

# BEAVER CREEK WATER SYSTEM

ANNUAL REPORT  
2020



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# 1.0 Background

## Purpose of the Annual Report

This annual report provides an overview of the Alberni-Clayoquot Regional District's (ACRD) Beaver Creek Water System. It is the ACRD's responsibility to the community and provincial health authority to share this information. This report is for the water consumers to review their individual water systems in order to be aware of the service provided and of the annual activities.

## Regulating Authority

The Province of British Columbia's Drinking Water Protection Act and Regulation prescribes the required performance of drinking water suppliers. The Island Health Authority (IH) is the body that oversees water systems in the ACRD, with the mission to minimize health risks to the public and to assist with providing safe drinking water to our communities. As part of IH regulations, water systems are required to have operators qualified by the Environmental Operators Certification Program to the same classification level as the system.

## Management

The ACRD's Community Services Department is responsible for the overall management of the Beaver Creek Water System. The Beaver Creek Water System has an advisory committee made up of the Beaver Creek Electoral Director and volunteer members from the community. This committee provides guidance and advice to the ACRD management regarding infrastructure improvements, bylaws and costs.

## Beaver Creek Water System Overview

Beaver Creek is a community of 2,873 (2016 Census) which borders the City of Port Alberni on the south, the Beaufort Electoral Area on the north and east, and the Sproat Lake Electoral Area on the west. The Stamp and Somass Rivers form the western boundary of Beaver Creek. The Beaver Creek Improvement District converted into a local service area of the ACRD on June 1<sup>st</sup>, 2012.

The majority of the Beaver Creek Water System was constructed in the 1960's. The watermains were originally constructed with asbestos cement pipe and more recent improvements with polyvinyl pipe (PVC). Historically, the source water was from the Stamp River but it is now from the City of Port Alberni through a bulk water agreement. The City's water is treated with chlorine and enters Beaver Creek at the Strick Road Booster Pump station where it is rechlorinated and distributed.

The water system is certified by the Environmental Operators Certificate Program (EOCP) as a Level Two Water Distribution System. There are two full time staff members that maintain and operate the system who are both certified as Level 2 Operators.

The Beaver Creek Water System includes:

- Concrete reservoir on Kitsuksis Road, Volume of 1,135 cubic meters
- Bolted steel reservoir on Beaver Creek Road, Volume of 273 cubic meters

- Glass fused reservoir on Kitsuksis Road, Volume of 1,135 cubic meters
- Strick Road Pump Station
- Darnley Road Pump Station
- North Reservoir Pump Station
- Stamp River Pump Station and Intake (currently not active)
- Service connections: 997 (9 new connections in 2020)
- Number of water parcels: 1,037
- Population: 2,873 (BC Stats 2016)
- Total length of mains: 46.3 kilometers
- Total number of fire hydrants: 121
- The majority (67.5%) of the distribution system is Asbestos Cement (AC)
- The remainder is made up of polyvinyl chloride (PVC)
- The total bulk water consumption was for 2020: 358,153 cubic meters
- The average daily flow for 2020: 981 cubic meters

## 2.0 Goal and Targets

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*It is our mission to provide potable, cost effective and reliable drinking water through continuous improvements*

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In order to achieve this mission, measurable targets for potability, cost-effectiveness, and reliability have been set.

### Potable Targets:

- 1) No E.coli, no total coliform in any water samples
- 2) Minimum 0.20 mg/L chlorine residual throughout the distribution system
- 3) Less than 1 NTU turbidity in the water
- 4) Meet the Canadian Drinking Water Quality Guidelines for all parameters (including DBPs)

Regular potability sampling of drinking water is conducted for physical, chemical and biological parameters. This sampling is to ensure that the drinking water meets the Canadian Drinking Water Quality Guidelines and is safe to drink. Each water system is provided with an Operational Certificate by IH that may outline specific testing and frequency requirements.

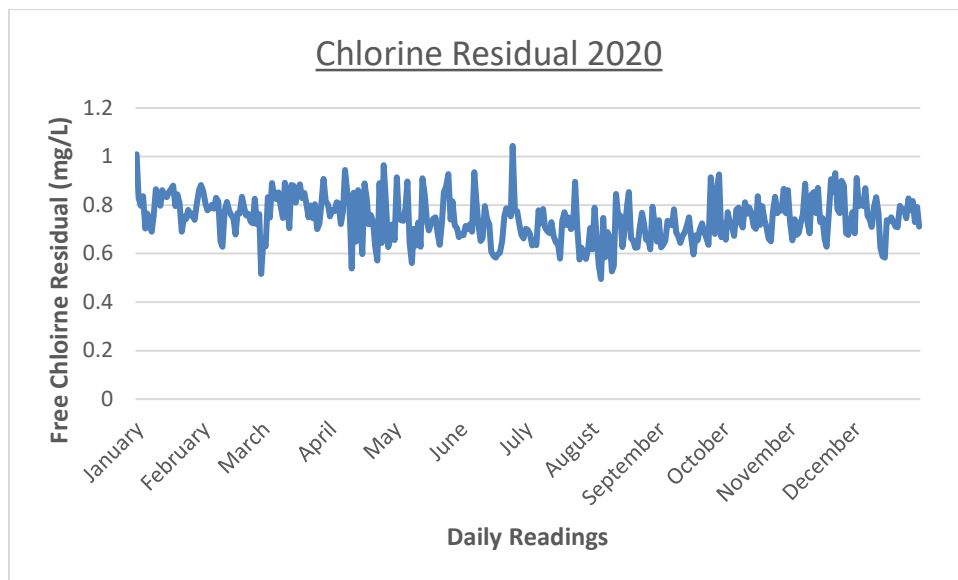
### Potable Target 1 – No E.coli and No Total Coliform in any water samples

Bacteria testing is performed once a week at multiple locations for Total Coliforms and Fecal Coliforms (E.Coli). The locations are spread throughout the distribution system for broad representation. The Total Coliforms and Fecal Coliforms are tested as they are good indicator organisms. Indicator organisms are easy and inexpensive to test for, can be correlated with the potential contamination level and are not

present in unpolluted waters. IH's Facility Sampling History shows that all of samples taken in 2020 tested negative for Total Coliforms and E.coli.

### Potable Target 2 - Minimum 0.20 mg/L Chlorine Residual

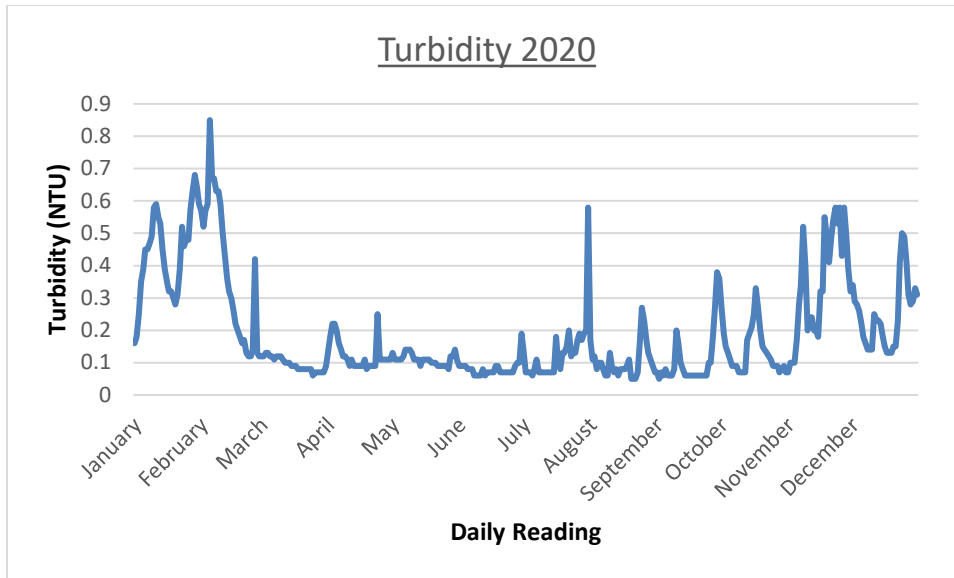
To ensure good water quality throughout the distribution system, water mains are regularly flushed to remove any accumulated silt in the water mains by creating an increase in velocity to scour the pipes. As water flows within a distribution system, the chlorine is slowly eaten up by organics in the water or any material built up in the pipes. Residual chlorine is an immediate test to measure if the water is safe to drink, although water without a chlorine residual is not necessarily unsafe, other tests to ensure safety (such as bacterial testing) require 3 to 4 days for results. Low to no chlorine residual in the water system can indicate poor circulation of water and a need to increase flushing. The Chlorine graph below illustrates the chlorine residual entering the water system from the Strick Road Pump House.



The water system operators continually check the free chlorine disinfection levels with the aim to keep the free chlorine levels between 0.4 mg/l and 0.6 mg/l in the reservoirs and 0.2 mg/l at all the ends of the distribution system. Winter months see a more consistent chlorine residuals than the summer as the chlorine reacts faster with the warmer water and higher flow rates.

### Potable Target 3 - Less than 1 NTU Turbidity in the water

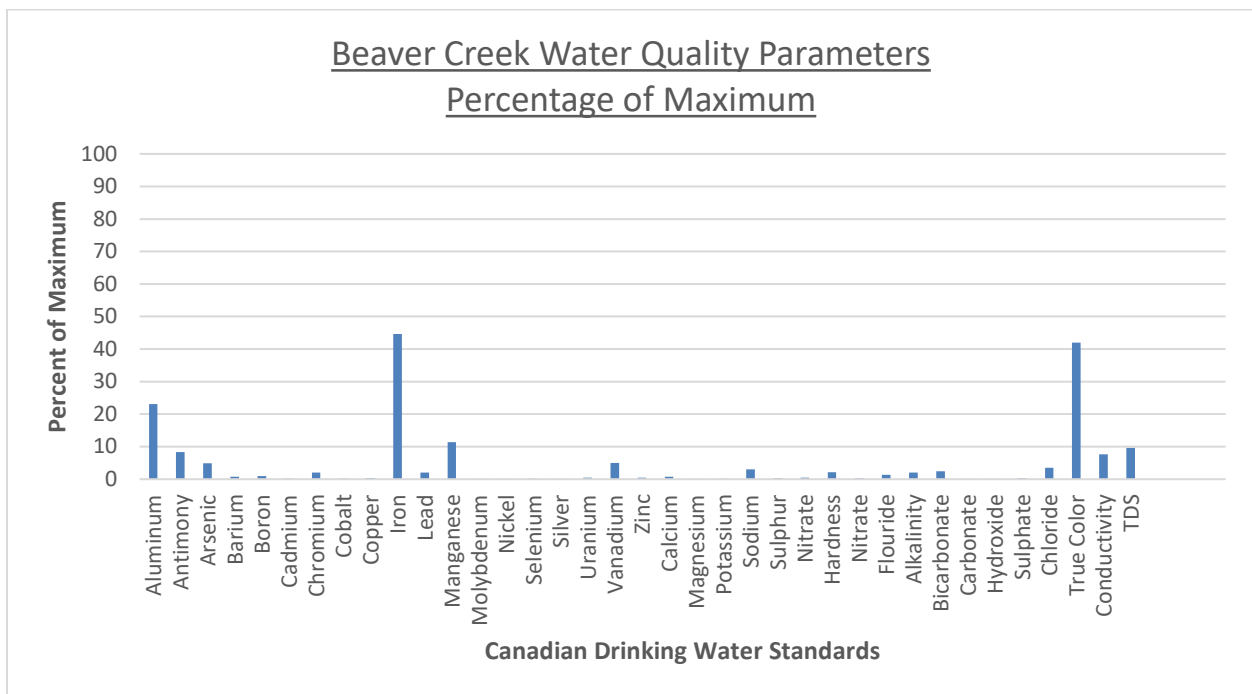
Turbidity is the cloudiness or haziness of a fluid caused by particles in the water. It is often increased in lakes and rivers after a heavy rain when soils enter the water body. This parameter is continually monitored as it negatively effects the ability of chlorine to disinfect.



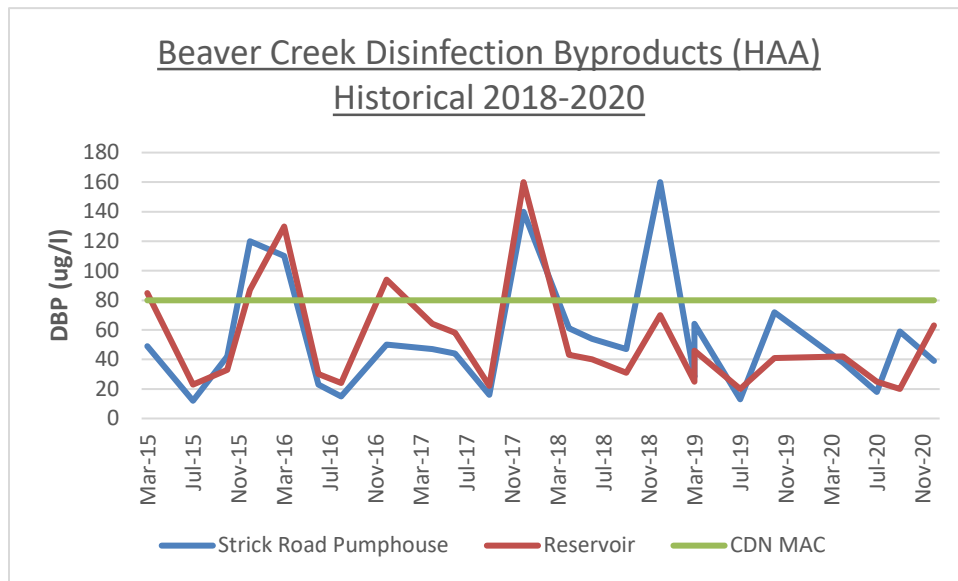
The turbidity readings are taken from the Strick Road Pump Station as water enters the system. The turbidity can have some variability due to events in the City’s water system such as water line breaks or source water changes. In the event of high turbidity entering the system, the automation in the pump house can stop pumping to protect the system.

#### Potable Target 4 - Meet the Drinking Water Quality Guidelines

The ACRD regularly performs tests to ensure that water in the system meets or exceeds the Canadian Guidelines for Drinking Water Quality. The most recent water sampling testing results are shown in the graph below. There are over 40 parameters in the guidelines, all of which were met in 2020.



Two of the CDWQG parameters are for disinfection byproducts (Trihalomethanes (THM) and Haloacetic acids (HAA)) and in past years we have seen individual results exceed the guidelines. These disinfection byproducts occur when chlorine combines with dissolved organics from the water source. China Creek, the main source of water, has low dissolved organics and turbidity for the majority of the year. However, during heavy rain events, the turbidity increases above the maximum acceptable limit of 1 NTU, requiring the use of the back-up water source, Bainbridge Lake. This lake has higher dissolved organics than China Creek and when it is used for the source water it can create higher levels of HAA's as seen in the graph below. When samples are taken during a heavy rain event the higher HAA results are found. It is clear that the last two November samples were elevated but not taken during a high rain fall event.



The Total Haloacetic Acids (HAA) maximum acceptable concentrations (MAC) by the Canadian Drinking Water Guidelines are 80 ug/L based on a running average of a minimum quarterly sampling. The 2020 values obtained at the reservoirs and pump house were all under the MAC running average.

### Cost-Effective Targets:

- 1) Average Water Demand less than 350 lpcd
- 2) Peak Demand Ratio of less than 2:1 PDD:ADD
- 3) O&M cost per customer less than \$400

There are many factors that affect how cost effective a system is running. Effective management and planning, bulk water purchase and water demands can all affect system costs.

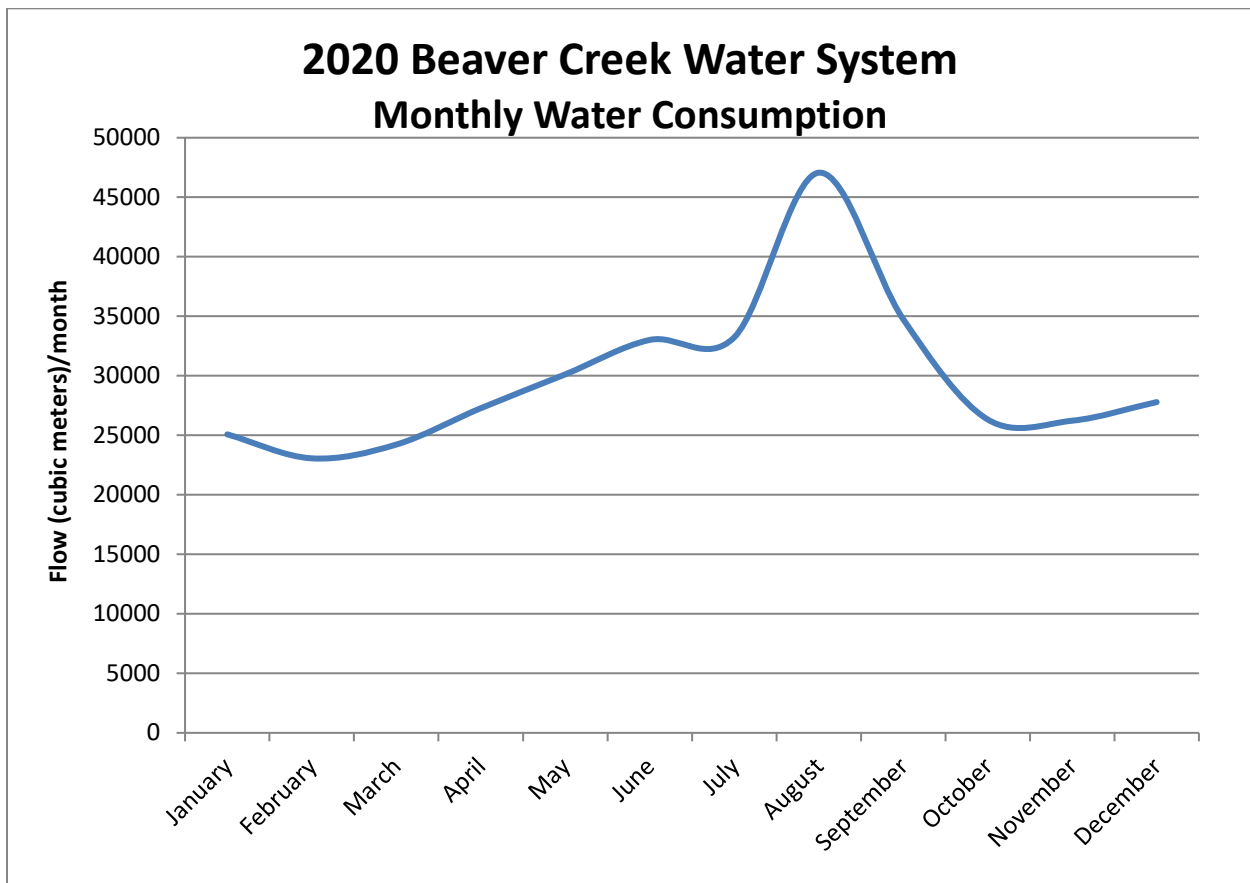
### Cost Effective Target 1 - Average Water Demand less than 350 lpcd

The BCWS purchases bulk water from the City of Port Alberni at \$0.40/m<sup>3</sup>. It must also treat and distribute water to meet the demands of the system. With a service area population of 2,873 and total water consumption of 358,153 cubic meters, this produces a daily average of 342 liters per person per

day (lpcd). This is just below the target of 350 lpcd and lower than last year's daily average at 374 lpcd but well below the 2016 UBC Survey's provincial average of 494 lpcd.

### Cost Effective Target 2 - Peak Demand Ratio of less than 2:1 PDD:ADD

A water system must be designed to provide the peak water demand and fire flows. If peak demands are excessively high, then the water pipes are required to be oversized which is expensive and causes operational challenges in keeping water fresh in the lower flow time periods. Peak summer demand is approximately 1,232 m<sup>3</sup>/day compared to the average daily demand of approximately 981 m<sup>3</sup>/day. This is approximately 1.26 to 1 ratio of peak to average demand. This is under the target of 2:1.



### Cost Effective Target 3 – O&M cost per customer less than \$400

In 2020, the total operating costs for the system were \$548,313 this excludes capital costs, bulk water and costs to install new services. Divided by the 997 water connections, this results in a \$550 cost per customer. This is slightly less than the costs in 2019, where the total operating costs were \$549,292 with 982 connections for a cost of \$556 per customer. Similar sized water systems typically have an operating cost per customer of between \$300 and \$400 per customer. The BCWS has a higher operating cost per



customer because of water system failures and the small size of the system. Emergency breaks and repairs are costly and directly impact this number due to watermain breaks. These costs can be reduced by replacing aging infrastructure. The BCWS also has a comparatively high cost as operations require a minimum of two operators to provide holiday and on-call coverage, meet safety requirements and complete activities that require two people. Whereas other systems of similar size are often operated by a water department that runs multiple systems, allowing efficiencies of scale to occur.

### Reliability Targets:

- 1) Unaccounted water loss to be less than 15%.
- 2) Maximum # of breaks less than 5/year.
- 3) Annual contribution to capital meets AMP targets of \$768/year

#### Reliability Target 1 – Unaccounted water loss to be less than 15%.

In 2020, the City of Port Alberni provided 358,153 cubic meters of water to Beaver Creek through a bulk water agreement. The total water consumed in Beaver Creek through all water meters for 2020 was 275,469 m<sup>3</sup> resulting in a total unaccounted water loss of 82,684 m<sup>3</sup> which made up 23% of all water entering the system. This is down from 29% in 2019. This loss can be attributed to meter error, watermain breaks, flushing, unauthorized consumption and leaks. This also means that 82,684 cubic meters of water was purchased from the city and generated no revenue, a potential loss of \$33,074. A certain amount of this volume is unavoidable loss including water lost due to main breaks and the flushing program. The estimated volume used for flushing in 2020 was 4,400 m<sup>3</sup> down significantly from the 10,005 m<sup>3</sup> in 2019.

#### Reliability Target 2 - Maximum # of breaks less than 5/year.

In 2020, the BCWS had three watermain breaks and five service line repairs, compared to six and eleven respectively in 2019. Through the water main replacement program, the number of total breaks should eventually be reduced as the mains that are breaking get priority in replacement. Often a service line will break at the water main connection due to the asbestos cement pipe being fragile. Operating the pumps and subsequently increasing pressure during the night results in an increased likelihood of breaks as water consumption is at its lowest. Therefore, all efforts are made to operate the pumps and fill the reservoirs during higher consumption periods.

#### Reliability Target 3 – Annual contribution to capital meets AMP targets

The first version of the Beaver Creek Water System Asset Management Plan (AMP) was adopted in 2019. This is a long-term replacement plan to ensure that we are renewing our infrastructure to minimize service interruption, risks and overall costs. The plan has assessed the age and condition of all of the system's assets to determine the replacement costs and schedule to calculate an annual amount that is required to be invested in capital infrastructure. This target will inform us to whether we are collecting enough money to proactively replace failing infrastructure replacement costs can be offset through the savings though the reduction in non-revenue water loss and a reduction in corrective and emergency repair costs.

In 2020 there were 1,037 water parcels contributing \$356,520 per year towards capital. This works out to be \$344 per parcel. Based on the Asset Management Plan required funding for future renewal the per parcel rate needs to be \$768.

### Summary of Target Results for 2020

All of the water quality targets continued to be met throughout the year. Average demand has dropped to 342 liters per capita per day (lpcd) from 374 lpcd in 2019. This is likely connected to the reduction of minimum allowable volume from 155 m3 in February 2020. Other reasons may be changes in activities related to Covid-19 or cooler weather events. This reduction is significant as we now have reached our target.

The cost per customer rate has come down slightly from \$556 to \$550. This is likely due to the replacement of chronic water main break areas including Fayette, Lamarque and Walker Road. These water main renewals also contributed to a reduction in water loss from 29% in 2019 to 23% for 2020 and a reduction in the number of breaks from 17 in 2019 to 8 in 2020. A new target for the amount of money that should be contributed to the Capital Reserve was established at \$768 per parcel. In 2020 we were only contributing \$344 which means that Beaver Creek will require additional contributions.

	Target	2020 BCWS
Bacteria Results	0	0
Chlorine Residual	>0.20 mg/l	>0.20 mg/l
Turbidity	< 1.0 NTU	<1.0 NTU
CDWQG	< 100%	100%
Average Demand	<350	342 liters per capita day
Peak Demand Ratio	<2	1.26
Cost per customer	\$300-\$400	\$550
Capital Contribution	\$768	\$344
Water Loss	<15%	23%
Breaks	<5	8

## 3.0 Improvement Plan

### 2020 Projects Completed

Fayette and Lamarque Water Main Replacement – Fayette and Lamarque water main replacement project was completed in 2020. This was a replacement of approximately 1,645 lineal meters of 150 mm dia. PVC water main on Fayette and Lamarque Roads, including 47 water services, 11 hydrants, appurtenances and surface restoration. These water mains were installed in the early 1960s and were approaching the end of their life expectancy. This project replaced the 4-inch AC mains with 6-inch PVC main and increase hydrant locations, reducing emergency repairs/loss of water and improving fire flows.

Vehicle Replacement – The 2001 GMC Sierra utility truck was replaced with a new Ford F-350 SuperCab 4wd with a dump box.

North Reservoir Emergency Generator – the lack of back-up power at the North Reservoir Pump Station resulted in frequent loss of water to 54 homes and high costs for call-out response. This was rectified with the installation of a generator which will also improve the reliability and integrity of the system.

Minor Capital Works – There where 2 auto flushing devices installed in 2020 which brings the number up 3. These auto flushers will measure the water used for flushing, and reduce the time required by staff to flush the system while still maintaining water quality throughout the system.

Rates and Bylaw Review – Staff updated the rates and regulation bylaw to provide clearer definitions as well as improved language and organization. The allowable volume within the base rates was also reduced from 108 m<sup>3</sup> to 90 m<sup>3</sup> to encourage water conservation and provide a minor increase in revenues to support the renewal and replacement program developed in the Asset Management Plan.

Stamp River Intake/McKenzie Pumpstation Assessment – This study determined the cost estimates to decommission or reactive the facility as a back-up water system. The study recommends a long-term strategy of decommissioning due to the high cost of reactivating and existence of 3 other back-up supplies for the City of Port Alberni Water Supply. This facility has now been operationally decommissioned.

Water Conservation Plan – All water systems must have adopted water conservation plans in order to be eligible any provincial or federal grant programs. Water consumption is an average of 342 liters per person per day (lpcd) which is just below the target of 350 lpcd. A strategic plan to reduce water usage will reduce costs to the system and benefit users.

Compton/Beavercreek Project – The transfer of 9 services and one hydrant onto a parallel city watermain, allowed a 400 meter section of watermain from the Strick Road pump station on Beaver Creek Road to the corner and along Compton Road to be abandoned. This section was a high priority area that had 3 major breaks in the past 2 years. There was an estimated cost savings of approximately \$220,000 by transferring services instead of installing new but redundant water infrastructure in this area. This reduced cost also allowed this project to be fast-tracked, saving emergency repair costs that would have been incurred.

Karen Road Watermain Design - The design of the highest priority watermain project was completed in order to allow the capital works to get underway. The current capital reserve may require this project to be delayed to 2022.

## Upcoming Projects

North Reservoir Pump Repairs – Vibration analysis has indicated that one of the motors is operating erratically. Staff will assess the best options for addressing this issue including potential rebuild or replacement of one or both motors.

Water System Audit – All water connections are charged based on the number of units serviced on each property. There may be properties with secondary suits or shops connected to the water system that are not being charged for their portion of the water system. A system audit would identify all existing connections and ensure rates are consistently and equitably applied throughout the system.

Unidirectional Flushing Plan – will be developed and begin to be implemented in 2021. Unidirectional Flushing (UDF) is an excellent, water-efficient method of cleaning water distribution pipes to improve water quality, reduce the demand for chlorine and restore capacity of the water mains. The intent is to achieve high velocity flow in the pipes which acts to scour the inside of the pipes, removing build-up.

Karen Road Watermain Renewal Project - This is the next scheduled watermain renewal project which is anticipated to be completed in 2022 with capital reserve funds.

Falls/Georgia Renewal Project - An application under the ICIP program was made for this project which is slated for completion in 2024 without additional grant funding. If the application is successful, this project will be fast tracked to meet grant deadlines.

Water Loss Investigation – Staff will be reviewing water use records, meter accuracy, and flushing volumes to get a more accurate estimation of the leakage in the water system. Once this has been determined, leak detection and reduction options will be assessed and a plan to reduce leakage to below 15% will be developed.