Gray & Osborne, Inc.
CONSULTING ENGINEERS

TECHNICAL MEMORANDUM 20434-1

TO: BILL HUNTER, P.E., ASSISTANT GENERAL MANAGER/DISTRICT ENGINEER
FROM: KEITH STEWART, P.E.
RUSSELL PORTER, P.E.
DATE: SEPTEMBER 10, 2021
SUBJECT: SUDDEN VALLEY WTP PUMP PERFORMANCE TESTING
LAKE WHATCOM WATER & SEWER DISTRICT, WHATCOM COUNTY, WASHINGTON
G&O #20434.00

INTRODUCTION

In 2019, the Lake Whatcom Water & Sewer District (District) contracted with Gray & Osborne to perform a condition assessment for their 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 and subsequent analysis is to identify potential improvements for the existing structures and treatment processes in an attempt to maximize treatment efficiency and extend the operational life of these facilities. The reports and technical memoranda generated as part of this assessment project will be used to develop a strategy for prioritizing modifications to the WTP to ensure it can efficiently and cost-effectively provide clean, potable water for the existing and projected service areas.

This report summarizes the findings of the pump performance analysis conducted on August 18, 2020.

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.

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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. The distribution system includes multiple pressure zones, four booster stations, and approximately 2.8 million gallons (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.

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 1.0 MGD (700 gallons per minute (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.

In February 2019, engineers from Gray & Osborne visited the WTP to conduct the condition assessment mentioned previously. As part of this assessment, Gray & Osborne evaluated the treatment components from electrical, mechanical, process, and structural perspectives and documented issues found during the visit that did not meet current codes or could be modified to optimize treatment efficiency. The assessment's findings and subsequent recommendations were documented in the *Sudden Valley Water Treatment Plant Assessment Report* (Assessment Report) produced by Gray & Osborne in July 2020. This report provides the basis for the analysis below as well as analysis for additional components at the WTP.

The WTP utilizes raw water pumps to move water from the Lake Whatcom source to the media filters, clearwell transfer pumps to move water from the clearwell to the chlorine contact basin, and finished water pumps to move water from the chlorine contact basin to the District's Division 7 Reservoir, Division 22 Reservoir, and the distribution system. Technical information for these pumps is provided in Table 1.

TABLE 1

WTP Pump Summary

Parameter	Value
Raw Water Pumps	
Type	Horizontal, Centrifugal
Quantity	2
Location	WTP Main Building
Year Installed	1992
Make	GS Aurora
Model	3PC-134075
Impeller (in.)	12
Suction/Discharge Size (in.)	6/6
Design Flow (gpm)	1,400
Design Head (ft)	40
Electrical	20 hp, 3 ph, 60 Hz, 1,180 rpm
Clearwell Transfer Pumps	
Type	Vertical Turbine Lineshaft
Quantity	2
Location	WTP Main Building
Year Installed	1992
Make	Peerless
Model	12HXB
Impeller (serial number, size)	2608379, 7-27/32″ x 8-5/16″
Suction/Discharge Size (in.)	10/10
Design Flow (gpm)	1,400
Design Head (ft)	43
Electrical	20 hp, 3 ph, 60 Hz, 1,760 rpm

TABLE 1 – (continued)

WTP Pump Summary

Parameter	Value
Finished Water Pumps – Division 7	
Type	Vertical Turbine
Quantity	2
Location	Finished Water Pump Building
Year Installed	1992
Make	Peerless
Model	12LD
Impeller (serial number, size)	2649365, 8-5/8″ x 9-7/16″
Number of Stages	6
Suction/Discharge Size (in.)	6/6
Design Flow (gpm)	700
Design Head (ft)	445
Electrical	100 hp, 3 ph, 60 Hz, 1,760 rpm
Finished Water Pumps – Division 22	
Type	Vertical Turbine
Quantity	2
Location	Finished Water Pump Building
Year Installed	1992
Make	Peerless
Model	12LD
Impeller (serial number, size)	2649365, 8-3/4″ x 9-19/32″
Number of Stages	8
Suction/Discharge Size (in.)	6/6
Design Flow (gpm)	700
Design Head (ft)	608
Electrical	150 hp, 3 ph, 60 Hz, 1,760 rpm

Raw Water Pumps

Both raw water pumps are located within the WTP Main Building in a below-grade pit adjacent to the flocculation tank. The pumps are accessed by a single vertical ladder. Although each pump is capable of pumping 1,400 gpm, WTP staff have adjusted the pump output to 700 gpm in order to maximize treatment efficiency and comply with previous directives from the Washington State Department of Health (DOH). The pumps are operated on a lead/lag schedule and are maintained in accordance with the manufacturers' recommendations. The raw water pumps are controlled by two across-the-line motor starters, both of which are located in Motor Control Center 3 (MCC3) in the WTP Main Building. MCC3 is located in the northeast corner of the building adjacent to the soda ash storage area. Photos of MCC3 are provided in Exhibit A.

The Assessment Report noted that both pumps were installed in 1992 and are in fair condition. The motor for Raw Water Pump 2 was replaced in 2002. The Assessment Report also noted that both of these pumps are likely nearing the end of their reliable useful life and recommended that the District conduct a performance test for these pumps, and depending on the results of that testing, replace both raw water pumps. The Assessment Report also noted that MCC3 was in fair/poor condition due to its proximity to soda ash chemicals as well as moisture. MCC3 exhibits a moderate level of corrosion and the Assessment Report recommended that the District replace MCC3 as part of any modifications to the raw water pumps and that they consider chemical storage and exposure to moisture before selecting a final installation location for these components. Lastly, the District has expressed interest in controlling these pumps using variable frequency drive (VFD) motor starters, which will provide additional operational flexibility for the treatment process, equipment, and staff.

Clearwell Transfer Pumps

Both clearwell transfer pumps are located within the WTP Main Building near the entrance to the WTP, above the below-grade clearwell. The pumps alternately operate based on the water level within the clearwell and cycle on and off to move water from the clearwell to the chlorine contact basin. The chlorine contact basin is a 225,000-gallon cylindrical welded steel tank with baffles and is located between the WTP Main Building and the Finished Water Pump Building. The clearwell transfer pumps are alternated on a lead/lag schedule and are maintained in accordance with the manufacturer's recommendations. The pumps are critical for supplying the chlorine contact basin, which is a vital component of the treatment process and is used to provide contact time (CT) for disinfection. The transfer pumps are controlled by two across-the-line motor starters, both of which are located in Motor Control Center 2 (MCC2) in the WTP Main Building. MCC2 is located along the south wall of the WTP Main Building. Photos of MCC2 are provided in Exhibit A.

The Assessment Report noted that both clearwell transfer pumps were installed in 1992, are in fair condition, but are likely nearing the end of their reliable useful life. The Assessment Report recommended that the District conduct a performance test for these pumps, and depending on the results of that testing, repair, rehabilitate, or replace both clearwell transfer pumps. The Assessment Report also noted that MCC2 was in good/fair condition, but because of its age is no longer supported by the equipment manufacturer. As such, acquiring spare parts has become increasingly difficult and expensive. MCC2 exhibits a moderate level of corrosion and the Assessment Report recommended that the District replace MCC2 as part of any modifications to the clearwell transfer pumps and that they consider chemical storage and exposure to moisture before selecting a final installation location for these components. Lastly, the District has expressed interest in controlling these pumps using VFD motor starters, which will provide additional operational flexibility for the treatment process, equipment, and staff.

Finished Water Pumps

All four finished water pumps are located in the Finished Water Pump Building. The pumps are fed from a common 10-inch diameter header that provides water from the chorine contact basin. Each set of pumps alternately operate based on the water level within the controlling reservoirs (Division 7 or 22). When the water level within the controlling reservoir reaches the pump off set point, the finished water pumps de-energize and remain offline until the water level in the controlling reservoir reaches the pump on set point. The finished water pumps are alternated on a lead/lag schedule and are maintained in accordance with the manufacturer's recommendations. The pumps are controlled by across-the-line motor starters, all of which are located in Motor Control Center 1 (MCC1) in the Finished Water Pump Building. MCC1 is located south of the finished water pumps in the middle of the Finished Water Pump Building. Photos of MCC1 are provided in Exhibit A.

The Assessment Report noted that all four pumps were originally installed in 1992, but are in good condition. The Assessment Report also noted that all of these pumps may be nearing the end of their reliable useful life and recommended that the District conduct a performance test for these pumps, and depending on the results of that testing, repair, rehabilitate, or replace the finished water pumps. The Assessment Report also noted that MCC1 was in good condition, but given its age is no longer supported by the equipment manufacturer. As such, acquiring spare parts has become increasingly difficult and expensive. The Assessment Report recommended that the District replace MCC1 as part of any modifications to the finished water pumps and that they consider the location of other electrical equipment before selecting a final installation location for these components. Lastly, the District has expressed interest in controlling these pumps using VFD motor starters, which will provide additional operational flexibility for the treatment process, equipment, and staff.

PUMP PERFORMANCE TESTING

On August 18, 2020, Keith Stewart from Gray & Osborne travelled to the Sudden Valley WTP to conduct a performance test of the pumps in use at the facility. WTP Lead Operator Kevin Cook and District Electrician Ken Zangari were also present and assisted with the testing.

The specific testing protocols are highlighted below, but generally, each pump was energized and allowed to equilibrate at its typical operating flow and conditions. From there, the discharge isolation valve associated with each pump was partially closed and the flow, discharge pressure, inlet pressure, and motor amperage were measured and recorded. This process was repeated for several additional flows. Once the test was completed, the discharge valve was fully opened and the pump was de-energized. All four finished water pumps were analyzed in a similar fashion.

Finished Water Pumps

The finished water pumps and MCC1 are shown as Figures A-1, A-2, and A-3 (Exhibit A). Each pump is equipped with manual isolation valves, hydraulic control valves, and inlet/discharge pressure gauges. The discharge piping from each pump connects to a common header, which exits the building below grade. Isolation valves are 6-inch butterfly valves and typically operate in the fully open position. Control valves for all four pumps are 6-inch Cla-Val Model 60-11BY. Pressure gauges are standard glycerin-filled units suitable for potable water service. The existing pressure gauges are at least 8 years old and have not recently been calibrated. Flow for Division 22 pumps is measured by an 8-inch Endress & Hauser magnetic flow meter located in a buried vault on the north side of the Finished Water Pump Building. This meter was installed in 2019 and the flow value for this meter is displayed on a remote display located on the east wall within the Finished Water Pump Building. Flow for Division 7 pumps is measured by an 8-inch Badger magnetic flow meter located in a buried vault southeast of the chlorine contact basin. This meter was installed in 2006 and the flow value for this meter is displayed on a remote display located on the east wall within the Finished Water Pump Building. Amperage across the motor was measured by an ammeter placed around the load wire within the motor control center cabinet as shown on Figure A-2.

For this analysis, finished water flow, motor amperage, discharge header pressure, and discharge piping pressure were measured at various discharge isolation valve positions. The data collected for the Division 7 Finished Water Pumps and the Division 22 Finished Water Pumps are listed in Tables 2 and 3, respectively. These data are also shown graphically on Figures 1 and 2.

TABLE 2

Division 7 Finished Water Pump Testing Summary

Valve Closure (no. of turns)	Flow (gpm)	Discharge Pressure (psi)	Header Pressure (psi)	Inlet Pressure (psi)	Net Pumping Head (psi)	Amperage (amps)
Finished Water Pump 7-1						
20	807	183	170	6.4	176.6	116.8
10	803	183	170	6.5	176.6	116.6
8	799	184	170	6.5	177.6	116.4
6	793	185	170	6.5	178.5	116.5
4	775	188	169	6.5	181.5	115.8
3	749	194	168	6.5	187.5	114.8
2.25	696	204	165	6.6	197.4	112.4
Finished Water Pump 7-2						
20	820	179	168	6.8	172.2	117.9
10	815	180	169	6.8	173.2	117.6
8	809	180	168	6.8	173.2	117.3
6	807	181	168	6.8	174.2	117.3
4	786	184	168	6.9	177.1	116.7
3	754	190	168	6.9	183.1	115.3
2.5	660	206	165	7.0	199.0	111.6

TABLE 3

Division 22 Finished Water Pump Testing Summary

Valve Closure (no. of turns)	Flow (gpm)	Discharge Pressure (psi)	Header Pressure (psi)	Inlet Pressure (psi)	Net Pumping Head (psi)	Amperage (amps)
Finished Water Pump 22-1						
20	730	254	262	7.3	246.7	150.2
10	730	254	258	7.3	246.7	150.2
8	740	256	258	7.3	246.7	149.8
6	739	259	256	7.3	251.7	149.4
4	697	264	252	7.4	256.6	147.5
3	633	277	250	7.4	269.6	143.1
2.25	430	310	234	7.6	302.4	120.6
Finished Water Pump 22-2						
20	730	252	260	7.7	244.3	158.0
10	724	252	258	7.8	244.3	157.5
8	718	254	260	7.8	246.2	157.0
6	706	258	260	7.8	250.2	157.0
4	700	263	258	7.8	255.2	155.9
3	440	279	250	8.0	271.0	132.8
2.75	306	310	238	8.1	301.9	123.8

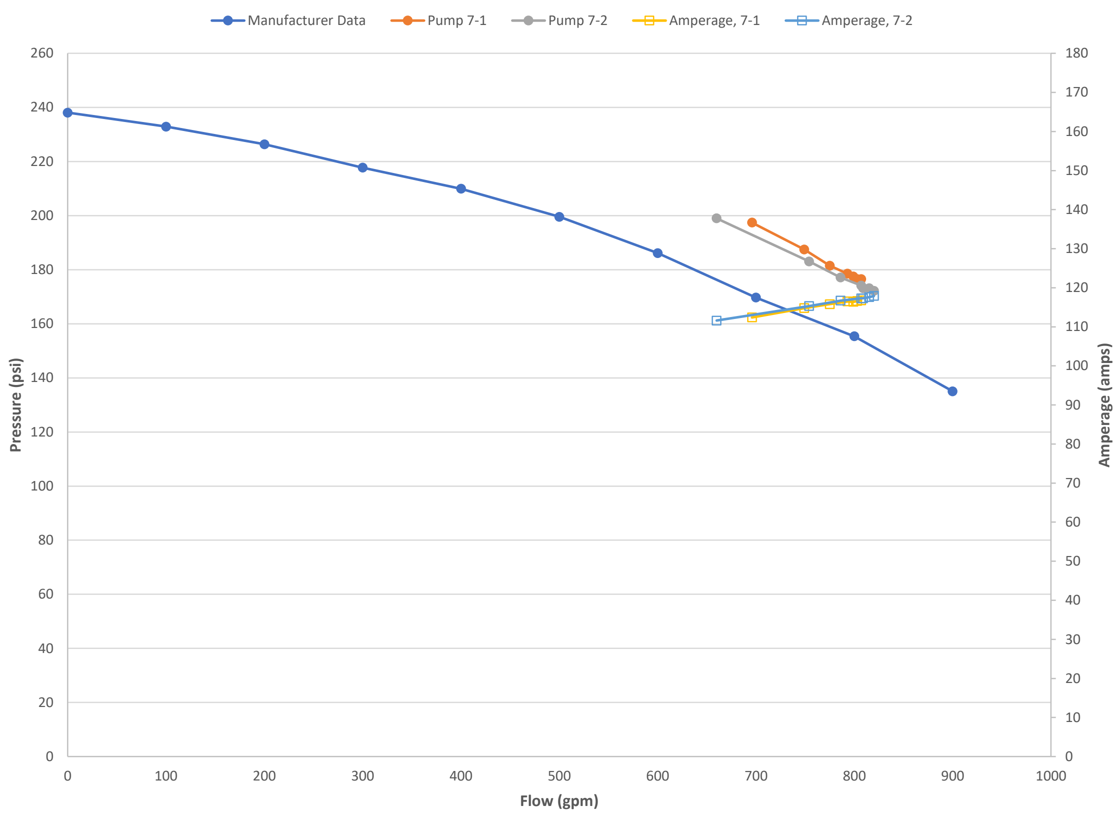

FIGURE 1

Division 7 Finished Water Pump Testing Analysis

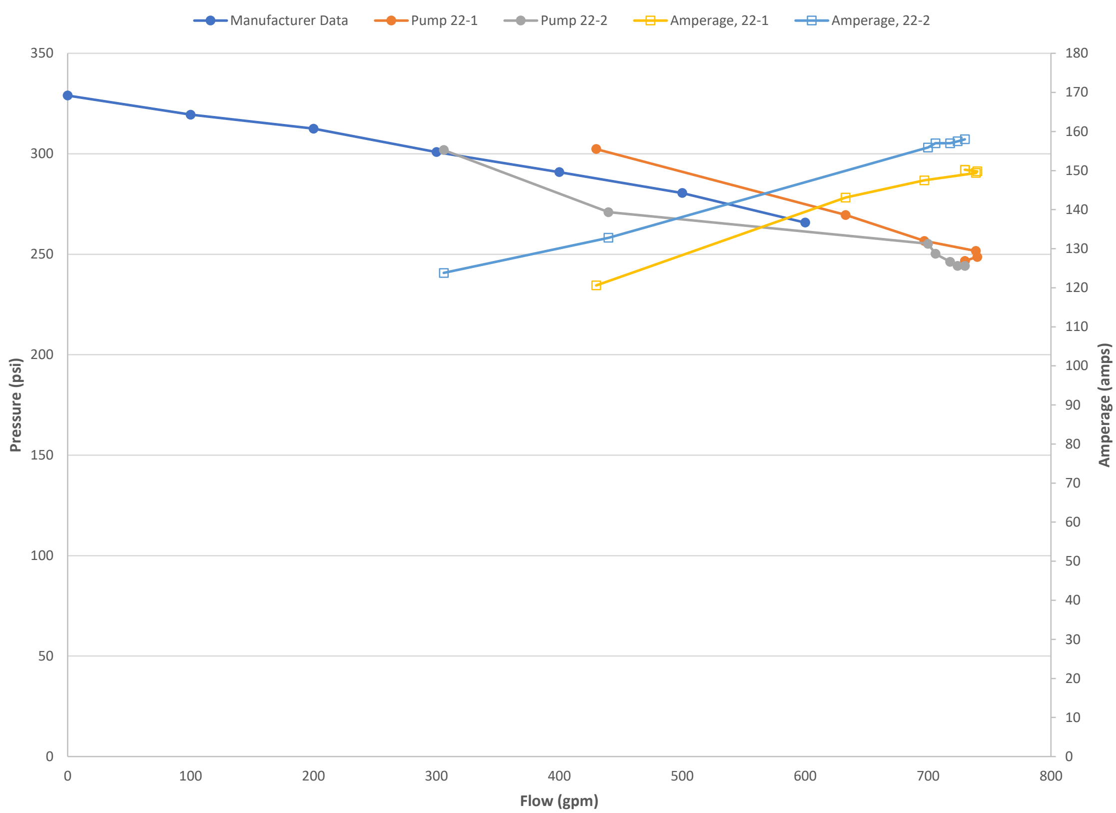

FIGURE 2

Division 22 Finished Water Pump Testing Analysis

The data on Figures 1 and 2 show that the existing finished water pumps are performing at or above the manufacturer's curve. It is unclear why the performance curves for the Division 7 finished water pumps are so far above the manufacturer's performance curve. This could be due to inaccuracies with the pressure gauges or could be related to inherent inaccuracies in recording the flow. During testing – and presumably during normal operation – the flow reading on the display was very jumpy and had a total reading range of approximately 40 to 45 gpm. For the final reading, the values were observed for 30 to 60 seconds and the "average" value was recorded.

The amperage during performance is below the listed maximum load amperage of 119 and 173 amps for Divisions 7 and 22 pumps, respectively.

Given the age of the pumps, if the District continues to utilize these pumps, we recommend that the District complete pump performance testing every 2 to 4 years to ensure functionality of the equipment and to proactively identify potential points of failure. We also recommend that the District replace the existing pressure gauge assemblies with new calibrated pressure gauges to ensure accurate measurements. Additional recommendations are discussed in subsequent sections of this memorandum.

Clearwell Transfer Pumps

The clearwell transfer pumps and MCC2 are shown as Figures A-4 and A-5 (Exhibit A). Each pump is equipped with a check valve, isolation valve, and pressure gauge assembly. The discharge from each pump connects to a common header, which then proceeds to the chlorine contact basin. Prior to the pipe exiting the building, various filtered water samples are extracted through small fitting connections. Check valves, isolation valves, and piping within the WTP Main Building are 10-inch diameter ductile iron materials. There is no flow meter on the transfer pump discharge line.

The testing team experienced several significant difficulties while trying to complete the performance test. First was the absence of a flow meter on the discharge line from the transfer pumps making direct measurement of the flow during the testing impossible. Although flow cannot be directly measured, it is possible to estimate the flow by dividing the volume of water pumped by the time for each run. The volume of water can be estimated by using information from the existing clearwell level sensor. This sensor measures water height in 0.1-foot increments, and using the known footprint and geometry of the clearwell, the volume of water within the clearwell can be estimated for any given water level. We attempted to measure the flow in this manner, but quickly determined that the water surface measurement was too inconsistent and not sensitive enough for the purposes of testing at small increments of flow.

Secondly, the pressure gauge assemblies on the discharge elbow for each pump were not operational. The isolation valves for these valve assemblies were closed and could not be opened without potentially damaging the threaded fittings. We did investigate other installation locations for these pressure gauge assemblies, but all available locations were downstream of the isolation valve and would not provide useful data.

Due to these issues, the transfer pumps were not tested as part of this analysis. We recommend that the District replace the existing pressure gauge assemblies with new equipment so that performance testing could be attempted in the future. Additional recommendations are discussed in subsequent sections of this memorandum.

New pressure gauge assemblies could be installed by replacing the existing components or by drilling a new threaded tap hole in the existing pump discharge elbow. It is important to note that even with new pressure gauge assemblies, performance testing will be difficult because the discharge piping does not contain a flow meter. Even though the pumps were installed in 1992, they appear to be functioning well; given their age, they are likely nearing the end of their reliable useful life.

Raw Water Pumps

The raw water pumps and MCC3 are shown as Figures A-6 and A-7 (Exhibit A). Each pump is equipped with a 4 x 10 reducer, 10-inch check valve, and 10-inch isolation valve. Ductile iron discharge piping from each pump connects to a common header and this header proceeds above grade and to the flocculation basin.

Similar to the transfer pumps, the existing pressure gauge assemblies were locked in the closed position. Even if these gauges were available for use, the equipment was installed in 1992 and is likely no longer accurate. Spare gauges could not be found and as such, the raw water pumps were not tested as part of this analysis. The discharge piping for the raw water pumps does contain a flow meter, so pump performance testing could be completed when new gauge assemblies are installed.

Given the age of the pumps, if the District continues to utilize these pumps, we recommend that the District complete pump performance testing every 2 to 4 years to ensure functionality of the equipment and to proactively identify potential points of failure. We also recommend that the District replace the existing pressure gauge assemblies with new calibrated pressure gauges to ensure accurate measurements. Additional recommendations are discussed in subsequent sections of this memorandum.

SUMMARY OF RECOMMENDATIONS AND COST ESTIMATES

As previously mentioned, the pumps tested as part of this work are controlled by individual across-the-line motor starters. These starters are located within separate MCCs located at various locations in the WTP Main Building and the Finished Water Pump Building. As mentioned previously, MCC1 and MCC2 are old and no longer supported by the manufacturer, while MCC3 is in poor condition due to its exposure to chemicals and moisture. The Assessment Report recommended that MCC1, MCC2, and MCC3 be replaced in order to bring the equipment up to current standards, to ensure that suitable replacement parts are available, and to ensure consistent and reliable functionality to the pumps they control. In addition to this, the District has expressed a desire to increase the flexibility of plant operations by utilizing VFD motor starters for these pumps. VFD motor starters will allow the operational staff to vary the flow based on instantaneous demands, to maintain consistent water levels within either the clearwell or chlorine contact basin, and to optimize functionality of the filtration equipment, among other benefits. Modern VFD motor starters are too large to fit within the existing MCCs, so retrofitting the existing units with new motor starters is not feasible. Furthermore, the existing motors for the raw water pumps, transfer pumps, and finished water pumps are not rated for use with VFDs and as such, would need to be replaced if VFD motor starters were installed.

Because the replacement of MCC1, MCC2, and MCC3 will necessitate the replacement of the associated motor starters and subsequently the pump motors and the District has expressed a desire to both upgrade the equipment to ensure functionality of the pumps and to improve the overall performance capabilities of the treatment plant, we recommend that the District complete the following items for each set of pumps investigated as part of this work.

Finished Water Pumps

Even though pump testing described herein suggests that the finished water pumps are performing very near their original design conditions, we recommend that the District replace the pumps, motors, and motor starters. The MCCs should be replaced and sized to accommodate the desired VFD motor starters and the pumping equipment, including the motor, should be replaced so that it is compatible with the desired VFD controllers. The location of the proposed MCCs should be coordinated with any other modifications to the WTP with regard to exposure to chemicals, water, or other planned improvements. We also recommend that the District replace the discharge pressure gauge assemblies for each pump and procure one spare pressure gauge for each type so that failures can be addressed quickly.

The recommendations listed above are estimated to cost $740,000, which includes materials and installation based on our current understanding of the project scope, contingency (20 percent), Washington State sales tax (9.0 percent), and design/project administration (25 percent). An itemized cost estimate for these recommendations is provided in Exhibit B.

Clearwell Transfer Pumps

Even though the clearwell transfer pumps appear to be performing adequately, we recommend that the District replace the pumps, motors, and motor starters. The MCCs should be replaced and sized to accommodate the desired VFD motor starters and the pumping equipment, including the motor, should be replaced so that it is compatible with the desired VFD controllers. The location of the proposed MCCs should be coordinated with any other modifications to the WTP with regard to exposure to chemicals, water, or other planned improvements. We also recommend that the District replace the discharge pressure gauge assemblies for each pump and procure one spare pressure gauge for each type so that failures can be addressed quickly.

The recommendations listed above are estimated to cost $338,000, which includes materials and installation based on our current understanding of the project scope, contingency (20 percent), Washington State sales tax (9.0 percent), and design/project administration (25 percent). An itemized cost estimate for these recommendations is provided in Exhibit B.

Raw Water Pumps

Even though the raw water pumps appear to be performing adequately, we recommend that the District replace the pumps, motors, and motor starters. The MCCs should be replaced and sized to accommodate the desired VFD motor starters and the pumping equipment, including the motor, should be replaced so that it is compatible with the desired VFD controllers. The location of the proposed MCCs should be coordinated with any other modifications to the WTP with regard to exposure to chemicals, water, or other planned improvements. We also recommend that the District replace the discharge pressure gauge assemblies for each pump and procure one spare pressure gauge for each type so that failures can be addressed quickly.

The recommendations listed above are estimated to cost $239,000, which includes materials and installation based on our current understanding of the project scope, contingency (20 percent), Washington State sales tax (9.0 percent), and design/project administration (25 percent). An itemized cost estimate for these recommendations is provided in Exhibit B.

EXHIBIT A

PHOTOGRAPHS OF EXISTING PUMPS

FIGURE A-1

Existing Finished Water Pumps
(Division 22 Pumps Are in the Foreground While Division 7 Pumps Are in the Background)

FIGURE A-2

Location Where Motor Amperage Was Measured
(An Ammeter Was Placed Around the Motor Load Conductor and the Value Was Read from the Digital Display)

FIGURE A-3

MCC1
(Shown Is Old and No Longer Supported by the Manufacturer)

FIGURE A-4

Clearwell Transfer Pumps
(The Pumps Move Water from the Below-Grade Clearwell to the Chlorine Contact Basin)

FIGURE A-5

MCC2
(Shows Slight Signs of Corrosion from Exposure to Chemicals and Moisture, Is Old, and Is No Longer Supported by the Manufacturer)

FIGURE A-6

Raw Water Pumps
(The Pumps Move Water from the Lake Whatcom Source to the Flocculation Basin and Are Located Below Grade in the Raw Water Pump Pit)

FIGURE A-7

MCC3
(Shows Signs of Corrosion – Interior and Exterior – from Exposure to Chemicals and Moisture)

EXHIBIT B

PUMP REPLACEMENT COST ESTIMATES

LAKE WHATCOM WATER AND SEWER DISTRICT

SUDDEN VALLEY WTP ASSESSMENT & ALTERNATIVES ANALYSIS PROJECT
PRELIMINARY PUMP IMPROVEMENTS COST ESTIMATE

Raw Water Pump Modifications
September 23, 2020
G&O# 20434.00

NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Pressure Gauge Assembly	2	EA	$ 600	$ 1,200
2	Spare Pressure Gauge	1	EA	$ 200	$ 200
3	Raw Water Pump VFD	2	EA	$ 15,000	$ 30,000
4	Raw Water Pump/Motor	2	EA	$ 20,000	$ 40,000
5	Pump Removal & Wastehauling	2	EA	$ 5,000	$ 10,000
6	MCC 3 Replacement	1	LS	$ 40,000	$ 40,000
7	Electrical	1	LS	$ 25,000	$ 25,000

Subtotal*	**$ 146,400**
Contingency (20%)	$ 29,300
Subtotal	**$ 175,700**
Washington State Sales Tax (9.0%)**	$ 15,800
Subtotal	**$ 191,500**
Design and Project Administration (25.0%)***	$ 47,900
TOTAL CONSTRUCTION COST	**$ 239,000**

* Costs listed are in 2020 dollars
** Current sales tax rate is 8.7%.
*** Standard project design and administration fees are 25% of the subtotal including contingency and tax and is provided for planning purposes only.

LAKE WHATCOM WATER AND SEWER DISTRICT

SUDDEN VALLEY WTP ASSESSMENT & ALTERNATIVES ANALYSIS PROJECT
PRELIMINARY PUMP IMPROVEMENTS COST ESTIMATE

Clearwell Transfer Pump Modifications
September 23, 2020
G&O# 20434.00

NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Pressure Gauge Assembly	2	EA	$ 600	$ 1,200
2	Spare Pressure Gauge	1	EA	$ 200	$ 200
3	Transfer Pump VFD	2	EA	$ 25,000	$ 50,000
4	Transfer Pump/Motor	2	EA	$ 30,000	$ 60,000
5	Pump Removal & Wastehauling	2	EA	$ 5,000	$ 10,000
6	MCC 2 Replacement	1	LS	$ 55,000	$ 55,000
7	Electrical	1	LS	$ 30,000	$ 30,000

Subtotal*	**$ 206,400**
Contingency (20%)	$ 41,300
Subtotal	**$ 247,700**
Washington State Sales Tax (9.0%)**	$ 22,300
Subtotal	**$ 270,000**
Design and Project Administration (25.0%)***	$ 67,500
TOTAL CONSTRUCTION COST	**$ 338,000**

* Costs listed are in 2020 dollars
** Current sales tax rate is 8.7%.
*** Standard project design and administration fees are 25% of the subtotal including contingency and tax and is provided for planning purposes only.

LAKE WHATCOM WATER AND SEWER DISTRICT

SUDDEN VALLEY WTP ASSESSMENT & ALTERNATIVES ANALYSIS PROJECT
PRELIMINARY PUMP IMPROVEMENTS COST ESTIMATE

Finished Water Pump Modifications
September 23, 2020
G&O# 20434.00

NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Pressure Gauge Assembly	4	EA	$ 600	$ 2,400
2	Spare Pressure Gauge	2	EA	$ 200	$ 400
3	Division 7 Pump VFD	2	EA	$ 30,000	$ 60,000
4	Division 7 Pump/Motor	2	EA	$ 35,000	$ 70,000
5	Division 22 Pump VFD	2	EA	$ 35,000	$ 70,000
6	Division 22 Pump/Motor	2	EA	$ 50,000	$ 100,000
7	Pump Removal & Wastehauling	4	EA	$ 10,000	$ 40,000
8	MCC 1 Replacement	1	LS	$ 75,000	$ 75,000
9	Electrical	1	LS	$ 35,000	$ 35,000

Subtotal*	**$ 452,800**
Contingency (20%)	$ 90,600
Subtotal	**$ 543,400**
Washington State Sales Tax (9.0%)**	$ 48,900
Subtotal	**$ 592,300**
Design and Project Administration (25.0%)***	$ 148,100
TOTAL CONSTRUCTION COST	**$ 740,000**

* Costs listed are in 2020 dollars
** Current sales tax rate is 8.7%.
*** Standard project design and administration fees are 25% of the subtotal including contingency and tax and is provided for planning purposes only.