



CITY OF PRINCE RUPERT After Incident Report

Operations Department



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This Report was developed with review and approval of Northern Health.

Preface

Abstract

This Report presents an assessment of the City's Boil Water Notice and subsequent Water Quality Advisory that began in December of 2018. Over the course of the Notice, the City, in collaboration with Northern Health and Health Canada, has significantly improved understanding surrounding local water quality parameters, treatment effectiveness, as well as the need for advanced forms of testing to accurately identify protozoa.

Following the suggestion of our contracted engineer, early into the Notice the City initiated comparative sampling of water results with an advanced laboratory. When re-testing a sample that had come up positive at the original lab, this secondary lab identified the item of concern within the sample as most likely a form of algae, with no confirmation of the presence of cryptosporidium. Consensus among several experts reviewing samples taken following the switch from the original lab have indicated that algae, rather than cryptosporidium is present. 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 very likely the original results for Cryptosporidium were false positives.

These test results aside, based on the reported levels of Cryptosporidium and understanding at the time regarding treatment effectiveness for Giardia, the Boil Water Notice was put into effect as a precaution to protect the health of residents. The shared intention of both the City and Northern Health is to protect community health, and we are pleased to be able to report that there were no recorded instances of giardia or cryptosporidium related health cases at the local hospital.

We have also significantly improved our monitoring capacity for protozoa. We are among the first communities in Canada to begin using Health Canada's Quantitative Microbial Risk Assessment (QMRA) model, which is the most up to date and accurate technology available in terms of identifying microbial risk to a community's water supply. We have also moved testing for protozoa to a more advanced laboratory, and will be continuing testing on a monthly basis moving forward, or more frequently at the direction of the Environmental Health Officer as a condition of our Operating Permit.

Finally, the City is awaiting notice from the Province regarding our application for funding to implement multiple phased treatment in the long term. This infrastructure will be developed under a Valued Engineering program in coordination with Northern Health and other partners, and will serve the community for generations to come.

After Incident Report

Incident Review

On December 14th, 2018, the City of Prince Rupert issued a Boil Water Notice within 40 minutes of notification from the Northern Health Authority. The Notice was issued based on results received showing unacceptable levels of Giardia and Cryptosporidium. These water quality parameters were monitored based on Northern Health's recommendations made in the past. More recent tests show that the water system has met acceptable water quality standards which have been following a more accurate form of pathogen identification. A subsequent evaluation of the City's treatment system has also found that it is effective at treating the levels of Giardia encountered. 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.

The test results received on December 14th, 2018 were recorded as part of the City's ongoing seasonal testing regime as recommended 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 an accredited microbiology lab that specializes in Giardia and Cryptosporidium 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 a research facility in Alberta, at which time they identified the item of concern within the sample as most likely a form of algae, with *no confirmation of the presence of cryptosporidium*. Consensus among several experts reviewing samples taken following the switch from the original lab have indicated that algae, rather than cryptosporidium is present. These findings were 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 very 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.

Testing During the Notice

As per Northern Health, there were initially no 'set' number of consecutive clear results that were required to lift the Notice. Multiple clear tests were required, as there were multiple factors considered to contribute to a given sample result (such as temperatures and turbidity). Over the course of the Notice, and with Health Canada guidance, a new standard for monitoring Giardia was adopted, and test accuracy for Cryptosporidium, specifically, was greatly improved through the use of a new research facility.

Rather than looking at a standardized maximum concentration for Giardia, the City and Northern Health are using a new sophisticated statistical system called a Quantitative Microbial Risk Assessment (QMRA) provided by Health Canada that determines how effective our municipal water system is in deactivating Giardia if it is found to be present in our raw water supply (Shawatlan Lake). This program essentially identifies what level of Giardia is treatable with our available chlorination system. The model takes into account the specific parameters of our treatment system, including contact time water has with chlorine, the concentration of chlorine applied, temperature, and pH. Results from this statistical model show that during the course of the Boil Water Notice Giardia has remained within treatable limits, which, following multiple clear results for Cryptosporidium, and the potential that past Cryptosporidium results were false positives, is why Northern Health was able to downgrade the Notice to an Advisory.

Over the course of the Notice, and continuing today, Northern Health requires two tests per week. The goal of testing is to continue to monitor levels for public health and safety, so that the water is safe to consume, and that Northern Health and the City will know in advance if the risk were to increase again.

Notification During the Boil Water Notice

The City made the following efforts to update and inform the community during the Boil Water Notice, including, but not limited to:

- Regular contact with local media outlets/radio stations

- Phone call notification to all local restaurants and hotels and food outlets on the Friday of the Notice
- Weekly updates posted to City of Prince Rupert website (first) and social media pages
- HealthLink BC (8-1-1) for specific health precautions
- Front desk at City Hall and Recreation Complex
- Scrolling screen in front of Recreation Complex
- Mobile application (for all updates)
- Connect Rocket Emergency Alert System (This method was used to issue the original Notice, and when the Notice was downgraded. This is a paid program)
- Calling in to City Hall and Public Works
- Word of mouth through friends and family

Downgrading of the Notice to an Advisory

As per Northern Health, the City demonstrated the following condition to rescind the boil water notice and downgrade to an Advisory:

“3 weeks of satisfactory consecutive results showing that the raw water shows no detection for Cryptosporidium using method EPA1623 from an approved lab (this must be achieved at a minimum sampling frequency of 2 samples per week separated 24h+ apart from one another with an ongoing sampling program for Cryptosporidium and Giardia approved by the Environmental Health Officer.

The City of Prince Rupert has demonstrated that the chlorine concentration and contact time is appropriate to deactivate Giardia present at Shawatlan Lake.

Ongoing sampling program for Cryptosporidium and Giardia using method US EPA 1623 approved by the Environmental Health Officer and in place.

Ongoing audit program for Giardia inactivation approved by the Environmental Health Officer in place.”

Northern Health has noted that they used a weighted evidence approach to downgrade the Notice, supported by the fact that, “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;”

Source: https://www.healthspace.ca/Clients/NHA/NHA_Website.nsf

Evaluating the City Response

If there had been a pandemic/mass illness, the City's Emergency Plan does have a policy in place to address community needs. In general, this involves opening up our Emergency Social Services (ESS) support system, and doing what we can to support the local health authority. However, there have been no known instances of anyone contracting a water-borne illness from the current water issue. We have also conducted a test on the City's sewer system, which is another potential indicator of an outbreak, and these tests also came back clear. Given that there is no recorded health impact in the community, activating our Emergency Response Plan was not an appropriate response to Boil Water conditions. As per direction of the health authority, boiling water makes it safe to consume as it is readily available and treatable.

The City did take a number of steps to address the Notice in the short and long term. Short term steps included:

- Boat patrol of 8 km Shawatlan Lake perimeter to look for potential sources of contaminants;
- Creek walks and sampling to look for potential contaminants;
- Increased testing;
- Consultation with the Conservation Officer to explore possible wildlife contaminate;
- Accuracy testing with a second lab;
- Testing of the City's sewer system to determine if Cryptosporidium or Giardia were present (these tests were negative);
- Regular contact with Northern Health regarding test outcomes; and,
- Tributary analysis for animal activity, due to reliance on secondary source at Shawatlan Lake (there are no tributaries that feed into the primary source at Woodworth).

As we have noted previously, the longer-term solution is multiple barriers of water treatment. The City is pursuing implementation of improvements to water treatment, given in 2018 new availability of funding has made it more attainable and will support the sustainability of treatment into the future regardless of climatic conditions. In August of 2018, the City applied for funding to facilitate a multiple-phased water treatment system and to replace the submarine line that carries our potable water beneath the harbour from Woodworth and Shawatlan lakes. Our understanding is a decision with respect to this funding should be issued within the first 6 months of 2019, and staff have been in contact with the associated Ministry to advance our application. This represents the final of 3 phases of the City's water infrastructure replacement project. Water colour/tannins that result from our use of an above-ground source impacts the effectiveness of UV filters alone. The desired new system, when implemented, will include treatment to remove colour prior to UV filtration, which means that there will be multiple treatment barriers put

into effect. Multiple treatment barriers will likely eliminate the risk from cryptosporidium and giardia in the future. If we are successful in achieving the grant for the Phase 3 \$29 million project, the City will be responsible for contributing \$7 million worth of the costs.

Lessons Learned – Action Plan

The City has not had a Boil Water Notice on a community-wide scale in a decade or more. This incident has prompted renewed attention and care to our internal procedures. The City in conjunction with Northern Health are reviewing the following:

- Looking to develop a procedure to address the needs of those with confirmed compromised immune systems in Prince Rupert;
- Revise the City's water testing regime;
- Additional tributary analysis for animal activity in the watershed;
- Review of primary watershed;
- Complete a water security exercise to evaluate risk;
- Complete Value Engineering for the community water treatment facility; and,
- Continued discussions with Northern Health and Health Canada

Improved Understanding of Potential Weather Related Impacts

The City's initial understanding of the incident was that test results were most likely related to the use of our backup/emergency source at Shawatlan Lake during construction on the water supply line and access road to the dam. This source supplied 80% of water to the community before a new, higher capacity watermain was installed to Woodworth Lake in 1995. Although the City and Northern Health have no confirmed record of Shawatlan testing confirmed positive for Cryptosporidium and Giardia historically, we understand this source to be more vulnerable to weather related run-off. This run-off can contribute to the source's turbidity and the contamination that occurred in this particular instance. It was believed that this year, a particularly dry summer followed by an intense rainfall event resulted in runoff debris in the water supply, which was believed to have contributed to the current issue.

Storm run-off combined with a dry summer remain very likely contributing factors to the presence of Giardia in the City's supply. Meanwhile, the results that indicated Cryptosporidium was present, which are now understood to likely be false-positives, resulted from the presence of an algae bloom in the Lake – another link to a warmer-than-average summer. Noting these combined determinants has improved the City's

understanding of these weather-related impacts, and have given staff additional factors to consider when interpreting water quality test results.

Next Steps with Northern Health

As previously noted, the City has applied for funding to implement multiple barriers of water treatment, as without multiple barriers of treatment our water source does remain unprotected against *Cryptosporidium*. Although test results have been clear, and the risk to the water supply is low, our aim is to virtually eliminate this risk moving forward to prevent future incident. In addition, multiple barriers of treatment will aid the City in improving aesthetic objectives related to tannins in our water, and ensure that we meet and exceed Provincial objectives for water quality into the future. This is part of planned improvements that were put into motion prior to the incident beginning in December of 2018.

Noted in the Action Plan section, moving forward the City will be developing a Value Engineering program to ensure that water treatment is implemented as efficiently as possible, to explore options to reduce project costs while ensuring a high quality facility is developed. This process will produce the best overall value for the community, and is recommended by the Province. The City has invited Northern Health, as the regulator, to be a party to that process to ensure that our water treatment system is in line with Federal water quality objectives.

Given this incident, Northern Health has directed the City to continue to monitor for protozoa at minimum on a monthly basis going ahead, which will be 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. We look forward to continuing to work cooperatively with the regulator to ensure that permit conditions are met.

Summary

On December 14th, 2018, the City of Prince Rupert issued a Boil Water Notice shortly after notification from the Northern Health Authority. The Notice was issued due to assumed unacceptable levels of *Giardia* and *Cryptosporidium* a level regulated by Northern Health and the Province, not the City. These assumed exceedances have now been discounted by the City and the results of all new laboratory tests were acceptable to lower the Notice to an Advisory. Following over an additional month of clear tests for *cryptosporidium*, the proven ability of the City's system to treat monitored levels of

Giardia, and with new conditions in place regarding future treatment and continued monitoring, Northern Health is now confident to remove the Advisory completely.

Over the course of the Notice, the City did our best to communicate updates to residents and businesses so that they continued to take necessary precautions with respect to boiling water. Staff also implemented short term strategies such as testing of sewer systems and patrols of the water supply and tributaries to monitor the situation. Towards a long term solution, in August the City applied for funds to implement a multiple water treatment barrier system.

As noted in the 'Lessons Learned' section, in conjunction with Northern Health, the City is renewing attention and care to internal procedures with respect to service provision to immune-compromised individuals during Boil Water Notices, improvements to water testing regimes, and ensuring efficiency of water treatment upgrades. We will also continue to maintain ongoing contact with our regulators to accomplish our shared aims with respect to service provision.

Appendix

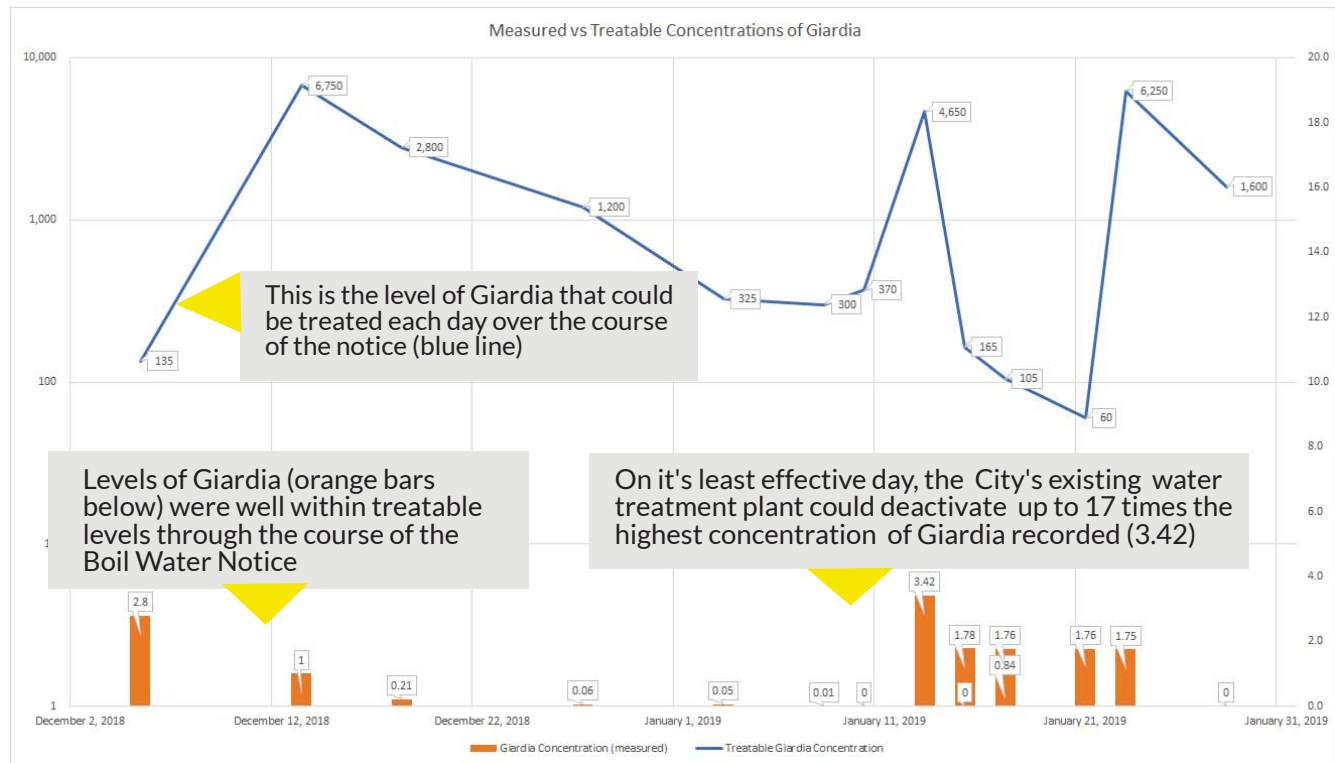
See Appendix for:

- Water Test Result Infographic
- Frequently Asked Questions (Issued January 14th, 2019)
- 2019 Watershed Report (Issued January 10th, 2019)



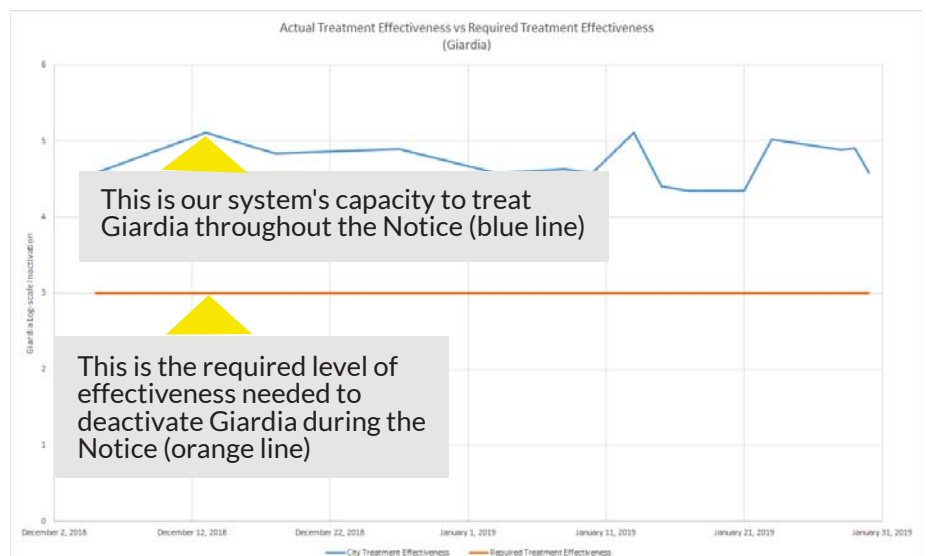
WATER TEST RESULTS

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).

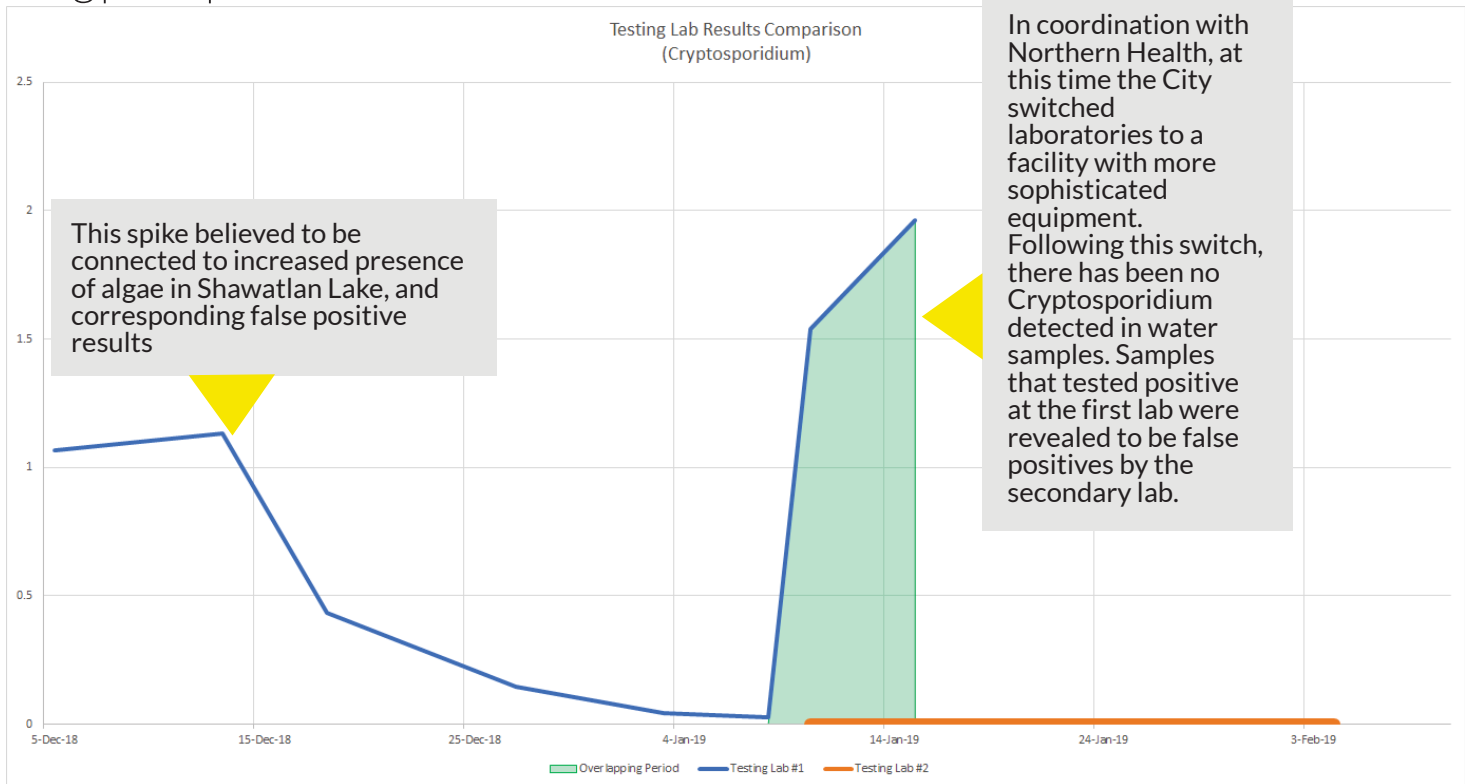


Data calculated by inputting parameters of City's treatment system into Health Canada's Quantitative Microbial Risk Assessment (QMRA)



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.



BOIL WATER NOTICE INFORMATION

FREQUENTLY ASKED QUESTIONS

Why is a Boil Water Notice in effect?

The City is currently working to fully redevelop our water supply infrastructure. Due to construction of the access road, new water supply line, and in 2019, a new dam, the City is not using our primary source of water at Woodworth Lake, and have not since 2016.

During construction, we have relied on our backup/emergency source at Shawatlan Lake. This source supplied 80% of water to the community before a new, higher capacity watermain was installed to Woodworth Lake in 1995. Although the City and Northern Health have no confirmed record of Shawatlan testing confirmed positive for cryptosporidium and giardia historically, this source is more vulnerable to weather related run-off. This run-off can contribute to the source's turbidity and the contamination that has occurred in this particular instance. This year, a particularly dry summer followed by an intense rainfall event resulted in runoff debris in the water supply, which is believed to have contributed to the current issue.

When were the City and Northern Health aware of the issue?

Tests are completed for cryptosporidium and giardia seasonally. Current Provincial Drinking Water testing regimes and standards do not require testing for cryptosporidium and giardia, due to the assumed low risk of contamination in most water supplies. Testing is above and beyond mandated requirements, with results assessed for health risks by Northern Health.

This year's fall testing revealed the slight presence of cryptosporidium and giardia in the raw (untreated) water supply. At this time, the levels at the raw source were determined by the regulator to be too low to warrant health concern, but prompted additional monitoring. Following this, tests were conducted of treated water to determine if the contaminants had entered the treated supply. In the interim between the first and second tests, it is believed that the major storm event occurred exacerbating levels due to storm run-off. The City was notified by Northern Health on December 14th that test results from the treated water supply indicated levels of cryptosporidium and giardia that warranted a Boil Water Notice to be issued as a precautionary measure, to protect the elderly, children, and immuno-compromised individuals. The Notice was then issued within forty minutes of directive from Northern Health.

What is the City doing to address the problem?

There are both short and long term solutions. In the short term, Operations Department Staff have completed the following to appropriately monitor and assess the situation:

- Boat patrol of 8 km Shawatlan Lake perimeter to look for potential sources of contaminants;
- Creek walks and sampling to look for potential contaminants;
- Increased testing;
- Accuracy testing with a second lab;
- Regular contact with Northern Health regarding test outcomes; and,
- Tributary analysis for animal activity, due to reliance on secondary source at Shawatlan lake (there are no tributaries that feed into the primary source at Woodworth).



BOIL WATER NOTICE INFORMATION

To address water quality in the long term, the City had already applied in August of 2018 for funding to support the implementation of multiple barrier water treatment, which will be more effective than our current system in removing cryptosporidium and giardia, will also remove colour, and will continue to disinfect for bacteriological contamination. The ICIP Green Infrastructure grant stream became available which would support this particular project, and given Council's strategic priority of security of the City's water infrastructure, staff brought this application forward.

Have there been any confirmed illnesses directly tied to water-borne cryptosporidium and giardia?

No – Northern Health has conducted tests at the local hospital to determine any public health impacts from the Notice. As of the date of this FAQ, there have not been any recorded any instances of giardia or cryptosporidium related illnesses directly tied to the water Notice. Unfortunately, this Notice also corresponds with flu season, as well as a gastrointestinal virus that is currently impacting many other Northern communities, and it is possible that many people are self-diagnosing incorrectly.

Why can't the City use the local lab to test water for cryptosporidium and giardia? And how often have you been testing since the Notice was put into place?

Prince Rupert is actually fairly lucky in that we are the regional hub for water testing. Most other communities in this region send their water to our local lab. Unfortunately, this particular test is very specialized and must be sent away. The City is sending multiple water samples twice a week to Vancouver and now Red Deer, Alberta to conduct these tests. The turnaround time for testing is a *minimum* of 3 days, based on travel time as well as the time it takes for the lab to culture results. Notably, the Christmas holiday did negatively impact testing schedules, as the lab must be open in order to receive a sample, and they were closed for multiple days. As such, there have been some delays in obtaining results.

There is also a significant amount of water that must pass through the system to obtain a valid result, and levels will reduce gradually, so it should be noted that more frequent testing will not lead to the Notice being lifted any sooner.

How does the City currently treat its water?

Currently the City performs chlorine gas injection for disinfection. This treatment is effective in removing bacteria and other potential contaminants from the water supply, but is not completely effective in removing cryptosporidium and giardia, which are the subject of the Notice.

How will the City try to mitigate these potential issues moving ahead while the dam is constructed?

Recognizing that plans are to continue to pull from the secondary source at Shawatlan, the City is exploring the cost of tying in the new water line laid down in Phase 1 of the 3 phase water infrastructure project to return to our primary water source at Woodworth Lake during construction.



BOIL WATER NOTICE INFORMATION

Once the Operations Department has a clearer picture of costs and feasibility, additional information will be provided to Council for review and consideration.

In response to this event, Northern Health will also determine an appropriate testing frequency to monitor future risk.

How will the City ensure that Woodworth water is safe to drink when we switch back to our primary source?

Prior to bringing that source back online once the dam is completed, regular testing will resume to ensure water quality standards are met. In addition, the City is seeking grant funds to support the implementation of multiple treatment barriers to improve overall water quality, and as a more effective barrier against cryptosporidium and giardia. As of the writing of this FAQ, the City is still awaiting a decision on this grant application which was sent in August, 2018.

Woodworth is also at a higher elevation than our secondary source at Shawatlan Lake, and does not have any tributaries running into it. It is thus less susceptible to run off. In addition, the surrounding grade is steep, and relatively inhabitable to large wildlife. Testing at Woodworth was conducted regularly according to Northern Health permitting guidelines for many years until we began pulling from our secondary source at Shawatlan Lake, and no recorded test has revealed the presence of cryptosporidium or giardia in that time until now.

Why weren't more updates provided on the status of the water during the Notice?

Multiple clear test results must be obtained prior to Northern Health removing the Notice, and there are various factors impacting how individual results are assessed (temperature and turbidity of the water are factors, for instance). It would be misleading to provide individual results, as one good result may be an outlier and will not necessarily indicate the removal of the Notice.

We have done our best to keep the community and the media informed, and are happy to confidently say now that although the notice remains in effect, tests are improving. We will continue to closely monitor the situation in conjunction with Northern Health and will remove the Notice as soon as we are able. Of note, following the 'okay' from Northern Health, the City will need to flush our water system to remove older water from the system, which will take up to 3 additional days.

As soon as the notice is lifted, the community will be notified. If you haven't already, please sign up for the City's emergency alert system to have a notification sent directly to your landline, cell phone and/or email address at: <https://princerupert.connectrocket.com/>

What is the City doing to address past-noted issues related to turbidity?

Use of our secondary source at Shawatlan has had notable impact on colour and turbidity, and increases in associated chlorine residuals as a result of the need to increase chlorination since 2016. These issues have been closely monitored and would not necessitate a Boil Water Advisory or Notice.

Our primary focus now is on completing replacement of our dam to secure our primary water supply, and on obtaining funding to implement water treatment that will eliminate above noted quality and colour concerns. The feasibility study developed for water treatment specifically addresses these issues through a proposed design that includes multiple treatment barriers.



BOIL WATER NOTICE INFORMATION

Why were additional treatment barriers not implemented sooner?

The 1999 Auditor General's Report noted that Prince Rupert has one of the most desirable and safest watersheds in a review of several communities across British Columbia. City and Provincial staff both agree, and it is noted in the 1999 Report, that cryptosporidium and giardia are less of a risk in the City's primary water source due to the extremely steep slopes of the Woodworth watershed and lack of habitability for larger wildlife in the very remote area. In addition, it was noted that the lower pH of our water supply was an asset in making chlorination more effective.

Drinking water standards evolve over time, alongside scientific understanding of the impacts of the character of water. Water quality has only more recently come to the attention of the City and local health authorities, and since then, we have been working together on monitoring and, as funding has become available, an application for a grant to implement multiple barriers of treatment.

If our primary water source is known to be better, why was the decision made to switch to our secondary source?

Shawatlan Lake has been the City's emergency water supply for many years, and previously was used to provide up to 80% of the City's water. The use of our secondary source, was not considered a significant risk given our regions' relatively consistent climate. The precipitation levels and consistent flushing of our watershed meant that history informed our decision to switch to our secondary water source while we proceed with the phases of our water infrastructure replacement. The uncharacteristic low precipitation experienced in Summer and Fall of 2018 followed by a significant and prolonged weather event is believed to have contributed to the Boil Water Notice coming into effect.

What kind of improvements is the City pursuing for water treatment? And how will it be funded?

As noted previously, in August of 2018, the City applied for funding to implement a multiple-phased water treatment system and to replace the submarine line that carries our potable water beneath the harbour from Woodworth and Shawatlan lakes. The City intends to construct a new water treatment plant at its Montreal Circle reservoir that would first remove sediment, dissolved organic material, and suspended solids from the water through a dissolved-air flocculation and filtration stage. This will remove the significant amount of colour present in the City's water supply from dissolved organic material, and will reduce the concentration of disinfection by-products in the treated water. Following clarification of the water, a two-barrier system of UV light exposure and chlorine salt addition will ensure that all biological contaminants in the water are inactivated.

The implementation of multiple phased treatment is an approximately \$30 million project (which also includes replacing an existing submarine water line), so unfortunately that is a significant expense for a community our size to carry alone. These major infrastructure projects are usually only undertaken with the aid of grant funds. As new sources of funding, like that announced in spring of 2018, become available, municipalities are more able to address these major infrastructure projects. Our understanding is a decision with respect to this funding should be issued within the first 6 months of 2019, and staff have been in contact with the associated Ministry to advance our application.



BOIL WATER NOTICE INFORMATION

We have been successful in achieving grants to complete the first two phases of our water replacement project, and are hoping to continue to build on that momentum and progress. If unsuccessful, we will immediately look to the next batch of available funding. To cover our \$7 million portion of the grant, the City has also been working hard to obtain new revenue streams and has put into place asset management funds to support future renewal.

Why are there rumours that the City knew sooner?

Issues completely unrelated to the appearance of cryptosporidium and giardia were noted locally in the spring and summer, which are the subject of continued joint-monitoring by Northern Health and the City. This is a fully separate issue, and not one that would trigger a Boil Water Notice.

In collaboration with Northern Health, in April of 2018, the City sent out postcards to local residences to notify them of the risk of home-sourced lead from older in-house plumbing fixtures, including the recommendation to run your water until it is cold every morning, implement filtration, and/or replace old plumbing fixtures.

The original notice can be found, here:

http://www.princ Rupert.ca/services/infrastructure/drinking_water/home_source_lead

Around the same time, testing was completed at the local hospital that noted the requirement to flush and monitor water quality, due to the age of their interior pipes, and this was reported on in the local newspaper. Although these issues are separate, they both relate to water quality, and seem to have been confused by some members of the public.

There has been discolouration, due to additional tannins as a result of pumping from a secondary source at Shawatlan lake. This, again, is not related to the Boil Water Notice, it's an aesthetic quality related to our secondary water source while we construct new water infrastructure. Our water is tested regularly, and if/when issues arise, a notice will be put into effect. The Boil Water Notice was issued as soon as possible following knowledge of elevated levels, as a precautionary measure to protect public health. City workers, and Northern Health staff are public servants who live with their friends and family in the community, and act in the public interest.

Why doesn't the City just truck in water from Port Edward?

The City of Prince Rupert would like to thank the community of Port Edward for their generous offer of a water truck for the remainder of the current Prince Rupert Boil Water Notice. Although trucking of water into our community from Port Edward's reservoir to set up a distribution centre was considered, it was determined by the City that this option presents additional health concerns with respect to the use of unsterilized containers. Northern Health notes that individuals retrieve water using personal containers from home at increased risk of bacteriological contamination, as there is no way to determine the sterility of containers provided. We are aware that some residents have elected to go to Port Edward to collect water, however those that do so are recommended by the Health Authority to ensure containers are sterilized.

In the instance of a water shortage, alternative water supplies would need to be considered. Rather, in this instance, the current Notice is with respect to compromization of the source, which can be rectified through boiling. As per Northern Health guidelines for the use of water during a Notice, the best advice remains to boil continuously for 1 minute to eliminate cryptosporidium and giardia.



BOIL WATER NOTICE INFORMATION

(Health-related Questions below provisioned directly by Northern Health)

How do I use water when a Boil Water Notice has been issued?

The water should NOT be used for drinking, making infant formula and juices, cooking, making ice, washing fruits, vegetables or brushing teeth. For these purposes, boiled or bottled water should be used. The water should be brought to a rapid rolling boil for one minute. If there are children in the home, place the pot on the back burner to avoid scalds. Boil only as much water in the pot as you can comfortably lift without spilling. Discard all ice made previously. Make ice using cooled water that was previously boiled.

What is the purpose of boiling or treating the water?

Boiling the water destroys all the disease-causing microorganisms (pathogens) and is considered potable after cooling.

Can I take a bath or shower?

Adults and teens may take baths or showers with untreated water. Older children could also be given a shower with a hand-held showerhead, avoiding the face. Due to the likelihood that young children will drink bath water, they should be given a sponge bath instead of bathing them in a tub.

Can I use the water for handwashing?

The water may be used for handwashing as long as proper handwashing technique is being applied. Use a hand sanitizer (60% ethyl alcohol) after washing hands.

During an outbreak: After handwashing, apply hand sanitizer. You can use alcohol-based hand disinfectants, containing more than 60% alcohol. There are other kinds of gels or solutions also available on the market that can effectively disinfect the hands. These products are widely used in health care settings after washing hands or in situations when water is not available. The wet wipes used for cleaning babies at diaper changes are not effective for disinfecting hands and should not be used for this purpose.

Can the dishwasher be used to clean and disinfect utensils?

The water may be used for regular dishwashing at home, unless otherwise directed. During an outbreak: Sanitize your dishware after washing. Set your dish machine to the "Sanitize" cycle, if applicable, to adequately sanitize your dishware. Alternatively, after dishwashing, soak your dishware for 2 minutes in a 100-200ppm chlorine solution. Make this solution by adding 1 tsp (5mL) of regular unscented household bleach to every 1 litre of water.

Should I change the way I'm doing laundry?

No. Continue doing laundry the way you usually do.



BOIL WATER NOTICE INFORMATION

Is the water safe to fill wading pools for children?

No. The water is not safe for use in wading pools. Water usually gets into the mouths of small children, providing a possibility of infection.

I have a water filtration device installed. Does this make the water safe for drinking or cooking?

No. Filtered water should also be brought to a rolling boil for one minute before drinking or using it for cooking. The units should be back-washed, disinfected, or replaced after the Boil Water Advisory has been rescinded. Contact your manufacturer or local Health Agency for more information.

How do I disinfect counter tops, chopping boards or utensils?

Counter tops, chopping boards or utensils should be washed with soap and sanitized with disinfected water. Mix 1 tsp (5mL) of bleach into 1 litre of water for this purpose. Do not reuse or store this solution. It must be made daily as the sanitizing solution loses its strength with time.

Can I brush my teeth with untreated water?

No. Untreated water may contain harmful microorganisms. Infection can occur even by swallowing only a small amount of water. Use cooled water that was previously boiled for brushing teeth. Approved bottled water is also acceptable.

Can I use bottled water or buy water from vending machines?

It would depend on when the water is bottled and how it is bottled. Local plants or vending machines that use the local water are acceptable only if the water undergoes acceptable further treatment to remove the contamination. Check with an Environmental Health Officer to determine if a certain brands of bottled water or vending machines are acceptable. Bottled water packaged or manufactured from out-of-town is acceptable.

Can I drink coffee from a coffee maker?

If tap water is heated in a machine to a temperature above 74°C for at least 15 seconds and the temperature is verified using a thermometer.



BOIL WATER NOTICE INFORMATION

QUICK REFERENCE GUIDE

Use tap water for:	Use boiled water for:
<ul style="list-style-type: none">• Laundry• Showering• Shaving• Flushing toilets	<ul style="list-style-type: none">• Drinking• Brushing Teeth• Sponge bathing babies• Making ice• Washing fruits and vegetables• Preparing food and baby formula• Coffee making• Pet water bowl

DO NOT USE:

- Any kind of household filter
- Ice makers, soda dispensers or any appliance with a line to the water supply



CITY OF PRINCE RUPERT WATERSHED REPORT

Operations Department



Richard Pucci
Director of Operations, City of Prince Rupert
January 10th 2019

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Preface

Abstract

Professionals around the world agree that strategic public investments in areas such as infrastructure are critical to drive economic growth and strengthen a community. Investing in infrastructure is more than generating jobs and economic growth. It's more than water pipes, roads and bridges. Infrastructure is what connects us to our community and allows us to participate, socially, recreationally and economically.

Watershed Report

System Overview

The City's water is transported through a gravity-fed system capable of supplying 10 million gallons of water per day. This is a significant amount of potable water for large commercial users and a population of 25,000 people or more.

Since the 1980's, the City has received its water from a dam at the Woodworth Lake Reservoir. The water is piped by gravity through a raw water supply pipeline to the chlorination station at the lower end of Shawatlan Lake. At this point, the raw water is treated using chlorine injection for disinfection, and supply mains bring the potable water via 2 underwater crossings at Fern Passage to the booster pump station on Frederick Street and reservoirs at Montreal Circle. From there, the water is piped by smaller supply mains and distribution lines to the residences and businesses within the City's serviced area.

Shawatlan Lake is the City's secondary water source and emergency back-up water supply, which is serviced by a pumping station located beside the chlorination station at the lower end of the lake. Shawatlan Lake was a primary water source (for 80% of the City water) until conversion to Woodworth in the 1980's. The switch to Woodworth lake was enabled by the building of a \$5.4 million pipeline in 1995.

Woodworth Dam

The raw water supply system is a critical component of the City's water supply. The City's primary water supply, the Woodworth Lake Reservoir, is created by a dam that is now over 100 years old. The Woodworth Lake Dam was originally built in 1910 to support hydroelectric generation and was operated by BC Hydro until it was transferred to the City in the 1980's for potable water use. At that time, the condition of the dam was already of concern, and so the height of the dam was reduced to eliminate some loading on the structure.

In 2017, the City completed design of a replacement dam for Woodworth Lake and in 2018, an RFP was issued to select a contractor to complete this work. Council voted in the fall to award the project to Eiffage Canada, who will be tasked to build a new modern and resilient dam to support the next 100 years of this community. Construction of the new dam is expected to begin early in 2019, and complete at some point in the early months of 2020. This new dam will be located immediately downstream from the current dam and will make use of the existing structure to manage and divert water from the project area during construction. The total project cost is expected to be approximately \$19 million once environmental and consultant fees are included, of which \$7 million is funded through a joint provincial and federal grant program.

New Raw Water Supply Line and Access Road

The raw water (untreated) from the Woodworth Lake reservoir previously flowed by gravity through the original 2.2 km long bell-and-spigot cast iron pipe installed when the dam was built in 1910. Beginning in 2017 and completed in 2018, this section of pipe was replaced with a new high-density polyethylene (HDPE) supply line. Installation of the new water supply line also included the construction of a road to provide vehicle access to the base of the Woodworth Lake Dam. The new pipeline was buried underneath the extended access road, and on the downstream end was connected to a 36 inch ductile iron pipe, previously upgraded in 1995. From this point, raw water is transported under the lower access road another 3.6 km to the chlorination station adjacent to Shawatlan Lake.

The new HDPE raw water supply line and vehicle access road to the dam site will provide a more secure water supply for the City, and allow for more cost effective dam construction and easier repairs and maintenance when required in the future.

Secondary Source Pumping

The City's backup water supply or secondary source of water is by a pump station at Shawatlan Lake. It draws water from the Lake by means of electric pumps. The pumps and associated control items were replaced in 2015 and 2016, and an emergency backup diesel generator installed in the event of loss of power at the station. The long term use of these pumps will be for emergency backup supply. However, in the event of an interruption in the primary supply from Woodworth Lake and during construction of the new Woodworth Lake Dam, all water being delivered to the City is currently being supplied from this secondary source system.

Current System Challenges

Due to the aforementioned construction in the primary watershed, the City's water system is currently more vulnerable to impacts from weather-related runoff. The use of the City's secondary source at a lower elevation coupled with a dry summer and the recent aggressive storm surge events have increased sediments and debris flows in the water. Since this move to the secondary source in 2016, the Operations Department and community has also noted more impacts to colour which is a direct result of these influences.

Nonetheless, the most recent challenge is the presence of cryptosporidium and giardia confirmed in the City's treated water supply in mid-December, causing the community wide Boil Water Notice that remains in effect today.

Cryptosporidium and giardia are microscopic parasites that are commonly found in surface waters such as lakes, ponds, rivers and creeks, especially in rural areas prevalent with an abundance of wildlife. Cryptosporidium and giardia are very resistant to disinfection. Current Provincial Drinking Water testing regimes and standards do not

require frequent testing for cryptosporidium and giardia, due to the low risk of contamination in most water supplies; however, many larger water systems are voluntarily taking action for greater control of these and other microbial contaminants that are addressed through multiple phased water treatment.

Cryptosporidium causes cryptosporidiosis and giardia causes giardiasis, both gastrointestinal diseases. People with severely weakened immune systems (immunocompromised) are likely to have more severe and more persistent symptoms than healthy individuals. As of the date of this Staff Report, there has not been a lab-confirmed case of cryptosporidiosis or giardiasis in Prince Rupert directly attributable to the current Boil Water Notice.

With the absence of an outbreak, health data is not adequate to determine how a person becomes infected. For example, other possible sources of cryptosporidiosis and giardiasis are exposure to feces of persons or domestic or wild animals, eating contaminated food without it being properly washed or lack of adequate hand-washing, among other sources.

Reactive & Proactive Response

The City issued the December 14th Boil Water Notice within 40 minutes of notification from the Northern Health Authority. The Notice was issued due to elevated levels of giardia and cryptosporidium. It should be noted the City is not self-regulating with respect to water quality, and that acceptable standards are determined by Northern Health and the Province in accordance with Drinking Water standards. Test results have thus far not dropped to levels deemed acceptable to remove the Notice. These microscopic parasites cannot be treated with available chlorination, therefore the Boil Water Notice must remain in effect until the organisms are reduced through natural processes.

As per Northern Health, there is currently no 'set' number of consecutive clear results that will be required to lift the Notice. Multiple clear tests will be required. There are other factors that can contribute to a given sample result such as temperatures and turbidity, so the City and Northern Health will observe how these other parameters/factors correlate with the changes in giardia and cryptosporidium levels during sampling periods prior to making their determinations regarding lifting the Notice.

The Operations Department Staff have completed the following to appropriately monitor and assess the situation:

- Boat patrol of 8 km Shawatlan Lake perimeter to look for potential sources of contaminants;
- Creek walks and sampling to look for potential contaminants;
- Increased testing;

- Accuracy testing with a second lab;
- Regular contact with Northern Health regarding test outcomes; and,
- Tributary analysis for animal activity, due to reliance on secondary source at Shawatlan lake (there are no tributaries that feed into the primary source at Woodworth).

As the situation has persisted longer than anticipated due to closures at the Vancouver testing lab over the Christmas, Operations Department Staff are proactively exploring alternative avenues for water provision. Recognizing that plans are to continue to pull from the secondary source at Shawatlan, we are exploring the cost of tying in the new HDPE line to return to our primary water source at Woodworth Lake during construction. Once this Department has a clearer picture of costs and feasibility, additional information will be provided to Council for review and consideration.

Long Term Solution - Water Treatment

Currently the City performs chlorine gas injection for disinfection. However, City and Provincial staff both agree, and it is noted in the 1999 *Auditor General's Report* on Provincial Drinking Water Sources, that cryptosporidium and giardia are less of a risk in the City's primary water source due to the extremely steep slopes of the Woodworth watershed and lack of habitability for larger wildlife in the very remote area. Additionally, it was noted in that Report that Prince Rupert has one of the most desirable watersheds in the Province and was one of the safest in a review of several communities across British Columbia.

Nonetheless, the City is pursuing implementation of improvements to water treatment, given in 2018 new availability of funding has made it more attainable and will support the sustainability of treatment into the future regardless of climatic conditions. In August of 2018, the City applied for funding to implement a multiple-phased water treatment system and to replace the submarine line that carries our potable water beneath the harbour from Woodworth and Shawatlan lakes. Our understanding is a decision with respect to this funding should be issued within the first 6 months of 2019, and staff have been in contact with the associated Ministry to advance our application. This represents the final of 3 phases of the City's water infrastructure replacement project. Water colour/tannins that result from our use of an above-ground source impacts the effectiveness of UV filters alone. The desired new system, when implemented, will include treatment to remove colour prior to UV filtration, which means that there will be multiple treatment barriers put into effect. Multiple treatment barriers will virtually eliminate the risk from cryptosporidium and giardia in the future. If we are successful in achieving the grant for the Phase 3 \$29 million project, the City will be responsible for contributing \$7 million worth of the costs.

Summary

On December 14th, as directed by the Northern Health Authority, the City immediately issued a Boil Water Notice. The Notice was as a result to the Northern Health Authority's determination regarding the presence of elevated levels of giardia and cryptosporidium in the City's drinking water. Test results have not dropped to levels deemed acceptable by the Northern Health Authority to remove the Notice. As these microscopic parasites cannot be treated with available chlorination disinfection, the Boil Water Notice must remain in effect until the issue is resolved. At this time the Operations Department cannot provide an estimated timeline to lift the notice, and are awaiting regulatory approval from Northern Health. We will continue to periodically update the community if/when information becomes available. Once the Notice is able to be lifted, the City will use all readily-available forms of notification, including the local newspaper, website, social media, word-of-mouth, and our Emergency Alert System to communicate this fact. Residents can register to receive a notification directly to their landline, cell phone, or email at www.princerupert.ca/emergency, or by filling out a form at the Public Library, Recreation Complex, City Hall front desk, and other participating locations.