



DISTRICT OF SICAMOUS ANNUAL WATER SYSTEM REPORT 2021



Table of Contents

| | |
|--|----|
| INTRODUCTION..... | 2 |
| DISTRICT OF SICAMOUS – MARA DISTRIBUTION SYSTEM | 2 |
| Water Pumping Overview..... | 2 |
| Water Distribution System Overview | 3 |
| Water Treatment Plant | 3 |
| Reservoirs..... | 3 |
| Booster Stations..... | 4 |
| Pressure Reducing Valves (PRVs)..... | 4 |
| Distribution System | 4 |
| Operator Certification and Training | 5 |
| Cross Connection Program..... | 5 |
| Turbidity Education | 5 |
| Emergency Response Plan | 6 |
| SCADA (Supervisory Control and Data Acquisition) | 6 |
| Pressure Zones..... | 6 |
| Water Distribution System Map..... | 6 |
| ROUTINE MAINTENANCE PROGRAM..... | 8 |
| Distribution (Hydrants, Mains, Valves, Intake) | 8 |
| Reservoirs..... | 8 |
| Pumps and PRVs..... | 8 |
| Sodium Hypochlorite (Hypo) Generation and Storage | 8 |
| WATER SAMPLING AND TESTING..... | 8 |
| Bacterial Monitoring | 8 |
| Chemical Monitoring..... | 9 |
| Water Monitoring and Testing..... | 9 |
| Water Quality Complaints..... | 9 |
| WATER SYSTEM..... | 10 |
| Consumption Overview..... | 10 |
| Financial Overview..... | 11 |
| 2021 Improvements..... | 11 |
| 2022 Projects and Improvements..... | 11 |
| WATER DISTRIBUTION FACILITIES AND EQUIPMENT PHOTOS:..... | 12 |

INTRODUCTION

Under the terms of the District of Sicamous' Operating Permit, the municipality is required to provide an annual report to users of the system that provides an overview of the water system, a summary of water test results, as well as maintenance and improvements made to the system. All water suppliers are required to provide a similar annual report to their users.

This report has been submitted to Interior Health and is posted on the District of Sicamous website, www.sicamous.ca

DISTRICT OF SICAMOUS – MARA DISTRIBUTION SYSTEM

Water Pumping Overview

All water that is supplied to the District of Sicamous is withdrawn, by permit, from Mara Lake. This water is used for industrial, commercial, residential and municipal uses, including irrigation. The water is drawn from a water intake located offshore in Mara Lake. Located on Cook Ave., the Low Lift Pump House pumps the water from Mara Lake to the Mara Water Treatment Plant on Dabell St. At the Mara WTP, the water goes through a set of Ultra Filtration Membranes, which essentially removes all the turbidity, bacteria and viruses. Sodium Hypochlorite is then injected into the treated water stream to provide further treatment and disinfection. The Sodium Hypochlorite used for disinfection is generated on site at the WTP. The water leaves the WTP and is pumped to the High Lift Pump House, also on Dabell St. The High Lift Pump House has been designed with a Contact Chamber to provide Chlorine Contact Time (CT) to achieve disinfection of the water by the Sodium Hypochlorite. This newly treated water is held longer in the Contact Chamber by way of walls and turns to achieve this CT value before it is pumped into the water distribution system and reservoirs. The High Lift Pump House then pumps this treated water to the Owlhead Reservoir and throughout the distribution system. The Mara Water System is connected to three reservoirs which service three separate zones within the District boundaries. The Bayview Booster Station is responsible for maintaining appropriate water levels in the Bayview Reservoir and the CPR Hill Booster Station is responsible for maintaining appropriate water levels in the CPR Reservoir. The High Lift Pump House keeps the appropriate water level in the Owlhead Reservoir, which is the system's primary reservoir. In situations where demand is great within a particular area, the Bayview Booster Station has been fashioned with a bypass system to allow the Owlhead and Bayview reservoirs to balance volume. This feature is designed to mitigate the risk associated with having overall system dependence driven solely by

the capacity of a single reservoir in servicing an entire zone during times of peak demand.

Water Distribution System Overview

District of Sicamous has 1512 total water connections, 1389 being residential and 193 being commercial. These users exclusively get their drinking water from Mara Lake.

Water from the Mara Lake is now put through Ultra Filtration Membranes, and then it is treated further with Sodium Hypochlorite, which is generated on site, to disinfect and ensure the integrity of the water is maintained while it travels through the distribution system.

As part of the water distribution system, the District of Sicamous maintains over 40 km of water main, 3 reservoirs, 2 booster stations and 2 PRV stations/chambers. There are approximately 240 fire hydrants in Sicamous. There are also generators in place at the Water Treatment Plant/High Lift Pump House and the Low Lift Pump House.

Water Treatment Plant

The District of Sicamous began full operation of the Water Treatment Plant in December of 2015. The plant uses an ultra-filtration membrane system, which has three trains for its first stage (which have 48 five-foot-long modules per train) and one train for the second stage (which has 18 more modules) to remove waterborne parasites and particles. The plant also adds sodium hypochlorite to the treated water to ensure the quality of the water up to the user's tap. The plant can supply 8.2 ML of finished, treated water per day and it has infrastructure in place that will not require building expansion to accommodate a 20-year design horizon of 10 ML/day. ML is a megalitre or one million litres.

Reservoirs

The District of Sicamous has 3 reservoirs in its system: Owlhead, Bayview and CPR. The primary reservoir for Sicamous is the Owlhead Reservoir. It is located 0.7 km up Owlhead Creek FSR. It is a concrete tank which holds 1.95 million litres of water. It was constructed in the early 80's with a second cell added in 1997.

Bayview reservoir is located off Hwy 97A above the Bayview subdivision. It is a concrete tank which holds 2.80 million litres of water. It was constructed in 2009. Bayview Reservoir feeds the Bayview Subdivision, as well as the Two Mile Subdivision. Due to its volume and low demand periods, a supplemental sodium hypochlorite injection system is in place here, in addition to free chlorine residual monitoring. This

allows District staff to maintain proper chlorine residuals in the Two Mile Subdivision distribution system.

CPR Reservoir is located above Old Spallumcheen Road across the Sicamous Narrows. It is a concrete tank which holds 200,000 litres of water. It was constructed in 1992. It provides water to a private development and to the CPR Subdivision.

Booster Stations

Due to the location and elevation of two of the District's reservoirs, booster stations are needed to fill them. The Bayview Booster Station is located off Hwy 97A and was constructed in 2010. It draws water from the Mara Distribution System and pumps it up to the Bayview Reservoir as required.

The CPR Hill Booster Station is located on Old Spallumcheen Road and was constructed in 2011. It draws water from the Mara Distribution System and pumps it up to the CPR Reservoir as required. Due to low demand situations, supplemental sodium hypochlorite injection takes place here to help ensure proper chlorine residuals in the CPR Subdivision distribution system.

Pressure Reducing Valves (PRVs)

Once again, due to the location and elevation of two of the District's reservoirs, PRVs are now needed to control the water after it has left them. In both instances, the water enters the PRV at high pressure and leaves at a lower pressure, more suitable for residential use.

Water leaves the Bayview Reservoir and heads south to the Two Mile Subdivision. Before entering that distribution system, the water passes through the Two Mile PRV Station. It is located on Two Mile Road and was constructed in 2010.

The CPR Subdivision Distribution System also has the protection of a PRV. Water leaving the CPR Reservoir passes through the CPR PRV, which is in a chamber located above the Trans Canada Hwy, west of Sicamous.

Distribution System

The District of Sicamous' 40 + km water distribution system is made up of primarily Asbestos Cement pipe, PVC pipe, and High-Density Polyethylene pipe. Pipe sizes range from 100 mm to 300 mm.

The water mains range from new installations to those installed in the 1960's. The age of the pipe does not necessarily reflect the need to replace it as the various material types have different average life expectancies based on installation, soil and water

conditions, and the environment. For example: PVC pipe life expectancy under pressure is estimated at 50 to 100 years or higher while galvanized pipe generally lasts 40-60 years. These wide ranges in pipe life expectancy are heavily dependent on the variables previously mentioned.

The District of Sicamous has an active program to replace pipes that are either inadequately sized, in poor condition or have reached the end of their functional life. Just over half of the District's water mains are PVC with the remaining being primarily Asbestos Cement (AC), for which the District has an AC Water Main Replacement Program.

Operator Certification and Training

The District is required by the British Columbia Drinking Water Protection Act to operate the Mara Water System with qualified operators, certified at or above the facility classification level or working towards such classification. The District has certified operators that are certified at Operator-In-Training, Level 1 and Level 3 in **Water Treatment**, Level 1, Multi-Utility Level 2 and Level 2 in **Water Distribution**. Utility staff has also achieved a variety of certification levels in **Waste Water Treatment and Waste Water Collection**. District staff is required to complete Continuing Education Unit Courses to maintain their certification and expand their knowledge. This is a requirement of the EOCP (Environmental Operator Certification Program), which is the governing body for operator certification in British Columbia. District staff is also continuously acquiring time in the field to achieve higher certification.

Cross Connection Program

The District of Sicamous, as a Condition of Permit to operate a water system, must have a functioning Cross Connection Control Program in place. The purpose of the program is to address the potential for the water system to be compromised by "high risk" service connections, which could introduce contaminated water. As part of its Bylaws, The District requires a backflow prevention device be installed on all service connections to the water system. The District has contracted MTS Inc., located in Vernon, BC, to administer the program and conduct assessments. Reports from MTS Inc. are available upon request. The District's cross connection / backflow prevention equipment is certified annually.

Turbidity Education

The District of Sicamous, in conjunction with Interior Health, has a Turbidity Education campaign. Information on turbidity can be found on the Interior Health's websites. A

monthly Water Quality Report is recurrently submitted to Interior Health and can be made available to the public upon request.

Emergency Response Plan

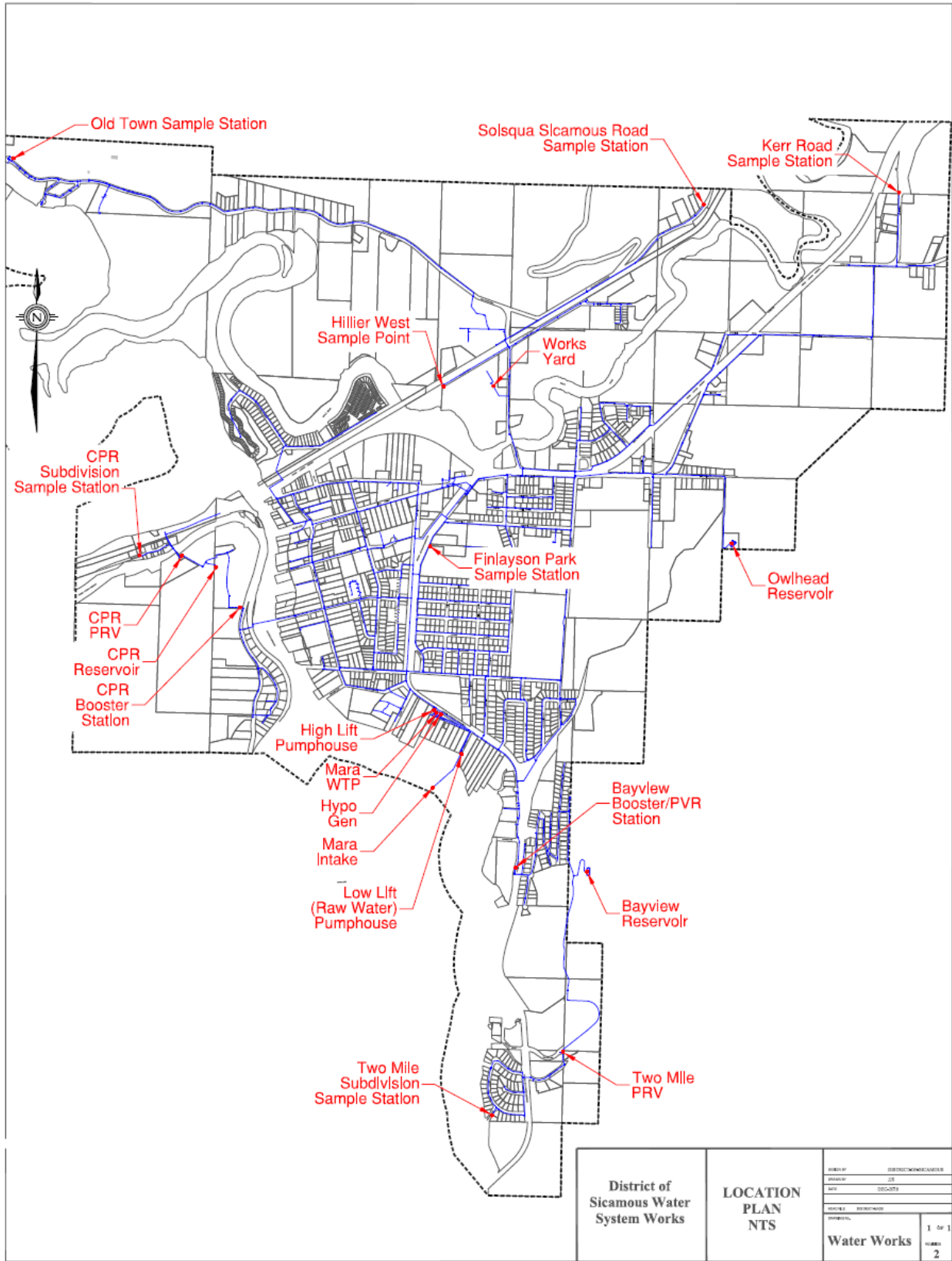
The District of Sicamous has developed an Emergency Response Plan for the Mara Water System. The plan identifies several potential emergencies that could occur and provides a systematic approach on how to deal with each emergency. This allows staff to react to a variety of emergency situations in a safe, timely and consistent way. A copy of the District's Emergency Response Plan is available upon request.

SCADA (Supervisory Control and Data Acquisition)

A SCADA computerized control system is used by the District of Sicamous to monitor and/or control many aspects of the pumping and distribution system, including its process equipment. Water Treatment is also monitored. This system lets the District staff monitor things like pump status and operation, reservoir levels, as well as chlorine residual and turbidity. District operators can change set points and monitor systems remotely 24 hours a day, 7 days a week. Alarms are set to alert operators to potential problems within the system to protect system integrity and the residents of Sicamous.

Pressure Zones

The District of Sicamous is divided into 3 pressure zones. The pressure in these zones ranges from 40 to 140 PSI, based on location and proximity to certain reservoirs and pumping stations. As part of its Bylaws, the District has a provision which may require residents to install a Pressure Reducing Valve on the service line entering the home, based on the situation and static pressure. Water Distribution System Map



Distribution System Map

| | | | |
|---|-------------------------|---------------------------|------------------|
| District of Sicamous Water System Works | LOCATION PLAN NTS | SHEET: DISTRICT/WORKS/NTS | |
| | | DRAWN BY: JG | |
| | | DATE: 06/20/21 | |
| | | CHECKED BY: | |
| | | Water Works | 1 of 1 PAGE 2 |

ROUTINE MAINTENANCE PROGRAM

Distribution (Hydrants, Mains, Valves, Intake)

The water intake is subject to annual inspection by a professional dive team. The District's 240 hydrants are inspected annually and serviced once every two years or as necessary to maintain optimum performance. Hydrant maintenance is aided by information supplied by the Sicamous Volunteer Fire Department as well. The District has implemented an annual hydrant inspection program, an annual water main flushing program, an annual valve exercising program, and a valve marking program.

Reservoirs

Reservoirs are inspected internally by professionals annually and will be drained and cleaned every 10 years. Draining will be avoided where possible to maintain a higher level of service to residents. Extra cleaning will take place whenever deemed necessary. The District's reservoirs are inspected weekly to ensure the site and structure is secure. Bayview Reservoir's chlorine analyzer and hypo injection system are checked then also. Turbidity and chlorine residual are also tested at each reservoir.

Pumps and PRVs

All the District's Pump Houses and Booster/PRV Stations are inspected three times per week. All PRVs, pumps and motors are inspected, rotated and/or serviced as per the operations and maintenance protocols for each facility. This also includes the hypo injection system at the CPR Booster Station.

Sodium Hypochlorite (Hypo) Generation and Storage

As part of the preventative maintenance program for this system, the site is visited three times per week and the generator operated. Product tests are conducted to ensure proper operation and strength. Hypo injection pumps for the Mara System are also found at this location. The generation, storage and injection systems are subject to inspection, rotation, and servicing, as per the operations and maintenance protocols for this facility. This entire system is now located in its own room at the Mara Water Treatment Plant on Dabell St.

WATER SAMPLING AND TESTING

Bacterial Monitoring

As required by the Interior Health Authority (IHA), District staff takes samples for bacteriological testing for E. coli bacteria and Total Coliforms. Our raw water is tested, plus samples from six separate locations throughout the District of Sicamous. The distribution system is tested weekly and the raw water is tested monthly. Here is a

compilation of the samples taken and the test results for the year 2021. Raw water being untreated lake water and distribution system water being treated, finished water that goes to the consumers' tap.

| TYPE OF SAMPLE AND # OF SAMPLES IN 2020 | # OF POSITIVE TESTS FOR E. COLI | # OF POSITIVE TESTS FOR TOTAL COLIFORMS | # OF POSITIVE TESTS FOR BACKGROUND COLONIES |
|---|---------------------------------|---|---|
| RAW WATER: 12 SAMPLES | 3 | 11 | 0 |
| DISTRIBUTION SYSTEM: 312 SAMPLES | 0 | 1* | 1* |

***immediately re-sampled and tested negative.**

Chemical Monitoring

District staff also sends samples from the source water for a variety of analysis other than bacterial. Parameters such as alkalinity, metals and disinfection by-products are tested for.

Any analytical results for the District's Bacterial, Comprehensive (General Potability) or Supplemental testing are available upon request.

Water Monitoring and Testing

The District of Sicamous monitors and tests for chlorine residual, turbidity, and certain bacteriological content. Although the District's raw water source (Mara Lake) frequently tests positive for Total Coliforms, Background Colonies and E. coli, the WTP and the disinfection process we use proves its effectiveness. A complete list of parameters monitored is included in the District's Water Quality Monitoring Program, which can also be viewed by the public upon request. The District presently uses CARO Analytical Services, a government certified facility located in Kelowna, BC, for its water testing.

Water Quality Complaints

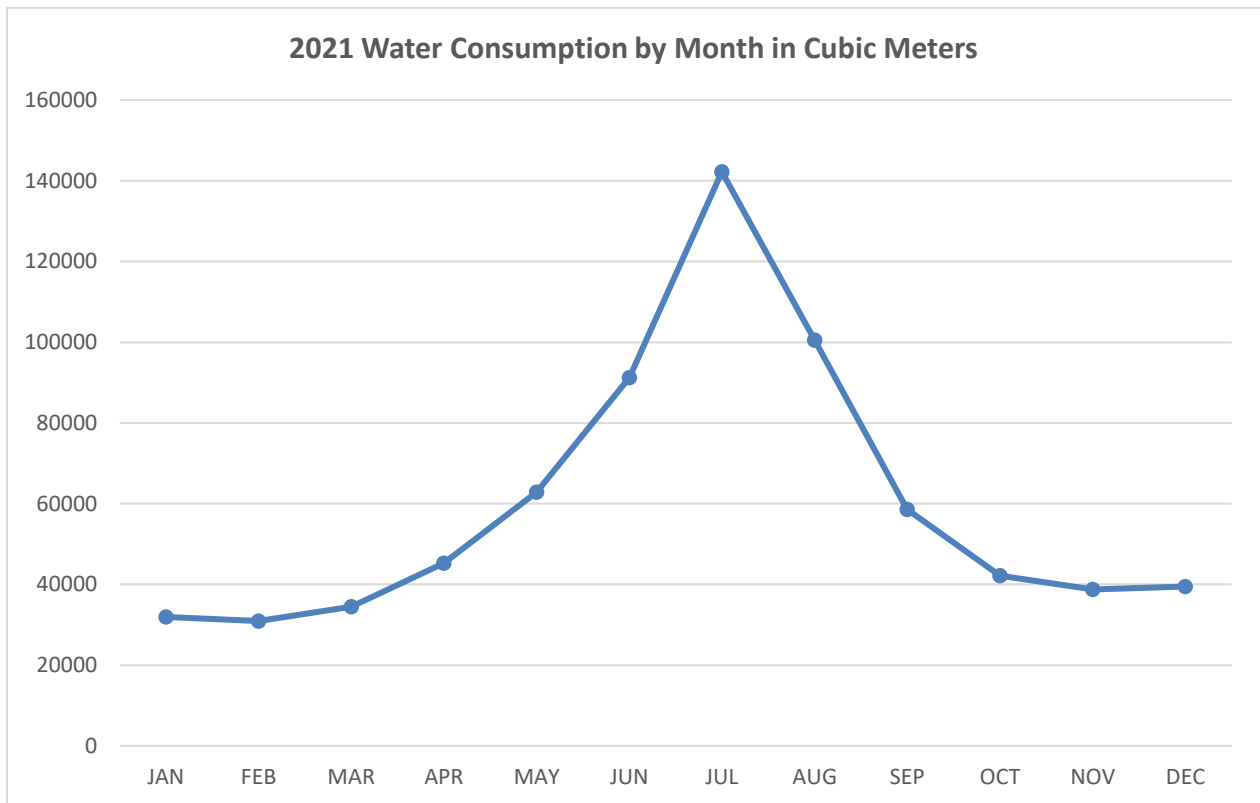
The Public Works Department received very few complaints in 2021. Most complaints about dirty water were directly attributed to water main breaks and flushing, fire hose use or hydrant maintenance. In these instances, the residents were advised that this was normal and were asked to wait a brief time for the turbidity to settle out and if the problem persisted, run their cold-water tap to flush the lines in their home until the cloudiness disappeared. As a part of the routine weekly testing, turbidity/chlorine levels are tested at 15 separate locations throughout the District.

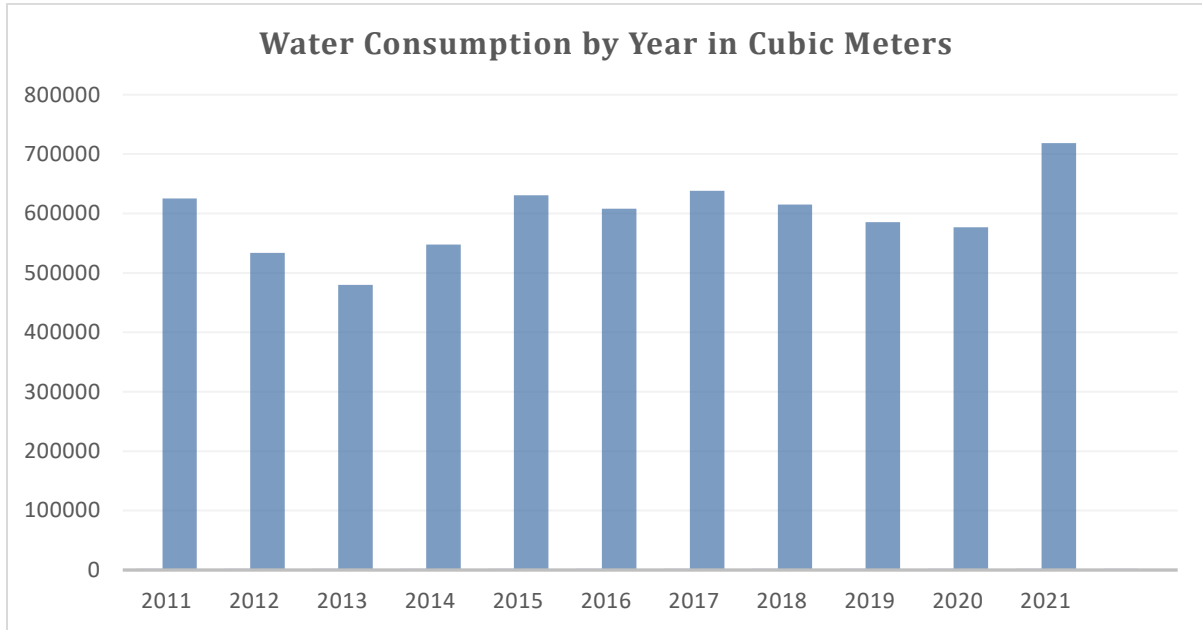
WATER SYSTEM

Consumption Overview

In 2021, the District of Sicamous pumped 718,395 cubic meters (m³) of water from Mara Lake. Our highest month for consumption was July (142,241 m³). An average of 4,588,000 litres were used per day. The lowest month was February (30,926 m³), where an average of 1,104,500 litres were used per day. The highest usage day of the year was July 20, 2021 @ 5,809,000 litres, with the lowest being April 26, 2021 @ 604,000 litres. The graphs following illustrate the 2021 Monthly Water Consumption, as well as the District Water Consumption over the last 10 years. Be advised that the 2012 value is an estimate due to the flood event that occurred.

Graphs to illustrate Sicamous' 2021 water consumption by month and water consumption for the last ten years can be found on the next page.





Financial Overview

Below is a brief High-Level Summary of the District’s Water Costs from the last several years. During this period there have been many upgrades, extensions and expansions, including the WTP.

| WATER COSTS | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Administrative | \$177,138 | \$178,698 | \$152,591 | \$167,101 | \$152,700 | \$145,105 |
| Operating | \$587,464 | \$633,801 | \$727,932 | \$ 880,226 | \$878,404 | \$894,238 |
| Reserve Transfers | \$100,000 | \$130,000 | \$0 | \$130,000 | \$150,000 | \$130,000 |
| | | | | | \$813,711 | \$21,833 |
| TOTAL WATER COSTS | \$1,335,496 | \$1,126,338 | \$1,358,437 | \$1,212,762 | \$1,994,815 | \$1,191,176 |

2021 Improvements

Improvements in 2021 to the DOS water system include:

- Electrical Modifications to CPR water booster station for generator
- Scada System communications update

2022 Projects and Improvements

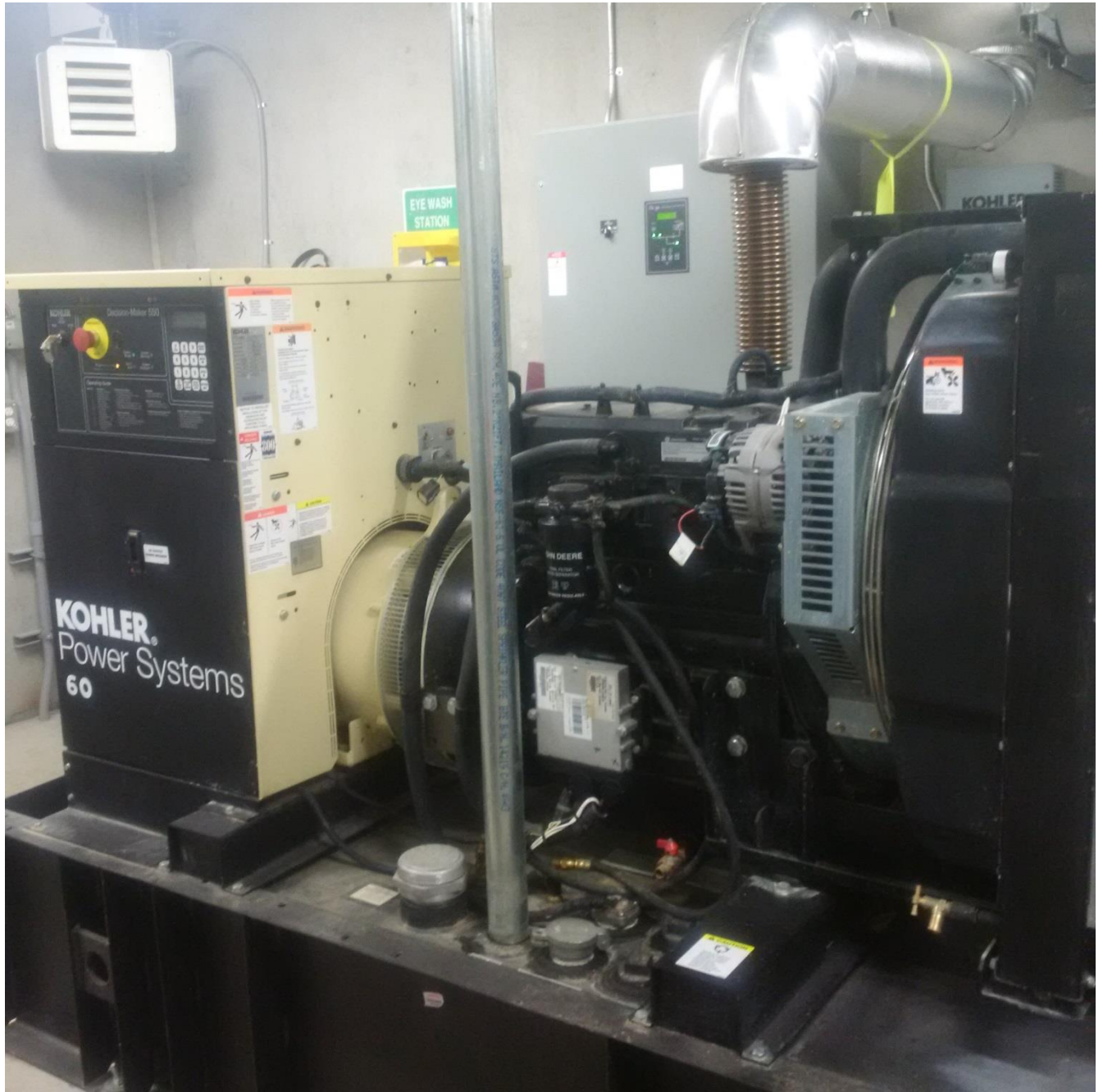
The following outlines projects planned for the upcoming year:

- Modifications to Bayview water booster station for generator
- Kappel to Riverside watermain upsize design

WATER DISTRIBUTION FACILITIES AND EQUIPMENT PHOTOS:



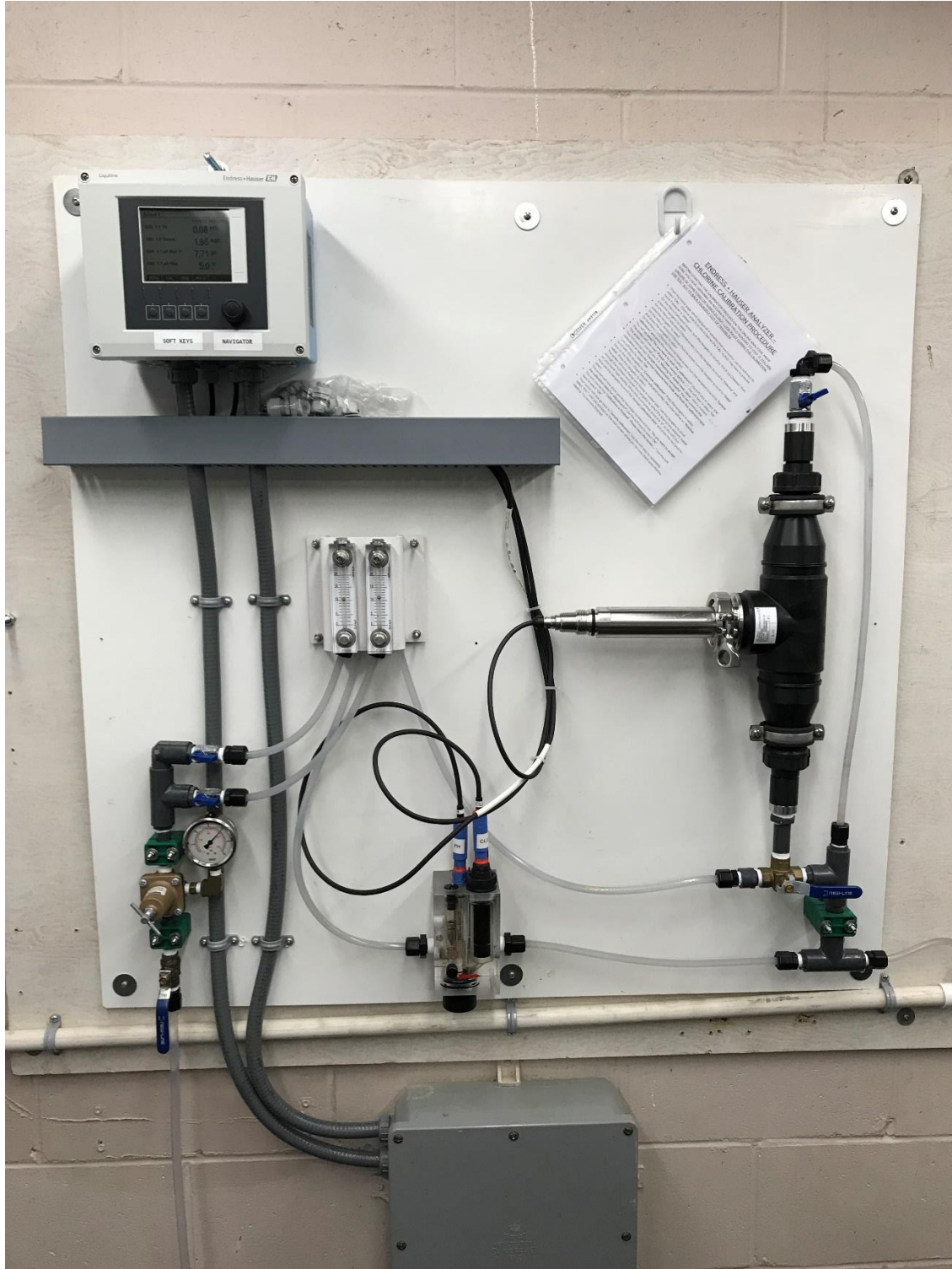
Low Lift Pump House



Low Lift Generator



High Lift Pump House



High Lift Pump House Analyzer



Water Treatment Plant



Sodium Hypochlorite Generator



WTP / High Lift Pump House Generator



Bayview Booster/PRV Station



CPR Hill Booster Station



Two Mile PRV Station



CPR PRV Chamber



Tecumseh Rd Water Sample Station



Owlhead Reservoir



Bayview Reservoir



CPR Reservoir