



CITY OF PRINCE RUPERT WATERSHED REPORT

Operations Department



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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.