An aerial photograph of a large, calm blue lake with a white shoreline, viewed from a high angle. The water is a deep blue, and the land is a light, sandy or silty white. The image is split vertically by a thin white line.

2020

DRINKING WATER ANNUAL REPORT

HOTHAM
Mount Hotham Resort Management Board

Contents

Introduction	2
Overview	2
Water supply system	2
Drinking Water Treatment Processes	10
Water treatment	10
Issues	10
Known or suspected contamination reported under section 22	11
Drinking water quality standards 2019-2020	12
<i>Escherichia coli</i>	12
Trihalomethanes	12
Turbidity	13
Chlorine based disinfection by-product chemicals	13
Other pathogens, chemicals, substances or algae that may pose a risk to human health	13
Aesthetic characteristics	13
Analysis of results	14
Complaints relating to water quality	14
Risk management plan audit results	15
Undertakings under section 30 of the Act	17
Variations, Exemptions and Regulated water	17
Further Information	17

Introduction

Purpose

This annual report has been produced in order to comply with the requirements of the *Safe Drinking Water Act 2003* (the Act) and the *Safe Drinking Water Regulations 2015* (the Regulations). This Drinking Water Annual Report provides information on the quality of drinking water provided to Mount Hotham Resort from July 1st 2019 to June 30th 2020.

Mount Hotham Alpine Resort

Mount Hotham Alpine Resort is located toward the southern end of the Great Dividing Range, approximately 365 kilometres north-east of Melbourne and 520 kilometres south-west of Canberra. Mount Hotham is the highest of all the Victorian alpine resorts with a summit elevation of 1861 metres above sea level (asl). The area is comprised of sharp and slightly rounded peaks connected by ridgelines, incised by steep watercourses and gullies. The resort is located at the headwaters of four major river catchments: the Kiewa, Mitta Mitta, Dargo (Mitchell) and Ovens. The resort encompasses an area of approximately 3,030 hectares, the majority of which is Crown Land, and is bounded on all sides by the Alpine National Park.

The average annual precipitation, including snowfall and rainfall, is over 1450 millimetres. Snowfalls that create and maintain a persistent snow cover usually begin about mid-June and continue intermittently until early September.

The urban area within the resort supports administrative, retail and commercial business as well as a large variety of accommodation. There are approximately 4,300 beds within the resort. The village population, and consequent demand for water, is highly seasonal. At the 2016 census, Hotham Heights recorded a permanent population of 196. There were 313,341 visitor days recorded during the 2019 winter season, with 389,401 and 368,313 in 2018 and 2017 respectively. The Mount Hotham Alpine Resort Management Board (RMB) is the statutory authority under the *Crown Land (Reserves) Act 1978*, and the *Alpine Resorts (Management) Act 1997*. *The Alpine Resorts (Management) Act 1997* states the RMB is to provide services within the resort including water supply.

Drinking Water Objective

RMB strives to provide the delivery of quality reliable services that meet customer needs and contributes to the ongoing viability of the resort. RMB is defined as a water supplier under the Safe Drinking Water Act 2003 and aims to provide a high quality safe drinking water supply.

Overview

Water supply system

Table 1. Source of water

Water Sampling Locality	Population supplied	Source Water	Storage	Treatment Plant
Mount Hotham	October to May less than 100, June to September approx. 4800.	Upper Swindlers Creek	Mt Higginbotham	UV 1 or UV 2

Water is sourced from Upper Swindlers Creek, a catchment of approximately 177 hectares. Water is collected at the Swindlers Inlet headwall and raw water is gravity fed to the pump station before being pumped through a pressure rising main to storage tanks located at the summit of Mount Higginbotham. From the storage tanks, the raw water flows to the ultra violet (UV) units 1 and 2 where it is disinfected immediately prior to its distribution to customers through the village water reticulation system. The water supply system is outlined in Table 1 and a working overview is shown in Figure 1. The key components of the water supply system is detailed in Figure 2.

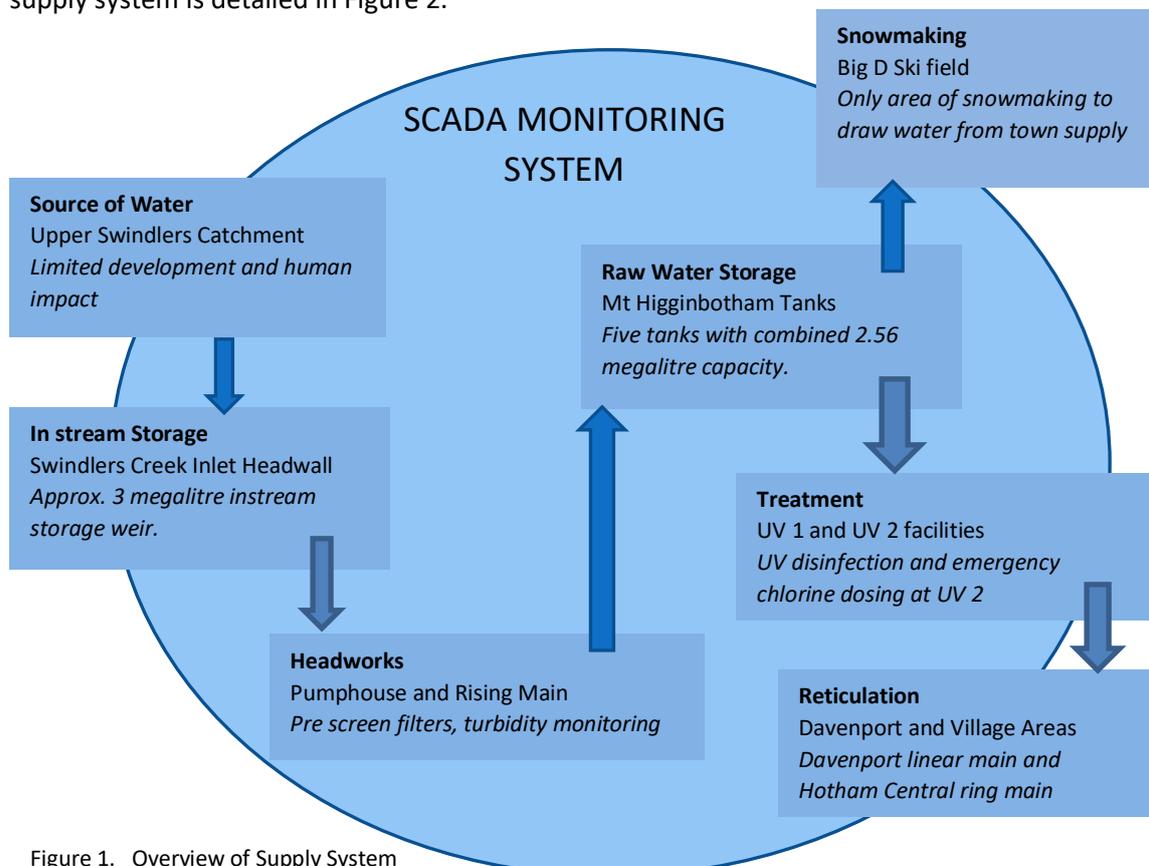


Figure 1. Overview of Supply System

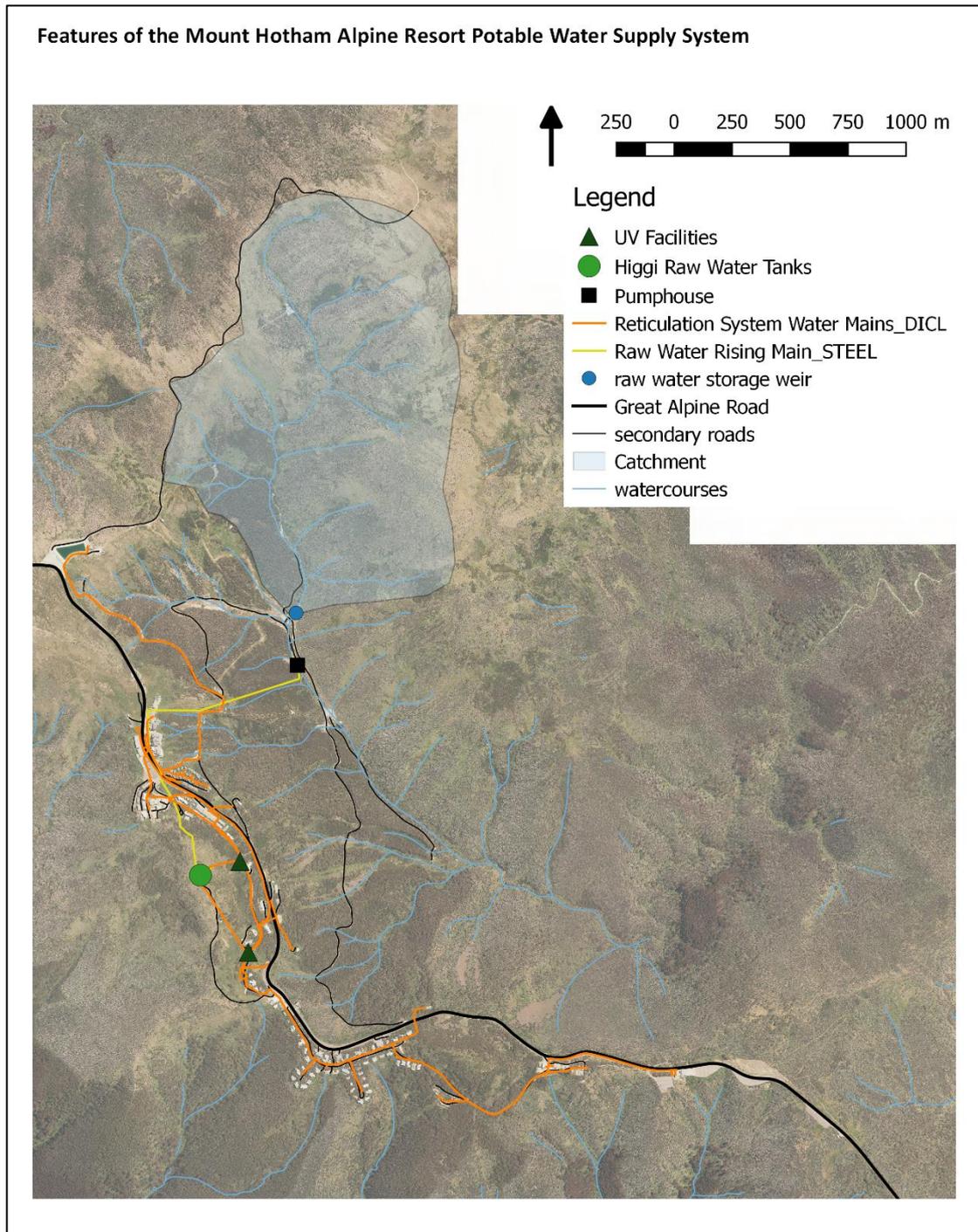


Figure 2. Key components of the drinking water supply system within the Mount Hotham Alpine Resort

Source water

The source of the village water supply is the upper reaches of Swindlers Creek. The upper Swindlers Creek watershed is a protected catchment comprising groundwater source, snow melt and precipitation within a 177 hectares area (Foresight Engineering, 2011) between 1800m asl and 1450m asl. A number of small tributaries deliver reliable flows to Swindlers Creek for most of the year and flows are significantly augmented during rain events. There is limited development within the catchment with winter ski field activity and no regular human habitation or sewerage discharge. Using the Victorian framework for water treatment: Best Practice Guidelines, the microbial risk classification is Level 2. An annual catchment survey is undertaken to monitor and record any changes within the catchment that may impact on source water quality. The MHARMB Drinking Water Catchment Sanitary Survey and Vulnerability Assessment 2018 classified the catchment as : Category 1 Source (Fully protected catchment).

Storage Weir

Swindlers Creek flows through an inlet structure and pipeline. The inlet headwall, constructed in early 2016, expanded the previous storage volume to 3 megalitres. It is accessible via an access track for maintenance works. The inlet is a reinforced concrete structure comprising an instream headwall approximately 20 meters wide and 5 meters high with grill and tapered walls to direct flows and accelerate water into the Swindler's Valley Pipeline. The headwall's draw point is fitted with a 18 mm screen filter over the gravity feed pipeline.

Headworks

The pump station houses two multi-stage vertical turbine pumps with two multi-stage pumps as emergency backup. A back-up emergency generator is housed in an annex of the pump house to provide electrical supply in the event of mains power failure. Raw water is pumped up the rising main to storage tanks on the summit of Mount Higginbotham.

The rising main steel pipeline was constructed in 1972 and has been highlighted for replacement within the RMBs Asset Management Systems. RMB commenced staged replacement of the rising main in 2019 and is committed to ongoing staged works to complete full replacement of the ageing pipeline over three years.

An in-line turbidity meter is incorporated into the Supervisory Control and Data Acquisition (SCADA) monitoring system and allows continuous monitoring and recording of the turbidity levels of the raw water being supplied to the pump house. Additionally, the SCADA system provides continuous monitoring of raw water turbidity as it enters the pump house and has a high limit interlock of 5 NTU which prevents pumps from operating and conveying turbid water to the storage tanks.

Raw water storage

Five storage tanks with a total capacity of 2.56 megalitres are located on Mount Higginbotham. The five storage tanks are de-silted on a rotating basis and cleaned every 3-4 years.

Treatment

The stored raw water flows to one of two UV facilities for disinfection before entering the reticulation system to be supplied to consumers. Two high intensity medium pressure UV lamp chambers exist. UV 2 is the primary disinfection system used while UV 1 provides additional capacity, maintenance and redundancy.

In the event of an interruption to mains power supply at the main UV 2 unit facility, a fully automated emergency backup generator and chlorine dosing system ensures that no loss of disinfection to the drinking water supply occurs. The automated system is made up of the following elements:

- diesel generator,
- auto change over switch,
- dosing pump, and
- an uninterruptible power supply unit.

In conjunction with the SCADA, the system provides a transitional power supply and immediate “start-up” of the chlorine dosing pump during mains to generator change over and the resultant 20-minute delay required before restarting the reactor lamps. Once the lamp time delay has passed, the SCADA system restarts the UV reactor and turns off the chlorine dosing.

Regular routine maintenance of both UV reactors was completed during the 2019-20 reporting period as well as maintenance to other system elements.

Reticulation

All drinking water supplied through the reticulation network is gravity fed with no pumps involved. Two interconnected static head systems (East and West) supply all parts of the village. Within the Davenport village area, a linear main exists, while the Hotham Central area is supplied via a ring main. Annual mains scouring occurs prior to each winter ski season as well as ongoing staged mains disinfection.

Snowmaking

The snow making water reticulation is largely independent of the drinking water supply system. Most of the snow making capability is supplied by a separate weir which is situated downstream of the drinking water weir in Swindlers Creek. Only the snow making operation on Big D Ski area draws water from the drinking water storage tanks. The SCADA system

enables continual monitoring of water demand from snowmaking to ensure drinking water supply is not compromised.

Snow melt of artificial snow in the Milky Way area of Heavenly Valley may enter Swindlers Creek just above the drinking water weir, however associated risks are deemed low as this area is small in comparison to the larger catchment and the dilution factor would be high.

Monitoring and Reporting

The SCADA system provides continuous real time supervision and control as well as historical data collection from the critical infrastructure sites within the resort that make up the drinking water supply system.

The SCADA system is linked to the Swindlers Inlet Weir, the drinking pump house, Mount Higginbotham water storage tanks and the UV 1 and UV 2 facilities (including the emergency backup generator and chlorine dosing systems). Swindlers Inlet Weir and the pump house points collect data regarding weir levels, pressure drop across the inlet filters (indicating if filters require maintenance), availability of water for pumps and flow path for pumps, flow rate and total flows, continuous turbidity monitoring (with a high limit set point to prevent pumping turbid water to tanks), and alarm notification of any electrical or mechanical faults with pumps. Further monitoring points at the Mount Higginbotham storage tanks record water storage levels.

Monitoring within UV 1 and UV 2 facilities includes flow rates and flow totals, status, UV intensity, lamp hours and alarm notification of electrical and lamp faults. Monitoring of emergency backup generator status and fault alarms as well as emergency chlorine dosing pump status and dose rates are conducted within UV 2. Each location has on-site computer access to SCADA, as well as remote access at the RMB Technical Services office.

The SCADA system further enhances the RMB's ability to manage and operate its drinking water systems elements. It provides the ability to respond to emergency or breakdown incidents, protection of important assets within the system at times outside of normal working hours and ensures provision of drinking water that meets the water quality standards specified by the Act and the Regulations.

The RMB monitors water quality to ensure the supply of safe, high quality drinking water to consumers and to meet regulatory compliance, weekly drinking water samples are collected and tested for *E. coli* and turbidity. Samples are taken at two points; immediately after UV treatment and at two of several designated consumer tap points throughout the resort. These samples are also tested for coliforms. Monthly sampling is also taken from the raw water weir prior to UV treatment for *E. coli* and coliforms. The water sampling results are discussed in the RMB's annual report on drinking water quality, which is submitted to the Department of Health & Human Services each year.

The RMB does not undertake any regular monitoring of other pathogens, chemicals, substances or algae in the drinking water. UV treatment is the predominant method used to disinfect drinking water at Mt Hotham. Emergency chlorine dosing is only required infrequently during unplanned power outages and then only for short durations while the emergency back-up power supply re-starts the UV disinfection unit. Due to the limited introduction of chlorine into the drinking water supply the RMB does not monitor for Trihalomethanes. The inlet headwall is not subject to algal blooms due to cool temperatures, low nutrient load and generally strong water flow through the weir. The drinking water catchment is of pristine nature with very little development (ski-lift and associated infrastructure). Following a detailed risk assessment of the Mount Hotham drinking water catchment and supply it was deemed not necessary to conduct regular monitoring for other pathogens, chemicals, substances or algae other than *E. coli* and turbidity as risk was considered low.

Source Water Protection

The Safe Water Drinking Regulations 2015 requires water suppliers to quantify microbial hazards within risk management frameworks to demonstrate an understanding of source water risks.

The source of the Mount Hotham locality water supply is the upper reaches of Swindlers Creek. The Upper Swindlers Creek watershed is a protected catchment comprising groundwater source, snow melt and precipitation within a 177 hectares area (Foresight Engineering, 2011) between 1800m asl and 1450m asl. A number of small tributaries deliver reliable flows to Swindlers Creek for most of the year and flows are significantly augmented during rain events.

In accordance with recommendations of the WSAA Drinking Water Source Assessment and Treatment Requirements outlined in the Manual for the Application of Health-Based Treatment Targets (September 2015), the RMB conducted a sanitary survey and vulnerability assessment of Upper Swindlers catchment. The catchment can be classified as Category 1 Source (*Fully Protected Catchment*) as the following has been considered during assessment:

- No permanent human habitation within the catchment;
- Negligible human impact, low intensity activity primarily during winter ski season;
- Winter ski activity is well monitored;
- No sewerage discharge within the catchment;
- Limited population of pest animals – ongoing monitoring and control works;
- No stock animals present in catchment;
- Natural landscape/bushland with well vegetated riparian zone along streams;
- Increased capacity in raw water storage supply at May 2016; and
- Locked gates to tracks to prevent recreational vehicle access.

The Category 1 Source classification further considered and confirmed against a microbial indicator assessment. Monthly raw water monitoring has been conducted for over 20 years with sampling points at the on stream storage weir, Mt Higginbotham storage tanks and prior to disinfection within the UV 2 facility for *E.coli* and coliforms. This allows for long term comparisons for pathogen levels within the on stream, off stream and treatment facilities.

The newly constructed inlet with headwall to the Swindlers Creek pipeline has resulted in an approximate 3 megalitres of instream storage capacity with an additional detention time, thereby further reducing the risk of pathogens within the source water.

Results from the raw water monitoring program have verified the effectiveness of the increased detention time within the off-stream storage to reduce pathogen occurrence. Regular raw water monitoring provides operational staff an early warning indicator of potential issues within the catchment to inform overall catchment health.

Drinking Water Treatment Processes

Water treatment

Table 2. Water treatment processes

Water Sampling Locality	Treatment Process	Added Substance
Mount Hotham	UV	NIL
	(chlorination upon UV disinfection failure)	Sodium hypochlorite on UV disinfection failure

All drinking water is disinfected by means of UV radiation immediately prior to distribution to consumers. There are two UV treatment systems in operation; UV 2 is the primary system and UV1 provides additional capacity, maintenance, and redundancy. Regular maintenance of the UV disinfection system consists of:

- Daily checks of UV reactors, chlorine dosing pump and supply level, and pipework during winter;
- Monthly replacement of chlorine supply;
- Weekly water sampling and testing;
- Annual cleaning of the reactor chamber;
- Annual cleaning of lamps and sleeves; and
- Scheduled replacement of lamps and sleeves.

Annual maintenance procedures are normally carried out in June, prior to the commencement of the peak winter ski season.

The SCADA system records the lamp replacement interval as well as real time UV intensity. Globes are replaced after 8,000 operating hours. In the event of power supply failure to the unit and subsequent disablement of the UV system, an automated emergency chlorine dosing facility ensures ongoing disinfection of the water supply. Upon the UV system being resumed, the chlorine facility will automatically cease dosing. When maintenance periods are being conducted the alternative UV facility is activated to achieve ongoing disinfection of water supply.

Issues

There have been no issues identified with the drinking water treatment and supply system within the July 2019 to June 2020 reporting period.

Emergency, Incident and Event Management

Known or suspected contamination reported under section 22

No incidents occurred impacting drinking water requiring to be reported to Department of Health and Human Services under section 22 of the Act during the 2019-20 reporting period. There were also no incidents that had the potential to impact on water quality during the 2019-20 reporting period.

Drinking water quality standards 2019-2020

Drinking water quality standards specified for water supplied within a water sampling locality are stated within Schedule 2 of the Safe Drinking Water Regulations 2015. To ensure the supply of safe, high quality drinking water to consumers and to meet regulatory compliance, weekly drinking water samples are collected and tested for *E. coli* and turbidity. Samples are taken at two points; immediately after UV treatment and at two of several designated consumer tap points throughout the resort. Monthly sampling is also taken from the raw water weir prior to UV treatment. Collected samples are then couriered to a NATA accredited laboratory.

Samples are also tested for coliforms to help provide an early warning of any gradual loss of efficiency of the UV disinfection system. Raw water microbial monitoring is carried out to maintain an ongoing awareness of raw water quality and to provide an early warning of any contamination that may have arisen within the catchment.

Escherichia coli

Schedule 2 of the Safe Drinking Water Regulations states all samples of drinking water collected must be found to contain no *Escherichia coli* (*E. coli*) per 100 millilitres of drinking water. No samples collected during the reporting period detected *E. coli*, therefore the RMB was found to be 100% compliant with the *E. coli* water quality standard during the 2019-20 reporting period (Table 3).

Table 3. *E. coli* detections of drinking water for the locality of Mount Hotham between July 2019 and June 2020.

Water sampling locality	Frequency of sampling	Number of samples	Maximum detected (orgs/100mL)	Number of detectives and investigations conducted (s. 22)	No of investigations where standard not met (s.18)
Mount Hotham	Weekly	52	0	0	0

Trihalomethanes

UV treatment is the predominant method used to disinfect drinking water at Mt Hotham. Emergency chlorine dosing is only required infrequently during unplanned power outages and then only for short durations while the emergency back-up power supply re-starts the UV disinfection unit. Due to the limited introduction of chlorine into the drinking water supply the RMB does not monitor for Trihalomethanes.

Turbidity

Schedule 2 of the Safe Drinking Water Regulations states the 95th percentile of results for samples in any 12-month period must be less than or equal to 5 Nephelometric Turbidity Units (NTU). Mount Hotham met the turbidity water quality standard during the 2019-20 reporting period (Table 4).

Table 4. Turbidity results for drinking water for the locality of Mount Hotham between July 2019 and June 2020.

Water sampling locality	Frequency of sampling	Number of samples	Max turbidity in a sample (NTU)	Maximum 95 th percentile of turbidity results in any 12 months (NTU)	Number of 95 th percentile of results in any 12 months above standard (s.18)
Mount Hotham	Weekly	52	0.3	0.2	0

Chlorine based disinfection by-product chemicals

Chlorine is only used to disinfect drinking water as an emergency back up for a very short period of time when the UV lamps have failed or are not able to be used. As chlorine is not used on a long-term basis, chlorine disinfection by products are not monitored.

Other pathogens, chemicals, substances or algae that may pose a risk to human health

Based on a detailed risk assessment that considered the risks to be low; the RMB does not undertake any regular monitoring of other pathogens, chemicals, substances or algae in the drinking water other than those mentioned previously. The source water catchment is pristine and Swindlers weir is not subject to algal blooms due to cool temperatures, low nutrient load and generally strong water flows. More details can be found under the “Monitoring and Reporting” section within this report.

Aesthetic characteristics

Aesthetics parameters including iron, hardness and colour are not formally assessed at Mount Hotham. The RMB, as the water supplier, has determined that it is appropriate that no aesthetic characteristics monitoring is necessary. There have been no reported issues with regards to taste, odour or colour of the drinking water supplied within the Mount Hotham water locality.

Analysis of results

The RMB has been compliant with the water quality standards for over seven years. Results for the past three reporting periods are presented below (Table 5). The RMB recognizes the good quality of the source water as well as well-maintained and serviced water treatment processes and systems has resulted in an ability to deliver good quality, safe drinking water to the Mount Hotham Resort. 100% of samples collected and analysed during the 2017-18, 2018-19 and 2019-20 reporting periods met the standards for *E.coli* and turbidity.

Table 5. Comparison of water quality parameters for 2017-18, 2018-19 and 2019-20.

Year	<i>E. coli</i>		Turbidity		Compliance with standards?
	No of samples containing <i>E.coli</i>	% of samples with no <i>E.coli</i>	Max NTU	95 th percentile	
2017-18	0	100	0.6	0.3	Yes
2018-19	0	100	0.3	0.2	Yes
2019-20	0	100	0.3	0.2	Yes

Complaints relating to water quality

The RMB did not receive any complaints relating to its drinking water quality or supply during the 2019-2020 reporting period nor for the previous five reporting periods. The RMB’s water treatment processes and systems continue to result in quality water supply to the Mount Hotham Resort.

Risk management plan audit results

No audit of the risk management plan was conducted in the reporting period.

The most recent audit of the RMB's drinking water risk management plan was during April 2018. The RMB's Drinking Water Quality Risk Management Plan was found to comply with the obligations of section 7(1) of the Act. The following opportunities for improvement were put forward by the auditor.

1. Two of the old water storage tanks have reached the end of their economic life. Best practice is to replace them with concrete tanks with increased capacity.
2. SMS alarms for water tanks.
3. The project to replace the rising main is a high priority. It is very important to budget for proactive replacement.
4. It is encouraging to note that there are some upgrades of the chlorine-dosing unit scheduled. Suggest manufacturer further develop and revisit the chemical dosing configuration, to improve it when there are low water flows.
5. Installation of record cupboard and equipment cupboards in the UV and pumphouse work area.
6. It is very encouraging to note the further development of onsite inspection record sheets and that they are kept next to each relevant area. Suggest that further training of operators to properly complete inspection record sheets is undertaken.
7. It is encouraging to note that drones are under review for inspection of catchments.
8. For your sampling taps, suggest considering a yearly audit, and replacement where required.

Status of OFI's:

OFI 1- Both tanks are now de-commissioned. Listed on Infrastructure Asset Management and Recurrent Maintenance spreadsheet as "Proposed". Preliminary planning commenced for replacement tank and associated works to provide increased storage.

OFI 2- Listed on Infrastructure Asset Management and Recurrent Maintenance spreadsheet as "Proposed".

OFI 3- Staged replacement is on-going. Stage 3 major capital works have been delayed, scheduled for commencement November 2020.

OFI 4- In progress, initial contact with manufacturer made.

OFI 5- Completed - Record cupboard and equipment cupboards have been installed in the UV and pumphouse work area.

OFI 6- Ongoing administrative review and improvement process.

OFI 7- Proposed drone purchase postponed.

OFI 8- Additional sampling points, upgrades and improvements listed on Infrastructure Asset Management and Recurrent Maintenance spreadsheet as “Proposed”.

The RMB is committed to the ongoing review and improvement of the Mt Hotham Drinking Water System. The RMB risk management process has prioritised the staged replacement of the Rising Main over the next three years as its highest priority Capital Works Project. Further staged replacement works scheduled to commence November 2020.

Prior to the RMB undertaking its drinking water Risk Management Plan audit scheduled in August 2020, the RMB has undertaken a full and comprehensive review of the Risk Management Plan and supporting documentation.

Undertakings under section 30 of the Act

The RMB does not have any undertakings in place with the Department of Health and Human Services.

Variations, Exemptions and Regulated water

The RMB does not have any variation to aesthetic standards of drinking water.

The RMB does not have any exceptions from water quality standards.

The RMB does not supply regulated water supplies that are not intended for drinking.

Further Information

Section 23 of the *Safe Drinking Water Act 2003* requires that MHARMB make available for inspection by the public the results of any water quality monitoring program that is conducted on any drinking water supplied by the MHARMB. Customers and members of the public may access drinking water quality data by contacting MHARMB on the details below;

Mount Hotham Alpine Resort Management Board

PO Box 188, Bright VIC 3741

Ph: (03) 5759 3550

Email: mhar@mthotham.com.au