and Division 22) at ~720 gpm and 850 gpm, but they run simultaneously once every hour for 25-26 minutes, so PHF (spread out over a full hour) out of the tank averages to 700 GPM and is no longer 600-785 gpm. This average 700 GPM flow needs to be verified by the new flowmeters installed on the transmission pumps leaving the CT tank.

It should also be noted that the clearwell under the treatment building is not included in the calculations for CT. There is also no 'CT credit' for flow through the plant (even though pre-chlorination is practiced with chlorine being injected in the flocculator). We also noted that there may be a small mound of filter media in the bottom of the clearwell. This should be investigated.

There is a separate chlorine room with the gas cylinders and feed regulators. The door has a glass window so that the equipment can be viewed without opening the door. Safety procedures/equipment are in place.

Chemical Addition – Corrosion Control/Stability/Other:

Chemical		Location	Dose	Chemical		Location	Dose
Soda Ash	☒	After filter/before clearwell	17.1 ppm	Orthophosphate	☐		
Caustic Soda	☐			Polyphosphate	☐		
Lime	☐			Other:	☐		

Target finished optimal water quality parameters:

pH: 7.2-7.4 Alk: ______ Phosphorus: ______ Other: ______

Fluoridation: None ☒ Hydrofluosilicic Acid ☐ Sodium Fluoride (Saturator) ☐ Sodium Silicofluoride (Dry Feed) ☐

Typical dosage is around 15-20 mg/l. pH has also been lowered slightly since the last survey to be more in line with the target pH of 7.2-7.4.

General Plant Operations/ Cross-Connection Protection (CCP)

Has purveyor had plant hazard evaluation by Cross Connection Control Specialist (CCS)? If so, when? ☐ Yes ☐ No

Internal CCP – chemical makeup; use of day tanks; chemical feed/ makeup interconnections; split chemical feeds? Submerged inlets in chemical feed tanks? Surface washers? FTW connections? Protection from overfeed? Connections to pumps? Hoses/ hose bibs? Any other treatment provided?

All of the plants RP's were tested on 2/24/2020 and all filter to waste, over flows and backwash outlets are double the diameter air gaps to atmosphere. The plant currently uses large bulk tanks to feed chemicals. They considered switching to day tanks, but determined that the tank size would not be much smaller.

Is plant staffed during all times of operation? ☐ Yes ☒ No Full SCADA monitoring/controls

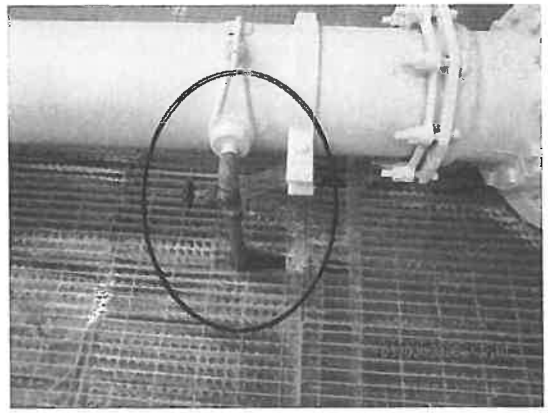
Hours of operation: Start: ~7:30 am Stop: ~3:00 pm Number of Shifts: 1

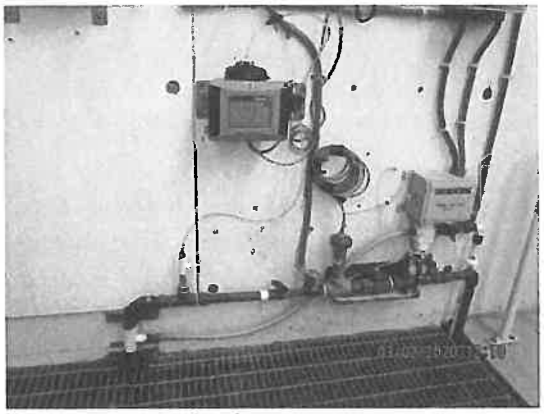
Kevin generally works at the plant from 7:30 am – 3:00 pm. When he arrives in the morning, he starts a backwash cycle, then puts the plant into production for the day and takes all necessary tests for the day. There is an after-hours/weekend person who monitors and responds to SCADA alarms. The plant has motion detectors throughout the building that, when the operator is present, can tell if he has stopped moving for an extended period of time and will trigger an alarm/alert if there is no movement.

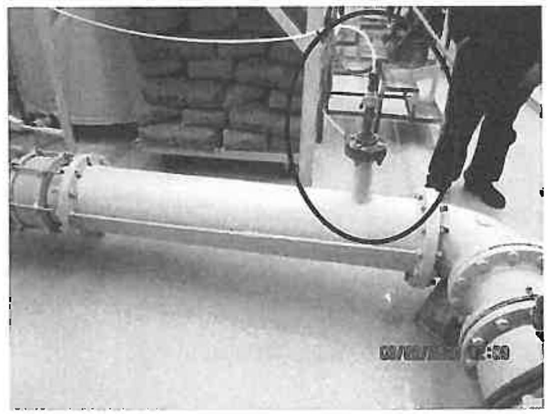
Critical Water Quality Alarms: **Alarms are tested on a routine basis.**

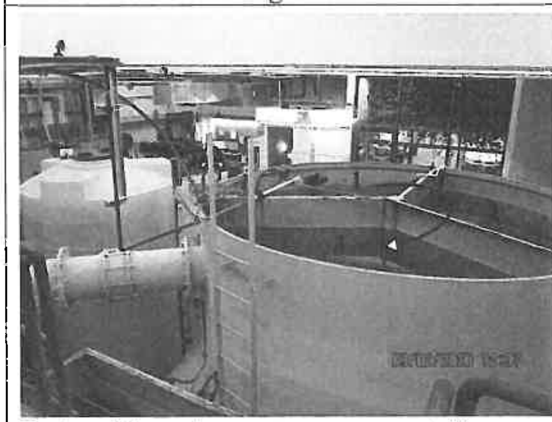
Parameter	Monitoring Point	Alarm Level	Shutdown Level	Response
Turbidity - Raw	Inlet to plant	5.0 NTU	None	Call operator
Turbidity - IFE	At each filter	0.07 NTU	None	Call operator
Chlorine Residual	After contact tank	0.7 low/1.5 high	None	Call operator- remote shutdown
pH - Finished	After contact tank	6.8 low/8.0 high	None	Call operator- remote shutdown
Turbidity - Finished	After contact tank	0.05		Call operator- remote shutdown
Other: Excessive starts			3 times	Shut down plant/call operator
Other: low flow @ intake				Shut down plant/call operator
Other: Clearwell level		3' low/8' high	3' low/8' high	Shut down plant/call operator
Other: Contact tank		17.5' low/21.8'high	21.8' high	Call operator/shut down plant for high level only
Other: Division 7 tank		Low = 28'	High = 33.5	Look at trend, how steep? Look at SCADA, if real, come in and find leak.
Other: Division 22 tanks		Low = 24' on both, auto turn on = 20'on both	High = 31.5'	Look at trend, how steep? Look at SCADA, if real, come in and find leak.


Inlet to plant

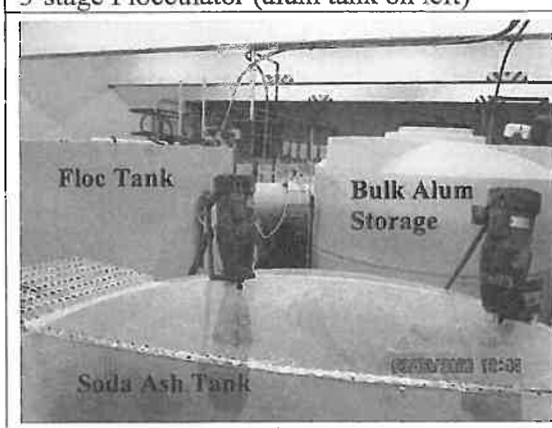

Raw water sample tap location


Raw water monitoring


Alum injection

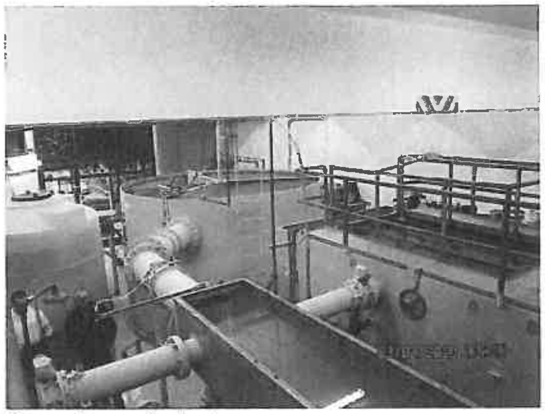

3-stage Flocculator (alum tank on left)

3-stage Flocculator

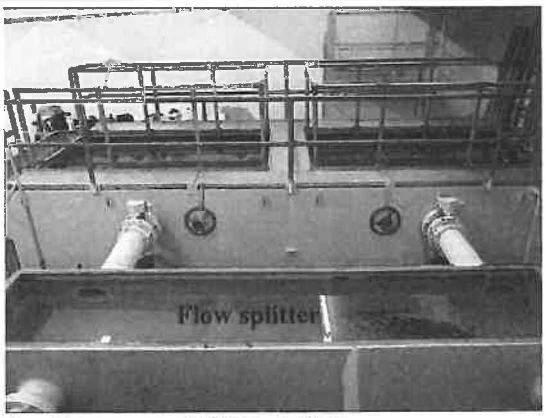


Soda ash tank with mixers

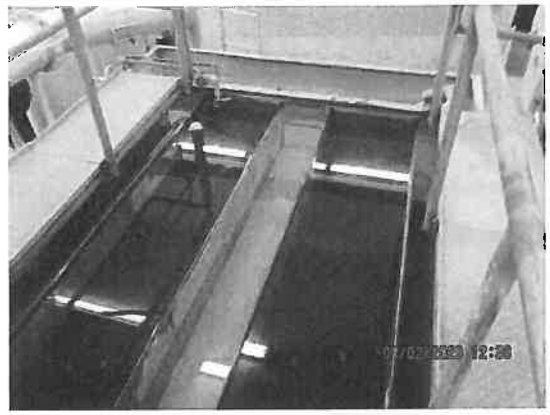
Soda ash – NSF approval


Overview of plant


Filter gallery

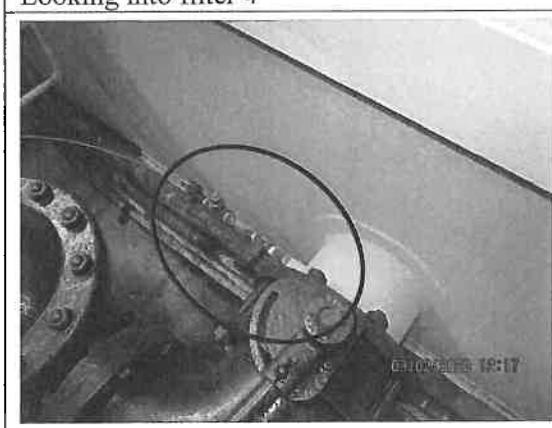


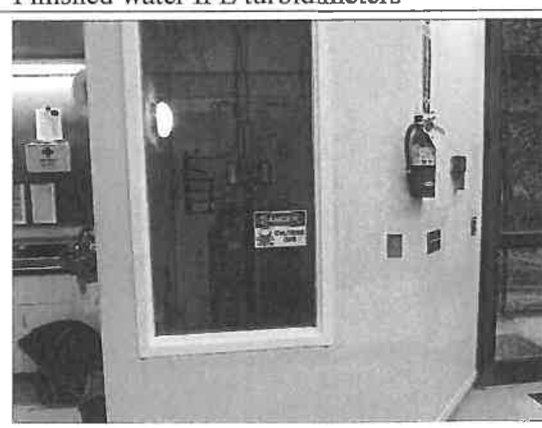
Looking over at filters 1 & 2

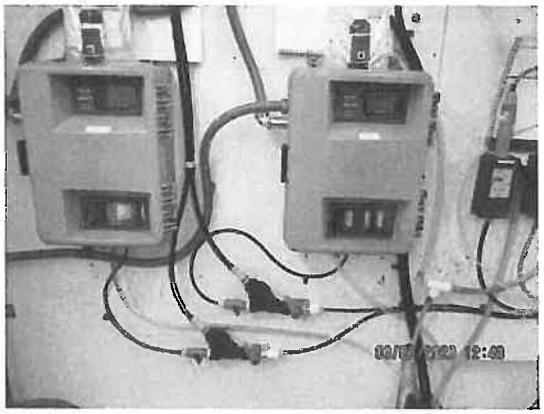

Filters 1 & 2

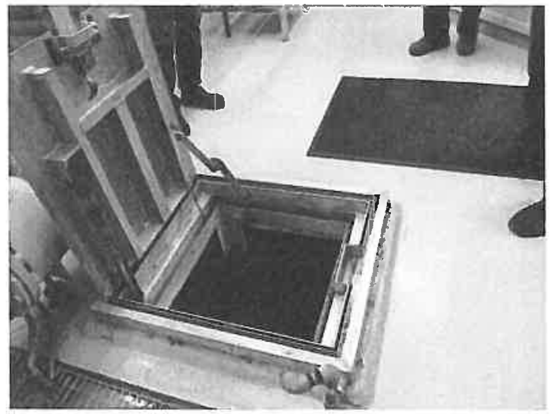

Looking into filter 4


Finished water IFE turbidimeters


IFE sample point (typical)

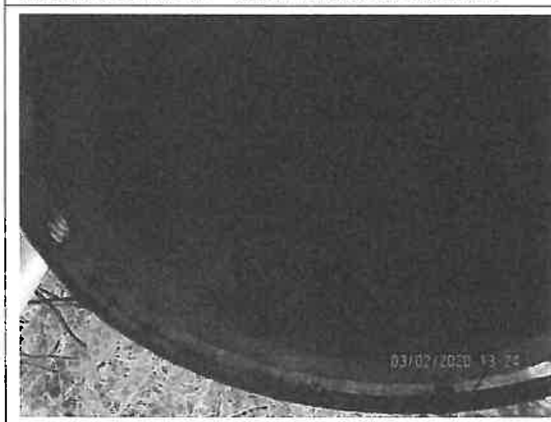

Chlorine gas – enclosed room


Finished water chlorine analyzers


Clearwell access hatch – well sealed

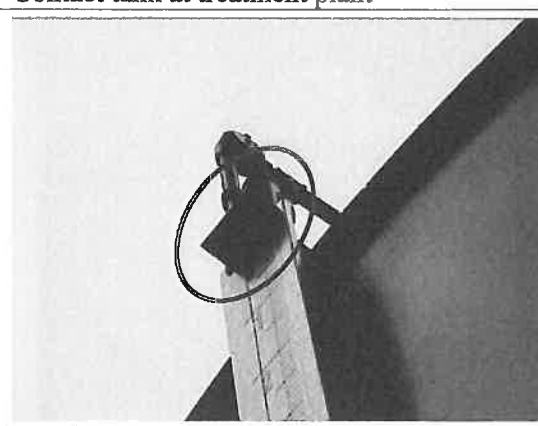

Inside clearwell – filter media in bottom?


Screened overflow on clearwell

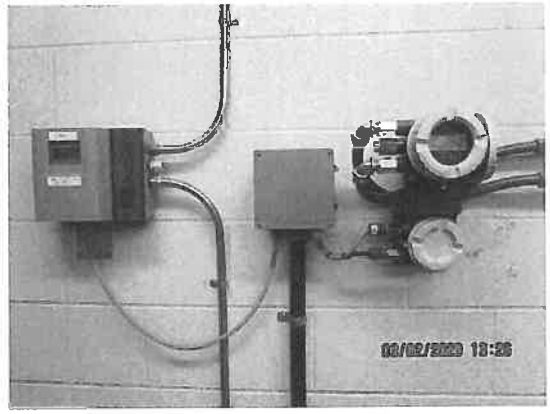

Screened overflow on clearwell

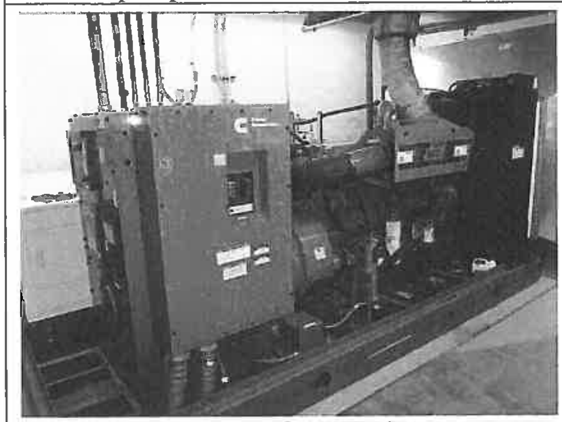
Contact tank at treatment plant


Screened overflow on contact tank

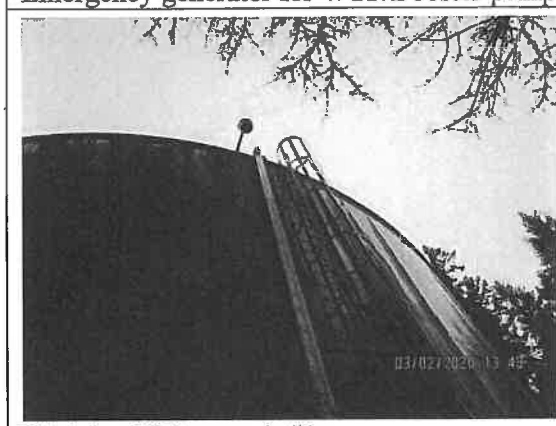

Level gauge travel wire (open end, typical)


Booster pumps from WTP to Division 7 & 22


Flow meters for Division 7 & 22

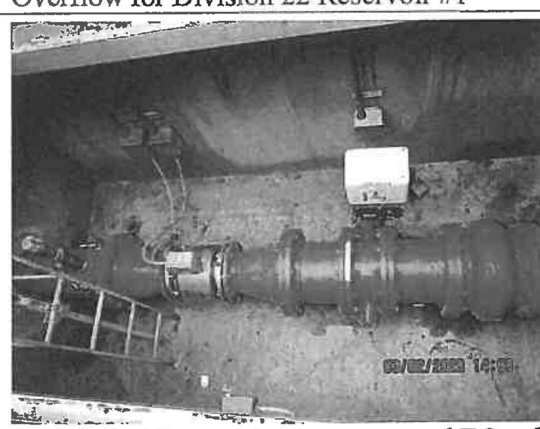

Emergency generator for WTP/Booster pumps

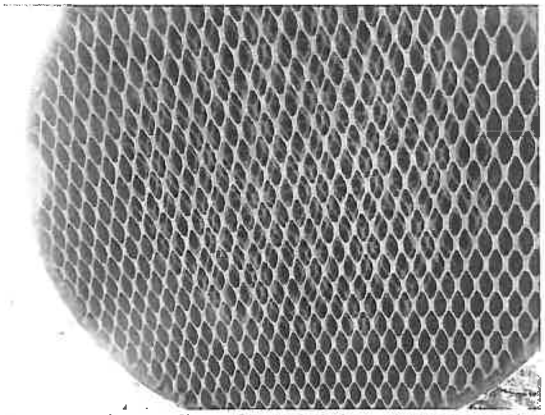

Division 22 tank site (#2, newer tank behind)

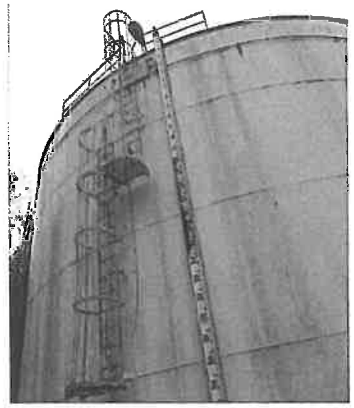

Division 22 Reservoir #1


Overflow for Division 22 Reservoir #1

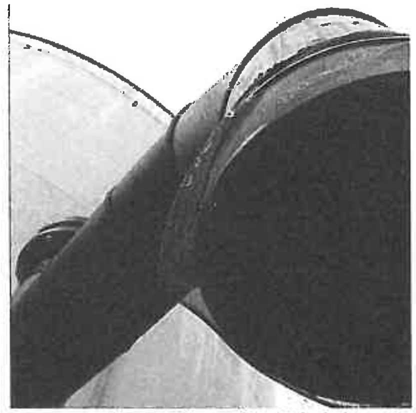

Division 22 Reservoir #2


Division 22 Reservoir #2 – meter and EQ valve


Screened overflow for Division 22 Reservoir #2


Division 30 Reservoir

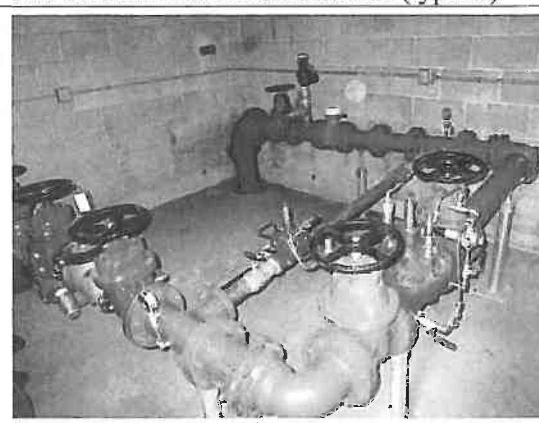

Screened overflow for Division 30 Reservoir


Screened overflow for Division 30 Reservoir

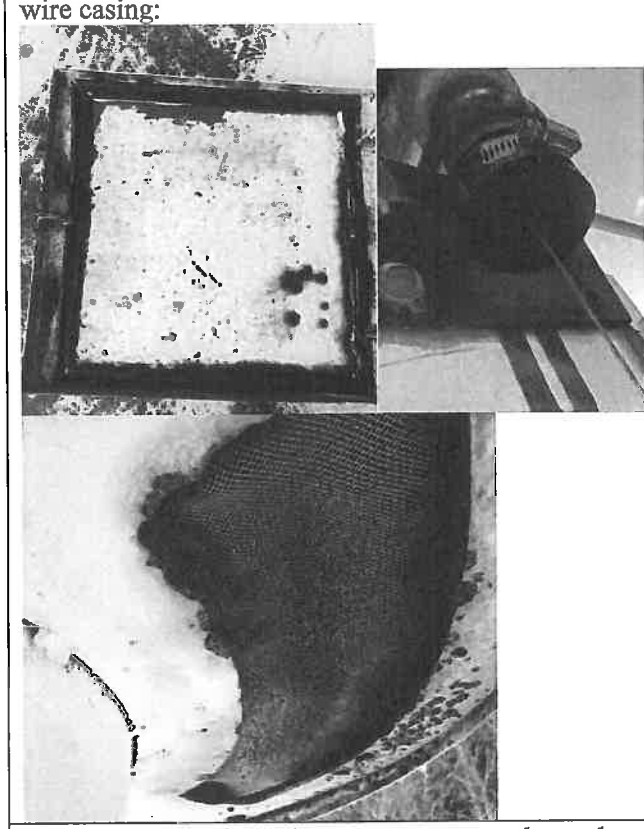
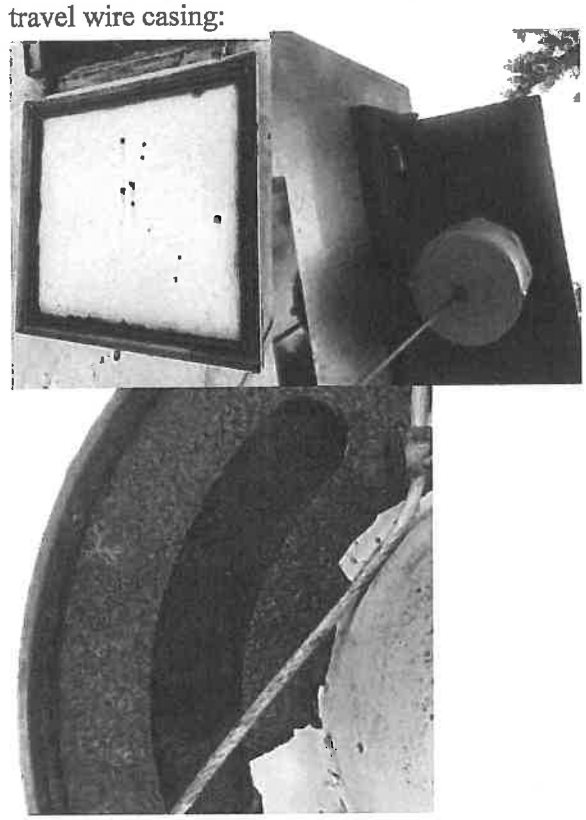
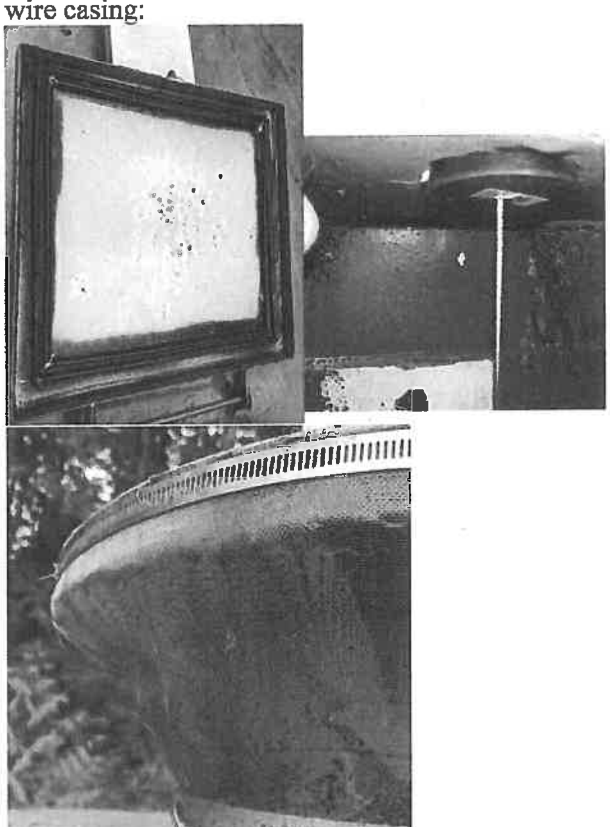
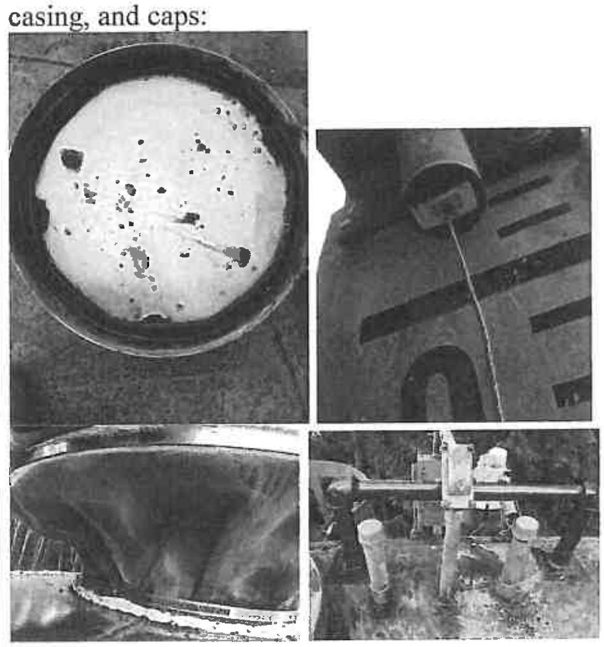

Geneva Reservoir

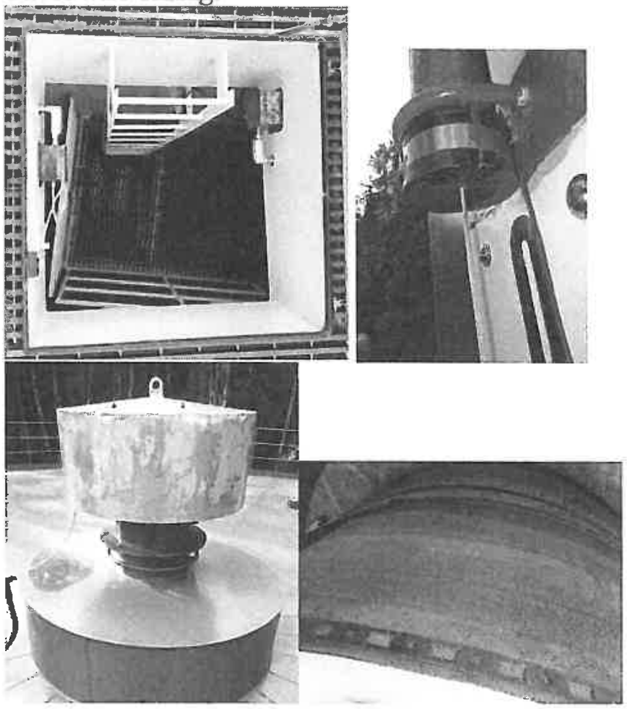
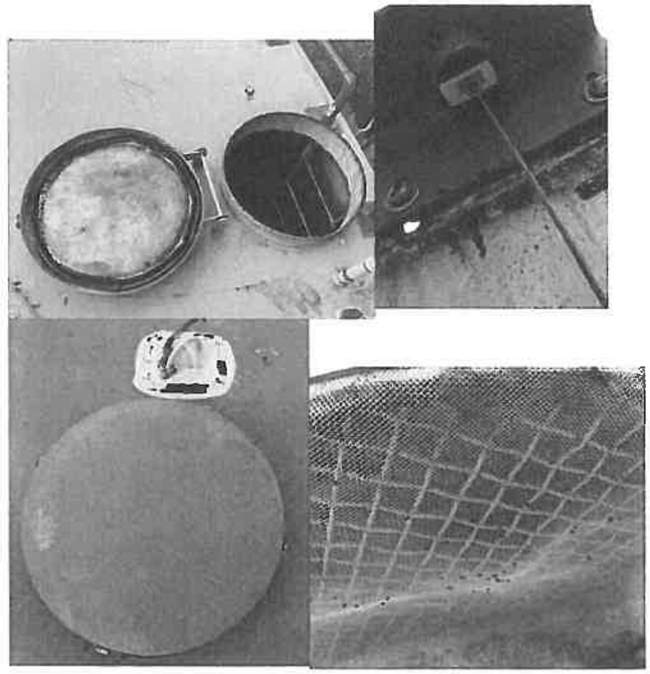

Air/vacuum valve in distribution (typical)


Older PRV station (typical)


New PRV at Bellingham Scenic St Intertie

Operator Tank Photos: Sent 3/18/2020:

Geneva Roof Hatch Gasket, vent screen, and travel wire casing: 	Sudden Valley Roof Hatch Gasket, vent screen, and travel wire casing: 
Division 30 Hatch Gasket, vent screen, and travel wire casing: 	Division 22 old Hatch Gasket, vent screen, travel wire casing, and caps: 

Division 22 New Hatch Gasket, vent screen, and travel wire casing: 	Division 7 New Hatch Gasket, vent screen, travel wire casing, and caps: 

APPENDIX E

CHLORINE GAS STORAGE INFORMATION

CHLORINE GAS STORAGE INFORMATION

MAXIMUM ALLOWABLE QUANTITIES

The hazardous materials provisions of the building codes begin with Tables 307.1(1) and 307.1(2) of the *2015 International Building Code*. These tables set the Maximum Allowable Quantities (per control area) of hazardous materials that pose either physical or health hazards. Gaseous chlorine is considered both an oxidizing gas (physical hazard) and a toxic gas (health hazard) and as such is regulated under the stricter of the requirements of either table. As a physical hazard, the maximum allowable quantity for liquefied oxidizing gases is 150 pounds. As a health hazard, the maximum allowable quantity for corrosive or toxic materials is 150 pounds as a liquefied gas, or 810 cubic feet at NTP as a gas (which is equivalent to a standard 150-pound cylinder). There are some exceptions to these quantities allowing two- to four-times to quantity to be stored or used. However, for the quantities in storage and use at the Sudden Valley WTP these exceptions would not have an effect on the code limits.

HAZARDOUS OCCUPANCY AND CODE REQUIREMENTS

When the quantity of chlorine gas exceeds the maximum allowable, the Occupancy of the Building or Control Area is typically upgraded to H-3. A summary of the building code requirements for H-3 occupancies is outlined below. The list below is not a complete and thorough list of code requirements, but rather a summarized listing of the many requirements.

International Building Code Requirements

- Provide a technical information report identifying the maximum expected quantities of hazardous materials and the methods of protection. This may include a Hazardous Materials Management Plan and a Hazardous Materials Inventory Statement as required by the local fire code official. [IBC 414.1.3, IFC 5001.5.1, IFC 5001.5.2]

- Provide mechanical ventilation where required by IBC, IFC, and IMC. [IBC 414.3]

- Provide an emergency power supply for mechanical ventilation, treatment systems, temperature control, fire and emergency alarm systems, gas and smoke detection systems, or other electrically operated systems. [IBC 414.5.2, IBC 2702.2.8, IFC 6004.2.2.8]

- Standby power for mechanical ventilation, treatment systems and temperature control systems shall not be required where an approved fail-safe engineered system is installed. [IBC 414.5.2.2, IFC 6004.2.2.8.1]

- Provide an automatic fire detection system in accordance with IBC 907.2. [IBC 415.3]

- Provide an automatic sprinkler system in accordance with IBC 903.2.5. [IBC 415.4]

- Provide an approved manual emergency alarm system for storage areas. The alarm-initiating device should be installed outside each access door and should sound a local alarm. [IBC 415.5.1]

- If hazardous materials are transported through corridors or exit passageways, there shall be an emergency telephone system, a local manual alarm station or an approved alarm-initiating device at not more than 150-foot intervals and at each exit and exit access doorway throughout the transport route. [IBC 415.5.2]

- Alarm systems should be monitored at an approved central location. [IBC 415.5.3]

- At least 25 percent of perimeter walls be exterior walls. [IBC 415.6]

- Hazardous occupancies shall be in detached buildings. [IBC 415.8]

- Detached buildings for hazardous occupancies shall be set back not less than 50 feet from lot lines.

- Floors should be liquid tight and non-combustible. [IBC 415.8.4]

- Storage and use cylinders of toxic gas shall be located within gas cabinets, exhausted enclosures, or gas rooms. [IFC 6004.2.2.1]

- Gas rooms shall be separated from other areas by not less than 1-hour fire barriers. [IBC 415.10.2

International Fire Code Requirements

- Provide a readily accessible manual valve or automatic remotely activated fail-safe emergency shut-off valve on all piping at the point of use and at the storage cylinder. [IFC 5003.2.2.1]

- Provide safeguards to prevent the backflow of hazardous materials. [IFC 5003.2.2.1]

- Any gas piping greater than 15 psi require an approved means of leak detection and automatic shut-off. [IFC 5003.2.2.1]

- Equipment using hazardous materials shall be braced and anchored to resist seismic forces per IBC. [IFC 5003.2.8]

- An automatic sprinkler system shall be installed in all Group H occupancies. [IFC 903.2.5, IFC 5004.5] The sprinkler system shall be designed per NFPA 13. [IFC 903.3.1.1]

- Indoor rooms or areas in which hazardous materials are dispensed or used shall be protected by an automatic fire-extinguishing system. [IFC 5005.1.8]

- One or more gas cabinets or exhausted enclosures shall be provided to handle leaking cylinders. [IFC 6004.2.2.3]

  Exemption:

  - Gas cabinets or exhausted enclosure are not required if:

    1. Approved containment vessels or systems capable of fully containing a release;

    2. Trained staff are at an approved location;

    3. Containment vessels or systems are capable of being transported to the leaking cylinder, container, or tank.

- The ventilation exhaust from a Gas Room shall be directed to a treatment system, which shall be utilized to handle the accidental release of gas. The treatment system shall be capable of neutralizing the contents of the largest single vessel. [IFC 6004.2.2.7]

  Treatment System Exemptions:

  - Storage of Toxic Gas ‑ A treatment system is not required to protect a storage area if:

    1. Valve outlets are equipped with gas-tight plugs or caps;

    2. Handwheel operated valves are secured to prevent movement; and

3. Approved containment vessels are provided for leaking cylinders, as noted below.

- Use of Toxic Gas ‐ A treatment system is not required to protect a use area for toxic gases supplied in cylinders not exceeding 1,700 pounds water capacity and if:

  1. An approved gas detection system with a sensing interval of less than 5 minutes is provided; and

  2. An approved automatic closing fail safe valve is located immediately adjacent to cylinder valves.

- Provide a gas detection system capable of detecting the presence of gas at or below the Permissible Exposure Limit and also capable of monitoring the discharge of an exhaust treatment system at or below one-half of the Immediately Dangerous to Life and Health limit. [IFC 6004.2.2.10]

- The gas detection system shall initiate a local alarm and transmit a signal to a constantly attended location. [IFC 6004.2.2.10.2]

- The gas detection system shall automatically close the shut-off valve at the source. [IFC 6004.2.2.10.3]

International Mechanical Code Requirements

- Provide either natural ventilation or a mechanical exhaust ventilation system. [IMC 502.8.1]

- Mechanical ventilation shall pre provided at a rate of not less than 1 cfm per square foot of floor area. [IMC 502.8.1.1]

- Mechanical ventilation shall be continuous. [IMC 502.8.1.1]

- Provide a labeled emergency manual shutoff for the ventilation system. Shutoff should be located outside of the room adjacent to the main access door. [IMC 502.8.1.1]

- Ventilation system for Gas Rooms shall operate under negative pressures within the room. [IMC 502.8.1.2, IFC 5003.8.4.2]