2020

CITY OF PRINCE GEORGE

ANNUAL WATER SYSTEM REPORT

CITY OF
PRINCE GEORGE

City of Prince George

(Image source: https://en.wikipedia.org/wiki/Prince_George,_British_Columbia)

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1.0 Introduction

The City of Prince George has prepared this Annual Water System Report (Report) for 2020 in compliance with the British Columbia Drinking Water Protection Act and the Northern Health Authority Operating Permit Requirements. The Report is intended to provide information to the public and government agencies regarding the quality of the drinking water and operation of the water system.

The City takes great pride in their drinking water, and strives to provide the highest quality of water to the residents of Prince George. Experienced, knowledgeable staff oversee the collection, pumping, distribution and protection of the City of Prince George Water Distribution System.

The City provides this report to the Northern Health Authority (NHA) and posts it on the City's website, www.princegeorge.ca

2.0 Northern Health Authority Operating Permit

The Drinking Water Protection Regulation requires that the City obtain an Operating Permit from the local health authority before water can be provided to users. Northern Health Authority (NHA) provides the City with the conditions of their Operating Permits.

In 2020, the City had five operating permits. The conditions of the operating permits are as follows:

- Maintain ongoing water bacteriology sampling as per schedule.
- Complete Level 4 staff training and certification at your earliest opportunity as specified by the EOCP.
- Develop and maintain a cross-connection control program.
- Develop and implement a wellhead/aquifer protection program.
- Maintain a minimum free chlorine residual of 0.2 ppm throughout the distribution system.

The City was compliant with all conditions of the permits.

3.0 Drinking Water System

Prince George is a city of 74,003 people, as per the 2016 census, located in central British Columbia. Being at the intersection of two major highways as well a major junction for rail traffic, Prince George services the majority of the northern portion of the province. Two major rivers, Nechako and Fraser, provide historic trade routes to the city. The groundwater aquifers from which the City provides majority of their water are under direct influence from these waterways. The main water system for the city covers over 90% of the developed area.

3.1 Distribution System Overview

The City supplied 10,374,262,440 litres of water in 2020, through more than 800 kilometres of distribution pipes. The City provided potable drinking water through 27,051 service connections to a population of 70,128.

Seven (7) groundwater well locations draw from underground aquifers to provide the City of Prince George with water. The City relies on nine (9) booster pump stations to transport the water throughout the distribution system. There are fifteen (15) water reservoirs throughout the City. The reservoirs provide storage capacity for potable water use, as well as fire protection. The City's total storage capacity of all the reservoirs combined in 2020 was 64,453,815 liters of water.

Throughout the City's water distribution system; there are twenty-four (24) pressure reducing valve (PRV) locations. The pressure reducing valves, along with the reservoirs, allow the City to provide sustained pressure throughout the City's twenty-one (21) pressure zones. Pressures zones can be viewed on the City of Prince George Open Data Portal through the following link CoPG Pressure Zones. The City has 7428 system valves. These valves allow the City to isolate areas for operations and maintenance purposes. The City of Prince George has 2,152 hydrants connected to the water distribution system. Hydrants are used primarily for firefighting, but can be a source of water for operational and maintenance purposes.

The City uses a Supervisory Control and Data Acquisition (SCADA) system to monitor and control equipment. The SCADA system will send an alarm notification to staff when equipment is not operating as required. One of the main functions of the SCADA system is water level monitoring. Water levels in the reservoirs are monitored with sensors, and instruct the pumps when to start and stop.

The following subcategories identify the operational, maintenance and upgrades of note, completed within the highlighted areas of the City of Prince George Water Distribution System in 2020. City staff perform routine maintenance and operational work to maintain the City's infrastructure, some of which is not contained in this report.

3.1.1 System Management

The City utilizes an asset management strategy to govern decision making for future upgrades, as well as operational and maintenance efficiencies. Insufficient fire flow, deteriorating infrastructure, water quality, and availability to customers are examples of the criteria considered. The City is one of over fifty municipalities that participates in the National Water and Wastewater Benchmarking Initiative (NWWBI). Benchmarking can help utility managers to achieve continuous performance improvement towards the utility's goals. The Utilities Division utilizes a Computer Maintenance Management System (CMMS) called Cityworks to schedule and document operational, maintenance and capital works performed. Utilities strives to continuously improve the use of Cityworks to ensure efficient and effective operations.

The City completed an upgrade to the SCADA system hardware and software in late 2020. The goals of the upgrade were to reduce communication failures, provide consistent monitoring throughout stations, improve human machine interface, and to decrease unnecessary alarm notifications.

3.1.2 Supply Wells

Three major groundwater wells along the Nechako River provide the majority of water for the system. Two groundwater wells along the western bank of the Fraser River provide additional flow to a portion of the main system during summer months. One groundwater well on the eastern bank of the Fraser River, PW627, has transitioned into backup supply for the BCR Industrial area. One groundwater well provides water to a separate system in the Southwest corner of the city. Table 1 shows a breakdown of the wells and the percentage of total water supplied.

Table 1: City of Prince George Well Location Details

NAME	Source (Area of Influence)	Type of Well	% of Total Water Supplied to City
PW601	Groundwater (Nechako River)	Radial Collector	26.10%
PW605	Groundwater (Nechako River)	Radial Collector	54.79%
PW621/624	Groundwater (Fraser River)	Standard x2	2.67%
PW625 (Jan/Feb)	Groundwater	Standard x1	0.03%
PW627 (Offline)	Groundwater (Fraser River)	Standard x2	0%
PW652	Groundwater	Standard x2	0.21%
PW660	Groundwater (Nechako River)	Radial Collector	16.21%

Operational

Groundwater at Risk of Containing Pathogens (GARP) Risk Assessment

In 2018, the City completed a Groundwater at Risk of Containing Pathogens (GARP) Risk Assessment for PW601, PW605 and PW660. The NHA Drinking Water Officer suggested the City obtain a GARP determination for these wells. The City acquired a Hydrogeologist to conduct the GARP Risk Assessment. A Level 2 GARP Investigation, following the Ministry of Health's GARP Guideline, was completed. The consulting Hydrogeologist provided a final report in January 2019. The report indicated a Level 3 GARP Investigation be conducted, as well as an increase in chlorine residuals from PW605. The City followed the advice, conducted a yearlong sampling routine throughout 2019, and increased disinfection levels at PW605. Table 2 identifies the parameters of the sampling routine. The City provided the GARP Risk Assessment to the NHA.

The data from the yearlong sampling routine was analyzed in early 2020 and was determined to be insufficient to provide a determination. Another round of sampling was recommended, with some adjustment to the chlorine injection location at PW605. The City was unable to complete the adjustments in time to collect all the samples due to material shortages and long lead times caused by the COVID-19 pandemic. Sampling was continued on the established routine at available sites in order to continue building the data set, and will continue at all sites in 2021.

Table 2: 2020 GARP Sampling Routine

Frequency	Analytes	Locations
At least every 4 hours (or continuously)	Turbidity and water levels	Production well (PW601, PW605, PW660)
Weekly	Field: pH, temperature, conductivity, turbidity, water levels in selected sentinel wells. Lab: E. Coli, total coliforms, aerobic spore forming bacteria	Production well (PW601, PW605, PW660) Nechako River Sentinel Wells 5A & 5B
Bi-monthly	Giardia, Cryptosporidium, modified Microscopic Particulate Analysis (MPA)	Production well (PW601, PW605, PW660) Nechako River

PW652 Completion

In early 2020 the PW652 Well Pump Station was commissioned and put into operation to provide more storage and a more reliable supply to the Western Acres Subdivision. One (1) new well was drilled, tested, and set up for use, while an existing well was set up for backup use. The existing PW625 Well Pump Station was decommissioned and demolished in late 2020.

Well Level Monitoring

In January 2020, the Nechako River experienced excessive amounts of ice on the surface, which acted as a cap on the river. This cap caused water to be pushed into the surrounding soils, and ultimately resulted in a rise of water level in nearby wells. . Staff monitored the water level inside PW601, PW605 and PW660 wells by measuring the top water level against a fixed location. Turbidity levels were also monitored closely throughout this period. None of the levels monitored reached parameters requiring additional action.

Maintenance/Upgrades

PW601	PW605
• Hydrogen gas sensor replaced. • Variable Frequency Drive #2 replaced.	• Hydrogen gas sensor replaced. • Building exterior re-painted. • Interior and exterior lights replaced with new LED fixtures.
PW621	**PW624**
• Building exterior re-painted.	• Interior and exterior lights replaced with new LED fixtures. • Free chlorine residual analyzer replaced.
PW625 (Replaced by PW652)	**PW627**
• Building decommissioned and demolished.	• Well #2 inspected, due to performance issues. • Well #2 rehabilitated and Well Pump #2 re-installed.
PW652	**PW660**
• Station constructed, commissioned and placed into operation.	• Hydrogen gas sensor replaced. • Water Pump #2 rebuilt and replaced. • Electrical components arc-flash rated and labelled. • Electrical transfer switch maintained.

3.1.3 Booster Stations

Operational

Heating, Ventilation and Air Conditioning Operation

In 2020, several booster stations had digital thermostats installed to better control station temperatures. This was to provide the equipment with a desirable working temperature all year long, along with more efficient use of the incoming electricity and natural gas supplies.

PW623 Pump #3 Installation

In 2020, PW623 received a new water pump, motor, drive, valves, piping and electrical components. PW623 was built with the capacity to add a third pump, to increase station production, when the demand was required. With the addition of the Boundary Rd. water main in 2019, PW623 became responsible for the daily supply of water to the BCR Industrial site. This was foreseen, and upgrades were scheduled to prevent any water demand issues.

Maintenance/Upgrades

PW602	PW619
• Building exterior re-painted. • Building roof repaired. • Interior and exterior lights replaced with new LED fixtures.	• Building exterior painted. • Building roof repaired. •
PW623	**PW628**
• Building roof repaired. • Water pump #2 replaced. • Water pump motor #2 rebuilt. • Water pump #3 and additional components installed.	• Electrical service replaced.
PW636	**PW650**
• Emergency backup, diesel fired, direct drive pump repaired.	• Check valve repaired in underground valve chamber. • Leaks repaired due to water hammer from failed check valve in underground valve chamber.

3.1.4 Reservoirs

Operational

PW852 Completion

In January of 2020, the City placed PW852 into operation, replacing PW825. PW852, a dual-cell reservoir was constructed in 2019. This allows the City to isolate one-half of the reservoir for maintenance purposes, without interrupting system operations. PW825 was decommissioned and demolished in the fall of 2020.

Brush Clearing

To ensure that the potable water reservoirs are accessible, and the integrity of the structure is kept, staff removed trees and brush from the surrounding areas. Tree roots can attempt to penetrate the underground portion of the Reservoir, causing premature damage. This work is required to be done at certain times of the year, to not affect bird nesting. 2020 saw a substantial amount of work done to achieve these goals.

Maintenance/Upgrades

In 2017, the City started an inspection and cleaning schedule for the potable water reservoirs. Inspection involved the use of a remote operated vehicle (ROV) inside the reservoir while it is full of water. Cleaning consists of removing the sediment from the interior floor. All equipment entering the potable water reservoir is thoroughly cleaned and disinfected prior to entry. Table 3 identifies the work accomplished at the completion of 2019.

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Table 3: Reservoir Inspection & Cleaning Completed

	2017	2018	2019	2020
Inspected	• PW803 • PW805 • PW810 • PW827 • PW828 • PW830 • PW860	• PW806 • PW810 • PW817 • PW823 • PW824 • PW832	• PW803 • PW806 • PW827	• PW823 • PW828
Cleaned	• PW860	• PW810 • PW817 • PW824 • PW832	• PW803 • PW806 • PW827	• PW823 • PW828

3.1.5 Pressure Reducing Valves (PRV)

Operational

PRV Inspections

Bi-annual inspections are completed on City PRV's to ensure they are operating as designed and to minimize the risk of fluctuations in system pressures. The majority of PRV's are located in underground vaults and require a confined space entry to perform inspection and maintenance activities. Future plans to raise PRV's to ground level where possible in order to eliminate the confined space entry are in discussion.

Maintenance/Upgrades

PW611	PW612
• Electrical service pole replaced. • Control Valve rebuilt. • Free-chlorine residual analyzer replaced.	• Building roof repaired.
PW629	
• Building exterior painted.	

3.1.6 Distribution System

Operational

Table 4 identifies the various piping materials that make up the Water Distribution System water mains in 2020. The material make up of some water mains is unknown. As pipe is exposed, the information is updated.

Table 4: Water Main Pipe Materials

Pipe Material	Length (km)	% of Distribution System
Polyvinyl Chloride (PVC)	80.68	14.03%
High-Density Polyethylene (HDPE)	1.77	0.31%
Steel	4.04	0.70%
Ductile Iron (DI)	38.90	6.76%
Cast Iron (CI)	60.65	10.54%
Asbestos Cement (AC)	387.39	67.35%
Other	0.08	0.02%
Unknown	1.69	0.29%
Total	**575.19**	**100%**

Maintenance/Upgrades

Unidirectional Flushing

Unidirectional flushing of water is a method used to clear blockages, debris and other unwanted material from water mains. This technique involves deliberately releasing high-pressure, high-velocity water flow in a single direction through a single pipeline. This helps reduce turbidity and enhance free chlorine residual throughout a water system, thus improving overall water quality. In 2020, the City flushed 12.47km's of water main, 2.16% of the water distribution system.

Valve Maintenance

The City performs valve maintenance throughout the year. City staff operate or "exercise" the valve to determine its condition and confirm if they will work when needed. The City has reported 395 valves exercised in 2020, or 5.3% of the total.

Hydrant Maintenance

Hydrants play a critical role in providing local areas with fire protection services. The City performed 461 hydrant inspections in 2020, this accounts for 21% of the total. The City is required to perform an inspection on hydrants annually and after each operation as per National Fire Protection Association (NFPA). The City replaced 12 hydrants in 2020.

Water Main/Service Connection Repairs

A break in a water main or service connection may cause negative effects within a water distribution system. A water service connection is a direct connection from the water main to the property. The City repaired/replaced 120 water service connections in 2020 due to immediate or anticipated failure. The City also experienced 7 water main breaks requiring repair. Due to the geographical location of Prince George, water pipes are required to be buried to a depth that will prevent them from freezing. This means the City typically has to excavate up to ten (10) feet, sometimes deeper, below ground level to perform the work. The water from a pipe break may take time come to the surface, due to the depth of bury. The City uses various methods to check for leaks in our water

system such as sounding technology. This technology allows workers to locate a problem before it becomes a major issue.

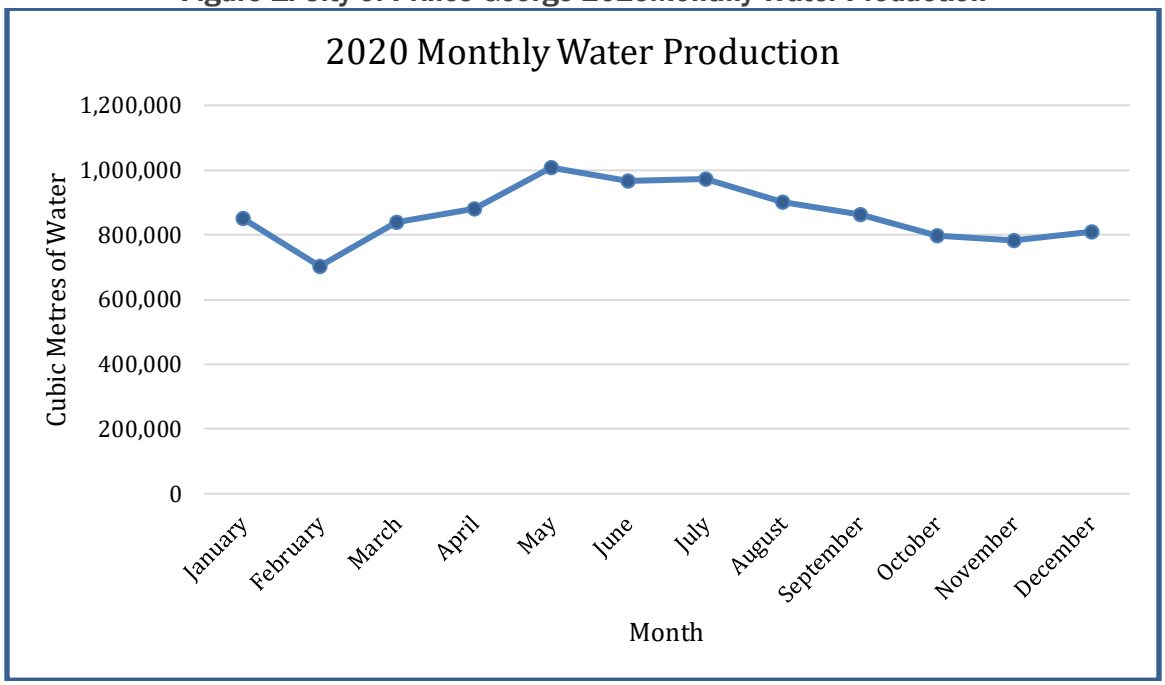
3.2 Water Production

The City reports water production totals to the Ministry of Forests, Lands, Natural Resource Operations and Rural Development Water Management Branch annually. Table 5 identifies the reported monthly volumes of water produced in 2020. Figure 1 highlights the typical trend of water production throughout the year. This is reported in cubic metres as volumes are substantial. One (1) cubic metre is equal to one thousand (1000) litres.

Table 5: City of Prince George 2019 Monthly Water Production Totals

Month	Cubic Metres
January	850,388
February	702,940
March	840,279
April	879,296
May	1,007,597
June	967,781
July	971,119
August	902,135
September	862,873
October	796,093
November	783,710
December	810,052
Total:	10,374,262

Figure 1: City of Prince George 2020Monthly Water Production

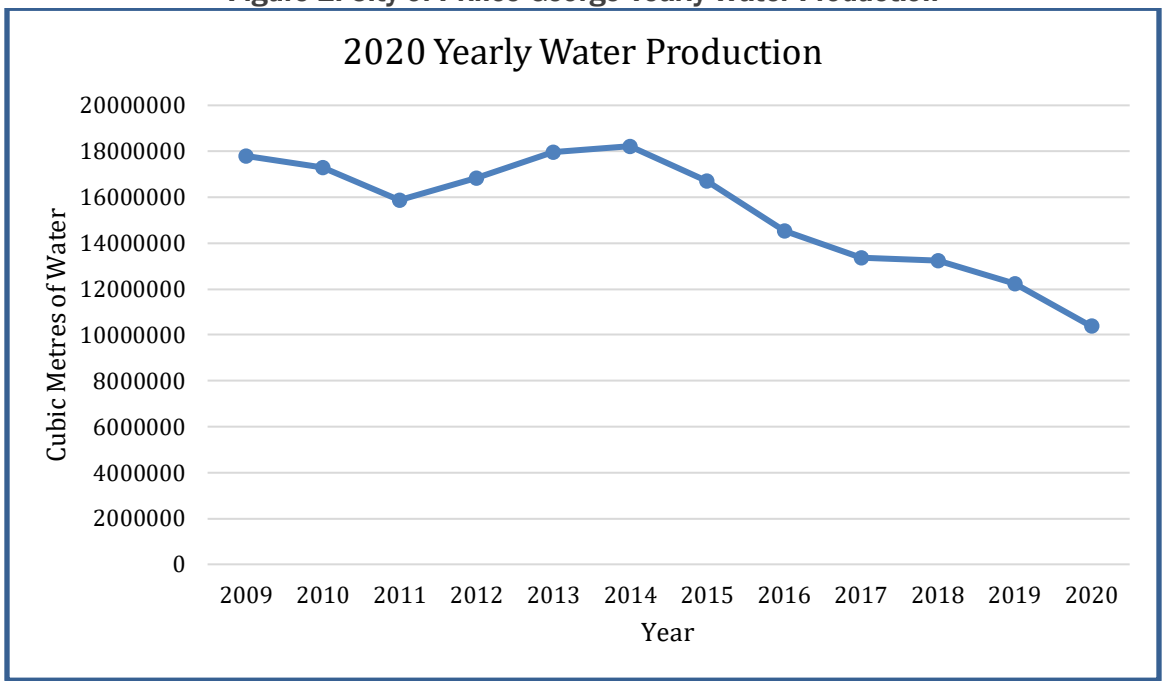


Water production in 2020 followed the typical trend for Prince George characterized by increased usage in the summer months; however, total production (both monthly and annual) was at an all-time low. An unusually cool and wet year combined with the COVID-19 pandemic are suspected to have contributed to this drop in production.

3.3 Water Conservation Program

The City has seen a decrease in total water production from its well locations over the past six (6) years. In 2020, the City saw its lowest water production numbers in recent history. The City of Prince George Water Conservation Plan was implemented in 2016 and since then total water production has decreased year to year. Figure 2 identifies the total production volume from 2009 to 2020, which demonstrates water production peak in 2014 and decrease to 2020.

Figure 2: City of Prince George Yearly Water Production



Efforts implemented under the 2016 Water Conservation Plan have also contributed to a reduction of water use, including the:

- Transition of Bulk Water Users from fire hydrants to public water filling stations;
- Calibration of water meters at all City wells and booster stations;
- Continuation of leak detection and repair program;
- Expansion of the City Sentinel automated irrigation system;
- Increased uptake of the Volunteer Water Meter program; and,
- Increased public education on sprinkling restrictions through summer events and door-to-door information sharing.

In early 2020, the City instituted changes that were made to the private use of City fire hydrants. The monthly charge increased to $1000.00, with a one-time permit fee of $100.00. This change made the use of the City's bulk water filling stations much more economical, and allows the City to more accurately track water usage.

3.4 Water Meter Program

3.4.1 Program Overview

A water meter is a device that measures the amount of water that passes through it. The City utilizes water meters, inside the groundwater well stations to record how much water the wells produce. Within the distribution system, there are sub-meters, located inside the booster stations. A

water meter identifies pump flow volumes, which assists with maintenance planning. Further downstream, water meters are located on some individual water service connections. Having water meters at varying locations throughout the distribution system allows a Utility to identify area demands and locations where leakage may be occurring. The City had 3,290 consumer water meters located on water service connections at the end of 2020.

A water meter is required on the water service connection when any new building is constructed (including a carriage house), mobile home placed on a lot, or when a plumbing permit is obtained for three (3) or more fixtures. All Industrial, Commercial or Institutional buildings require a water meter as well. Meter sizing is determined by the amount of flow that is required to meet the needs of the property.

3.4.2 Program Updates

Due to COVID-19 cutbacks the Volunteer Water Meter Program started in 2016 has been put on hold. Discussions are currently in progress as to when the program can resume.

4.0 Water Quality

4.1 Overview

The use of underground aquifers allows the City to utilize the gravel bed layer between the surface water and the pump intakes as a natural filtration system. The City has no additional filtration systems. The City ensures the water is potable through water sampling protocols, disinfection, and a cross-connection control program. The Guidelines for Canadian Drinking Water Quality (Guideline), set by Health Canada, determine the maximum acceptable concentration (MAC) and aesthetic objective (AO) for various parameters within Canadian drinking water systems. The City strictly adheres to these guidelines.

4.2 Water Quality Sampling

4.2.1 Bacteriological Samples

The City obtains bacteriological samples on a weekly basis from various locations throughout the distribution system. The City is required to provide 74 samples from the distribution system per month. The City provided an average of 30 samples per week (120 samples per month) in 2020, as per the NHA's request. The City achieved their required sampling frequency in 2020.

The drinking water samples were sent to the British Columbia Centre for Disease Control (BCCDC) to confirm the absence of E. coli and total coliforms. The results were provided to the Environmental Health Officer within the NHA and to City staff.
The City met the Drinking Water Protection Regulation standards in 2020, as outlined below in Table 6.

Table 6: Drinking Water Protection Regulation
Schedule A
Water Quality Standards for Potable Water

Parameter:	Standard:
Fecal coliform bacteria	No detectable fecal coliform bacteria per 100 ml
Escherichia coli	No detectable *Escherichia coli* per 100 ml
Total coliform bacteria	
(a) 1 sample in a 30 day period	No detectable total coliform bacteria per 100 ml
(b) more than 1 sample in a 30 day period	At least 90% of samples have no detectable total coliform bacteria per 100 ml and no sample has more than 10 total coliform bacteria per 100 ml

4.2.2 Boil Water Advisories

The regulating health authority of a water distribution system will impose a boil water advisory when there is a concern for the public's health. The associated water purveyor would implement the boil water advisory within their system. The City was not required to implement any boil water advisories in 2020.

4.2.3 Raw Water Samples

The City obtains raw (non-disinfected) water samples from each well site on a semi-annual basis and tests them for organic, inorganic, microorganisms, radionuclides and physical parameters. The testing laboratory uploads sample results directly to Watertrax, an electronic documenting system used by the City, then City staff posts the results on the City's website for the residents to view. The City met all the set parameters within the Guidelines for Canadian Drinking Water Quality in 2020, except for the following:

Parameter	Sample Date	Location	Result	MAC	AO
Manganese	April 22, 2020	PW624	0.072 mg/l	0.12 mg/l	0.02 mg/l
Antimony	October 20, 2020	PW624	0.00776 mg/l	0.006 mg/l	n/a
Manganese	October 20, 2020	PW624	0.0531 mg/l	0.12 mg/l	0.02 mg/l

Antimony

Antimony is a shiny gray metalloid, found mainly in nature as the sulfide mineral stibnite. Antimony can enter waterways through naturally occurring erosion or soil runoff. Some causes can be industrial effluents, along with leaching from plumbing materials and solder. There is no aesthetic objective for antimony, but it has a Maximum Acceptable Concentration (MAC) of 0.006 mg/l. The health basis of the MAC is due to microscopic changes in organs and tissues (thymus, kidney, liver, spleen and thyroid). Plumbing systems where antimony levels exceed the MAC should be flushed before water is used for consumption.

Manganese

Manganese is a dissolution of naturally occurring minerals commonly found in soil and rock. On March 10, 2019 the guideline was updated to include a new MAC of 0.12 mg/l and reduced aesthetic objective (AO) from 0.05 to 0.02 mg/l. The MAC adjustment was introduced as new research has shown that levels above the MAC can pose effects on neurological development and behaviour, deficits in memory, attention, and motor skills, especially in formula-fed infants where water containing levels above the MAC was used. The AO was reduced to minimize the occurrence of discoloured water, consumer complaints and staining of laundry.

PW624 Antimony

The raw water sample obtained from PW624 on April 22, 2020 contained < 0.00020 mg/l total antimony. At the time of this report the raw water sample obtained on April 21, 2021 contained 0.00027 mg/l total antimony. The City will continue to monitor the levels of antimony in PW624 closely, but a cause for the exceedance has not been determined.

PW624 Manganese

The City is continuing to monitor the levels of manganese in PW624 well. No action has been applied to correct the exceedance at this time.

4.2.4 Sentinel Well Samples

The City obtained groundwater samples from six (6) sentinel (monitoring) wells around PW660 three (3) times in 2020. The intent of the sentinel wells is to aid in the protection of the water quality from potential landward spills or existing areas of contamination. The City samples for physical parameters, dissolved cations, nutrients, anions, microbiological, organics, and radionuclides. This information is available upon request.

4.2.5 Distribution System Samples

The City gathered monthly drinking water samples from each pressure zone and tested them for pH, iron, alkalinity, and hardness. The City's internal laboratory performed the testing, and recorded the results in Watertrax. This information is available upon request.

4.2.6 PW621/PW624 Additional Samples

The City of Prince George Wastewater Treatment Centre requires a permit to operate from the Ministry of Environment. The permit identifies the following requirements:

"The Permittee must analyze the unchlorinated water from the College Heights water pumping station three times per week (Monday, Wednesday and Friday) for Faecal Coliform CFU per mL or MPN per 100 mL. Any positive result must be immediately reported to the Director and the Medical Health Officer for the Northern Interior Health Unit. If a positive result is encountered, daily

monitoring (Monday to Friday inclusive) must be carried out until three successive monitoring results show no Faecal Coliforms. All samples results must be submitted together with the monthly sewage analyses and the flow measurement report."

The City met these permit requirements and received zero positive results in 2020.

4.2.7 Turbidity

Turbidity is the measure of relative clarity of a liquid. It is measured by analyzing the amount of light that is scattered by material in the water. The higher the intensity of scattered light, the higher the turbidity, or particles in the water. Particles in the water can harbor microorganisms, protecting them from disinfection. The Guidelines recommend that water entering the distribution system have turbidity levels of 1.0 Nephelometric Turbidity Unit (NTU) or less to ensure effectiveness of disinfection and for good operation of a distribution system.

The City has in-line turbidity monitors located at each supply well. The monitors provide continuous monitoring of the well turbidity levels. City staff perform quality assurance checks and calibrations on the turbidity monitors by comparing the results to hand-held monitors on a monthly basis. Turbidity levels leaving each supply well were under 1.0 NTU in 2020, ranging from 0.01 NTU to 0.20 NTU.

4.3 Disinfection

The City is required to maintain a minimum free chlorine residual of 0.2 ppm throughout the distribution system, as per the NHA Operating Permit. The City accomplishes this by adding sodium hypochlorite to the water. The sodium hypochlorite is generated on-site at the major groundwater wells (PW601, PW605, and PW660), and transported to the smaller groundwater wells (PW621, PW624, PW652). The free chlorine residuals leaving each well site vary, depending on system demands, from 0.5 ppm to 1.0 ppm. The City uses five (5) booster stations as monitoring and re-injection sites.

City staff utilize continuous free chlorine monitoring equipment throughout the system, and performs quality assurance checks by comparing the results to hand-held monitors on a weekly basis. The free chlorine monitoring equipment is connected to the City's SCADA system, which will notify City staff when free chlorine residuals drop below or above the desired amount. Free chlorine residual information is recorded in Watertrax for historical reference. The City tests the free chlorine residual throughout each pressure zone at over 30 locations two times per week to ensure consistency.

The City requires that all new water main installations over four (4) inch in size undertake disinfection in accordance with the American Water Works Association (AWWA) Standard B300 or C651. The City administers this through the Subdivision & Development Servicing Bylaw No. 8618, 2014.

4.4 Cross-Connection Control (CCC) Program

4.4.1 Program Overview

The NHA requires the City to develop and maintain a CCC program. A cross-connection is any actual or potential connection between a potable water supply and any pipe, vessel, tank, plumbing fixture, equipment or device through which it is possible for used, polluted or contaminated water or any other substance to enter the potable water system. A CCC program is a program designed to administer and regulate the selection, installation, testing and maintenance of *backflow preventers*.

The City administers its CCC program through the following City of Prince George Bylaws:

- *Water Regulation and Rates Bylaw No. 7479, 2003*
- *Building Bylaw No. 8922, 2018*
- *Comprehensive Fees & Charges Bylaw No. 9080, 2019*

The City requires that a Plumbing Permit be obtained for all backflow preventer installations. The device must be installed by a certified Plumber and tested by a certified Backflow Preventer Tester. The backflow preventer is input into the City's backflow preventer database. Annual tests are required on each backflow preventer. The City will notify the property owner one (1) month prior to their re-certification date via mail. If a test report is not received before the re-certification date, two (2) follow-up letters are mailed; one (1) month post, and two (2) months post re-certification date. Penalties for non-compliance of the CCC Program can lead to fines and/or disconnection of the water service. The City backflow preventer database housed 1,695 backflow preventers at the end of 2020.

4.4.2 Program Updates

Due to the COVID-19 Pandemic, the City had to work with backflow testers to ensure backflow devices were tested, while ensuring the safety of all parties involved. This took planning, strategizing and being innovative in how backflow reports were obtained.

The British Columbia Water & Waste Association (BCWWA) is the recognized administrative body for backflow tester certifications. Backflow testers are required to pass a recertification exam every five (5) years. The exam is largely conducted in person, and thus backflow testers were given a grace period to recertify. The City had to monitor backflow tester's certification, to ensure they were still eligible to perform backflow testing.

4.5 Wellhead/Aquifer Protection Program

The City has established a Wellhead/Aquifer Protection Program through the development of several reports, and assessments throughout the Water Distribution System's history.

Some of these reports include:

- 1993, City of Prince George Wilson Park Collector Well No. 3 (PW601) Construction and Testing Report;
- 2002, Capture Zone Analysis and Preliminary Delineation of Well Protection Areas for Wells PW605, PW601, and Fishtrap Island: City of Prince George, BC;
- 2005, Installation Report: Fishtrap Island Collector Well Design and Construction Project;
- 2010, Sentinel Well Construction and Sampling PW660;
- 2010, Flood Risk Evaluation and Flood Control Solutions;
- 2015, City of Prince George Wells Protection Plan: For CN Related Risks;
- 2019, City of Prince George Groundwater at Risk of Containing Pathogens Risk Assessment

As the City obtains new information about the wellhead and aquifer protection areas, the Wellhead/Aquifer Protection Program is updated.

Currently, the City performs the sentinel well, raw water and PW621/PW624 additional sampling, noted in Section 4.2 Water Quality Sampling, as part of this Program. Additionally, there are specific requirements around developing land within the wellhead and aquifer protection areas. City staff monitor the wells on a routine basis to ensure the immediate area is safe.

Future plans include; identify the wellhead/aquifer protection areas with signage, and implement recommendations from the City of Prince George GARP Risk Assessment.

4.6 Water Quality Concerns

In 2020, the City received fifty-one (51) concerns from the public regarding the drinking water quality. The City receives water quality concerns through phone, email and app inquiries to the City's Service Centre. Service Centre staff create a Service Request in Cityworks, and dispatch the requests to the Utilities Division. Utilities staff investigate each concern and determine the appropriate path to correct the water quality. The concern and resolution are documented within the Service Request for the associated address. The calls received are typically for dirty water, or undesirable taste and odour. The common causes are water main construction, water main breaks, unidirectional flushing, higher flow output from pumps than normal and undesirable chlorine residual taste.

5.0 Emergency Response Plan

The City has prepared an Emergency Response Plan (Plan) for the City of Prince George Water Distribution System. City staff review the Plan on an annual basis, and update when required. The City updated the Plan in 2017. City staff and the NHA receive the Plan, as it pertains to the operation of the system.

The City communicates emergency response situations through the City of Prince George website.

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6.0 Environmental Operators Certification Program (EOCP)

6.1 Classification

The City of Prince George Water Distribution System is classed as a Level IV system. The classification system is from Level I to Level IV, with Level IV being the highest level of classification. This is due to the systems complexity and size.

6.2 Certified Operators

In 2020, the City had the following numbers of EOCP certified Water Distribution staff, excluding management staff:

- Level IV – 2
- Level III – 1
- Level II – 6
- Level I – 11
- Operator in Training – 4

Additionally, the City relies on specialists in their field, such as technology, engineering, electrical and mechanical trades, environmental and administrative staff to ensure a safe and efficient drinking water system.

6.3 Training

The City ensures staff receive training in all health and safety related areas that pertain to their work environment. This includes, but not limited to the following:

- Confined Space Entry
- Fall Protection
- Aerial Work Platform
- Traffic Control
- Arc Flash & Low Voltage
- H2S Alive
- Excavation Safety
- Electrical Safety
- Hoisting, Lifting & Rigging
- Forklift
- Skid Steer
- Bullying & Harassment
- First Aid
- WHMIS
- Due Diligence for Supervisors
- Lockout & Tag Out

As a result of the COVID-19 pandemic in 2020 many training providers were required to cease in-person training, which in turn reduced the number of available training courses directly related to the Water Distribution System. Training that did take place was limited to the following:

- BCWWA Operator CEU Day
- Thawing Underground Frozen Water Lines

7.0 Conclusion

The City of Prince George remains committed to safeguarding the highest quality of water to their residents. Staff are continuously monitoring the system, updating infrastructure and advancing their knowledge of any changes in regulations, or technology that pertain to the operations and maintenance of the Water Distribution System. The City will continue to be transparent and work with the government agencies, health authority, and citizens to ensure their satisfaction.

For questions or comments regarding the Report, please contact the aforementioned Utilities Division staff on Page 1.