Mt. Washington Alpine Resort Water System Annual Report 2021

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1. Introduction

The following annual report describes the Mt. Washington Alpine Resort (MWAR) Water System and summarizes the water quality and production data from 2021. This report also includes a summary of any inquiries/complaints, repairs, completed maintenance, the Emergency Response Plan, treatment protocols, Cross Connection Control and water usages. It is a visual account of the utility's continuous efforts towards achieving an above-average product for our customers through continued management, operation, evaluation, and maintenance of the water system. This report demonstrates that the utility is striving to meet or exceed all regulations and identifies potential areas of improvement in an effort to increase operational efficiency and consumer confidence.

A copy of this report will be submitted to the Island Health Authority and posted online on the MWAR website.

2. Mt. Washington Alpine Resort Water System

The MWAR Water System was established in 1979 when the ski resort was first built. As the resort has increased in size, so has the water distribution system. Additional sources have been licensed and new reservoirs were built. Extensions were made to the existing distribution system to service new developments. Over the years, regulatory amendments have been introduced reflecting the increased importance of water quality and service in the mind of the general population. Mt. Washington is perpetually adapting to meet the needs and increasing expectations of our community.

The resort's water supply, treatment and distribution are completely self-contained. We do not depend on a separate purveyor for water delivery, and we are completely independent of the Comox Valley Regional District's other water utilities. Because of this isolation and the nature of operations at the resort, the water utility has its own unique set of challenges to contend with.

The water supply originates from three springs on the southwest face of Mt. Washington which are all within the resort's legal tenure. The water from each spring is collected then funneled to two raw water open reservoirs, the Middle and East reservoirs. From these reservoirs, the water is transported via gravity to the Water Treatment Facility, where it is treated with ultra-violet light and chlorinated. It is then pumped into a 4th reservoir, a covered storage tank. From there, the water is transported via gravity throughout the distribution system. In 2021, the MWAR Water System consisted of 238 residential connections and 17 resort connections, supplying roughly 631 total units. A backup generator is available and wired to turn on immediately during a power outage.

Provincial water withdrawal licensing allows the water utility to divert water from 5 different sources. Currently, only 3 of the sources are actively being used. Except for a few isolated occurrences, the maximum daily volumes consistently fall below the allowable withdrawal limits. Higher than maximum draws typically occur when one source is taken offline for scheduled maintenance or when an emergency out of our control (such as fire) takes place. The annual volumes are well below the allowable limits as highlighted in the following table.

Source	Max. Daily Volume Allowed (m^3)	Max. Daily Volume Used (m^3)	Max. Annual Volume Allowed (m^3)	Annual Volume Used (m^3)
West Spring	455	444	62046	52719
Middle Spring	455	330	62046	33431
East Spring	200	489	73000	42432
Duckenfield Creek	389	0	141852	0
Goss Creek	3845	0	145000	0

3. Water Sampling & Testing Program

Regularly scheduled water sampling and testing is performed on the distribution system. The following table includes a summary of all testing:

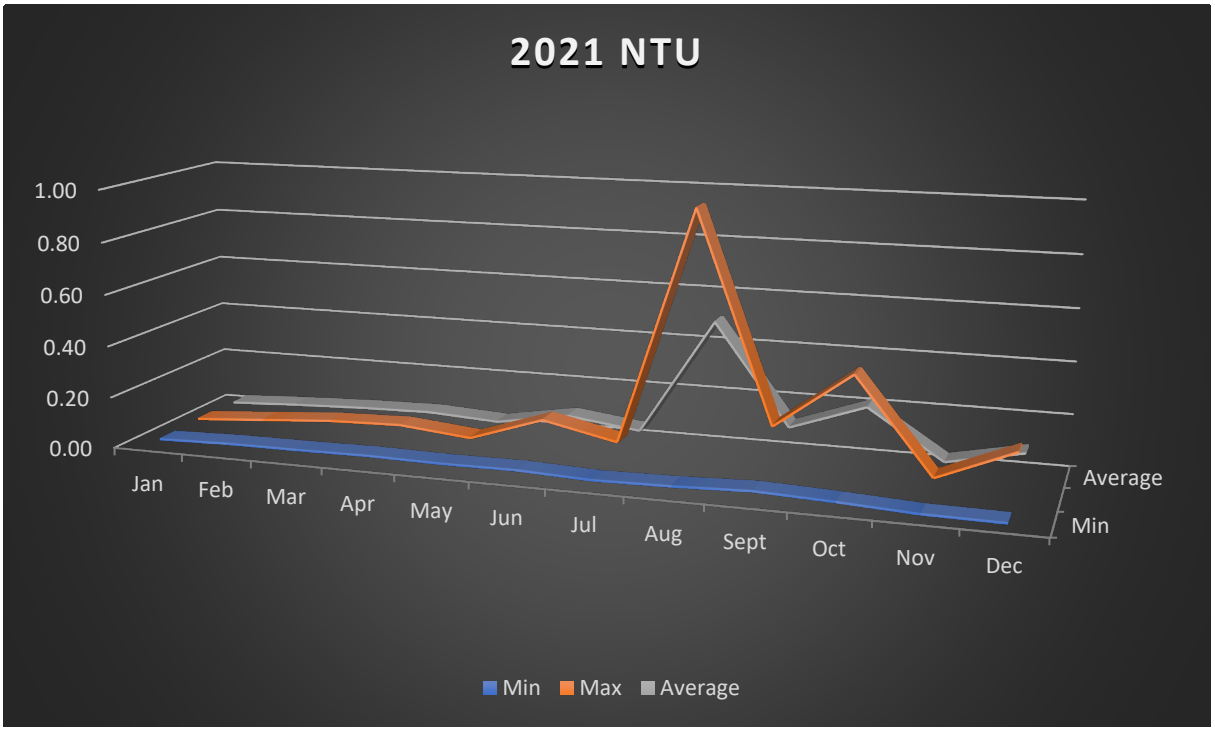
Frequency	Location	Tests
Daily	Water Treatment Facility	Turbidity, Chlorine Residual
	Raven Lodge	Chlorine Residual
Bi- weekly	Raw Water Sources	Total Coliform, E. Coli, Turbidity, pH
Bi- weekly	Potable Water	Total Coliform, E. Coli, Turbidity, pH, Chlorine Residual
Yearly	Raw and Potable	Full Metal/Chemical Analysis
Yearly	Potable Water	THM's/HAA's

4. Water Quality – Source Water and Distribution System

A. Source Water & Distribution System

Up to date water quality reports and lab data are always available from the Utilities Department. Some of the more important parameters tested are turbidity, and chlorine residuals at the beginning and end of the distribution system.

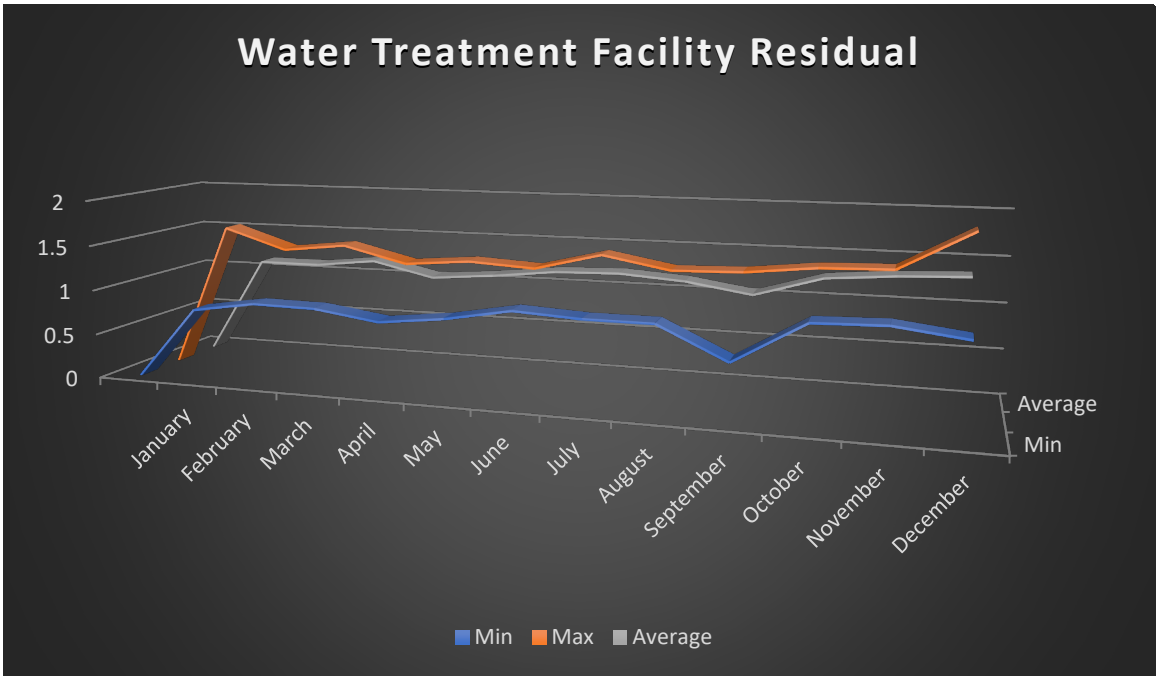
Turbidity is a measurement of the cloudiness of water. Reported in nephelometric turbidity units (NTU), it is an optical measurement of water's ability to scatter and absorb light rather than transmit it in straight lines. Turbidity is caused by fine suspended particles of clay, silt, organic and inorganic matter, plankton, and other microscopic organisms that are picked up by water as it passes through a watershed. It is an important water quality indicator because contaminants such as bacteria and viruses can attach themselves to the suspended particles in turbid water. These particles can interfere with disinfection.



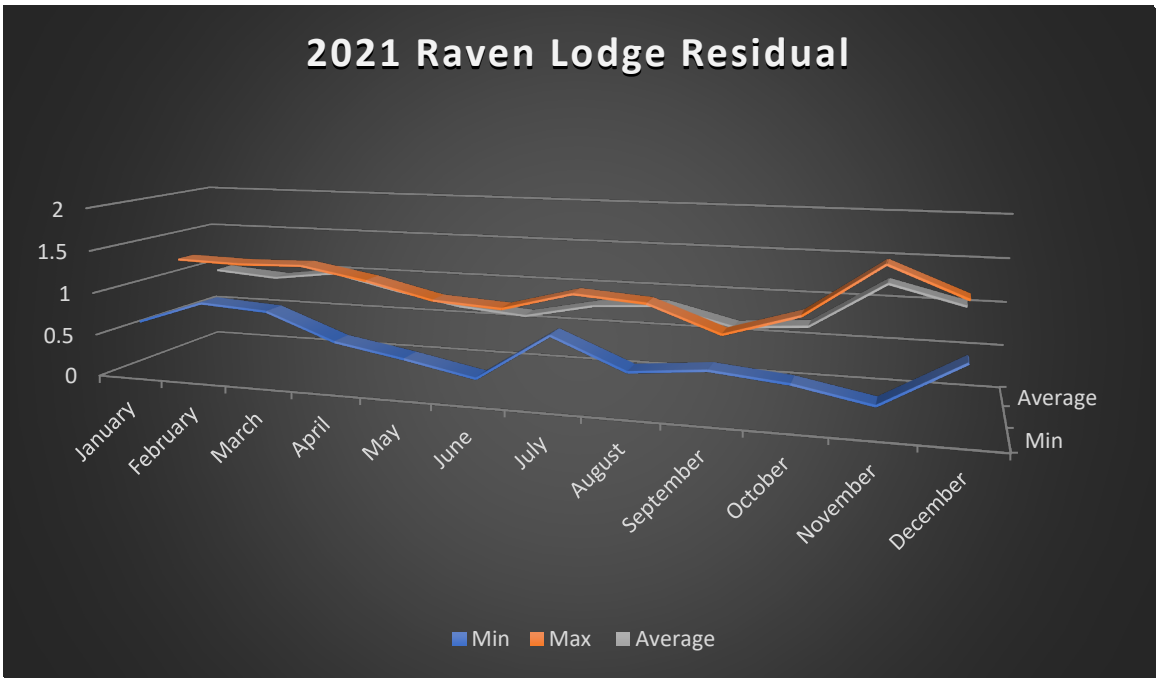
Due to the remote nature of the environment and the quality of the water from our springs, we have consistently low turbidity levels. Occasional high readings are observed, which typically coincide with heavy rain events, storms or rapid spring melts. As shown in the graph above, average values are generally well below 1.00 NTU.

Chlorine is one of the most used disinfectants for drinking water and is highly effective in the deactivation of pathogenic microorganisms. We use sodium hypochlorite in liquid form as our primary disinfectant. Relative to larger city operations, our raw drinking water is of excellent quality, so a smaller amount of chlorine is needed to disinfect.

Sodium hypochlorite is injected into the raw water as it is pumped up to the treated water storage tank. Allowing the solution to mix thoroughly in this tank provides sufficient contact time between the disinfectant and the water. Some of the chlorine is used up in the disinfection process. The residual chlorine is measured continuously by an online analyzer at the water treatment facility, the first tap on the distribution system. Our goal is to meet the 4-3-2-1 guidelines set out by Island Health. The following graph displays the maximum, minimum and average measured chlorine residuals for each month in 2021.



As chlorinated water travels through the distribution system, the chlorine available for disinfection will decrease. It is either used up by any organics or contaminants found in the distribution system, or it dissipates if water sits around for too long. It is important that potable water maintains a measurable chlorine residual throughout the entire system.



The Raven Lodge is the last connection on the distribution system. Mt. Washington utilities tests the chlorine residual at Raven using a Chlorometer daily. The Chlorometer is used to measure the degree of colouring, and correlates that to a measurement of residual in mg/L or ppm.

Our goal is to maintain a minimum chlorine residual of 0.2mg/L at the Raven Lodge consistently. Occasionally, during the off-season months, there is very little flow at the end of the distribution system, since the Raven Lodge and many other buildings in the area are closed. If the chlorine residual measured falls below the target of 0.2mg/L, we will briefly flush a hydrant in the area to pull fresher water into the end of the system. This typically happens once in June and again in October or November, as shown in the above graph.

B. Filtration Deferral and UV Disinfection

The Island Health Authority has implemented the federal '4-3-2-1' drinking water quality initiative. All water systems that use surface water sources are required to maintain the following treatment specifications:

- 4 log removal/inactivation of viruses
- 3 log removal/inactivation of Giardia cysts and Cryptosporidium oocysts
- 2 treatment processes, usually filtration and disinfection
- 1 NTU maximum turbidity in finished water

Most systems require a form of disinfection AND filtration, but the resort qualifies for a filtration deferral in which we must adhere strictly to 4 main objectives; **1)** Maintain 2 forms of disinfection that inactivate pathogens such as Giardia and Cryptosporidium. Mt. Washington does this by the aforementioned chlorine protocols as well as by operating 10 UV units within our Water Treatment Facility. **2)** The number of E.coli in raw water does not exceed 20/100mL in at least 90% of the weekly samples from the previous 6 months. To accomplish this Mt. Washington has an above average testing protocol in which we test our raw water at a minimum of 2 times per month. We have zero instances of going above this concentration within the 2021 calendar year to report. **3)** Daily average source water turbidity of 1 NTU or less 95% of the time and not above 5 NTU for more than 2 days in a 12-month period. As seen above, the resort monitors its turbidity in real time using an in-line turbidity unit connected to an alarm that contacts an operator 24hrs a day. As seen in the above graph, we did not exceed these limitations at any time throughout the 2021 year. **4)** Finally, the resort is mandated to maintain a watershed control program that minimizes the potential for fecal contamination. We accomplish this in several ways. The sources are protected by fencing year-round to minimize animal interaction with sources. The location themselves have been chosen to meet these criteria. The remote nature of the sources is surrounded by steep terrain and are out of the way of known animal corridors. This makes interaction between people and animals much less likely.

5. Water Quality Inquiries and Complaints

We received no complaints regarding water quality during 2021. There were several complaints lodged with our accounting department regarding high water bills. We investigated the source of the high-water bills and found that plumbing issues or running toilets within the units were responsible for the high-water usage. Once a year, we include a list of reminders with utility bills. Checking for leaky toilets or faucets is always on this list.

A few times a year, we receive calls from customers who have found water pooling on the ground and are concerned that a water main has been broken. These calls typically happen

in spring and early summer, and this year was no exception. As snow melts, water follows the path of least resistance and often collects in unusual areas, dammed by snowbanks and ice jams. We always investigate these calls to confirm that the water is not originating from our distribution system usually by testing for chlorine residual.

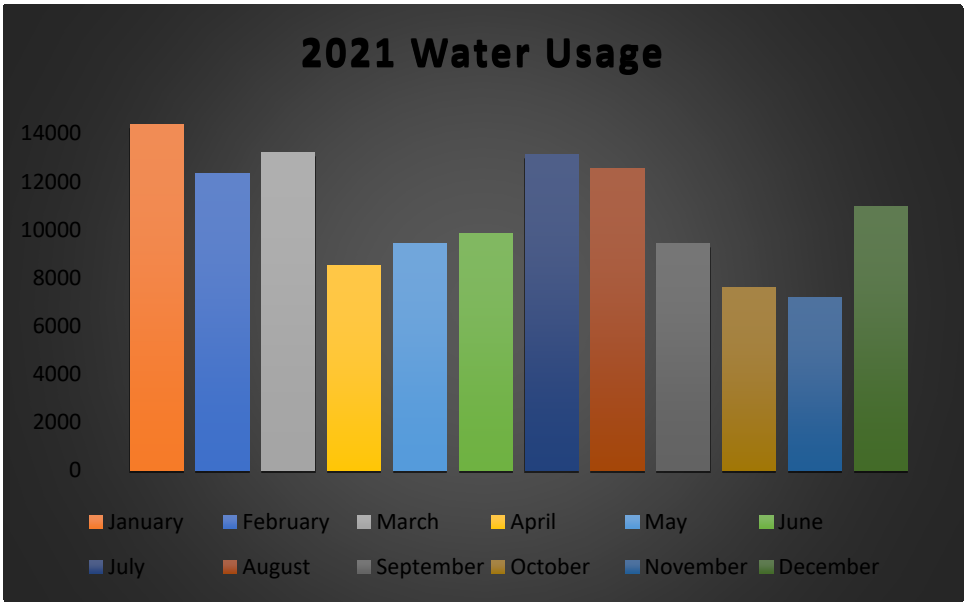
6. Water Leaks and Repairs

We dealt with **9** instances of leaks in the distribution system this year. Various cold snaps and aging infrastructure are the primary catalysts for these incidents.

1. **January 12.** Located leak in front of unit #80 after observing water loss via our SCADA system. Leak concluded to be coming from under building. Water shut off, owner notified, and leak fixed by plumber.
2. **April 9-12.** Significant water loss detected via SCADA. Roughly 20 feet of snow in spots made Sonophone and visual detection extremely difficult. Over 2 days we began digging up valves and isolating parts of the village before zeroing in on one small section of the village. There were no signs of buildings leaking so we decided to dig up an old air relief valve and realized it had failed. Plug installed and water recovered over several days.
3. **June 16.** Detected a wet spot in front of unit #24. Verified leak using Sonophone. Assumed it was their service line but concluded it was a faulty seal on the main lines bell joint. Fixed using 3 bolt Romac compression coupler.
4. **July 5.** Got a call in the morning regarding water loss at 1381 Henry rd. Determined leak to be on owner's side. Provided as-builts and key to Terra Nova plumbing. Took a couple days to fix.
5. **July 12.** Got a call from building maintenance early morning about a leak at Reception Store. After shutting water off, the line was excavated and a 1" service line was installed through the old 2" water line. The building only services a couple staff for short periods and no longer requires a 2" service line.
6. **Aug 10-11**. Found a leak coming from an old (but deep) ARV. Vac truck from Edgett Construction called up and leak fixed. No major water losses.
7. **Aug 17.** Located leak at fosters place unit #14 coming from under the concreted driveway. Water for the unit was shut off. Excavation using vac truck by Edgett Construction proved to be too dangerous to fix using conventional methods generally used at Mt. Washington. Wacor Construction was eventually hired to perform the fix on Oct 14. BC Hydro also on site to cut power when needed.
8. **September 19.** Small leak detected at unit #83. Replaced Service line.
9. **November 29.** Water loss detected on SCADA. Leak detected quickly, water shut off and owner contacted about leak coming from under building.

7. Water Consumption

Since the covid-19 pandemic cut short the 2020 ski season, Mt. Washington has been fortunate to maintain an above average amount of skier visits and village bookings this year. Our water usage for this year reflects this but is also slightly higher as we were not mandated to have porta potties for customers which slightly increased usage from last year. A considerable structure fire last year also increased water used but thankfully in 2021 we did not have that issue. Although as seen in July/August, we had considerably higher usage than average due to a leak which coincided with an above average mountain bike season.



8. Maintenance Program

Inspections of the springs, reservoirs, chlorination equipment and pumps are conducted on a daily basis. This is done to decrease the risk of equipment failure and contamination of the water, and to ensure the consistent application of chlorine for disinfection. All of the gate valves in the distribution system are exercised once per year to ensure they will function properly in an emergency. Water mains are flushed once per year, and all hydrants are serviced at this point as well. An operator is always on call 24 hours a day to respond to any emergencies.

9. Water Operator Projects and Non-Leak Related Repairs

2021 Completed Projects

- **March 29-** Took hydrant at 1386 Nordic Rd offline after being struck by at snowcat. Replaced using spare once snow allowed.
- **April 21-23-** Replaced 100’ service line at the Vehicle Maintenance Shop.
- **Oct 13-14-** Murray Mackay and team conducted online cleaning of the treated water storage tank. Boil water advisory implemented for 1 week thereafter by order of Environmental Health Officer.
- Updated the Drinking Water Emergency Response Plan.
- Removed trees and shrubs surrounding storage tank and hydrants.
- Continued ongoing operator education
- Updated Watershed Protection Plan
- Flushed and pressure tested dead-end hydrants and tested for THM’s and HAA’s.
- continued with project of servicing, repairing, and replacing water meter displays and readers that did not seem to be functioning properly

10. Emergency Response Plan

The resort's utility department has an Emergency Response Plan (ERP) that contains procedures and contact information to efficiently respond to water system emergencies such as contamination of water supply, loss of supply, and pump failure. The ERP is reviewed and updated every year. Copies are available in the Water Reclamation Facility, the Water Treatment Facility, and on the company's internal computer network.

11. Cross Connection Control

A Cross Connection Control (CCC) Program was initiated in 2011 and is still ongoing. This is now performed by the contractor Caledonia Fire Protection Ltd for all resort buildings and fire suppression systems. The requirement for backflow prevention devices is stressed for all new buildings being built by customers. This requirement is also reinforced with the owners of existing buildings in the village.

12. Dam Safety and Maintenance Program

The Dam Safety Auditor visited us in the fall of 2018 to review the requirements of the necessary Dam Safety and Maintenance program and the changes made to the program. All of our operators completed a Dam Safety course put on by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development in the late fall of 2019. Due to the early snow fall burying our dam location, we were not able to complete the update of our Dam Safety program, but we will be revisiting this once that area is clear of snow.

13. Closing

The annual report for the year 2021 will be prepared and will be submitted to The Island Health Authority. The annual report will also be posted on our website for the public.