CITY OF PRINCE RUPERT

2018 ANNUAL REPORT ON THE COMMUNITY WATER SYSTEM

This report details the 2018 status of the Prince Rupert water system, providing an overview of the level of servicing, water quality, treatment, and health data associated with the City's water supply.

FEBRUARY 2018

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2018 ANNUAL REPORT ON THE COMMUNITY WATER SYSTEM

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2018 WATER SERVICE OVERVIEW

- Responded to 312 BC1 calls to locate sewer/water services;
- Addressed 37 homeowner reported water service leaks;
- Conducted 10 water main repairs;
- Responded to 107 water service leaks;

History of Prince Rupert's Water System

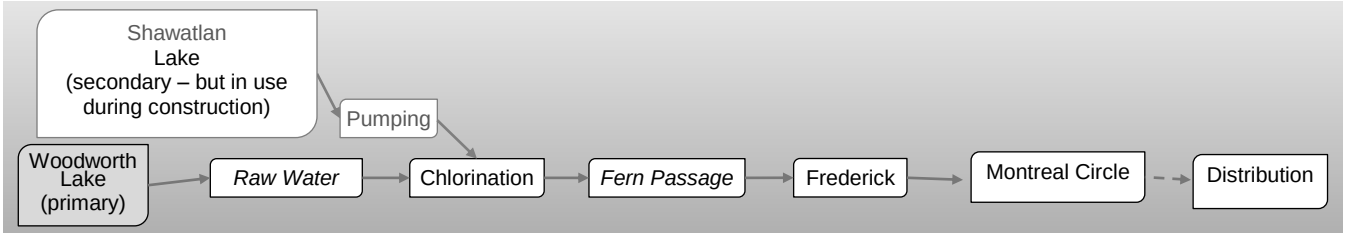
When the City was established, the Prince Rupert Water Utility began with just two small dams on Kaien Island. However, these were unacceptable for the longer term and by 1914, the City had secured a much more reliable source of raw water-- two large lakes and watersheds on the Tsimshian Peninsula. Unfortunately, the elevation of Shawatlan Lake was lower than much of Kaien Island, necessitating the construction of a large pump house at the shoreside intake. The new pumping system pushed the water through an undersea or sub-marine supply main across Fern Passage to the Kaien Island townsite where booster pumps moved it on to the Acropolis Reservoir in the City's west end.

Ultimately, the large diameter penstock line from the former BC Hydro Utility dam at Woodworth Lake, higher up in the Coastal Mountain Range, would be extended and form the backbone of a gravity water supply system, leaving the Shawatlan pumping system as a valuable back-up facility to be used in case of emergency or necessary maintenance activity, which is occurring currently as the City replaces critical water infrastructure. However, it was 1996 before key infrastructure improvements finally allowed Woodworth Lake to totally fulfill all of Prince Rupert's potable water and fire protection needs. After over 80 years of continual pumping, the City was finally able to switch to a full gravity-fed supply system, eliminating substantial annual hydro electric costs.

Water System Description

Today, the Prince Rupert water system feeds approximately 6 million cubic metres of potable water per year to local residents, businesses, and industry, utilizing over 50 kilometres of distribution line and close to 6000 individual service connections. The Community Water System supplies the Port of Prince Rupert and related industries, as well as BC Ferries. The system is also capable of meeting the peak seasonal demand of a number of industrial fish processors, an industry that has declined in recent years, but when active can generate over twice the average daily consumption.

See below for a schematic diagram describing the path that water takes through the Community Water System, currently, due to reliance on our secondary supply at Shawatlan Lake during construction on water supply infrastructure.



Water Quality

Few issues are more important to a municipality than the quality of the drinking water it delivers. It has consequently been Prince Rupert's extreme good fortune to have always had one of the best protected raw water sources in British Columbia. In order to prevent human contamination of the water supply, the City of Prince Rupert maintains restricted access to the watersheds surrounding both Woodworth and Shawatlan Lakes. As noted in the B.C. Auditor General's Report, which reviewed our water protection practices, water source protection is by far the easiest, least expensive, and most practical approach to ensuring the long term safety of the water supply.

Additionally, as a second barrier of defence against the incidence of waterborne disease, the municipality maintains an enduring chlorine residual throughout the water distribution system. Chlorine is the most reliable and widely used drinking water disinfectant in North America. A "residual" is the trace amount of chlorine left in the drinking water after initial disinfection have taken place. As long as a trace of chlorine or residual can be detected, the line is still subject to active disinfection. For greater public safety and adequate contact time, chlorine is added before the water reaches Kaien Island. Chlorine dosage must be constantly trimmed and balanced to maximize disinfection but minimize the production of disinfection by-products (DBPs), such as Trihalomethanes (THMs) and Haloacetic Acids (HAAs). Residual levels are therefore electronically monitored on a constant basis throughout the municipality. To further check that the chlorination process is working properly and that the water system has not been otherwise compromised, various types of water quality samples are taken daily, weekly, or at other regular intervals. The results of the Water Quality Testing Program are reported to the Provincial Ministry of Health and are available on the Northern Health Authority's Public Health Protection website at: http://www.healthspace.ca/nha

This public site lists the following up-to-date information about our water quality monitoring program:

- **Drinking Water inspection Reports**

- **Water Notice December 2018-March 2019** - A Boil Water Notice was in effect from December 14th, 2018 – January 25th, 2019 in Prince Rupert primarily due to perceived presence of cryptosporidium in the water supply. The City was downgraded from a Boil Water Notice January 25th, 2019, due to an assessment from Northern Health, which found:

    - No outbreak in the community for Cryptosporidiosis or Giardiasis has been detected;
    - Consecutive satisfactory results for Cryptosporidium by an approved lab;
    - Appropriate chlorine concentration and contact time value to Giardia deactivation applied;
    - Improvements to sampling protocols;

- The Water Quality Advisory was removed fully March 15th, 2019, as the City has met Northern Health's condition to meet treatable limits. combined with a post treatment Giardia cyst viability/infectivity monitoring program approved by the Environmental Health Officer. Northern Health has directed the City to continue to monitor for protozoa at minimum on a monthly basis, which has been added as a condition of our Water Operating Permit. The Environmental Health Officer may also request greater testing frequency during times where there is higher risk to the water supply, for instance during periods of inclement weather or higher levels of recorded turbidity in the water supply.

- **Current Water Notices** – There are no current notices in effect with respect to water quality in Prince Rupert.

- **Chemical Samples & Results** – Actual chemical analysis test results for 8 key sampling points going back as far as 1989. In addition, results here include Giardia and Cryptosporidium sample results.

- **Water Sample Results** – Actual bacteriological test results for selected sampling points dating back to 1994. "L1" means "less than one" or no coliform issues detected.

In a drinking water quality concern or emergency, as occurred this year, a Water Quality Advisory, Boil Water Notice, or Do Not Use Water Notice is issued by the Northern Health Authority. This notice is placed on the home page of the City's website at www.princerupert.ca as part of a larger media and public notification effort. For further information see the section below regarding "Emergency Planning".

Water Quality Data and Inspection Results

Test results are established through the Guidelines for Canadian Drinking Water Quality and the British Columbia Drinking Water Protection Regulation. These result criteria are:

  - No one sample should contain more than ten Total Coliform per 100ml, so long as less than 10% of samples have detectable coliforms. There is to be zero E.Coli per 100ml.
  - There should be no two consecutive positive samples from the same sample site location that show the presence of coliform indicators; and,
  - 90% of all samples must have zero Total Coliforms per 100ml sample

In 2018, there were 4 Sample Range Reports produced that are available online at the source listed below.

- The total number of potential sampling sites in Prince Rupert in 2018 is 11 -- 218 samples total were taken during 2018. Sampling sites are listed online and in the Appendix of this Report.

- There were 0 samples containing e. coli.
- The CWS was well within the acceptable range for Total Coliforms, with over 99% of all samples having zero Total Coliforms per 100ml sample.

The last facility inspection of the City of Prince Rupert's Community Water System was in July of 2018, with further discussion below. This inspection was the first recorded instance of violations recorded during a Routine Inspection, due to regulatory changes with respect to chlorine byproducts and pH values over time. A summary of the inspection results and follow-up actions taken by the City immediately following the inspection are listed on the following page.

Inspection Information:

(This information taken directly from Northern Health website)

Facility Type: WS1A
Inspection type: Routine
Inspection date: July 24, 2018
Follow-up Required: No
This facility was given a low hazard rating.

Violations:

A summary of the violations found during the inspection are listed below, including a description of the violation, observation and recommended corrective actions.

313 Inadequate treatment

Observation: Monitoring of disinfection by-products are being conducted at an acceptable frequency. Results show exceedances of maximum allowable concentrations for trihalomethanes and haloacetic acids. Although the chlorination process may create the formation of disinfection byproducts the health risk associated with not having disinfection is a greater risk to public health

Corrective Action: Seek out long term plan for turbidity and organics while maintaining a minimum 0.2 ppm chlorine residual at the end of the line. Continue to monitor disinfection by-products.

SUMMARY OF CITY RESPONSE

As a component of our water system upgrades, the City has been in discussions with Northern Health regarding the implementation of a system of treatment that includes multiple treatment barriers.

In August of 2018, directly following these Inspection results, the City applied to the Federal/Provincial Investing in Canadian Infrastructure Program (ICIP) Green Infrastructure fund to support the development of a ~$30 million new water treatment plant with multiple barriers of treatment.

If the City is able to successfully fund this project, this facility will ensure that the City addresses all noted Northern Health concerns with respect to treatment. In the meantime, the City has enhanced monitoring and abatement efforts with respect to noted violations, specifically monitoring of disinfection byproducts and corrosion, and public education efforts directed towards leaching of lead from within home-plumbing.

City Response: *Long term plan is to implement treatment that will remove turbidity related sediment and organics through multiple barriers of treatment. Monitoring of disinfection by-products is ongoing.*

313 Inadequate treatment

Observation: Chemical results indicate that the water is corrosive (characteristic of water from coastal communities). This is due to low pH and low alkalinity. This may lead to elevated levels of lead at the tap. (*Note – due to presence of lead in home-plumbing fixtures and assets – this was the subject of a public mail out warning community members of risk of lead in home-plumbing).*

Corrective Action: Continue to work to satisfy the following conditions of permit: "By 31 Mar 2019, working with the Drinking Water Officer and using the reference approved guidance documents, develop a monitoring program for assessing corrosion of materials in residential distribution (the "field sampling program")", "By 31 Jul 2019, complete the field sampling program" and "By 30 Sep 2019, forward a project report and complete results of field sampling program to Northern Health for review."

City Response: *Work with the Drinking Water Officer to develop a monitoring program for corrosion ("field sampling program") is ongoing, with the schedule to be prepared by the end of March as per the above direction.*

313 Inadequate treatment

Observation: Water system is not meeting drinking water treatment objectives for surface waters in BC, which requires two treatment processes for surface water.

Corrective Action: Seek out engineered solution to ensure BC treatment objectives are met.

City Response: *The City's long term plan is to implement multiple barriers of treatment that will address all drinking water treatment objectives (ie. 3-log reduction).*

Source: For a complete list of Water Quality Data obtained from www.healthspace.ca/nha

Chemical Composition of Community Water Supply

The testing results regarding the chemical composition of the CWS are listed below. Water quality meets all known non-aesthetic objectives. The most noticeable physical property of Prince Rupert's potable water is color. It is noted that there is a greater TCU amount for Prince Rupert's water colour than is ideal according to regulatory guidelines. This discolouration has increased somewhat due to the use of the secondary water source at Shawatlans Lake, and the nearby construction on the access road to the planned dam replacement project. While this has a measurable aesthetic value, there is no impact on human health.

Additionally, the pH levels of the CWS hover below the lower limit of the identified goals for pH, which was updated in 2016 to a range of 7.0 to 10.5 in finished drinking water. This is due to the City's above ground water supply sources, which are subject to slight acidification from rain, as experienced by most coastal communities.

In 2017-2018, there have been impacts to aesthetic objectives to the City's water supply as a result of ongoing construction on our adjacent water supply project. Due to nearby construction, the City has been pumping our water from our secondary source at Shawatlans Lake. Due to the nature of the source, as well as nearby construction, testing shows the water supply has seen increased incidences of turbidity and colour that are above aesthetic objectives identified by Northern Health. The construction has also had some ripple effects with respect to chemical treatment outcomes. To reduce potential risks of increased pathogens associated with turbidity and local disturbances, the City has increased chlorine levels in the water supply as per Northern Health recommendations. This, in turn, has increased levels

of chlorine residual chemicals present in the supply. Both Trihalomethane and Haleoacetic Acids are a by-product of drinking water disinfection with chlorine, and result from the accumulation of the byproduct as the water travels through the CWS. These exceedances were noted in the July inspection report as requiring continued monitoring.

Trihalomethanes (THMs) and Haloacetic Acids (HAAs) are common disinfection by products. They occur as a result of chlorine mixed with the organics in the water (e.g. decaying plants etc.). THMs and HAAs are monitored routinely to ensure that Prince Rupert's CWS makes every effort to maintain their concentrations to be as low as reasonably achievable without compromising the effectiveness of chlorine disinfection to eliminate harmful microbial pathogens. Currently both THMs and HAAs are above the maximum acceptable concentration (MAC) in our system. However, further reduction of the current chlorine residual will put public health at a greater risk associated with microbial contamination. The extremely low potential risk of developing adverse health effects from long-term exposure to small amounts of chlorine by-products is outweighed by the value of chlorine in significantly reducing the risks and consequences of water-borne infections. Prince Rupert's CWS will continue to monitor these concentrations routinely. The City is currently considering long term solutions to address this issue such as reducing the level of the precursor natural organic material in the water prior to chlorination through centralised multiple-barriered treatment.

Fluoride is not presently added to Prince Rupert's potable water. The injection system is currently off-line, awaiting sufficient funding for upgrading and replacement.

Source: Complete list of Water Quality Data obtained from www.healthspace.ca/nha

Emergency Planning:

While water system reliability is absolutely essential, all public water systems can be the victims of various types of emergencies from either natural or man-made causes. Some potential emergencies can be averted or have their impact greatly minimized by advance preparation and sound infrastructure planning. These activities reflect the importance of the water system in sustaining a safe and healthy community. Key to emergency planning is the recognition of the need for a certain amount of redundancy in both physical and human resources.

Prince Rupert is extremely fortunate to have two operational water sources – Shawatlans and Woodworth Lakes. In 2009, Prince Rupert's main water source was cut off for a considerable time period when the pipeline from Woodworth Lake was heavily damaged by a landslide. In many communities, this would certainly have qualified as a disaster. In this case however, the Public Works department was utilizing the pumping system already in place at the Shawatlans Lake water source. That system has double power-source redundancy, with hydro power as the primary electrical source, and power backed up by a diesel-powered generator.

In the case of any serious emergency, the Prince Rupert Public Works Department works hand-in-hand with all other City departments, local Emergency Services, the Provincial Emergency Program (PEP), the Provincial Ministry of Health through the Northern Health Authority, and other utilities and organizations as required. Additionally, City Council would be informed in a timely manner regarding all pertinent aspects of the problem as will the general public through the City's website at www.princerupert.ca and all other available media. The City has also instituted a smartphone application and landline push notification system which has successfully targeted emergency communications to residents in the event of an emergency. All of these available communications avenues were used by the City during the recent Boil Water Notice.

System Improvements Completed and Planned:

In 2018, the City of Prince Rupert conducted major planned and unplanned water service infrastructure improvements. Emergency capital water works repairs were completed in various locations around town, including major replacements on McBride Street, and other areas. Eighty metres of watermain was also replaced between Graham and Atlin Avenues.

In terms of large-scale infrastructure replacement, in 2015, the City received matching grants from senior government to replace the raw-water supply line and construct a new access road, which is Phase 1 of the Raw Water Line Replacement Project. The new access road will provide the opportunity to upgrade or replace the dam, which will be the City's next priority for improvement. The City has finalized the design for the new dam will issue a contract for it to begin in 2019. This is the second phase of the water supply project. In addition, the Operations Department continued work on a SCADA improvement Study to improve technological monitoring capacity of the City's water system.

Full replacement of the Woodworth Dam and extension of the access road to the dam provides a number of advantages, including:

- Improved ability to access the dam for operation, maintenance and surveillance;
- A significantly longer design life than the rehabilitated existing Woodworth Dam, which may require high repair costs or replacement in the future.
- Improved access for emergency response.
- Elimination of existing concrete and abutment deficiencies.
- Updated spillway capacity.
- Improved debris removal capability.
- Opportunity to install improved communications systems.
- Accessibility across the top of the dam for maintenance, inspection and future repairs.
- Erosion control to the downstream side of the spillway based on the design of a long spillway

The third and final phase, which may be broken down further into two projects, involves replacement of one of the submarine lines carrying potable water beneath the harbour from the water supply to the community, and the development of a new water treatment facility. As previously noted, the City applied in August of 2018 to the Investing in Canada Infrastructure Program for funding to complete this final phase.

Again, the principle of redundancy, which will be built into future upgrades as in the past, is key to responsible emergency preparedness. Local water charges reflect the cost of ensuring an appropriate level of reliability and safety, as well as the logistics involved in the delivery of fresh water from "Lake-to-Tap".

Remedial Actions or Assessments undertaken, where applicable

Operational challenges were encountered in 2017-2018 that affected water quality and aesthetics (unrelated to the Boil Water Notice in late 2018). These incidents were related to elevated turbidity levels related to construction activities during the ongoing replacement of the raw water supply line. Additional sampling was completed at this time, and the City remained in close contact with Northern Health to ensure vigilant and constant monitoring. Additional chlorine was added to the water supply, as per Northern Health's recommendations. Unfortunately, this action has resulted in exceedances of chlorine

residual elements in the City's supply. These levels are the subject of continued monitoring, however Northern Health has indicated that, "although the chlorination process may create the formation of disinfection byproducts the health risk associated with not having disinfection is a greater risk to public health" (NHA Inspection Report, July 24th, 2018).

In addition, in late 2018 the City was put on a Boil Water Notice due to exceedances of Giardia and perceived exceedances of Cryptosporidium. The original perceived exceedances of Cryptosporidium cannot be entirely confirmed, however, as more recent tests that follow a more accurate form of pathogen identification have met acceptable water quality standards. The details of these findings are described in more detail below.

Given that Cryptosporidium was not detected for multiple weeks, and as a result of available treatment options for Giardia, we were able to lower the Boil Water Notice to an Advisory on January 25th, 2019.

Boil Water Event Details and Improvements to Testing Regimes

The results received on December 14th, 2018 were conducted as part of the City's ongoing seasonal testing regime as regulated by Northern Health. The sample was gathered by City staff and then dropped off to our local provider who then sent it to a laboratory in Richmond, BC. The City has used this testing facility for many years. After the initial unacceptable test, several subsequent tests were sent to the same lab with continued unfavorable results. Consequently, under advice from the City's engineering consultant the samples were sent to a very sophisticated medical research facility in Alberta for analysis. This facility is known to Health Canada and nationwide for their advanced research equipment and highly skilled staff. Since initiating testing with this lab, the results from this facility showed no signs of cryptosporidium and recorded levels of giardia that are well-within treatable limits given the City's available chlorination system.

As a result of these conflicting results, the City started taking comparative samples, sending them to both labs. Each time the Richmond, BC lab failed a sample, the Alberta research facility would give the City an acceptable result with a comparative sample. To confirm the suspicions of both Northern Health and the City, staff sent the last failed sample from the Richmond lab to be retested by the research facility in Alberta, at which time they identified the item of concern within the sample as a form of algae, not cryptosporidium. This result was later cross-referenced with an aerial image of our water supply where a naturally occurring algae bloom was spotted during a patrol of Shawatlan Lake.

As a result of all of the information gathered over the 9 week Boil Water Notice term and the noted algae bloom in Shawatlan Lake, the City believes that it is likely the original results for Cryptosporidium were false positives. There is no way to confirm this theory, as the original samples have been discarded. However, the research facility, Northern Health and the City are confident in the testing results from the Alberta research facility as they specialize in the analysis of water for the detection of Giardia and Cryptosporidium. This laboratory is accredited by the Canadian Association for Laboratory Accreditation and are audited on site every two years.

The City's long term plan is to implement treatment that will remove turbidity related sediment and organics, achieve a minimum 3 log reduction of potential parasites and other micro-organisms, and better manage pH through multiple barriers of treatment.

Compliance with Operating Permit Requirements

The City is in compliance with Operating Permit Requirements. As a component of requirements, the City implemented a system of public information and education on personal protective measures for metal leaching and corrosion control [due to lead components in interior plumbing]. The City released a flier to

households in Spring of 2018 describing steps residents can take to reduce the leaching of lead into their household water from the outdated pipes in their home or business. We will also be implementing a field sampling program with respect to corrosion in 2019.

For Additional Information:

Contact:

Garin Gardiner, Public Works Manager

(250) 624 6795 ext. 206

garin.gardiner@princerupert.ca

For more information regarding water quality standards, the following links may be of interest:

Northern Health website: http://www.healthspace.ca/nha

Guidelines for Canadian Drinking Water Quality: http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php

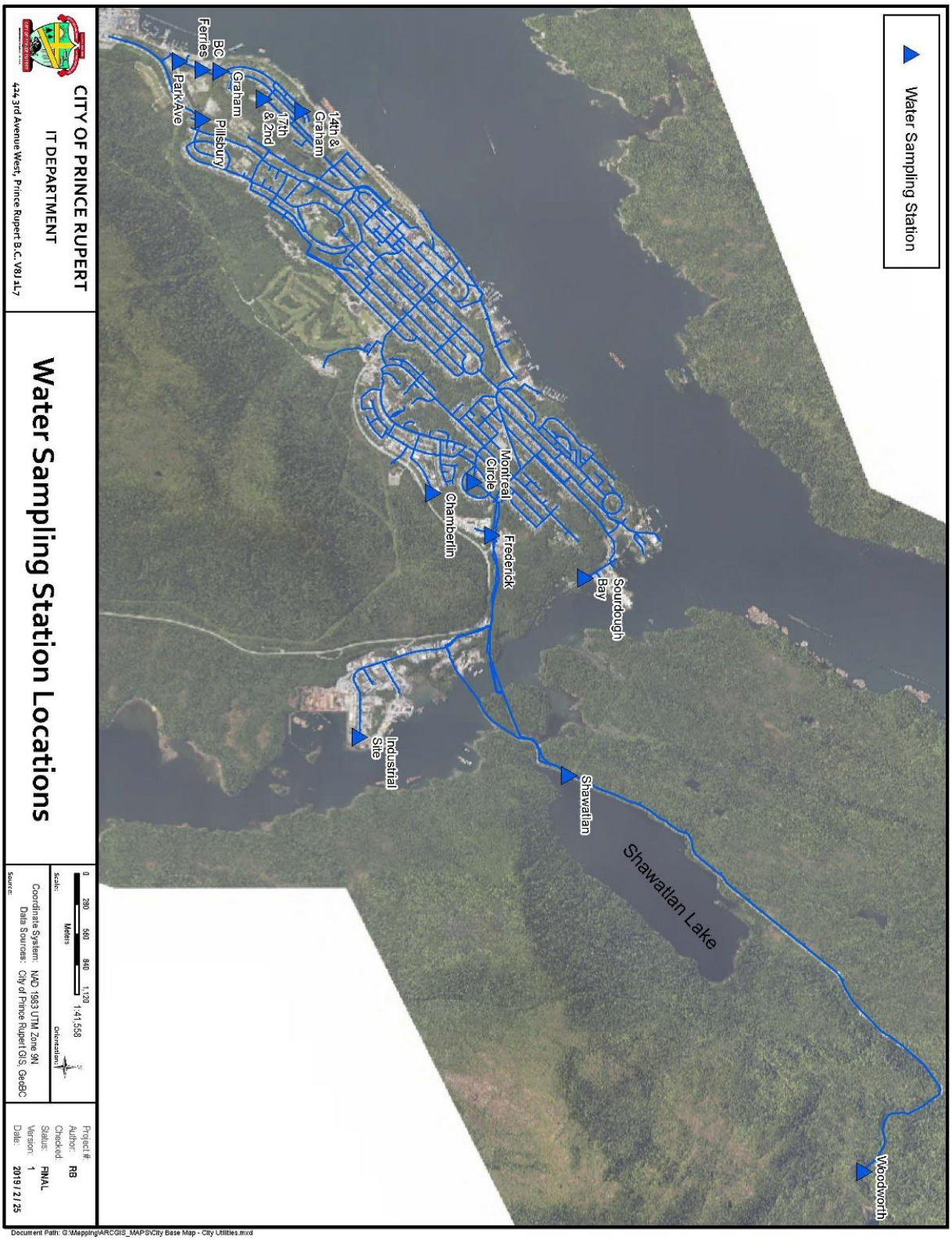
For a record of actual rainfall events please navigate to the City Hall Weather Station

Summary

The City of Prince continues to prioritize the replacement of aged water supply infrastructure located across the harbour at the dam site. In 2018, work initiated in 2016-2017 was completed to renew and bury our water supply line and build an associated access road. Greater security and water quality certainty has been achieved through burying the supply line, currently subject to falling trees and landslides. Additionally, an access road will permit quality checks in all weather conditions, and ease of access in case of any incident or emergency.

As noted throughout this Report, the eventual goal for the City is the full replacement of water supply infrastructure – including the dam and submarine lines, and a water treatment plant. Construction on the dam will begin in 2019, and the City will proceed on replacing this historic and significant community infrastructure project. In addition, the City should be notified in early 2019 with respect to the outcome of our application for funding to support the development of a new water treatment facility, which will assist us in addressing any and all concerns noted by the regulator in 2018.

Appendix A: Map of Sampling Locations



Appendix B: Operating Permit

PERMIT
TO OPERATE

A Drinking Water System with 301-10000 Connections

System Name: Prince Rupert CWS
Physical Location: 424 3rd Avenue West
Prince Rupert BC

Owner Name: City Of Prince Rupert

Conditions of Permit

>Maintain a minimum of 20 water bacteriology samples per month unless the Environmental Health Officer requests a greater frequency.
>Maintain a minimum of 1 water protozoology (Giardia and Cryptosporidium) sample per month, unless the Environmental Health Officer requests greater frequency.
>Minimum initial concentration 3.0 mg/L chlorine must be met unless the Environmental Health Officer requests a greater concentration
>Minimum chlorine residual of 0.2 ppm shall be maintained within the distribution system and monitored daily.
>Turbidity shall be maintained at a maximum level of 1 NTU in accordance with the Guidelines for Canadian Drinking Water Quality.
>Submit water chemistry data every 6 months, unless the Environmental Health Officer requests a greater frequency.
>An up-to-date Emergency Response plan shall be maintained.
>Operator must be trained and certified to the level specified by the Environmental Operators Certification Program.
>By 31 Mar 2019, working with the Drinking Water Officer and using for reference approved guidance documents, develop a monitoring program for assessing corrosion of materials in residential distribution system (the "field sampling program").
>By 31 Jul 2019, complete the field sampling program.
>By 30 Sep 2019, forward a project report and complete results of field sampling program to Northern Health for review.
> By December 31st, 2019, engage a qualified professional acceptable to the Drinking Water Officer and direct them to complete: (a) an assessment of water quality; and (b) a report detailing treatment options to meet the Provincial Objectives.
> By December 31st, 2019, in consultation with the Drinking Water Officer, determine preferred treatment option or options.
> By March 30th, 2020, complete a financing plan for the preferred option or options.
> By December 31st, 2020, acquire land and obtain regulatory approvals and permits (including a construction permit under the Drinking Water Protection Act) required to implement the preferred option or options.
> By January 1st, 2024, complete the construction of infrastructure necessary to implement the preferred option or options.

1-Jul-1992
Effective Permit Date

Environmental Health Officer

8-Mar-2019
Permit Revised Date

This permit must be displayed in a conspicuous place and is non-transferable

northern health
Expires March 2019
0645

northern health
the northern way of caring

10-411-7011 (LC - Appr. - 06/11pc)

Appendix C: Lab Test Results

See following pages.

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N805194

RECEIVED: 31-May-18

REPORTED: 31-May-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N805194

LAB #				**N805194-01**
SAMPLED DATE				**31-May-18**
SAMPLED TIME				**09:45**
SAMPLE ID				**Frederick Station**
	MRL	***Units***	***CDWG***	
General Parameters (Water)				
Turbidity	*0.05*	*NTU*	*MAC = 1*	**0.83**

Glossary of Terms

MRL	Method Reporting Limit
NTU	Nephelometric Turbidity Units
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Shawatlans
Project Number: -
Project Manager: Public Works Department

Work Order: N812145

RECEIVED: 27-Dec-2018

REPORTED: 09-Jan-2019

Revised to correct "Reported" date format.

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

ANALYTICAL REPORT

City of Prince Rupert - Shawatlans **Work Order:** N812145

LAB #			**N812145-01**	**N812145-02**
SAMPLED DATE			**27-Dec-18**	**27-Dec-18**
SAMPLED TIME			**14:00**	**14:30**
SAMPLE ID			**Shawatlans Lake**	**Frederick Station**
	MRL	***Units***		
General Parameters (Water)				
Carbon, Total Organic	*0.50*	*mg/L*	**6.33**	**3.59**

Glossary of Terms

MRL	Method Reporting Limit
mg/L	Milligrams per Litre

Northern Laboratories (2010) Ltd.
Address: 530 3rd Avenue West Prince Rupert, BC V8J 1L8
Phone: 250.627.1906 • Fax: 250.627.8214 • www.norlabsltd.com • info@norlabsltd.com

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Shawatlans
Project Number: -
Project Manager: Public Works Department

Work Order: N812134

RECEIVED: 20-Dec-2018

REPORTED: 09-Jan-2019

Revised to correct "Reported" date format.

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

ANALYTICAL REPORT

City of Prince Rupert - Shawatlans **Work Order:** N812134

LAB #			**N812134-01**	**N812134-02**
SAMPLED DATE			**20-Dec-18**	**20-Dec-18**
SAMPLED TIME			**09:30**	**09:30**
SAMPLE ID			**Shawatlans Lake**	**Frederick Station**
	MRL	***Units***		
General Parameters (Water)				
Carbon, Total Organic	*0.50*	*mg/L*	**5.43**	**5.29**

Glossary of Terms

MRL	Method Reporting Limit
mg/L	Milligrams per Litre

Northern Laboratories (2010) Ltd.
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ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N811110

RECEIVED: 20-Nov-2018

REPORTED: 09-Jan-2019

Revised to correct "Reported" date format.

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

norlabs
Northern Laboratories (2010) Ltd.

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N811110

LAB #				**N811110-01**	**N811110-02**	**N811110-03**	**N811110-04**
SAMPLED DATE				**20-Nov-18**	**20-Nov-18**	**20-Nov-18**	**20-Nov-18**
SAMPLED TIME				**09:45**	**10:45**	**08:55**	**08:35**
SAMPLE ID				**Sourdough Bay Flushing Station**	**Pillsbury Station**	**Frederick Station**	**Montreal Circle Reservoir**
	MRL	***Units***	***CDWG***				
Calculated Parameters (Water)							
Total Trihalomethanes	*0.0130*	*mg/L*	*MAC = 0.1*	**0.189**	**0.206**	**0.171**	**0.136**
Volatile Organic Compounds (VOC) (Water)							
Bromodichloromethane	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Bromoform	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Chloroform	*0.0100*	*mg/L*	-	**0.189**	**0.206**	**0.171**	**0.136**
Dibromochloromethane	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Toluene-d8	*70-130*	*[surr]*	-	*93%*	*88%*	*91%*	*95%*
4-Bromofluorobenzene	*70-130*	*[surr]*	-	*82%*	*78%*	*82%*	*85%*

Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N808173

RECEIVED: 28-Aug-18

REPORTED: 13-Sep-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N808173

LAB #				**N808173-01**	**N808173-02**	**N808173-03**	**N808173-04**
SAMPLED DATE				**28-Aug-18**	**28-Aug-18**	**28-Aug-18**	**28-Aug-18**
SAMPLED TIME				**08:40**	**09:02**	**09:25**	**14:08**
SAMPLE ID				**Frederick Station**	**Montreal Circle Reservoir**	**Sourdough Bay Flushing Station**	**Pillsbury Station**
	MRL	***Units***	***CDWG***				
Calculated Parameters (Water)							
Total Trihalomethanes	*0.0130*	*mg/L*	*MAC = 0.1*	**0.192**	**0.209**	**0.227**	**0.237**
Volatile Organic Compounds (VOC) (Water)							
Bromodichloromethane	*0.0010*	*mg/L*	-	**0.0011**	**0.0012**	**0.0013**	**0.0014**
Bromoform	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Chloroform	*0.0100*	*mg/L*	-	**0.191**	**0.208**	**0.226**	**0.235**
Dibromochloromethane	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Toluene-d8	*70-130*	*[surr]*	-	*81%*	*71%*	*75%*	*77%*
4-Bromofluorobenzene	*70-130*	*[surr]*	-	*84%*	*60% [1]*	*71%*	*82%*

Special Notes

1 = Surrogate recovery outside of control limits. Data accepted based on acceptable recovery of other surrogates.

Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N805102

RECEIVED: 15-May-18

REPORTED: 12-Jun-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

norlabs
Northern Laboratories (2010) Ltd.

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N805102

LAB #				**N805102-01**	**N805102-02**	**N805102-03**	**N805102-04**
SAMPLED DATE				**15-May-18**	**15-May-18**	**15-May-18**	**15-May-18**
SAMPLED TIME				**08:32**	**08:43**	**09:05**	**09:59**
SAMPLE ID				**Frederick Station**	**Montreal Circle Reservoir**	**Sourdough Bay Flushing Station**	**Pillsbury Stn**
	MRL	***Units***	***CDWG***				
Calculated Parameters (Water)							
Total Trihalomethanes	*0.0130*	*mg/L*	*MAC = 0.1*	<0.0130	**0.0148**	**0.0189**	**0.0186**
Volatile Organic Compounds (VOC) (Water)							
Bromodichloromethane	*0.0010*	*mg/L*	-	<0.0010	<0.0010	**0.0011**	<0.0010
Bromoform	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Chloroform	*0.0100*	*mg/L*	-	**0.0126**	**0.0148**	**0.0178**	**0.0186**
Dibromochloromethane	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Toluene-d8	*70-130*	*[surr]*	-	*118%*	*116%*	*113%*	*113%*
4-Bromofluorobenzene	*70-130*	*[surr]*	-	*63% [1]*	*62% [1]*	*66% [1]*	*62% [1]*

Special Notes

1 = Surrogate recovery outside of control limits. Data accepted based on acceptable recovery of other surrogates.

Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N802124

RECEIVED: 27-Feb-18

REPORTED: 21-Mar-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N802124

LAB #				**N802124-01**	**N802124-02**	**N802124-03**	**N802124-04**
SAMPLED DATE				**27-Feb-18**	**27-Feb-18**	**27-Feb-18**	**27-Feb-18**
SAMPLED TIME				**09:20**	**09:42**	**10:00**	**10:50**
SAMPLE ID				**Frederick Station**	**Montreal Circle Reservoir**	**Sourdough Bay Flushing Station**	**Pillsbury Stn**
	MRL	***Units***	***CDWG***				
Calculated Parameters (Water)							
Total Trihalomethanes	*0.0130*	*mg/L*	*MAC = 0.1*	**0.0676**	**0.0965**	**0.152**	**0.146**
Volatile Organic Compounds (VOC) (Water)							
Bromodichloromethane	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Bromoform	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Chloroform	*0.0100*	*mg/L*	-	**0.0676**	**0.0965**	**0.152**	**0.146**
Dibromochloromethane	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Toluene-d8	*70-130*	*[surr]*	-	*111%*	*107%*	*106%*	*109%*
4-Bromofluorobenzene	*70-130*	*[surr]*	-	*96%*	*93%*	*91%*	*95%*

Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N810003

RECEIVED: 02-Oct-18

REPORTED: 21-Oct-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

City of Prince Rupert - Drinking Water **Work Order:** N810003

LAB #				N810003-01	N810003-02	N810003-03	N810003-04
SAMPLED DATE				02-Oct-18	02-Oct-18	02-Oct-18	02-Oct-18
SAMPLED TIME				11:19	08:58	09:14	08:46
SAMPLE ID				Shawatlans Lake	Montreal Circle Reservoir	Sourdough Bay Flushing Station	Frederick Station
	MRL	*Units*	*CDWG*				
Anions (Water)							
Chloride	*1.0*	*mg/L*	*AO <= 250*	**1.3**	**5.3**	**5.6**	**5.7**
Fluoride	*0.05*	*mg/L*	*MAC = 1.5*	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	*0.01*	*mg/L*	*MAC = 1*	<0.01	<0.01	<0.01	<0.01
Nitrate + Nitrite (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10	<0.10	<0.10	<0.10
Sulfate	*1.0*	*mg/L*	*AO <= 500*	**1.9**	**2.0**	**2.0**	**2.0**
General Parameters (Water)							
pH	*1.0*	*pH units*	*7.0-10.5*	**6.6**	**5.7**	**5.8**	**5.7**
Alkalinity (total, as CaCO3)	*1*	*mg/L*	-	**8**	**3**	**3**	**3**
Conductivity	*1.0*	*uS/cm*	-	**13.5**	**15.7**	**16.2**	**15.6**
Colour	*1*	*PtCo units*	*AO <= 15*	**50**	**22**	**22**	**21**
Turbidity	*0.05*	*NTU*	*MAC = 1*	**0.50**	**0.52**	**0.77**	**0.68**
Solids, Total Dissolved / TDS	*1.0*	*mg/L*	*AO <= 500*	**24**	**30**	**46**	**56**
Carbon, Total Organic	*0.50*	*mg/L*	-	**6.10**	**6.42**	**6.57**	**6.68**
Calculated Parameters (Water)							
Nitrate (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10	<0.10	<0.10	<0.10
Hardness, Total (as CaCO3)	*0.500*	*mg/L*	-	**10.5**	**10.2**	**11.0**	**10.1**
Total Metals (Water)							
Aluminum, total	*0.0050*	*mg/L*	*OG < 0.1*	**0.109**	**0.0984**	**0.100**	**0.0999**
Antimony, total	*0.00020*	*mg/L*	*MAC = 0.006*	<0.00020	<0.00020	<0.00020	<0.00020
Arsenic, total	*0.00050*	*mg/L*	*MAC = 0.01*	<0.00050	<0.00050	<0.00050	<0.00050
Barium, total	*0.0050*	*mg/L*	*MAC = 1*	**0.0116**	**0.0116**	**0.0125**	**0.0122**
Beryllium, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Boron, total	*0.0050*	*mg/L*	*MAC = 5*	**0.0187**	**0.0157**	**0.0149**	**0.0143**
Cadmium, total	*0.000010*	*mg/L*	*MAC = 0.005*	**0.000146**	<0.000010	<0.000010	**0.000010**
Calcium, total	*0.20*	*mg/L*	-	**3.58**	**3.48**	**3.77**	**3.44**
Chromium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Copper, total	*0.00040*	*mg/L*	*AO <= 1*	**0.236**	**0.0622**	**0.0337**	**0.0460**
Iron, total	*0.010*	*mg/L*	*AO <= 0.3*	**0.157**	**0.146**	**0.183**	**0.148**

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N810003

				N810003-01	N810003-02	N810003-03	N810003-04
LAB #							
SAMPLED DATE				02-Oct-18	02-Oct-18	02-Oct-18	02-Oct-18
SAMPLED TIME				11:19	08:58	09:14	08:46
SAMPLE ID				Shawatlans Lake	Montreal Circle Reservoir	Sourdough Bay Flushing Station	Frederick Station
	MRL	***Units***	***CDWG***				
Total Metals (continued)							
Lead, total	*0.00020*	*mg/L*	*MAC = 0.01*	**0.00812**	**0.00037**	**0.00064**	**0.00024**
Lithium, total	*0.00010*	*mg/L*	-	**0.00023**	**0.00022**	**0.00025**	**0.00025**
Magnesium, total	*0.010*	*mg/L*	-	**0.384**	**0.366**	**0.392**	**0.368**
Manganese, total	*0.00020*	*mg/L*	*AO <= 0.05*	**0.00527**	**0.00461**	**0.00523**	**0.00469**
Mercury, total	*0.000010*	*mg/L*	*MAC = 0.001*	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Nickel, total	*0.00040*	*mg/L*	-	**0.00085**	<0.00040	**0.00042**	<0.00040
Phosphorus, total	*0.050*	*mg/L*	-	<0.050	<0.050	<0.050	<0.050
Potassium, total	*0.10*	*mg/L*	-	**0.43**	**0.40**	**0.42**	**0.41**
Selenium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050	<0.00050	<0.00050	<0.00050
Silicon, total	*1.0*	*mg/L*	-	**1.3**	**1.2**	**1.1**	**1.1**
Silver, total	*0.000050*	*mg/L*	-	<0.000050	<0.000050	<0.000050	<0.000050
Sodium, total	*0.10*	*mg/L*	*AO <= 200*	**1.10**	**1.04**	**1.23**	**1.06**
Strontium, total	*0.0010*	*mg/L*	-	**0.0128**	**0.0126**	**0.0131**	**0.0123**
Sulfur, total	*3.0*	*mg/L*	-	<3.0	<3.0	<3.0	<3.0
Tellurium, total	*0.00050*	*mg/L*	-	<0.00050	<0.00050	<0.00050	<0.00050
Thallium, total	*0.000020*	*mg/L*	-	<0.000020	<0.000020	<0.000020	<0.000020
Thorium, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin, total	*0.00020*	*mg/L*	-	**0.00142**	<0.00020	<0.00020	<0.00020
Titanium, total	*0.0050*	*mg/L*	-	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten, total	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Uranium, total	*0.000020*	*mg/L*	*MAC = 0.02*	<0.000020	<0.000020	<0.000020	<0.000020
Vanadium, total	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Zinc, total	*0.0040*	*mg/L*	*AO <= 5*	**0.0755**	**0.0053**	<0.0040	**0.0052**
Zirconium, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N810003

LAB #				**N810003-05**
SAMPLED DATE				**02-Oct-18**
SAMPLED TIME				**09:33**
SAMPLE ID				**Pillsbury Station**
	MRL	***Units***	***CDWG***	
Anions (Water)				
Chloride	*1.0*	*mg/L*	*AO <= 250*	**5.8**
Fluoride	*0.05*	*mg/L*	*MAC = 1.5*	<0.10
Nitrite (as N)	*0.01*	*mg/L*	*MAC = 1*	<0.01
Nitrate + Nitrite (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10
Sulfate	*1.0*	*mg/L*	*AO <= 500*	**2.0**
General Parameters (Water)				
pH	*1.0*	*pH units*	*7.0-10.5*	**5.7**
Alkalinity (total, as CaCO3)	*1*	*mg/L*	-	**3**
Conductivity	*1.0*	*uS/cm*	-	**16.1**
Colour	*1*	*PtCo units*	*AO <= 15*	**22**
Turbidity	*0.05*	*NTU*	*MAC = 1*	**0.81**
Solids, Total Dissolved / TDS	*1.0*	*mg/L*	*AO <= 500*	**51**
Carbon, Total Organic	*0.50*	*mg/L*	-	**6.42**
Calculated Parameters (Water)				
Nitrate (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10
Hardness, Total (as CaCO3)	*0.500*	*mg/L*	-	**10.7**
Total Metals (Water)				
Aluminum, total	*0.0050*	*mg/L*	*OG < 0.1*	**0.0978**
Antimony, total	*0.00020*	*mg/L*	*MAC = 0.006*	<0.00020
Arsenic, total	*0.00050*	*mg/L*	*MAC = 0.01*	<0.00050
Barium, total	*0.0050*	*mg/L*	*MAC = 1*	**0.0117**
Beryllium, total	*0.00010*	*mg/L*	-	<0.00010
Bismuth, total	*0.00010*	*mg/L*	-	<0.00010
Boron, total	*0.0050*	*mg/L*	*MAC = 5*	**0.0142**
Cadmium, total	*0.000010*	*mg/L*	*MAC = 0.005*	**0.000013**
Calcium, total	*0.20*	*mg/L*	-	**3.67**
Chromium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050
Cobalt, total	*0.00010*	*mg/L*	-	<0.00010
Copper, total	*0.00040*	*mg/L*	*AO <= 1*	**0.100**
Iron, total	*0.010*	*mg/L*	*AO <= 0.3*	**0.155**
Lead, total	*0.00020*	*mg/L*	*MAC = 0.01*	**0.00060**

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N810003

LAB #				**N810003-05**
SAMPLED DATE				**02-Oct-18**
SAMPLED TIME				**09:33**
SAMPLE ID				**Pillsbury Station**
	MRL	***Units***	***CDWG***	
Total Metals (continued)				
Lithium, total	*0.00010*	*mg/L*	-	**0.00025**
Magnesium, total	*0.010*	*mg/L*	-	**0.364**
Manganese, total	*0.00020*	*mg/L*	*AO <= 0.05*	**0.00489**
Mercury, total	*0.000010*	*mg/L*	*MAC = 0.001*	<0.000010
Molybdenum, total	*0.00010*	*mg/L*	-	<0.00010
Nickel, total	*0.00040*	*mg/L*	-	<0.00040
Phosphorus, total	*0.050*	*mg/L*	-	<0.050
Potassium, total	*0.10*	*mg/L*	-	**0.41**
Selenium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050
Silicon, total	*1.0*	*mg/L*	-	**1.2**
Silver, total	*0.000050*	*mg/L*	-	<0.000050
Sodium, total	*0.10*	*mg/L*	*AO <= 200*	**1.05**
Strontium, total	*0.0010*	*mg/L*	-	**0.0126**
Sulfur, total	*3.0*	*mg/L*	-	<3.0
Tellurium, total	*0.00050*	*mg/L*	-	<0.00050
Thallium, total	*0.000020*	*mg/L*	-	<0.000020
Thorium, total	*0.00010*	*mg/L*	-	<0.00010
Tin, total	*0.00020*	*mg/L*	-	<0.00020
Titanium, total	*0.0050*	*mg/L*	-	<0.0050
Tungsten, total	*0.0010*	*mg/L*	-	<0.0010
Uranium, total	*0.000020*	*mg/L*	*MAC = 0.02*	<0.000020
Vanadium, total	*0.0010*	*mg/L*	-	<0.0010
Zinc, total	*0.0040*	*mg/L*	*AO <= 5*	**0.0053**
Zirconium, total	*0.00010*	*mg/L*	-	<0.00010

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N810003

Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
NTU	Nephelometric Turbidity Units
pH units	pH units
PtCo units	Platinum Colbalt colour units
uS/cm	Micro Siemens per centimeter
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
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Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N807180

RECEIVED: 24-Jul-18

REPORTED: 22-Aug-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N807180

LAB #				**N807180-01**	**N807180-02**	**N807180-03**	**N807180-04**
SAMPLED DATE				**24-Jul-18**	**24-Jul-18**	**24-Jul-18**	**24-Jul-18**
SAMPLED TIME				**09:15**	**09:58**	**10:30**	**11:30**
SAMPLE ID				**Frederick Station**	**Montreal Circle Reservoir**	**Pillsbury Station**	**Sourdough Bay Flushing Station**
	MRL	***Units***	***CDWG***				
Anions (Water)							
Chloride	*1.0*	*mg/L*	*AO <= 250*	**4.8**	**5.0**	**5.2**	**5.5**
Fluoride	*0.05*	*mg/L*	*MAC = 1.5*	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	*0.01*	*mg/L*	*MAC = 1*	<0.01	<0.01	<0.01	<0.01
Nitrate + Nitrite (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10	<0.10	<0.10	<0.10
Sulfate	*1.0*	*mg/L*	*AO <= 500*	**1.8**	**1.7**	**1.6**	**1.6**
General Parameters (Water)							
pH	*1.0*	*pH units*	*7.0-10.5*	**5.9**	**5.8**	**5.8**	**5.8**
Alkalinity (total, as CaCO3)	*1*	*mg/L*	-	**3**	**2**	**3**	**3**
Conductivity	*1.0*	*uS/cm*	-	**23.1**	**23.4**	**24.1**	**24.1**
Colour	*1*	*PtCo units*	*AO <= 15*	**5**	**14**	**11**	**15**
Turbidity	*0.05*	*NTU*	*MAC = 1*	**0.51**	**0.58**	**0.60**	**0.45**
Solids, Total Dissolved / TDS	*1.0*	*mg/L*	*AO <= 500*	**36**	**32**	**63**	**39**
Carbon, Total Organic	*0.50*	*mg/L*	-	**4.80**	**5.32**	**4.94**	**4.97**
Calculated Parameters (Water)							
Nitrate (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10	<0.10	<0.10	<0.10
Hardness, Total (as CaCO3)	*0.500*	*mg/L*	-	**10.6**	**10.1**	**10.9**	**10.2**
Total Metals (Water)							
Aluminum, total	*0.0050*	*mg/L*	*OG < 0.1*	**0.0826**	**0.0924**	**0.0845**	**0.0903**
Antimony, total	*0.00020*	*mg/L*	*MAC = 0.006*	<0.00020	<0.00020	<0.00020	<0.00020
Arsenic, total	*0.00050*	*mg/L*	*MAC = 0.01*	<0.00050	<0.00050	<0.00050	<0.00050
Barium, total	*0.0050*	*mg/L*	*MAC = 1*	**0.0112**	**0.0106**	**0.0112**	**0.0111**
Beryllium, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Boron, total	*0.0050*	*mg/L*	*MAC = 5*	**0.0104**	**0.0093**	**0.0089**	**0.0084**
Cadmium, total	*0.000010*	*mg/L*	*MAC = 0.005*	**0.000012**	<0.000010	<0.000010	<0.000010
Calcium, total	*0.20*	*mg/L*	-	**3.66**	**3.49**	**3.80**	**3.52**
Chromium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Copper, total	*0.00040*	*mg/L*	*AO <= 1*	**0.0528**	**0.0634**	**0.101**	**0.0186**
Iron, total	*0.010*	*mg/L*	*AO <= 0.3*	**0.100**	**0.102**	**0.113**	**0.129**

City of Prince Rupert - Drinking Water **Work Order:** N807180

LAB #				**N807180-01**	**N807180-02**	**N807180-03**	**N807180-04**
SAMPLED DATE				**24-Jul-18**	**24-Jul-18**	**24-Jul-18**	**24-Jul-18**
SAMPLED TIME				**09:15**	**09:58**	**10:30**	**11:30**
SAMPLE ID				**Frederick Station**	**Montreal Circle Reservoir**	**Pillsbury Station**	**Sourdough Bay Flushing Station**
	MRL	***Units***	***CDWG***				
Total Metals (continued)							
Lead, total	*0.00020*	*mg/L*	*MAC = 0.01*	**0.00036**	**0.00034**	**0.00042**	**0.00052**
Lithium, total	*0.00010*	*mg/L*	-	**0.00019**	**0.00019**	**0.00019**	**0.00018**
Magnesium, total	*0.010*	*mg/L*	-	**0.340**	**0.329**	**0.344**	**0.342**
Manganese, total	*0.00020*	*mg/L*	*AO <= 0.05*	**0.00315**	**0.00300**	**0.00326**	**0.00386**
Mercury, total	*0.000010*	*mg/L*	*MAC = 0.001*	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Nickel, total	*0.00040*	*mg/L*	-	**0.00091**	**0.00047**	<0.00040	**0.00044**
Phosphorus, total	*0.050*	*mg/L*	-	<0.050	<0.050	<0.050	<0.050
Potassium, total	*0.10*	*mg/L*	-	**0.35**	**0.33**	**0.36**	**0.36**
Selenium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050	<0.00050	<0.00050	<0.00050
Silicon, total	*1.0*	*mg/L*	-	<1.0	<1.0	<1.0	<1.0
Silver, total	*0.000050*	*mg/L*	-	<0.000050	<0.000050	<0.000050	<0.000050
Sodium, total	*0.10*	*mg/L*	*AO <= 200*	**0.98**	**0.92**	**0.96**	**0.94**
Strontium, total	*0.0010*	*mg/L*	-	**0.0132**	**0.0133**	**0.0136**	**0.0132**
Sulfur, total	*3.0*	*mg/L*	-	<3.0	<3.0	<3.0	<3.0
Tellurium, total	*0.00050*	*mg/L*	-	<0.00050	<0.00050	<0.00050	<0.00050
Thallium, total	*0.000020*	*mg/L*	-	<0.000020	<0.000020	<0.000020	<0.000020
Thorium, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin, total	*0.00020*	*mg/L*	-	<0.00020	<0.00020	<0.00020	<0.00020
Titanium, total	*0.0050*	*mg/L*	-	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten, total	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Uranium, total	*0.000020*	*mg/L*	*MAC = 0.02*	<0.000020	<0.000020	<0.000020	<0.000020
Vanadium, total	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Zinc, total	*0.0040*	*mg/L*	*AO <= 5*	**0.0083**	**0.0053**	<0.0040	<0.0040
Zirconium, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010

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City of Prince Rupert - Drinking Water **Work Order:** N807180

LAB #				**N807180-05**
SAMPLED DATE				**24-Jul-18**
SAMPLED TIME				**11:30**
SAMPLE ID				**Shawatlans Lake**
	MRL	***Units***	***CDWG***	
Anions (Water)				
Chloride	*1.0*	*mg/L*	*AO <= 250*	**1.6**
Fluoride	*0.05*	*mg/L*	*MAC = 1.5*	<0.10
Nitrite (as N)	*0.01*	*mg/L*	*MAC = 1*	<0.01
Nitrate + Nitrite (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10
Sulfate	*1.0*	*mg/L*	*AO <= 500*	**1.6**
General Parameters (Water)				
pH	*1.0*	*pH units*	*7.0-10.5*	**6.8**
Alkalinity (total, as CaCO3)	*1*	*mg/L*	-	**9**
Conductivity	*1.0*	*uS/cm*	-	**19.9**
Colour	*1*	*PtCo units*	*AO <= 15*	**43**
Turbidity	*0.05*	*NTU*	*MAC = 1*	**0.38**
Solids, Total Dissolved / TDS	*1.0*	*mg/L*	*AO <= 500*	**28**
Carbon, Total Organic	*0.50*	*mg/L*	-	**5.03**
Calculated Parameters (Water)				
Nitrate (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10
Hardness, Total (as CaCO3)	*0.500*	*mg/L*	-	**9.50**
Total Metals (Water)				
Aluminum, total	*0.0050*	*mg/L*	*OG < 0.1*	**0.0814**
Antimony, total	*0.00020*	*mg/L*	*MAC = 0.006*	<0.00020
Arsenic, total	*0.00050*	*mg/L*	*MAC = 0.01*	<0.00050
Barium, total	*0.0050*	*mg/L*	*MAC = 1*	**0.0096**
Beryllium, total	*0.00010*	*mg/L*	-	<0.00010
Bismuth, total	*0.00010*	*mg/L*	-	<0.00010
Boron, total	*0.0050*	*mg/L*	*MAC = 5*	**0.0082**
Cadmium, total	*0.000010*	*mg/L*	*MAC = 0.005*	<0.000010
Calcium, total	*0.20*	*mg/L*	-	**3.27**
Chromium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050
Cobalt, total	*0.00010*	*mg/L*	-	<0.00010
Copper, total	*0.00040*	*mg/L*	*AO <= 1*	**0.00179**
Iron, total	*0.010*	*mg/L*	*AO <= 0.3*	**0.101**
Lead, total	*0.00020*	*mg/L*	*MAC = 0.01*	<0.00020

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LAB #				**N807180-05**
SAMPLED DATE				**24-Jul-18**
SAMPLED TIME				**11:30**
SAMPLE ID				**Shawatlans Lake**
	MRL	***Units***	***CDWG***	
Total Metals (continued)				
Lithium, total	*0.00010*	*mg/L*	-	**0.00020**
Magnesium, total	*0.010*	*mg/L*	-	**0.323**
Manganese, total	*0.00020*	*mg/L*	*AO <= 0.05*	**0.00314**
Mercury, total	*0.000010*	*mg/L*	*MAC = 0.001*	<0.000010
Molybdenum, total	*0.00010*	*mg/L*	-	<0.00010
Nickel, total	*0.00040*	*mg/L*	-	<0.00040
Phosphorus, total	*0.050*	*mg/L*	-	<0.050
Potassium, total	*0.10*	*mg/L*	-	**0.34**
Selenium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050
Silicon, total	*1.0*	*mg/L*	-	<1.0
Silver, total	*0.000050*	*mg/L*	-	<0.000050
Sodium, total	*0.10*	*mg/L*	*AO <= 200*	**0.90**
Strontium, total	*0.0010*	*mg/L*	-	**0.0128**
Sulfur, total	*3.0*	*mg/L*	-	<3.0
Tellurium, total	*0.00050*	*mg/L*	-	<0.00050
Thallium, total	*0.000020*	*mg/L*	-	<0.000020
Thorium, total	*0.00010*	*mg/L*	-	<0.00010
Tin, total	*0.00020*	*mg/L*	-	<0.00020
Titanium, total	*0.0050*	*mg/L*	-	<0.0050
Tungsten, total	*0.0010*	*mg/L*	-	<0.0010
Uranium, total	*0.000020*	*mg/L*	*MAC = 0.02*	<0.000020
Vanadium, total	*0.0010*	*mg/L*	-	<0.0010
Zinc, total	*0.0040*	*mg/L*	*AO <= 5*	<0.0040
Zirconium, total	*0.00010*	*mg/L*	-	<0.00010

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Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
NTU	Nephelometric Turbidity Units
pH units	pH units
PtCo units	Platinum Colbalt colour units
uS/cm	Micro Siemens per centimeter
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

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424 3rd Avenue West
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water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N804089

RECEIVED: 17-Apr-18

REPORTED: 23-May-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N804089

LAB #				**N804089-01**	**N804089-02**	**N804089-03**	**N804089-04**
SAMPLED DATE				**17-Apr-18**	**17-Apr-18**	**17-Apr-18**	**17-Apr-18**
SAMPLED TIME				**08:52**	**09:06**	**10:12**	**10:46**
SAMPLE ID				**Frederick Station**	**Montreal Circle Reservoir**	**Pillsbury Station**	**Sourdough Bay Flushing Station**
	MRL	***Units***	***CDWG***				
Anions (Water)							
Chloride	*1.0*	*mg/L*	*AO <= 250*	**5.0**	**5.2**	**5.2**	**5.2**
Fluoride	*0.05*	*mg/L*	*MAC = 1.5*	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	*0.01*	*mg/L*	*MAC = 1*	<0.01	<0.01	<0.01	<0.01
Nitrate + Nitrite (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10	<0.10	<0.10	<0.10
Sulfate	*1.0*	*mg/L*	*AO <= 500*	**1.6**	**1.6**	**1.6**	**1.6**
General Parameters (Water)							
pH	*1.0*	*pH units*	*7.0-10.5*	**6.0**	**5.9**	**5.9**	**5.9**
Alkalinity (total, as CaCO3)	*1*	*mg/L*	-	**4**	**3**	**4**	**8**
Conductivity	*1.0*	*uS/cm*	-	**28.3**	**28.5**	**21.7**	**28.5**
Colour	*1*	*PtCo units*	*AO <= 15*	**27**	**26**	**25**	**20**
Turbidity	*0.05*	*NTU*	*MAC = 1*	**0.79**	**0.69**	**0.69**	**0.68**
Solids, Total Dissolved / TDS	*1.0*	*mg/L*	*AO <= 500*	**25**	**56**	**35**	**36**
Carbon, Total Organic	*0.50*	*mg/L*	-	**4.37**	**4.64**	**4.70**	**4.72**
Calculated Parameters (Water)							
Nitrate (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10	<0.10	<0.10	<0.10
Hardness, Total (as CaCO3)	*0.500*	*mg/L*	-	**9.59**	**9.19**	**9.23**	**9.24**
Total Metals (Water)							
Aluminum, total	*0.0050*	*mg/L*	*OG < 0.1*	**0.130**	**0.122**	**0.117**	**0.155**
Antimony, total	*0.00020*	*mg/L*	*MAC = 0.006*	<0.00020	<0.00020	<0.00020	<0.00020
Arsenic, total	*0.00050*	*mg/L*	*MAC = 0.01*	<0.00050	<0.00050	<0.00050	<0.00050
Barium, total	*0.0050*	*mg/L*	*MAC = 1*	**0.0111**	**0.0106**	**0.0106**	**0.0113**
Beryllium, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Boron, total	*0.0050*	*mg/L*	*MAC = 5*	**0.0056**	<0.0050	<0.0050	<0.0050
Cadmium, total	*0.000010*	*mg/L*	*MAC = 0.005*	<0.000010	<0.000010	<0.000010	<0.000010
Calcium, total	*0.20*	*mg/L*	-	**3.27**	**3.14**	**3.17**	**3.15**
Chromium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	**0.00011**
Copper, total	*0.00040*	*mg/L*	*AO <= 1*	**0.0302**	**0.0454**	**0.0536**	**0.00943**
Iron, total	*0.010*	*mg/L*	*AO <= 0.3*	**0.239**	**0.218**	**0.217**	**0.392**

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ANALYTICAL REPORT

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LAB #				**N804089-01**	**N804089-02**	**N804089-03**	**N804089-04**
SAMPLED DATE				**17-Apr-18**	**17-Apr-18**	**17-Apr-18**	**17-Apr-18**
SAMPLED TIME				**08:52**	**09:06**	**10:12**	**10:46**
SAMPLE ID				**Frederick Station**	**Montreal Circle Reservoir**	**Pillsbury Station**	**Sourdough Bay Flushing Station**
	MRL	***Units***	***CDWG***				
Total Metals (continued)							
Lead, total	*0.00020*	*mg/L*	*MAC = 0.01*	<0.00020	<0.00020	**0.00026**	**0.00041**
Lithium, total	*0.00010*	*mg/L*	-	**0.00025**	**0.00019**	**0.00019**	**0.00018**
Magnesium, total	*0.010*	*mg/L*	-	**0.344**	**0.323**	**0.315**	**0.333**
Manganese, total	*0.00020*	*mg/L*	*AO <= 0.05*	**0.00924**	**0.00793**	**0.00680**	**0.0170**
Mercury, total	*0.000010*	*mg/L*	*MAC = 0.001*	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Nickel, total	*0.00040*	*mg/L*	-	<0.00040	<0.00040	<0.00040	<0.00040
Phosphorus, total	*0.050*	*mg/L*	-	<0.050	<0.050	<0.050	<0.050
Potassium, total	*0.10*	*mg/L*	-	**0.39**	**0.38**	**0.36**	**0.38**
Selenium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050	<0.00050	<0.00050	<0.00050
Silicon, total	*1.0*	*mg/L*	-	**1.3**	**1.3**	**1.2**	**1.3**
Silver, total	*0.000050*	*mg/L*	-	<0.000050	<0.000050	<0.000050	<0.000050
Sodium, total	*0.10*	*mg/L*	*AO <= 200*	**1.04**	**0.96**	**0.93**	**0.92**
Strontium, total	*0.0010*	*mg/L*	-	**0.0112**	**0.0110**	**0.0111**	**0.0110**
Sulfur, total	*3.0*	*mg/L*	-	<3.0	<3.0	<3.0	<3.0
Tellurium, total	*0.00050*	*mg/L*	-	<0.00050	<0.00050	<0.00050	<0.00050
Thallium, total	*0.000020*	*mg/L*	-	<0.000020	<0.000020	<0.000020	<0.000020
Thorium, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin, total	*0.00020*	*mg/L*	-	<0.00020	<0.00020	<0.00020	<0.00020
Titanium, total	*0.0050*	*mg/L*	-	<0.0050	<0.0050	<0.0050	**0.0054**
Tungsten, total	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Uranium, total	*0.000020*	*mg/L*	*MAC = 0.02*	<0.000020	<0.000020	<0.000020	<0.000020
Vanadium, total	*0.0010*	*mg/L*	-	<0.0010	<0.0010	<0.0010	<0.0010
Zinc, total	*0.0040*	*mg/L*	*AO <= 5*	<0.0040	<0.0040	<0.0040	<0.0040
Zirconium, total	*0.00010*	*mg/L*	-	<0.00010	<0.00010	<0.00010	<0.00010

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City of Prince Rupert - Drinking Water **Work Order:** N804089

LAB #				**N804089-05**
SAMPLED DATE				**17-Apr-18**
SAMPLED TIME				**15:00**
SAMPLE ID				**Shawatlans Lake**
	MRL	***Units***	***CDWG***	
Anions (Water)				
Chloride	*1.0*	*mg/L*	*AO <= 250*	**1.8**
Fluoride	*0.05*	*mg/L*	*MAC = 1.5*	<0.10
Nitrite (as N)	*0.01*	*mg/L*	*MAC = 1*	<0.01
Nitrate + Nitrite (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10
Sulfate	*1.0*	*mg/L*	*AO <= 500*	**1.6**
General Parameters (Water)				
pH	*1.0*	*pH units*	*7.0-10.5*	**6.7**
Alkalinity (total, as CaCO3)	*1*	*mg/L*	-	**8**
Conductivity	*1.0*	*uS/cm*	-	**24.5**
Colour	*1*	*PtCo units*	*AO <= 15*	**47**
Turbidity	*0.05*	*NTU*	*MAC = 1*	**1.80**
Solids, Total Dissolved / TDS	*1.0*	*mg/L*	*AO <= 500*	**37**
Carbon, Total Organic	*0.50*	*mg/L*	-	**4.74**
Calculated Parameters (Water)				
Nitrate (as N)	*0.10*	*mg/L*	*MAC = 10*	<0.10
Hardness, Total (as CaCO3)	*0.500*	*mg/L*	-	**8.81**
Total Metals (Water)				
Aluminum, total	*0.0050*	*mg/L*	*OG < 0.1*	**0.117**
Antimony, total	*0.00020*	*mg/L*	*MAC = 0.006*	<0.00020
Arsenic, total	*0.00050*	*mg/L*	*MAC = 0.01*	<0.00050
Barium, total	*0.0050*	*mg/L*	*MAC = 1*	**0.0104**
Beryllium, total	*0.00010*	*mg/L*	-	<0.00010
Bismuth, total	*0.00010*	*mg/L*	-	<0.00010
Boron, total	*0.0050*	*mg/L*	*MAC = 5*	<0.0050
Cadmium, total	*0.000010*	*mg/L*	*MAC = 0.005*	<0.000010
Calcium, total	*0.20*	*mg/L*	-	**3.01**
Chromium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050
Cobalt, total	*0.00010*	*mg/L*	-	<0.00010
Copper, total	*0.00040*	*mg/L*	*AO <= 1*	**0.00150**
Iron, total	*0.010*	*mg/L*	*AO <= 0.3*	**0.200**
Lead, total	*0.00020*	*mg/L*	*MAC = 0.01*	<0.00020

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N804089

LAB #				**N804089-05**
SAMPLED DATE				**17-Apr-18**
SAMPLED TIME				**15:00**
SAMPLE ID				**Shawatlans Lake**
	MRL	***Units***	***CDWG***	
Total Metals (continued)				
Lithium, total	*0.00010*	*mg/L*	-	**0.00014**
Magnesium, total	*0.010*	*mg/L*	-	**0.310**
Manganese, total	*0.00020*	*mg/L*	*AO <= 0.05*	**0.00775**
Mercury, total	*0.000010*	*mg/L*	*MAC = 0.001*	<0.000010
Molybdenum, total	*0.00010*	*mg/L*	-	<0.00010
Nickel, total	*0.00040*	*mg/L*	-	<0.00040
Phosphorus, total	*0.050*	*mg/L*	-	<0.050
Potassium, total	*0.10*	*mg/L*	-	**0.35**
Selenium, total	*0.00050*	*mg/L*	*MAC = 0.05*	<0.00050
Silicon, total	*1.0*	*mg/L*	-	**1.2**
Silver, total	*0.000050*	*mg/L*	-	<0.000050
Sodium, total	*0.10*	*mg/L*	*AO <= 200*	**0.89**
Strontium, total	*0.0010*	*mg/L*	-	**0.0107**
Sulfur, total	*3.0*	*mg/L*	-	<3.0
Tellurium, total	*0.00050*	*mg/L*	-	<0.00050
Thallium, total	*0.000020*	*mg/L*	-	<0.000020
Thorium, total	*0.00010*	*mg/L*	-	<0.00010
Tin, total	*0.00020*	*mg/L*	-	<0.00020
Titanium, total	*0.0050*	*mg/L*	-	<0.0050
Tungsten, total	*0.0010*	*mg/L*	-	<0.0010
Uranium, total	*0.000020*	*mg/L*	*MAC = 0.02*	<0.000020
Vanadium, total	*0.0010*	*mg/L*	-	<0.0010
Zinc, total	*0.0040*	*mg/L*	*AO <= 5*	<0.0040
Zirconium, total	*0.00010*	*mg/L*	-	<0.00010

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N804089

Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
NTU	Nephelometric Turbidity Units
pH units	pH units
PtCo units	Platinum Colbalt colour units
uS/cm	Micro Siemens per centimeter
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert BC, V8J 1L7
water@princerupert.ca

Project: New Landfill
Project Number: -
Project Manager: Public Works Department

Work Order: N803097

RECEIVED: 15-Mar-18

REPORTED: 25-Apr-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

ANALYTICAL REPORT

City of Prince Rupert **Work Order:** N803097

LAB #			**N803097-01**	**N803097-02**	**N803097-03**	**N803097-04**
SAMPLED DATE			**15-Mar-18**	**15-Mar-18**	**15-Mar-18**	**15-Mar-18**
SAMPLED TIME			**10:20**	**09:47**	**09:57**	**10:50**
SAMPLE ID			**Lower East Creek**	**Lower West Creek**	**MW 04**	**MW 15**
	MRL	***Units***				
Anions (Water)						
Chloride	*1.0*	*mg/L*	**4.8**	**5.1**	**4.1**	**3.1**
Nitrite (as N)	*0.01*	*mg/L*	<0.01	<0.01	<0.01	<0.01
Nitrate+Nitrite (as N)	*0.0050*	*mg/L*	**0.562**	**0.0347**	**0.0683**	**0.214**
Sulfate	*1.0*	*mg/L*	**69.3**	**5.1**	<1.0	**59.6**
General Parameters (Water)						
pH	*1.0*	*pH units*	**7.6**	**7.4**	**8.1**	**8.0**
Conductivity	*1.0*	*uS/cm*	**244**	**82.2**	**478**	**492**
Biochemical Oxygen Demand / BOD	*4.0*	*mg/L*	<4.0	<4.0	<4.0	<4.0
Chemical Oxygen Demand / COD	*20*	*mg/L*	<20	<20	<20	<20
Solids, Total Dissolved / TDS	*1.0*	*mg/L*	**160**	**54**		
Solids, Total Suspended / TSS	*1.0*	*mg/L*	<1.0	**1.9**		
Ammonia (total as N)	*0.03*	*mg/L*	<0.03	**0.05**	**0.12**	<0.03
Nitrogen, Total Kjeldahl	*0.050*	*mg/L*			**0.145**	**0.091**
Calculated Parameters (Water)						
Nitrate (as N)	*0.010*	*mg/L*	**0.56**	**0.035**	**0.068**	**0.21**
Hardness, Total (as CaCO3)	*0.500*	*mg/L*	**100**	**31.1**	**101**	**185**
Hardness, Total (as CaCO3)	*0.500*	*mg/L*	**98.9**	**31.9**		
Nitrogen, Total	*0.0500*	*mg/L*			**0.213**	**0.305**
Dissolved Metals (Water)						
Aluminum, dissolved	*0.0050*	*mg/L*	**0.0544**	**0.0550**	<0.0050	<0.0050
Antimony, dissolved	*0.00020*	*mg/L*	<0.00020	<0.00020	<0.00020	<0.00020
Arsenic, dissolved	*0.00050*	*mg/L*	<0.00050	<0.00050	**0.00094**	**0.00056**
Barium, dissolved	*0.0050*	*mg/L*	**0.0191**	**0.0165**	**0.0227**	**0.0482**
Beryllium, dissolved	*0.00010*	*mg/L*	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth, dissolved	*0.00010*	*mg/L*	<0.00010	<0.00010	<0.00010	<0.00010
Boron, dissolved	*0.0050*	*mg/L*	**0.0080**	<0.0050	**0.0537**	**0.0079**
Cadmium, dissolved	*0.000010*	*mg/L*	**0.000029**	<0.000010	**0.000015**	**0.000033**
Calcium, dissolved	*0.20*	*mg/L*	**35.3**	**11.0**	**17.1**	**58.0**
Chromium, dissolved	*0.00050*	*mg/L*	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt, dissolved	*0.00010*	*mg/L*	<0.00010	<0.00010	<0.00010	<0.00010
Copper, dissolved	*0.00040*	*mg/L*	**0.00073**	**0.00044**	**0.00046**	**0.00045**

City of Prince Rupert **Work Order:** N803097

LAB #			N803097-01	N803097-02	N803097-03	N803097-04
SAMPLED DATE			15-Mar-18	15-Mar-18	15-Mar-18	15-Mar-18
SAMPLED TIME			10:20	09:47	09:57	10:50
SAMPLE ID			Lower East Creek	Lower West Creek	MW 04	MW 15
	MRL	*Units*				
Dissolved Metals (continued)						
Iron, dissolved	*0.010*	*mg/L*	**0.098**	**0.139**	**0.028**	<0.010
Lead, dissolved	*0.00020*	*mg/L*	<0.00020	<0.00020	<0.00020	<0.00020
Lithium, dissolved	*0.00010*	*mg/L*	**0.00030**	<0.00010	**0.00480**	**0.00077**
Magnesium, dissolved	*0.010*	*mg/L*	**2.88**	**0.896**	**14.2**	**9.80**
Manganese, dissolved	*0.00020*	*mg/L*	**0.00691**	**0.0239**	**0.0305**	**0.00039**
Mercury, dissolved	*0.000010*	*mg/L*	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum, dissolved	*0.00010*	*mg/L*	**0.00115**	<0.00010	**0.00037**	**0.00849**
Nickel, dissolved	*0.00040*	*mg/L*	**0.00135**	<0.00040	<0.00040	<0.00040
Phosphorus, dissolved	*0.050*	*mg/L*	<0.050	<0.050	<0.050	<0.050
Potassium, dissolved	*0.10*	*mg/L*	**2.65**	**1.03**	**12.7**	**5.89**
Selenium, dissolved	*0.00050*	*mg/L*	**0.00108**	<0.00050	<0.00050	<0.00050
Silicon, dissolved	*1.0*	*mg/L*	**1.4**	**1.7**	**6.5**	**4.8**
Silver, dissolved	*0.000050*	*mg/L*	<0.000050	<0.000050	<0.000050	<0.000050
Sodium, dissolved	*0.10*	*mg/L*	**2.41**	**2.06**	**58.9**	**29.1**
Strontium, dissolved	*0.0010*	*mg/L*	**0.128**	**0.0288**	**0.374**	**0.368**
Sulfur, dissolved	*3.0*	*mg/L*	**20.0**	<3.0	<3.0	**19.3**
Tellurium, dissolved	*0.00050*	*mg/L*	<0.00050	<0.00050	<0.00050	<0.00050
Thallium, dissolved	*0.000020*	*mg/L*	<0.000020	<0.000020	<0.000020	<0.000020
Thorium, dissolved	*0.00010*	*mg/L*	<0.00010	<0.00010	<0.00010	<0.00010
Tin, dissolved	*0.00020*	*mg/L*	<0.00020	<0.00020	<0.00020	<0.00020
Titanium, dissolved	*0.0050*	*mg/L*	<0.0050	<0.0050	<0.0050	<0.0050
Tungsten, dissolved	*0.0010*	*mg/L*	<0.0010	<0.0010	**0.0021**	<0.0010
Uranium, dissolved	*0.000020*	*mg/L*	**0.000636**	<0.000020	**0.000117**	**0.00283**
Vanadium, dissolved	*0.0010*	*mg/L*	<0.0010	<0.0010	<0.0010	<0.0010
Zinc, dissolved	*0.0040*	*mg/L*	<0.0040	<0.0040	<0.0040	**0.0041**
Zirconium, dissolved	*0.00010*	*mg/L*	<0.00010	<0.00010	<0.00010	<0.00010
Total Metals (Water)						
Aluminum, total	*0.0050*	*mg/L*	**0.109**	**0.0754**		
Antimony, total	*0.00020*	*mg/L*	<0.00020	<0.00020		
Arsenic, total	*0.00050*	*mg/L*	<0.00050	<0.00050		
Barium, total	*0.0050*	*mg/L*	**0.0255**	**0.0212**		
Beryllium, total	*0.00010*	*mg/L*	<0.00010	<0.00010		
Bismuth, total	*0.00010*	*mg/L*	<0.00010	<0.00010		
Boron, total	*0.0050*	*mg/L*	**0.0242**	**0.0147**		
Cadmium, total	*0.000010*	*mg/L*	**0.000030**	<0.000010		

ANALYTICAL REPORT

City of Prince Rupert **Work Order:** N803097

			N803097-01	N803097-02	N803097-03	N803097-04
LAB #						
SAMPLED DATE			15-Mar-18	15-Mar-18	15-Mar-18	15-Mar-18
SAMPLED TIME			10:20	09:47	09:57	10:50
SAMPLE ID			Lower East Creek	Lower West Creek	MW 04	MW 15
	MRL	***Units***				
Total Metals (continued)						
Calcium, total	*0.20*	*mg/L*	**34.2**	**11.0**		
Chromium, total	*0.00050*	*mg/L*	<0.00050	<0.00050		
Cobalt, total	*0.00010*	*mg/L*	<0.00010	<0.00010		
Copper, total	*0.00040*	*mg/L*	**0.00102**	**0.00055**		
Iron, total	*0.010*	*mg/L*	**0.180**	**0.243**		
Lead, total	*0.00020*	*mg/L*	**0.00022**	<0.00020		
Lithium, total	*0.00010*	*mg/L*	**0.00043**	<0.00010		
Magnesium, total	*0.010*	*mg/L*	**3.25**	**1.07**		
Manganese, total	*0.00020*	*mg/L*	**0.00846**	**0.0275**		
Mercury, total	*0.000010*	*mg/L*	<0.000010	<0.000010		
Molybdenum, total	*0.00010*	*mg/L*	**0.00133**	<0.00010		
Nickel, total	*0.00040*	*mg/L*	**0.00163**	<0.00040		
Phosphorus, total	*0.050*	*mg/L*	<0.050	<0.050		
Potassium, total	*0.10*	*mg/L*	**2.82**	**1.19**		
Selenium, total	*0.00050*	*mg/L*	**0.00126**	<0.00050		
Silicon, total	*1.0*	*mg/L*	**1.5**	**1.8**		
Silver, total	*0.000050*	*mg/L*	<0.000050	<0.000050		
Sodium, total	*0.10*	*mg/L*	**2.59**	**2.31**		
Strontium, total	*0.0010*	*mg/L*	**0.146**	**0.0332**		
Sulfur, total	*3.0*	*mg/L*	**21.6**	<3.0		
Tellurium, total	*0.00050*	*mg/L*	<0.00050	<0.00050		
Thallium, total	*0.000020*	*mg/L*	<0.000020	<0.000020		
Thorium, total	*0.00010*	*mg/L*	<0.00010	<0.00010		
Tin, total	*0.00020*	*mg/L*	<0.00020	<0.00020		
Titanium, total	*0.0050*	*mg/L*	<0.0050	<0.0050		
Tungsten, total	*0.0010*	*mg/L*	<0.0010	<0.0010		
Uranium, total	*0.000020*	*mg/L*	**0.000782**	**0.000022**		
Vanadium, total	*0.0010*	*mg/L*	<0.0010	<0.0010		
Zinc, total	*0.0040*	*mg/L*	<0.0040	<0.0040		
Zirconium, total	*0.00010*	*mg/L*	<0.00010	<0.00010		

ANALYTICAL REPORT

City of Prince Rupert **Work Order:** N803097

			N803097-05	N803097-06	N803097-07	N803097-08
LAB #						
SAMPLED DATE			15-Mar-18	15-Mar-18	15-Mar-18	15-Mar-18
SAMPLED TIME			10:45	10:06	09:40	10:10
SAMPLE ID			MW 16	Treatment Pond Effluent Discharge	Treatment Pond Influent #1 (Manhole)	Treatment Pond Influent #2 (East Cell Discharge)
	MRL	***Units***				
Anions (Water)						
Chloride	*1.0*	*mg/L*	**7.1**	**156**	**165**	**487**
Nitrite (as N)	*0.01*	*mg/L*	<0.01	**0.01**	**0.03**	<0.01
Nitrate+Nitrite (as N)	*0.0050*	*mg/L*	**0.219**	**2.81**	**0.432**	**0.652**
Sulfate	*1.0*	*mg/L*	**4.7**	**40.6**	**25.7**	**108**
General Parameters (Water)						
pH	*1.0*	*pH units*	**8.1**	**8.1**	**7.3**	**8.0**
Conductivity	*1.0*	*uS/cm*	**578**	**2090**	**2020**	**5850**
Biochemical Oxygen Demand / BOD	*4.0*	*mg/L*	<4.0	**18**	**11**	<38
Chemical Oxygen Demand / COD	*20*	*mg/L*	<20	**101**	**100**	**394**
Solids, Total Dissolved / TDS	*1.0*	*mg/L*		**900**	**840**	**2400**
Solids, Total Suspended / TSS	*1.0*	*mg/L*		**36**	**36**	**32**
Ammonia (total as N)	*0.03*	*mg/L*	<0.03	**92.6**	**82.6**	**375**
Nitrogen, Total Kjeldahl	*0.050*	*mg/L*	**0.083**			
Calculated Parameters (Water)						
Nitrate (as N)	*0.010*	*mg/L*	**0.22**	**2.8**	**0.40**	**0.65**
Hardness, Total (as CaCO3)	*0.500*	*mg/L*	**37.4**	**456**	**405**	**1070**
Hardness, Total (as CaCO3)	*0.500*	*mg/L*		**481**	**422**	**1100**
Nitrogen, Total	*0.0500*	*mg/L*	**0.302**			
Dissolved Metals (Water)						
Aluminum, dissolved	*0.0050*	*mg/L*	<0.0050	**0.0159**	**0.0057**	**0.0642**
Antimony, dissolved	*0.00020*	*mg/L*	<0.00020	**0.00085**	**0.00025**	**0.00306**
Arsenic, dissolved	*0.00050*	*mg/L*	**0.00306**	**0.00288**	**0.00071**	**0.0192**
Barium, dissolved	*0.0050*	*mg/L*	**0.0240**	**0.0762**	**0.0891**	**0.226**
Beryllium, dissolved	*0.00010*	*mg/L*	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth, dissolved	*0.00010*	*mg/L*	<0.00010	<0.00010	<0.00010	<0.00010
Boron, dissolved	*0.0050*	*mg/L*	**0.116**	**1.31**	**1.26**	**4.66**
Cadmium, dissolved	*0.000010*	*mg/L*	**0.000015**	**0.000016**	<0.000010	**0.000029**
Calcium, dissolved	*0.20*	*mg/L*	**9.35**	**151**	**135**	**318**
Chromium, dissolved	*0.00050*	*mg/L*	<0.00050	**0.00367**	**0.00150**	**0.0257**
Cobalt, dissolved	*0.00010*	*mg/L*	<0.00010	**0.00252**	**0.00249**	**0.00798**

City of Prince Rupert **Work Order:** N803097

			N803097-05	N803097-06	N803097-07	N803097-08
LAB #						
SAMPLED DATE			15-Mar-18	15-Mar-18	15-Mar-18	15-Mar-18
SAMPLED TIME			10:45	10:06	09:40	10:10
SAMPLE ID			MW 16	Treatment Pond Effluent Discharge	Treatment Pond Influent #1 (Manhole)	Treatment Pond Influent #2 (East Cell Discharge)
	MRL	*Units*				
Dissolved Metals (continued)						
Copper, dissolved	*0.00040*	*mg/L*	**0.00262**	**0.00312**	**0.00043**	**0.00138**
Iron, dissolved	*0.010*	*mg/L*	<0.010	**0.371**	**0.227**	**0.941**
Lead, dissolved	*0.00020*	*mg/L*	<0.00020	<0.00020	<0.00020	**0.00040**
Lithium, dissolved	*0.00010*	*mg/L*	**0.00101**	**0.00866**	**0.00294**	**0.0523**
Magnesium, dissolved	*0.010*	*mg/L*	**3.42**	**19.1**	**16.0**	**66.0**
Manganese, dissolved	*0.00020*	*mg/L*	**0.00033**	**0.672**	**0.758**	**2.36**
Mercury, dissolved	*0.000010*	*mg/L*	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum, dissolved	*0.00010*	*mg/L*	**0.00633**	**0.00063**	**0.00039**	**0.00099**
Nickel, dissolved	*0.00040*	*mg/L*	<0.00040	**0.00799**	**0.00530**	**0.0329**
Phosphorus, dissolved	*0.050*	*mg/L*	**0.234**	**0.139**	<0.050	**4.00**
Potassium, dissolved	*0.10*	*mg/L*	**6.03**	**67.0**	**56.0**	**193**
Selenium, dissolved	*0.00050*	*mg/L*	<0.00050	<0.00050	<0.00050	**0.00068**
Silicon, dissolved	*1.0*	*mg/L*	**4.9**	**6.8**	**7.3**	**18.9**
Silver, dissolved	*0.000050*	*mg/L*	<0.000050	<0.000050	<0.000050	<0.000050
Sodium, dissolved	*0.10*	*mg/L*	**121**	**115**	**113**	**372**
Strontium, dissolved	*0.0010*	*mg/L*	**0.0639**	**0.869**	**0.786**	**2.63**
Sulfur, dissolved	*3.0*	*mg/L*	<3.0	**14.5**	**9.9**	**48.0**
Tellurium, dissolved	*0.00050*	*mg/L*	<0.00050	<0.00050	<0.00050	<0.00050
Thallium, dissolved	*0.000020*	*mg/L*	<0.000020	<0.000020	<0.000020	<0.000020
Thorium, dissolved	*0.00010*	*mg/L*	<0.00010	<0.00010	<0.00010	<0.00010
Tin, dissolved	*0.00020*	*mg/L*	<0.00020	<0.00020	<0.00020	**0.00091**
Titanium, dissolved	*0.0050*	*mg/L*	<0.0050	<0.0050	<0.0050	**0.0123**
Tungsten, dissolved	*0.0010*	*mg/L*	**0.0022**	<0.0010	<0.0010	**0.0012**
Uranium, dissolved	*0.000020*	*mg/L*	**0.00256**	**0.000321**	**0.000255**	**0.000734**
Vanadium, dissolved	*0.0010*	*mg/L*	<0.0010	<0.0010	<0.0010	**0.0057**
Zinc, dissolved	*0.0040*	*mg/L*	**0.0649**	**0.0143**	**0.0057**	**0.0321**
Zirconium, dissolved	*0.00010*	*mg/L*	<0.00010	**0.00048**	**0.00031**	**0.00264**
Total Metals (Water)						
Aluminum, total	*0.0050*	*mg/L*		**0.180**	**0.122**	**0.0944**
Antimony, total	*0.00020*	*mg/L*		**0.00100**	**0.00031**	**0.00355**
Arsenic, total	*0.00050*	*mg/L*		**0.00338**	**0.00147**	**0.0201**
Barium, total	*0.0050*	*mg/L*		**0.122**	**0.169**	**0.278**
Beryllium, total	*0.00010*	*mg/L*		<0.00010	<0.00010	<0.00010
Bismuth, total	*0.00010*	*mg/L*		<0.00010	**0.00015**	<0.00010
Boron, total	*0.0050*	*mg/L*		**1.39**	**1.34**	**4.54**

City of Prince Rupert **Work Order:** N803097

			N803097-05	N803097-06	N803097-07	N803097-08
LAB #						
SAMPLED DATE			15-Mar-18	15-Mar-18	15-Mar-18	15-Mar-18
SAMPLED TIME			10:45	10:06	09:40	10:10
SAMPLE ID			MW 16	Treatment Pond Effluent Discharge	Treatment Pond Influent #1 (Manhole)	Treatment Pond Influent #2 (East Cell Discharge)
	MRL	*Units*				
Total Metals (continued)						
Cadmium, total	*0.000010*	*mg/L*		**0.000051**	**0.000051**	**0.000056**
Calcium, total	*0.20*	*mg/L*		**157**	**141**	**321**
Chromium, total	*0.00050*	*mg/L*		**0.00500**	**0.00219**	**0.0283**
Cobalt, total	*0.00010*	*mg/L*		**0.00304**	**0.00296**	**0.00879**
Copper, total	*0.00040*	*mg/L*		**0.00564**	**0.00667**	**0.00271**
Iron, total	*0.010*	*mg/L*		**2.25**	**11.1**	**1.10**
Lead, total	*0.00020*	*mg/L*		**0.00050**	**0.00045**	**0.00083**
Lithium, total	*0.00010*	*mg/L*		**0.0117**	**0.00392**	**0.0582**
Magnesium, total	*0.010*	*mg/L*		**21.6**	**17.2**	**72.0**
Manganese, total	*0.00020*	*mg/L*		**0.785**	**0.776**	**2.42**
Mercury, total	*0.000010*	*mg/L*		<0.000010	<0.000010	**0.000010**
Molybdenum, total	*0.00010*	*mg/L*		**0.00082**	**0.00058**	**0.00135**
Nickel, total	*0.00040*	*mg/L*		**0.00949**	**0.00620**	**0.0368**
Phosphorus, total	*0.050*	*mg/L*		**0.532**	**0.874**	**4.57**
Potassium, total	*0.10*	*mg/L*		**72.4**	**57.1**	**269**
Selenium, total	*0.00050*	*mg/L*		<0.00050	<0.00050	**0.00079**
Silicon, total	*1.0*	*mg/L*		**7.6**	**7.7**	**19.5**
Silver, total	*0.000050*	*mg/L*		<0.000050	<0.000050	<0.000050
Sodium, total	*0.10*	*mg/L*		**131**	**121**	**410**
Strontium, total	*0.0010*	*mg/L*		**0.950**	**0.827**	**2.79**
Sulfur, total	*3.0*	*mg/L*		**16.4**	**10.7**	**51.3**
Tellurium, total	*0.00050*	*mg/L*		<0.00050	<0.00050	<0.00050
Thallium, total	*0.000020*	*mg/L*		<0.000020	<0.000020	<0.000020
Thorium, total	*0.00010*	*mg/L*		<0.00010	<0.00010	<0.00010
Tin, total	*0.00020*	*mg/L*		**0.00033**	**0.00039**	**0.00137**
Titanium, total	*0.0050*	*mg/L*		**0.0125**	**0.0099**	**0.0139**
Tungsten, total	*0.0010*	*mg/L*		**0.0010**	<0.0010	**0.0020**
Uranium, total	*0.000020*	*mg/L*		**0.000392**	**0.000320**	**0.000837**
Vanadium, total	*0.0010*	*mg/L*		**0.0019**	**0.0021**	**0.0062**
Zinc, total	*0.0040*	*mg/L*		**0.0272**	**0.0123**	**0.0656**
Zirconium, total	*0.00010*	*mg/L*		**0.00059**	**0.00039**	**0.00222**

ANALYTICAL REPORT

City of Prince Rupert **Work Order:** N803097

	MRL	Units	
LAB #			**N803097-09**
SAMPLED DATE			**15-Mar-18**
SAMPLED TIME			**10:25**
SAMPLE ID			**East Creek Tributary**
General Parameters (Water)			
Conductivity	1.0	uS/cm	**97.6**

Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
pH units	pH units
uS/cm	Micro Siemens per centimeter

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N812013

RECEIVED: 04-Dec-2018

REPORTED: 09-Jan-2019

Revised to correct "Reported" date format.

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N812013

LAB #				**N812013-01**
SAMPLED DATE				**04-Dec-18**
SAMPLED TIME				**10:40**
SAMPLE ID				**Pillsbury**
	MRL	***Units***	***CDWG***	
Haloacetic Acids (Water)				
Monochloroacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Monobromoacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Dichloroacetic Acid	*0.0020*	*mg/L*	-	**0.0699**
Trichloroacetic Acid	*0.0200*	*mg/L*	-	**0.0732**
Dibromoacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Total Haloacetic Acids (HAA5)	*0.0200*	*mg/L*	*MAC = 0.08*	**0.143**
2-Bromopropionic Acid	*70-130*	*[surr]*	-	*112%*

Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N809156

RECEIVED: 26-Sep-18

REPORTED: 21-Oct-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

norlabs
Northern Laboratories (2010) Ltd.

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N809156

LAB #				**N809156-01**
SAMPLED DATE				**26-Sep-18**
SAMPLED TIME				**08:30**
SAMPLE ID				**Pillsbury Station**
	MRL	***Units***	***CDWG***	
Haloacetic Acids (Water)				
Monochloroacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Monobromoacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Dichloroacetic Acid	*0.0020*	*mg/L*	-	**0.0817**
Trichloroacetic Acid	*0.0200*	*mg/L*	-	**0.127**
Dibromoacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Total Haloacetic Acids (HAA5)	*0.0200*	*mg/L*	*MAC = 0.08*	**0.209**
2-Bromopropionic Acid	*70-130*	*[surr]*	-	*112%*

Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N806073

RECEIVED: 12-Jun-18

REPORTED: 06-Jul-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N806073

LAB #				**N806073-01**
SAMPLED DATE				**12-Jun-18**
SAMPLED TIME				**10:50**
SAMPLE ID				**Pillsbury Station**
	MRL	***Units***	***CDWG***	
Haloacetic Acids (Water)				
Monochloroacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Monobromoacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Dichloroacetic Acid	*0.0200*	*mg/L*	-	**0.0894**
Trichloroacetic Acid	*0.0200*	*mg/L*	-	**0.116**
Dibromoacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Total Haloacetic Acids (HAA5)	*0.0200*	*mg/L*	*MAC = 0.08*	**0.206**
2-Bromopropionic Acid	*70-130*	*[surr]*	-	*108%*

Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N803084

RECEIVED: 14-Mar-18

REPORTED: 22-Apr-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

norlabs
Northern Laboratories (2010) Ltd.

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N803084

LAB #				**N803084-01**
SAMPLED DATE				**15-Mar-18**
SAMPLED TIME				**10:10**
SAMPLE ID				**Pillsbury Station**
	MRL	***Units***	***CDWG***	
Haloacetic Acids (Water)				
Monochloroacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Monobromoacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Dichloroacetic Acid	*0.0020*	*mg/L*	-	**0.0575**
Trichloroacetic Acid	*0.0200*	*mg/L*	-	**0.0720**
Dibromoacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Total Haloacetic Acids (HAA5)	*0.0200*	*mg/L*	*MAC = 0.08*	**0.130**
2-Bromopropionic Acid	*70-130*	*[surr]*	-	*95%*

Glossary of Terms

MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

ANALYTICAL REPORT

City of Prince Rupert
424 3rd Avenue West
Prince Rupert, BC V8J 1L7
water@princerupert.ca

Project: Drinking Water
Project Number: -
Project Manager: Public Works Department

Work Order: N802021

RECEIVED: 06-Feb-18

REPORTED: 26-Feb-18

All analyses were performed in accordance with standard procedures published by BC MoE, Health Canada, Environment Canada, the American Public Health Association, or the US EPA.

Northern Laboratories (2010) Ltd.

Jesse Newton
Laboratory Manager

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Northern Laboratories (2010) Ltd.

ANALYTICAL REPORT

City of Prince Rupert - Drinking Water **Work Order:** N802021

LAB #				**N802021-01**
SAMPLED DATE				**06-Feb-18**
SAMPLED TIME				**10:13**
SAMPLE ID				**Pillsbury Stn**
	MRL	***Units***	***CDWG***	
Haloacetic Acids (Water)				
Monochloroacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Monobromoacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Dichloroacetic Acid	*0.0020*	*mg/L*	-	**0.0620**
Trichloroacetic Acid	*0.0200*	*mg/L*	-	**0.128**
Dibromoacetic Acid	*0.0020*	*mg/L*	-	<0.0020
Total Haloacetic Acids (HAA5)	*0.0200*	*mg/L*	*MAC = 0.08*	**0.190**
2-Bromopropionic Acid	*70-130*	*[surr]*	-	*100%*

Glossary of Terms

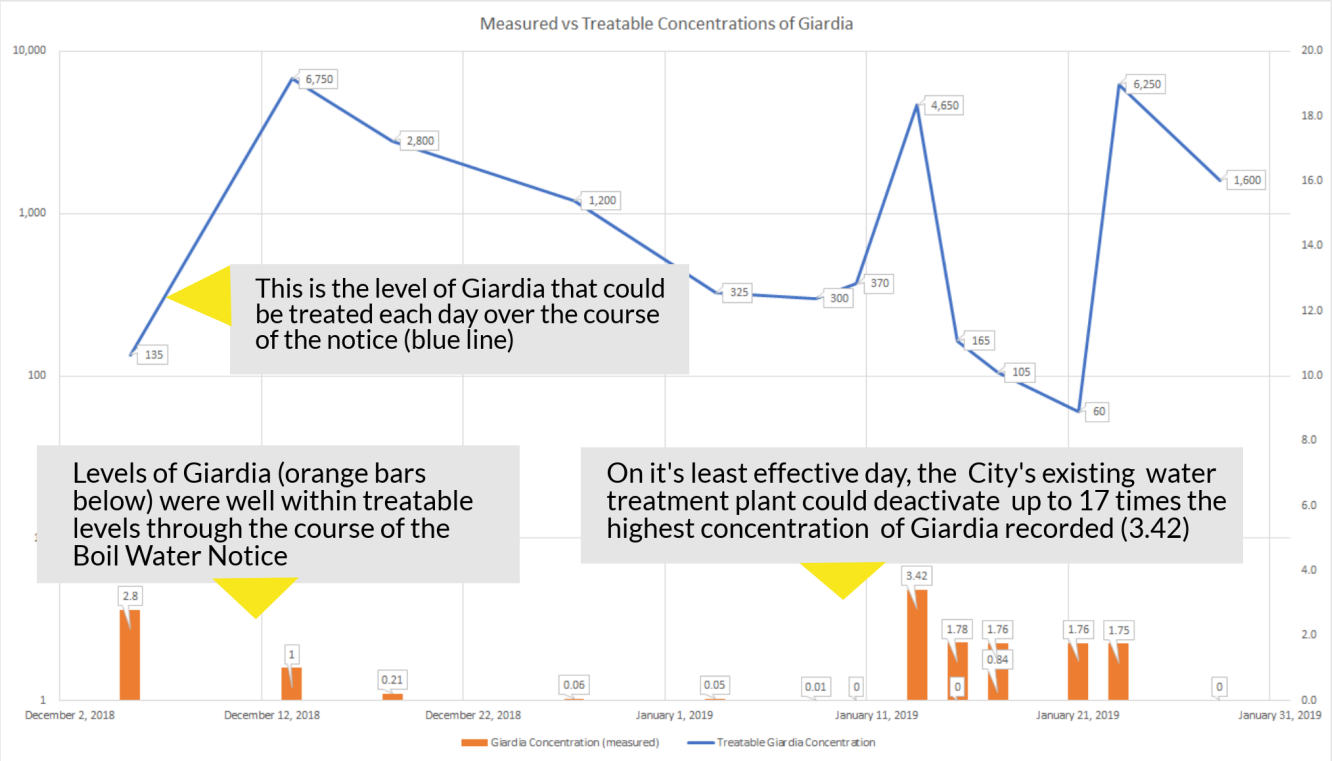
MRL	Method Reporting Limit
<	Less than the reported detection limit (RDL)
mg/L	Milligrams per Litre
MAC	Maximum Acceptable Concentration. Values above MAC are formatted with **red** text and solid outline.
AO	Aesthetic Objective (not health related). Values above AO are formatted with a dashed outline.
OG	Operational guideline (for treated water)

Standards / Guidelines Referenced

CDWG	Canadian Drinking Water Quality Guidelines (2014) http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

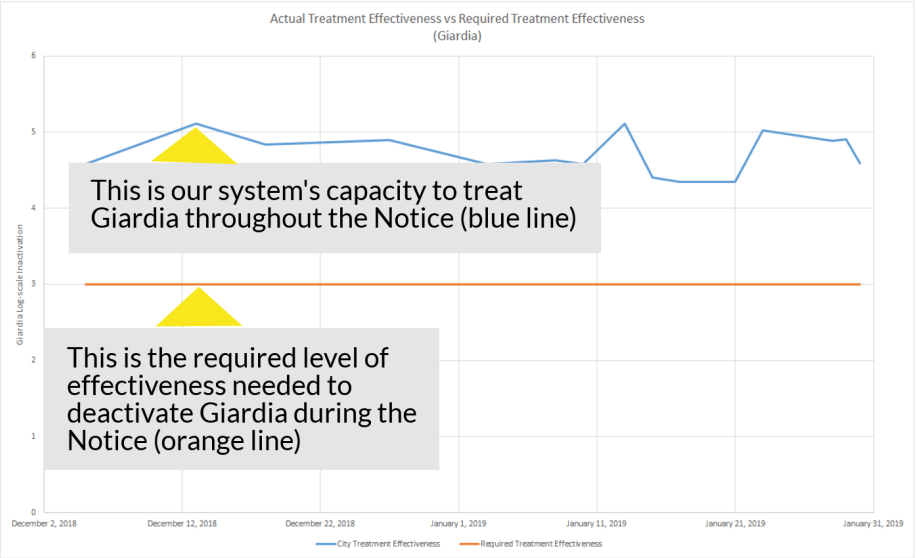
WATER TEST RESULTS

Giardia Results



The above graph describes measured levels of Giardia as compared to treatment capacity of City's chlorination system. Effectiveness of treatment (shown in the blue line) depends on a number of factors which the City tracked during the Boil Water Notice, including temperature, pH, concentration of chlorine, and the water's contact time with chlorine. Over the entire course of the notice, the City's water treatment system was well within its ability to treat (render harmless) the amounts of Giardia detected (as shown in the orange bars).

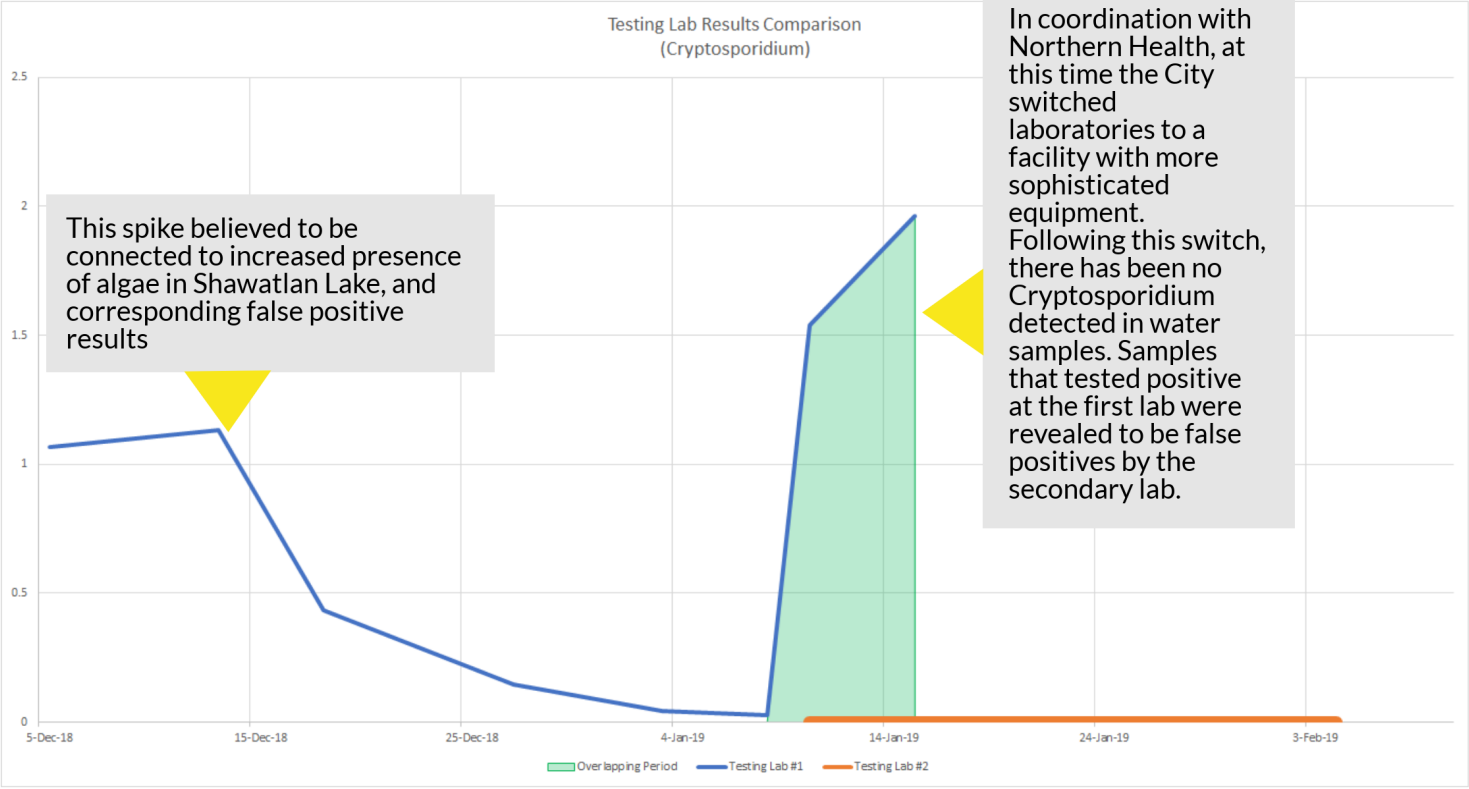
The graph to the right further illustrates the required treatment effectiveness for Giardia over the course of the Boil Water Notice (orange line), as compared to the City's treatment capacity (blue line).



Data calculated by inputting parameters of City's treatment system into Health Canada's Quantitative Microbial Risk Assessment (QMRA)

WATER TEST RESULTS

Cryptosporidium Results



Our chlorination system can treat Giardia, but it is not fully effective in deactivating Cryptosporidium, which was the primary motivation for the Boil Water Notice. The above graph describes perceived levels of Cryptosporidium in the City's water supply over the course of the Boil Water Notice. However, as noted in the After-Incident Report, the City now believes that the initial test result for Cryptosporidium was a false positive.

This is due to a number of factors:

- Cryptosporidium is easy to misidentify without sophisticated equipment, which is why additional tests were done when a small amount of Cryptosporidium was detected in November.
- The City switched to a more sophisticated lab after it was revealed that the testing designation for the original lab had lapsed after a change in ownership.
- As observed in the graph above, testing at a secondary, more sophisticated lab has not confirmed the presence of Cryptosporidium in any test result.
- Water samples tested by both labs showed that Lab #1 misidentified algae as Cryptosporidium in a sample taken January 11th.
- An aerial photograph and patrol of Shawatlan Lake conducted in late December revealed an algal bloom present in the lake.

Unfortunately, there is no way to confirm whether the initial tests were false positives, as the slides were discarded by the first lab. Given the result provided, the regulator (Northern Health) and the City acted in the best interests of public health by putting a Boil Water Notice into effect.