



WATER SUPPLY
ANNUAL REPORT
2018-19



Southern Alpine Resort Management Board

Water supply 2018-19 Annual Report

For year ending 30 June 2019

Lake Mountain Alpine Resort and Mount Baw Baw Alpine Resort

Contents

INTRODUCTION.....	4
1. Legislative framework.....	4
2. Board governance.....	4
3. Vision for the resorts.....	4
4. Mission for management of the resorts.....	4
5. Water supply for the resorts.....	4
6. Reporting requirements.....	4
SECTION A - LAKE MOUNTAIN ALPINE RESORT.....	5
1. The location and scope of activities.....	5
2. Water supply system.....	5
2.1 Snowy Hill.....	6
2.2 Arnold Gap.....	6
2.3 Cascades.....	6
3. Schematic Drawing.....	8
4. Water (Regulated) Supply.....	8
5. Quality Management Systems.....	9
6. Regulated Water Risk Management Activities.....	9
SECTION B - MOUNT BAW BAW ALPINE RESORT.....	10
1. The Location and Scope of Activities.....	10
1.1. Characterisation of the system.....	10
2. Water Treatment and Quality Management Systems.....	15
2.1. Water Treatment.....	15
3. Drinking Water Quality Standards for 2018/2019.....	20
3.1.1 Escherichia coli (E. coli).....	20
3.1.2 Trihalomethanes.....	20
3.1.3 Turbidity.....	21
3.2 Other Algae, Pathogen, Chemical or Substance that may pose a risk to human health.....	21

3.3	Aesthetic Characteristics.....	24
3.3.1	Results for pH Units	24
3.3.2	Results for True Colour	25
3.3.3	Results for Iron.....	26
3.3.4	Results for Copper and Manganese.....	26
3.4	Analysis of Results.....	27
3.4.1	Trends over time	27
3.4.2	Analysis Issues.....	31
SECTION C – RISK MANAGEMENT PLAN		32
1.	Review of the Risk Management Plan	32
2.	Findings of the most recent risk management plan audit.....	32
3.	Complaints or issues	32
4.	Emergency / Incident Management	32

Southern Alpine Resort Management Board
ABN 80 841 224 798
PO Box 55
MARYSVILLE VIC 3779
Website: www.southernalpine.vic.gov.au

INTRODUCTION

1. Legislative framework

The Southern Alpine Resort Management Board ('the Board') was established on 1 January 2017 as a result of an amendment to the *Alpine Resorts (Management) Act 1997*. It is the successor to the Lake Mountain Alpine Resort Management Board and the Mount Baw Baw Alpine Resort Management Board.

2. Board governance

The Board is established by the *Alpine Resorts (Management) Act 1997* s34 (2) as amended by the *Alpine Resorts Legislation Amendment Act 2016*. The Board is deemed to be the committee of management of all the Crown land within the Lake Mountain Alpine Resort and Mount Baw Baw Alpine Resort that is permanently reserved under the *Crown Land Reserves Act 1978*.

The Board has vested in it, all the rights, property and assets that as at 31 December 2016 that were vested in the Mount Baw Baw and Lake Mountain Alpine Resort Management Boards. Similarly, all debts, liabilities and obligations of the previous Boards became the debts, liabilities and obligations of the new Board. The assets and liabilities were transferred at fair value.

3. Vision for the resorts

Recognised as providing memorable, accessible, all seasons alpine adventures.

4. Mission for management of the resorts

Building a dynamic, passionate, customer focused culture and pursuing relationships to adapt to climate change and deliver exciting all-seasons adventures.

5. Water supply for the resorts

The Board is committed to the delivery of quality reliable water service for its visitors and meeting all of its regularity obligations to the resorts. The aim is to provide safe and aesthetically pleasing drinking water for Mount Baw Baw Alpine Resort and provide a regulated water supply for Lake Mountain Alpine Resort that its water is not intended for drinking water and cannot be mistaken for drinking water.

6. Reporting requirements

This report has been prepared for the Secretary, to the Department of Health and Human Services as outlined in Section 26 of the *Safe Water Drinking Act 2003* and Section 16 of the *Safe Drinking Water Regulations 2015*. The report is provided each year on the issues relating to the quality of drinking water and regulated water supplied by that water supplier.

SECTION A - LAKE MOUNTAIN ALPINE RESORT

1. The location and scope of activities

Lake Mountain Alpine Resort is located approximately 120km northeast of Melbourne, is the closest alpine resort to Melbourne and the premier family snow play destination in the State. Lake Mountain's summit elevation is 1,433m. Located adjacent to the Yarra Ranges National Park and with 37km of groomed trails, and access to over 2,400 hectares of skiable terrain in the National Park the Resort is also one of Victoria's premier cross-country ski resorts. The resort covers an area of 465 hectares. The resort comprises of toboggan slopes, cross country trails, the visitor centre and administration building which are all situated at an elevation of approximately 1,400m.

During the green season Lake Mountain is an event venue, hosts guided walking tours, mountain biking, road cycling and provides several nature-based adventure activities within the resort.

Lake Mountain is located at the edge of the Yarra Valley, one of Victoria's key gourmet produce and wine regions. The resort is close to and has a strong relationship with the town of Marysville, 22 kilometres away. Once a prospering tourism and conference hub, with a strong day visitation market, Marysville and the surrounding region continue to rebuild the tourism offer after the devastating 'Black Saturday' bushfires of early February 2009 and have seen growing overnight stay visits.

2. Water supply system

Lake Mountain Alpine Resort is a Regulated Water System as defined under the *Safe Drinking Water Act 2003* ('the Act'). The storage and supply of water to the Resort is untreated as declared and gazetted by the Minister for Health on the 23rd of October 2005.

Regulated Water

The Act defines two types of water – 'drinking water' and 'regulated water'.

Declaration concerning regulated water:

- The Minister may, by notice publish in the Government Gazette, declare any water that is not drinking water to be regulated water for the purposes of this Act.
- The Minister may only make a declaration in relation to particular water if the Minister is satisfied that the water may be supplied to the public in circumstances in which it may be mistaken as being drinking water.
- In making a declaration, the Minister may identify the water that is the subject to the declaration by reference to its source, its method of supply, its composition or in any other way the Minister considers to be appropriate.

'Regulated Water' is defined in Sec 6 of the Act as, water that is not intended as drinking water, but which may be supplied to the public in circumstances in which it may be mistaken as drinking water. Where water supplier supplies water that is not intended for drinking, but which may be supplied to the public in circumstances such that it may be mistaken as drinking water, the Minister for Health may declare such water as regulated water.

SECTION A - LAKE MOUNTAIN ALPINE RESORT

The water supplier is responsible, under the Act to:

- Prepare a risk management plan for the regulated water.
- Ensure that the risk management plan contains the matters detailed in Regulation 6 of the Safe Drinking Water Regulations (except those that specifically relate to drinking water only).
- Have the Risk Management Plan audited, when required, by the Secretary to the Department of Health and Human Services by an approved auditor.
- Take all reasonable steps to ensure that the intended recipients of the water are made aware of the nature of the water and of the health risks that may arise from the use of the water.
- Include a summary of their management activities for regulated water in their annual report.

Actions taken as the responsible water supplier during this reporting period are referred to in the section for Risk Management.

Source Water, Gerratys

Water is sourced from the Upper Taggerty River. This small stream is fed by the bog and heath catchment area of Echo Flat. This plateau is within the Yarra Ranges National Park and considered a pristine environment, the only possible human contact is from some of the cross country ski trail network that borders the catchment area which is limited.

Storage and distribution

The main water supply system for Gerratys, the resorts village centre, consists of a small concrete weir directing water, via a series of 50mm poly pipes under a gravity/syphons process from the Taggerty River to 3 enclosed concrete tanks. The combined storage capacity of these tanks is 800kl. The storage tanks supply water to resorts facilities via a 100mm Ductile Iron pipe.

2.1 Snowy Hill

Water is sourced from the storage and distribution system from Gerratys. The delivery line works on gravity/syphons process via 50mm polythene line that supplies the Snowy Hill amenities.

2.2 Arnold Gap

Water is sourced from a small tributary and stored in 1000 litre polythene tanks. The supply and delivery lines for systems work on gravity/syphons process via 50mm polythene lines which in turn supplies water to the amenities building located at Arnold Gap.

2.3 Cascades

Water is sourced from a small tributary and stored in 500 litre polythene tanks. The supply and delivery lines for systems work on gravity/syphons process via 50mm polythene lines which in turn supplies water to the amenities building located at Cascades.

SECTION A - LAKE MOUNTAIN ALPINE RESORT

Resort Water Supply, Storage and Reticulation System Gerratys

Source Water



Water collection point



Water Storage



Amenities Building



Commercial Centre



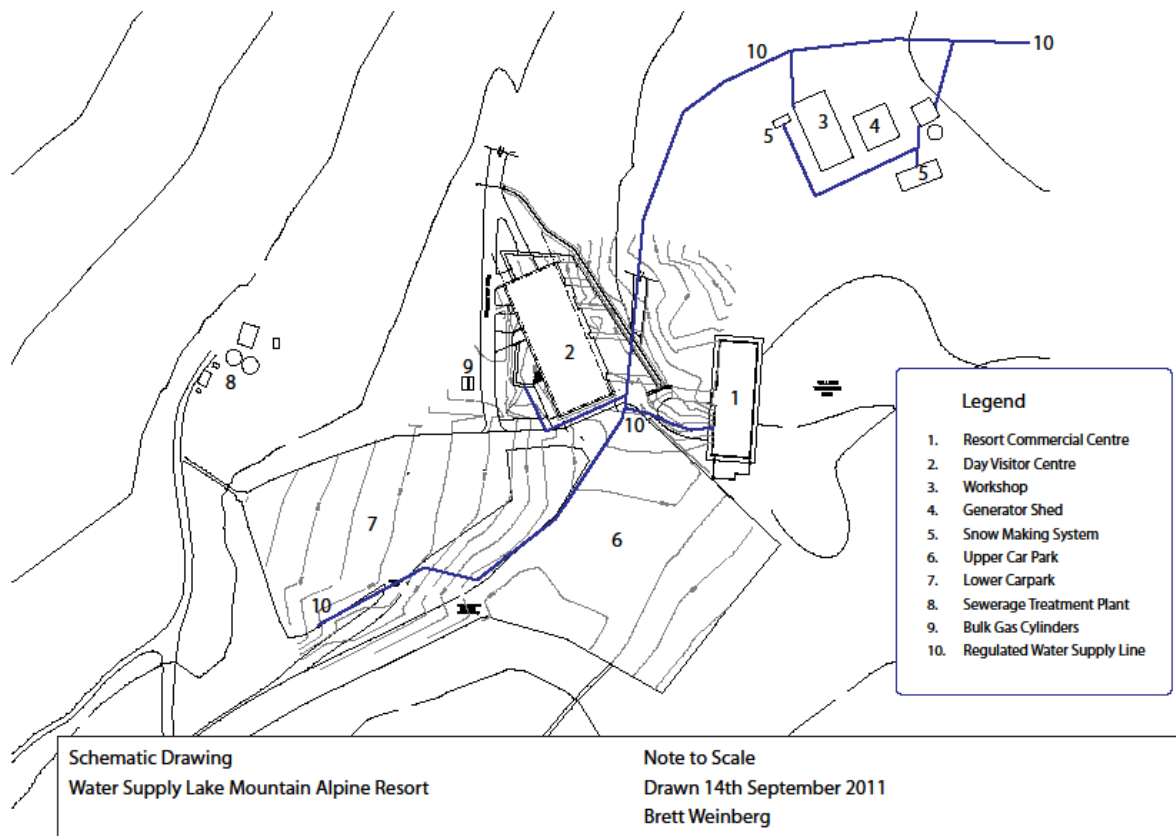
Machinery Workshop



SECTION A - LAKE MOUNTAIN ALPINE RESORT

3. Schematic Drawing

Water Supply Lake Mountain Alpine Resort



4. Water (Regulated) Supply

Lake Mountain Alpine Resort is the sole water (regulated) supplier to the following facilities on Lake Mountain.

- Day Visitor Centre which includes;
 - Public space
 - Public amenities
 - Food outlet
 - Snow sports centre
 - Ski patrol/ first aid
 - Resort ticketing outlet
- Resort Commercial Centre which includes;
 - Retail outlet
 - Rentals department
 - Public space
 - Administrative & management offices
- Workshop/ Machinery Shed
- Snowy Hill Amenities Building
- Resort Snow Making System.

SECTION A - LAKE MOUNTAIN ALPINE RESORT

5. Quality Management Systems

There is no treatment applied to the water supply at Lake Mountain. With this in mind, resort management is taking steps to minimize the possibility of potential health risks by raising public awareness through the signing of all the resort water outlets, advising resort visitors that the water is not treated, nor is it suitable for consumption. Water that feeds into the food preparation outlets is filtered with both a 20-micron and 5-micron cartridge unit. Testing occurs on a fortnightly basis.

As part of the management of the water supply system, water quality monitoring is undertaken, catchment and associated water delivery and storage infrastructure inspections are conducted to minimise any potential for supply failure and contaminants which may affect water quality and impact the water supply system. The management of the storage and water diversion infrastructure includes the purging of the reticulation system coupled with the cleaning of the storage tanks which is undertaken on a quarterly basis.

6. Regulated Water Risk Management Activities

The management activities that have been implemented in relation to regulated water supply, in particular those that pertain to Section 25 of the *Safe Drinking Water Act 2003*, warning to be given if regulated water supplied are described as follows:

- A blanket signage program for all water outlets on the resort has been completed and maintenance schedule that is monitored through the resort Water Supply Risk Management Plan. All water outlets have been signed warning visitors to Lake Mountain that water is untreated and of the health risks that may arise from its use.



- User groups of the mountain through public forums and stakeholder meetings are advised of the issues pertaining to the non-treatment of the resorts water supply and of the health risks that may arise from its use.
- All managers and staff working within the commercial operations on the resort are briefed on issues pertaining to the non-treatment of the resorts water supply and the health risks that may arise from its use.
- As a part of the resort staff induction information sessions, the non-treatment and health risks that may arise from the use of water on the resort are covered both verbally and as inclusion in the resort employee handbook, which all employees receive prior to commencement of employment.
- To minimise risk to employees the resort management have installed water coolers and supply potable water for consumption.

SECTION B - MOUNT BAW BAW ALPINE RESORT

1. The Location and Scope of Activities

The resort is located on the south-west face of the Baw Baw Plateau, two and a half hours' drive east of the Melbourne CBD. Mount Baw Baw has a summit elevation of 1,565 metres and gently sloping terrain with gradients of 15% to 25%. It consists of and is surrounded by a rich variety of diverse alpine and sub-alpine native vegetation.

The resort's northern and eastern boundaries are adjacent to Parks Victoria's Baw Baw National Park. The resort's western and southern boundaries are adjacent to the DELWP managed, Tanjil State Forest.

Whilst the resort covers 355 hectares, just 37 hectares have been developed. Developed land includes groomed ski runs, 7 ski lifts, several terrain parks, 2 toboggan runs and 10 kilometres of groomed cross-country ski trails. The resort village has 43 surveyed sites, 34 of which are developed. Land occupied by site holders is under leasehold or a licence.

The resort at peak operation during the snow season has seven surface lifts, with a mix of terrain of for beginners, intermediate skiers and more advanced skiing, two toboggan parks, two magic carpet style conveyors, a beginners area, a small terrain park and is home to two indigenous Alpine Dingoes. Parking is available for up to 700 cars (around 2,600 guests) and at least 20 buses at any time.

The resort offers mountain biking trails, road cycling (including Seven Peaks), is an event venue, hosts guided walking tours and fishing breaks, is the launch point for walks into the neighbouring state forests and national parks during the non-snow season.

The village offers almost 700 accommodation beds, with a variety of styles covering most budgets. Occupancy is highest in the snow season, particularly on weekends.

1.1. Characterisation of the system

Mount Baw Baw Alpine Resort is a Drinking Water Supplier as defined under the *Safe Drinking Water Act 2003*.

Water Supplier

The Board must:

- Prepare, implement, review and revise a risk management plan in relation to its supply of drinking water and regulated water.
- Prepare for the Secretary to DHHS an Annual Report on drinking water quality.
- Monitor drinking water supply from catchment to tap (water sampling points).
- Ensure all drinking water supplied meets water quality standards.
- Notify the Secretary if non-complying water is supplied or is likely to be supplied.

SECTION B - MOUNT BAW BAW ALPINE RESORT

Catchment

The water catchment for the resort, Dam Valley, is located in a protected valley slightly elevated above the village. The village is supplied by surface water from within the catchment by means of rainfall runoff and snowmelt. Runoff in the catchment flows through sphagnum moss, which is thought to act as a filter for suspended particulate matter, and is collected in a small mountain stream being a minor tributary of the headwaters of the Tanjil River - Eastern Branch.

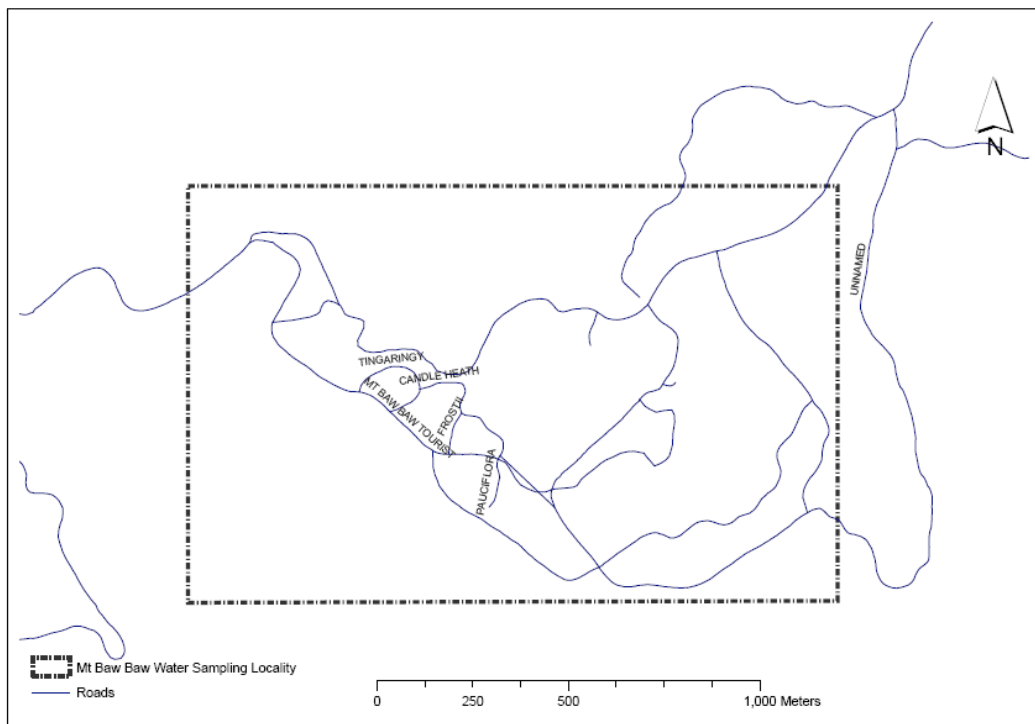
A weir has been constructed on the stream below Dam Valley to capture water and direct it to a draw off pipe which then transports water into two 400,000 litre concrete storage tanks which service the village.

Despite the close proximity of the catchment to the village, there is minimal public access. Only one trail 6 metres in width passes through the north western side of the catchment, which is accessible only by foot. The catchment is heavily vegetated with trees, moss and shrubs and apart from the abovementioned trail, is in pristine condition.

The primary access to the catchment occurs with cross country skiers in winter and bush walkers and mountain bikers in summer. Because the trail is relatively close to the resort, guests pass through this area quickly, and are unlikely to stop and eat or go to the toilet. Signage has been erected to advise guests of the status of the area and how to prevent catchment contamination occurring.

Regular monthly sampling of raw water in the catchment area is undertaken to monitor the raw water quality and includes monitoring for parameters such as turbidity and organic chemicals.

Figure 1: Map outlining the water sampling locality of the resort



SECTION B - MOUNT BAW BAW ALPINE RESORT

Distribution System – Tanks

Two covered circular concrete tanks are located close to the weir at the bottom (south-western end) of the catchment. These tanks are filled with raw water by gravity from the weir, and are connected by a 150mm ductile iron, concrete lined (DACL) pipe to the village distribution and reticulation network. Overflow from the tanks discharges back into the headwaters of the Tanjil River - Eastern Branch. This overflow runs most of the time, indicating that the flow through the weir pipe currently exceeds the village demand.

Regular weekly monitoring of raw water quality in the supply tanks is undertaken to ensure that pathogens and organic chemicals within raw water storages are within the regulated guidelines. Results obtained from raw water quality sampling are utilised to assist with identification of potential issues prior to final treatment of water and supply to the village reticulation network.

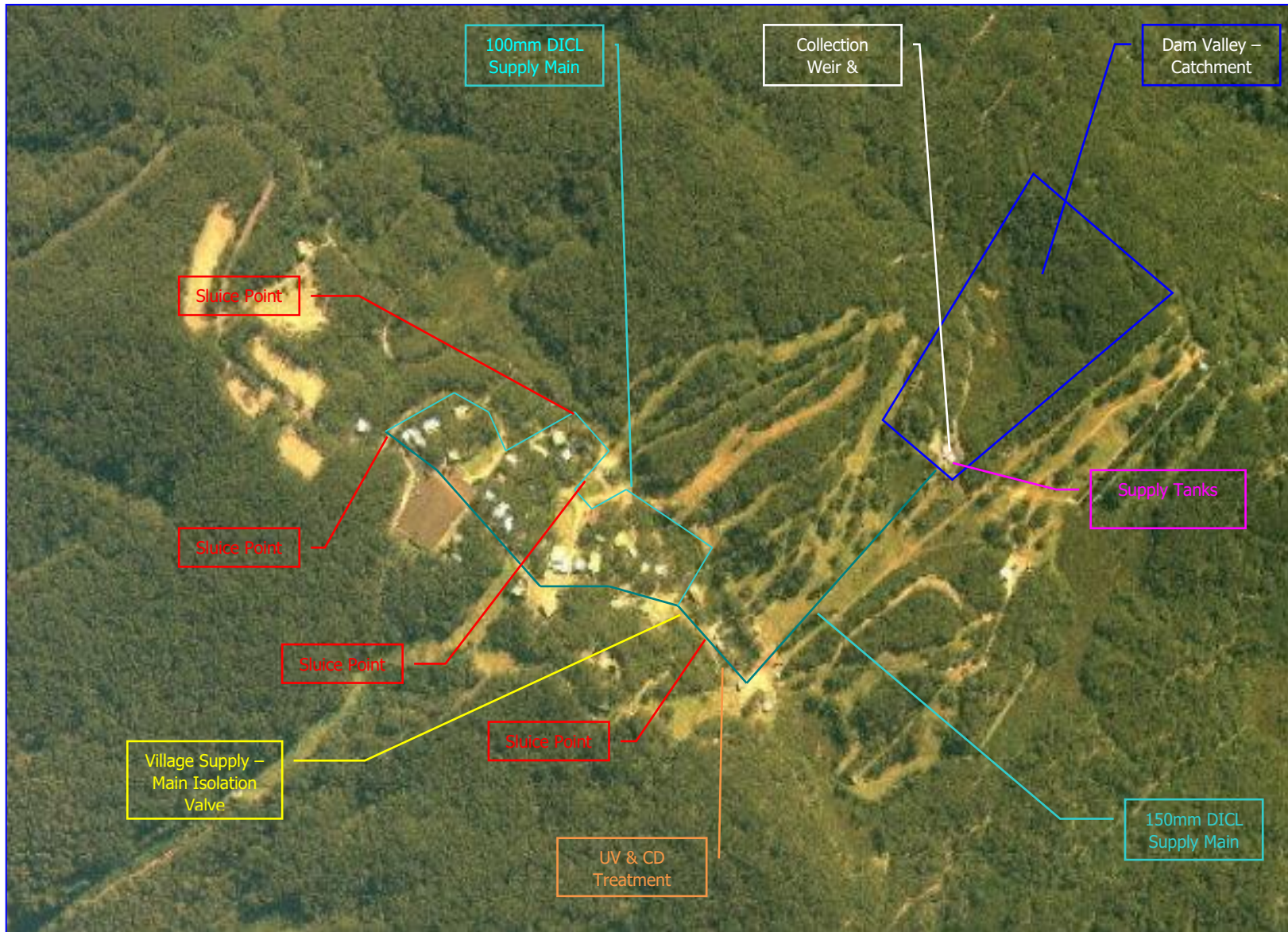
Distribution System - Pipelines

A pressurised buried main pipeline carries raw water from the two storage tanks to the UV treatment plant and chlorine dosing plant, which is then distributed throughout the village reticulation system as treated drinking water. Flow is under gravity, with head supplied by the natural height of the catchment and storage tanks in comparison to the village. The pressurised main is 150mm DACL from the supply tanks to the end of Currawong Road, adjacent to Site 38. The remainder of the distribution and reticulation pipeline throughout the village is 100mm DACL.

There are four scour points within the system and these are run usually at monthly intervals to ensure that there is no accumulation of sediments within the system. The reticulation system is of a ring main configuration hence creating minimal dead ends, which in turn will not allow stagnation to occur (see Figures 2 & 3).

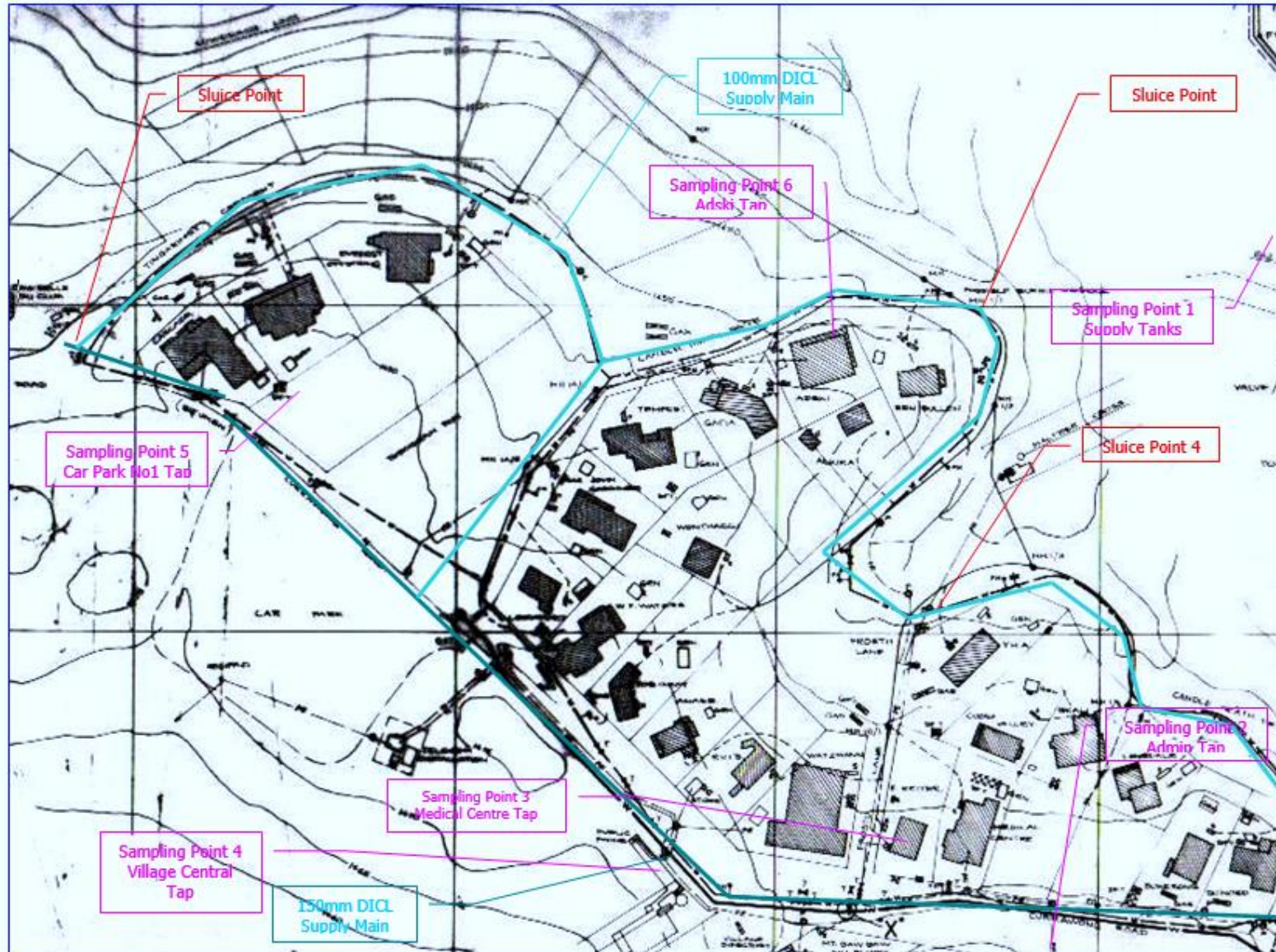
SECTION B - MOUNT BAW BAW ALPINE RESORT

Figure 2: Plan and aerial view of the Mount Baw Baw Village – Water Supply System



SECTION B - MOUNT BAW BAW ALPINE RESORT

Figure 3: Schematic of the Mount Baw Baw Alpine Resort water supply system



SECTION B - MOUNT BAW BAW ALPINE RESORT

2. Water Treatment and Quality Management Systems

2.1. Water Treatment

Prior to final distribution to consumers all water is treated by Ultra Violet (UV) Treatment Plant located at the Mountain Sports Centre at the base of the ski area (see Figure 2). A sketch image and photograph of the UV treatment plant is shown below.

Figure 4: Cutaway diagram of ultraviolet treatment plant

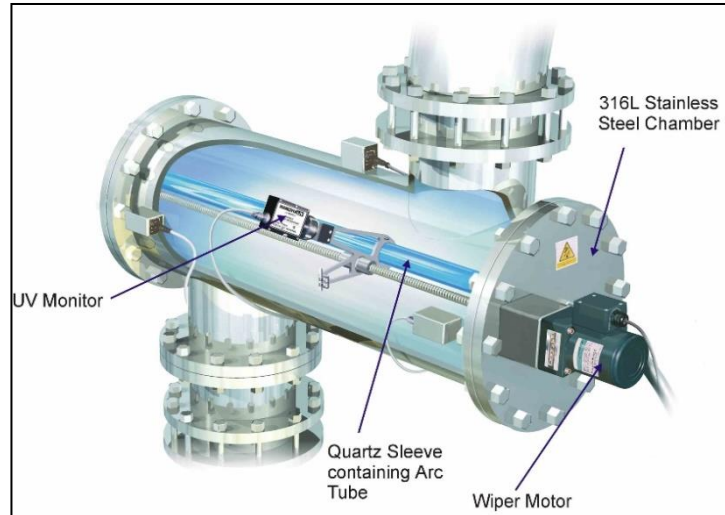
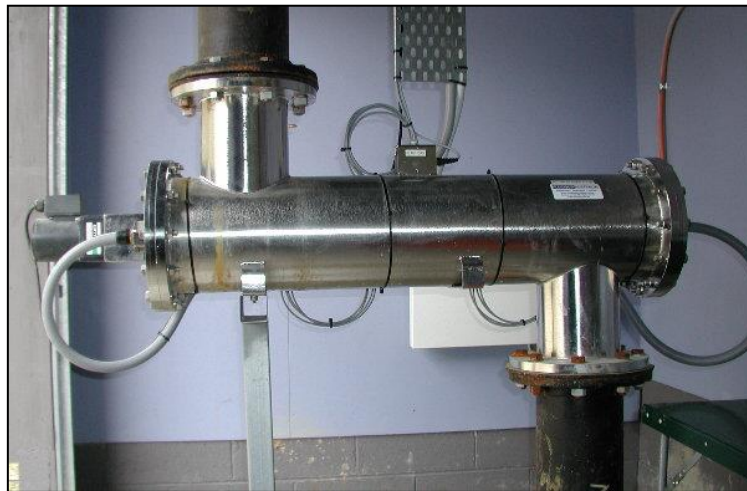


Figure 5: Photograph of actual UV treatment plant at Mt Baw Baw Alpine Resort

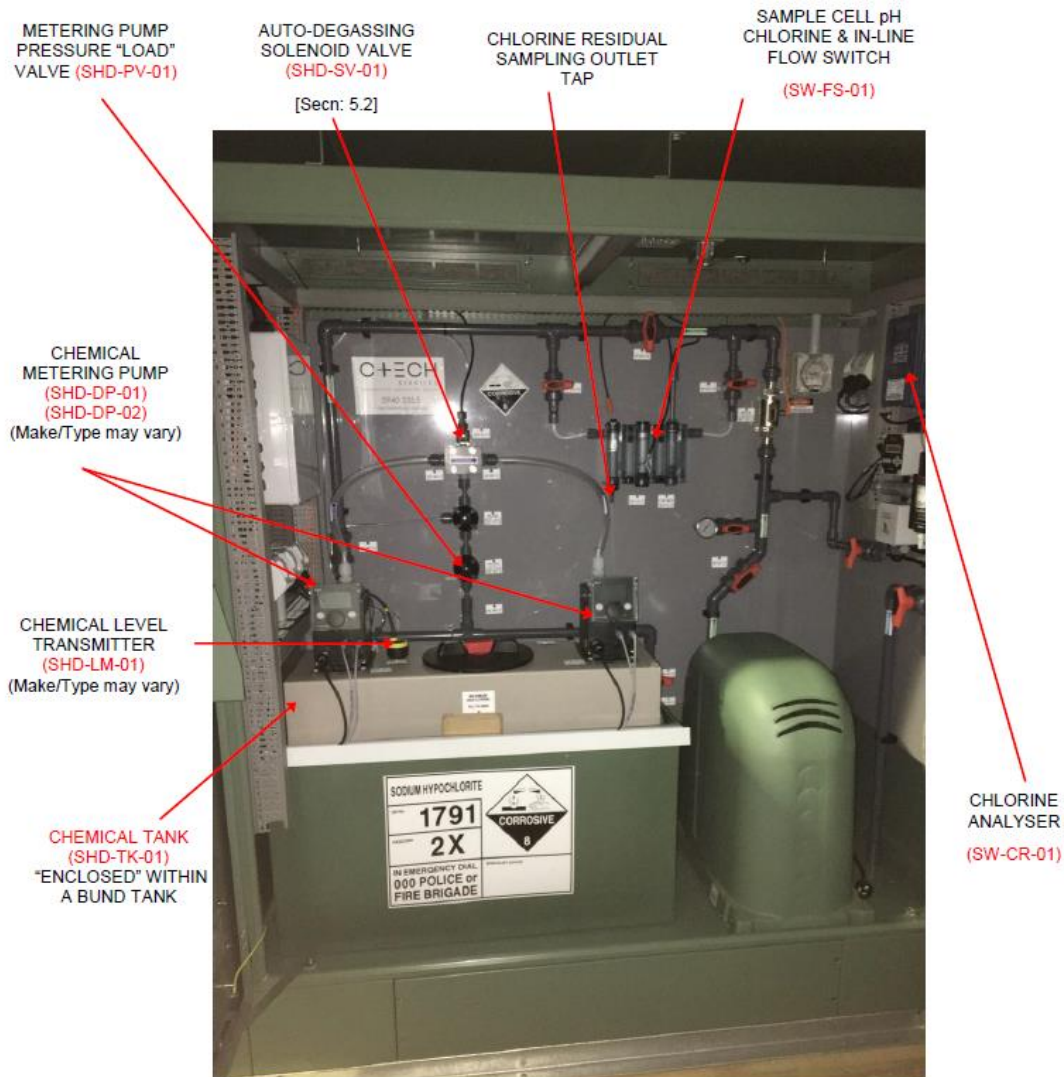


In addition to the abovementioned UV Treatment Plant (see Figures 4 & 5), a residual trim unit provides automated chlorine dosing, after being treated with UV. The residual trim unit acts as a secondary disinfection barrier in Mount Baw Baw's multiple barrier approach to water treatment. This unit provides the ability to control the level of chlorine and provide a disinfection residual within the water supply distribution system (see Figure 6).

SECTION B - MOUNT BAW BAW ALPINE RESORT

Since the installation of the automated dosing system the chlorine residual within the distribution system have stabilised with measurements logged in the range of 0.10 mg/L – 1.13 mg/L for Free Chlorine and 0.21 mg/L – 1.27 mg/L for total Chlorine.

Figure 6: Labelled photograph of the residual trim unit



An uninterrupted power supply (UPS) is installed and connected to both the ultraviolet treatment plant and residual trim unit. The installation of this backup power supply has alleviated issues related to the potential supply of untreated water in the event of an interruption to mains power. This unit is able to provide a backup power supply in the event of a power outage within the village electricity system.

Prior to installation of the chlorine residual trim unit, the Board conducted a manual chlorination program. The program was introduced as a second barrier of protection in managing potential issues of microbial risk during the warmer months and through periods of low water flow/use.

SECTION B - MOUNT BAW BAW ALPINE RESORT

Water quality profiling has been undertaken throughout the reporting periods with regular testing for chlorine residuals in the village water supply. Methodology for manual chlorine dosing consisted of simple pool floats and calcium hypochlorite tablets, which are inserted into the floats at periods determined by system demand and residual measurements in the village system. This process was discontinued in March 2016, however, as a result of a recommendation for improvement during water supply risk management plan audit conducted 13th June 2016 and consultation with C-Tech Services it was decided that this process should be reinstated as a further barrier of protection should the chlorine dosing plant be offline for scheduled maintenance or during periods of low system loading. This was reinstated in March 2017.

Regular sluicing is undertaken at four sluice points within the reticulation system. Catchment inspections are also a scheduled maintenance item and are undertaken to ensure that the catchment is clear of dead animals, faeces and any other foreign matter, which may compromise/contaminate water quality. Catchment inspections are also undertaken in the event of reported irregularities (i.e. dead animal smells, etc.).

There have not been any major changes to treatment of potable water this reporting period.

Please Note: *Sluicing is undertaken in line with catchment yield, water availability and is generally not undertaken during extreme dry periods in summer.*

Table 2.1: Treatment and Management Processes – Chemical and Ultra Violet

Locality	Treatment Process	Added Substances	Comments
Mount Baw Baw Alpine Resort	Chlorination	Aquaward 700g/kg Calcium Hypochlorite tablets.	Implemented to ensure multiple treatment barriers in place. Please Note: Procedure discontinued March 2016, reinstated in March 2017
	Chlorination	Sodium Hypochlorite Solution @ 9%	Implemented to ensure multiple treatment barriers in place
	Ultra Violet	Nil	Implemented to ensure multiple treatment barriers in place

Table 2.1.1: Treatment and Management Processes – Inspections, Sluicing and Systems Management

Period	Location	Treatment/Inspection Process	Comments
July 2018	Dam Valley Catchment	Inspected catchment for possible contaminants on 23/07/2018	All Clear
August 2018	Dam Valley Catchment	Inspected catchment for possible contaminants on 27/08/2018	All Clear

SECTION B - MOUNT BAW BAW ALPINE RESORT

Period	Location	Treatment/Inspection Process	Comments
September 2018	Dam Valley Catchment	Inspected catchment for possible contaminants on 29/09/2018	All Clear
October 2018	Dam Valley Catchment	Inspected catchment for possible contaminants on 16/10/2017	All Clear
October 2018	Village Main	No full sluice of system undertaken this month.	
November 2018	Dam Valley Catchment	Inspected catchment for possible contaminants on 15/11/2018	All Clear
November 2018	Village Main	No full sluice of system undertaken this month	
December 2018	Dam Valley Catchment	Inspected catchment for possible contaminants on 17/12/2018	All Clear
December 2018	Village Main	No full sluice of system undertaken this month	
January 2019	Dam Valley Catchment	Inspected catchment for possible contaminants on 17/01/2019	All Clear
January 2019	Village Main	No full sluice conducted this month due to low catchment inflows	
February 2019	Dam Valley Catchment	Inspected catchment for possible contaminants on 19/02/2019	All Clear
February 2019	Dam Valley Supply Tanks	Water cartage contractor engaged to cope with low inflows. Additional water pumped from snowmaking tanks. 20 - 22/02/19	Additional manual chlorine dosing and continued testing ensured water quality
February 2019	Village Main	No full sluice conducted this month due to low catchment inflows	
March 2019	Dam Valley Catchment	Inspected catchment for possible contaminants on 21/03/2019	All Clear
March 2019	Dam Valley Supply Tanks	Water cartage contractor engaged to cope with low inflows. Additional water pumped from snowmaking tanks. 1 - 2/03/19	Additional manual chlorine dosing and continued testing ensured water quality
March 2019	Village Main	No full sluice conducted this month due to low catchment inflows	Low catchment inflows this month
April 2019	Dam Valley Catchment	Inspected catchment for possible contaminants on 17/04/2019	All Clear

SECTION B - MOUNT BAW BAW ALPINE RESORT

Period	Location	Treatment/Inspection Process	Comments
April 2019	Village Main	No sluice conducted this month due to low catchment inflows	Low catchment inflows this month
May 2019	Dam Valley Catchment	Inspected catchment for possible contaminants on 14/05/2019	All Clear
May 2019	Village Main	No full sluice conducted this month due to low catchment inflows	Low catchment inflows this month
June 2019	Dam Valley Catchment	Inspected catchment for possible contaminants on 21/06/2019	All Clear

SECTION B - MOUNT BAW BAW ALPINE RESORT

3. Drinking Water Quality Standards for 2018/2019

3.1.1 Escherichia coli (E. coli)

Results**Table 3.1.1: Summary of *E.coli* results**

Water quality standard Schedule 2 Safe Drinking Water Regulations 2015: No *E. coli* per 100 millilitres of drinking water, with the exception of any false positive sample.

Locality	Frequency of sampling	No. of samples collected	No. of samples containing <i>E.coli</i>	No. of investigations conducted	No. of confirmed false positives	No. of investigations where standard not met
Mount Baw Baw	Weekly	52	0	0	N/A	N/A

3.1.1 Actions Taken in Relation to Non-compliance

Mount Baw Baw complied with the E.coli water quality standard for the reporting period 1 July 2018 to 30 June 2019.

3.1.2 Trihalomethanes

Results**Table 3.1.2: Summary of trihalomethanes results**

Water quality standard Schedule 2 Safe Drinking Water Regulations 2015: ≤ 0.25 mg/L

Locality	Frequency of sampling	No of samples	Drinking water quality standard (mg/L)	Max (mg/L)	Average (mg/L)	No. of Non-Complying Samples
Mount Baw Baw	Monthly	12	0.25	0.15	0.038	0

3.1.2 Actions Taken in Relation to Non-compliance

Mount Baw Baw Alpine Resort potable water supply complied with the trihalomethane water quality standard for the reporting period.

SECTION B - MOUNT BAW BAW ALPINE RESORT

3.1.3 Turbidity

Results

Table 3.1.3: Summary of turbidity results

Water quality standard Schedule 2 Safe Drinking Water Regulations 2015: 95th percentile of results for samples in any twelve month period must be ≤ 5.0 Nephelometric Turbidity Units (NTU)

Locality	Frequency of sampling	No of samples	Maximum NTU	95 th percentile	Complying (Yes/No)
Mount Baw Baw	Weekly	52	0.8	0.6	Yes

3.1.3 Actions taken in Relation to Non-compliance

Mount Baw Baw Alpine Resort’s drinking water complied with the turbidity water quality standard for the reporting period.

3.2 Other Algae, Pathogen, Chemical or Substance that may pose a risk to human health

As previously discussed in section 2.1, Mount Baw Baw Alpine Resort utilises UV and chlorine based disinfection treatment processes to mitigate microbial risks including *E. coli* detections. To ensure the provision of high quality drinking water, testing is conducted regularly for the following chlorine based disinfection by-products, chloroacetic acid, dichloroacetic acid and trichloroacetic acid. A summary of results obtained during the 2018/2019 reporting period and standards for chlorine by-product parameters as listed in the Australian Drinking Water Guidelines (ADWG) 2011 are contained in Tables 3.2.1 to 3.2.3.

In January 2011, Mount Baw Baw Alpine Resort commenced sampling and monitoring of its raw water supply. This was implemented as a result of the auditor’s recommendation for improvement identified during the regulatory audit conducted 15th December 2009. Further raw water supply sampling and monitoring was implemented in January 2013 as a result of a regulatory audit conducted 10th March 2012. The auditor recommended the implementation of monitoring for metals such as copper, iron and manganese.

Samples are collected from the raw water supply at Dam Valley Catchment and are analysed for the following parameters: pH, turbidity, nitrogen, phosphorus, organic carbon, suspended solids, electrical conductivity, nitrate, copper, iron, manganese and radiation. It is anticipated that this data will over time assist with the risk assessment process and identification of potential issues prior to final treatment and supply of water to the resort.

SECTION B - MOUNT BAW BAW ALPINE RESORT

A summary of results obtained for radiation, nitrate, copper, iron, manganese, pH and true colour parameters and measured against the ADWG 2011 health guideline values during the 2018/2019 reporting period are contained in Tables 3.2.4 to 3.2.8 and 3.3.1 to 3.3.3.

Results

As can be seen by the monthly results shown in Tables 3.2.1 to 3.2.3, the Mount Baw Baw Alpine Resort potable water supply complied with the standard for water quality in relation to the chlorine-based disinfection by-products: Chloroacetic acid, dichloroacetic acid and trichloroacetic acid.

Table 3.2.1: Summary of chloroacetic acid results

Water quality standard (ADWG): ≤ 0.15 mg/L

Locality	Frequency of sampling	No of samples	No of Non - Complying Samples	Max mg/L	Average mg/L	No. of Non-Complying Samples
Mount Baw Baw	Monthly	12	0	<0.01	0.0054	0

Table 3.2.2: Summary of dichloroacetic acid results

Water quality standard (ADWG): ≤ 0.1 mg/L

Locality	Frequency of sampling	No of samples	No of Non - Complying samples	Max mg/L	Average mg/L	No. of Non-Complying Samples
Mount Baw Baw	Monthly	12	0	0.029	0.0095	0

Table 3.2.3: Summary of trichloroacetic acid results

Water quality standard (ADWG): ≤ 0.1 mg/L

Locality	Frequency of sampling	No of samples	No of Non - Complying samples	Max mg/L	Average mg/L	No. of Non-Complying Samples
Mount Baw Baw	Monthly	12	0	0.014	0.0077	0

SECTION B - MOUNT BAW BAW ALPINE RESORT

Table 3.2.4: Summary of alpha radiation results

Water quality standard (ADWG): Gross alpha activity < 0.5 Bq/L

Locality	Frequency of sampling	No of samples	No. of non-complying samples	Maximum Bq/L	No. of Non-Complying Samples
Mount Baw Baw	Annually	1	0	<0.05	0

Table 3.2.5: Summary of beta radiation results

Water quality standard (ADWG): Gross beta activity < 0.5 Bq/L

Locality	Frequency of sampling	No of samples	No. of non-complying samples	Maximum Bq/L	No. of Non-Complying Samples)
Mount Baw Baw	Annually	1	0	0.23	0

Mount Baw Baw Alpine Resort potable water supply met the water quality standards in relation to both alpha radiation and beta radiation. Radionuclides should be identified and investigated if gross alpha or beta activities exceed 0.5 Bq/L for drinking water samples. For both gross alpha and beta activities, levels were below 0.5 Bq/L.

Table 3.2.6: Summary of nitrate results

Water quality standard (ADWG): ≤ 50mg/L

Locality	Frequency of sampling	No of samples	No. of non-complying samples	Maximum mg/L	Average mg/L	No. of Non-Complying Samples
Mount Baw Baw	Monthly	12	0	0.017	0.005	0

Mount Baw Baw Alpine Resort potable water supply met the water quality standards in relation to nitrate.

SECTION B - MOUNT BAW BAW ALPINE RESORT

Table 3.2.7: Results for copperWater quality standard (ADWG): $\leq 2\text{mg/L}$.

Locality	Frequency of sampling	No of samples	No. of non-complying samples	Maximum mg/L	Average mg/L	No. of Non-Complying Samples
Mount Baw Baw	Monthly	12	0	0.001	0.001	0

Table 3.2.8: Results for manganeseWater quality standard (ADWG): $\leq 0.5\text{mg/L}$.

Locality	Frequency of sampling	No of samples	No. of non-complying samples	Maximum mg/L	Average mg/L	No. of Non-Complying Samples
Mount Baw Baw	Monthly	12	0	0.001	0.001	0

Mount Baw Baw Alpine Resort potable water supply met both the water quality standard and the aesthetic guideline value for manganese.

3.2 Actions Taken in Relation to Non-compliance

Mount Baw Baw Alpine Resort met the water quality standards for all the parameters monitored during the reporting period.

3.3 Aesthetic Characteristics**3.3.1 Results for pH Units**

The mean result for pH was within the range as outlined in the ADWG of pH 6.5 to 8.5 (see Table 3.3.1).

Mount Baw Baw Alpine Resort utilises DICL piping and these pipes have the ability to significantly increase the pH level of water. A pH result of up to 9.2 may be tolerated provided there is no indication of deterioration in the microbial quality of the water supply.

As in previous years, spikes in pH levels appear to be related to catchment flow levels and system load due to reduced water usage due to lower levels of visitation during the warmer summer months. Lower visitation levels result in lower flows through the reticulation system, causing water to sit. This water subsequently is in contact with the concrete lined pipes for longer periods, which can elevate pH levels within the system. Summer visitation is expected to

SECTION B - MOUNT BAW BAW ALPINE RESORT

increase as a result of a greater focus on activities such as mountain biking and it is envisaged that spikes in the pH levels will reduce as a more constant loading on the system is achieved.

Table 3.3.1: Results for pH

Aesthetic guideline value (ADWG): 6.5 – 8.5. No health guideline value.

Locality	Frequency of sampling	No of samples	Minimum pH	Maximum pH	Mean pH
Mount Baw Baw	Weekly	52	5.5	10.1	6.98

3.3.2 Results for True Colour

The mean result for true colour is outside the range outlined in the ADWG aesthetic guideline value of mean 15 Hazen Units (see Table 3.3.2). Mount Baw Baw Alpine Resort utilises UV disinfection as part of its drinking water treatment process, high colour and organic matter, have the potential to reduce the effectiveness of UV disinfection. This reduction can increase the microbial risk of the water. Due to the large amounts of vegetation, it is thought that the Dam Valley supply catchment contains naturally occurring organic matter which may contribute to the high results. During the last 6 reporting periods, Mount Baw Baw Alpine Resort has trialled closing the supply tank inlet valve prior to major rain events in addition to its regular sluicing program. This action appears to have had some effect on true colour results, particularly during times of high catchment inflows and low system loading.

Closure of the supply tank inlet valve prior to major rain events and regular sluicing of the main when conditions permit can minimise the occurrence of readings above ADWG guideline values. However, these actions currently rely heavily on manual monitoring and sluicing times are limited by other operational issues such as catchment flow and system loading. This can be observed in Table 2.1.1.

Table 3.3.2: Results for true colour

Aesthetic guideline value (ADWG): mean 15 Hazen Units (HU)

Locality	Frequency of sampling	No. of samples	Minimum - HU	Maximum - HU	Mean – HU
Mount Baw Baw	Weekly	52	10	48	27.5

SECTION B - MOUNT BAW BAW ALPINE RESORT

3.3.3 Results for Iron

Elevated levels of metals such as copper, iron and manganese have the potential to discolour water. As previously discussed in section 3.3.2, Mount Baw Baw Alpine Resort utilises UV disinfection, with high colour having the potential to reduce the effectiveness of the UV disinfection process. This reduction has the potential to increase the microbial risk for the water supply.

Mount Baw Baw Alpine Resort drinking water met the aesthetic guideline values for Iron.

It is anticipated that the collection of this water sample data will, over time, assist with the risk assessment process and the supply of an improved quality of potable drinking water to the Mount Baw Baw Alpine Resort.

Table 3.3.3: Results for Iron

Aesthetic guideline value (ADWG): $\leq 0.3\text{mg/L}$

Locality	Frequency of sampling	No. of samples	No. of non-complying samples	Maximum mg/L	Average mg/L	Complying (Yes/No)
Mount Baw Baw	Monthly	12	0	0.14	0.062	Yes

3.3.4 Results for Copper and Manganese

Drinking water met the aesthetic guideline values for copper (Table 3.2.7) and manganese (Table 3.2.8).

SECTION B - MOUNT BAW BAW ALPINE RESORT

3.4 Analysis of Results

3.4.1 Trends over time

There has been a reduction in *E.coli* detections overall, since the 2006/2007 reporting period with 100% compliance achieved in all periods with the exception of 2009/2010.

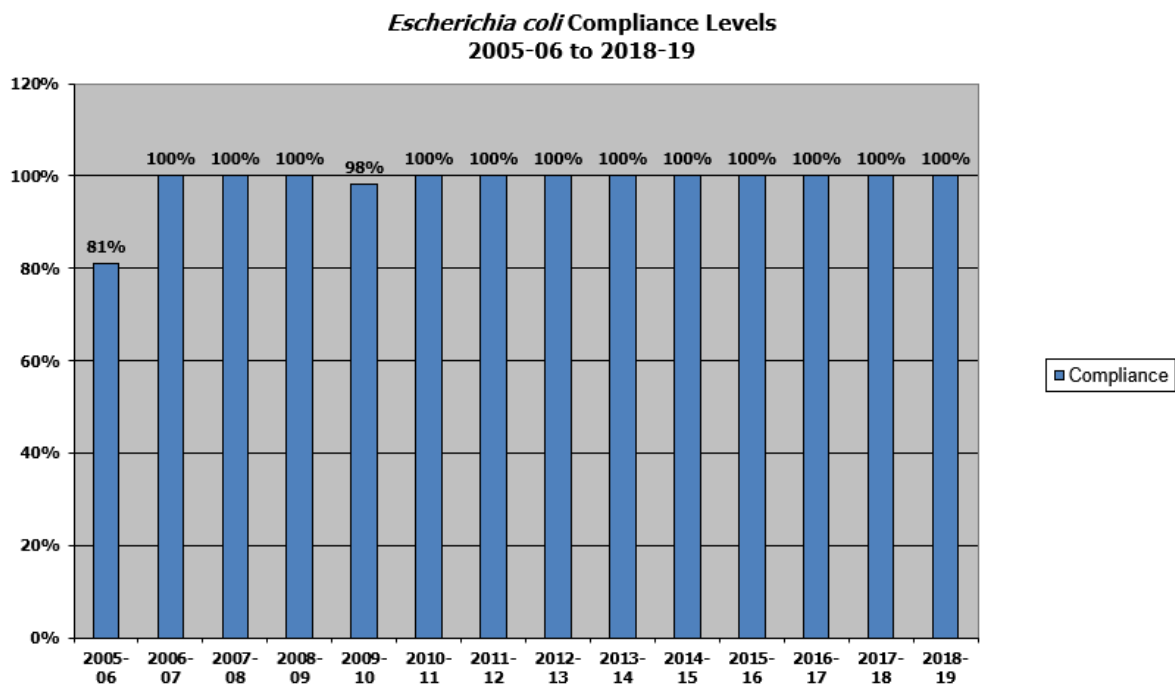
One *E.coli* detection occurred during 2009/2010, however the overall result of 98% still complied with the water quality standard for *E.coli* at that time.

This reduction of *E.coli* detections post 2005/2006 reporting period and increase in compliance with the *E.coli* water quality standard was as a direct result of the installation and operation of the UV treatment plant.

The introduction of improved systems management, the effect of the UV treatment plant, manual disinfection using chlorine, the installation of an automated chlorine dosing plant and thorough staff training in relation to sampling procedures and techniques have assisted with the improvement in compliance across the last ten reporting periods.

The trend for *E.coli* compliance is shown below in Figure 7.

Figure 7: Results for *E.coli* compliance throughout recent reporting years



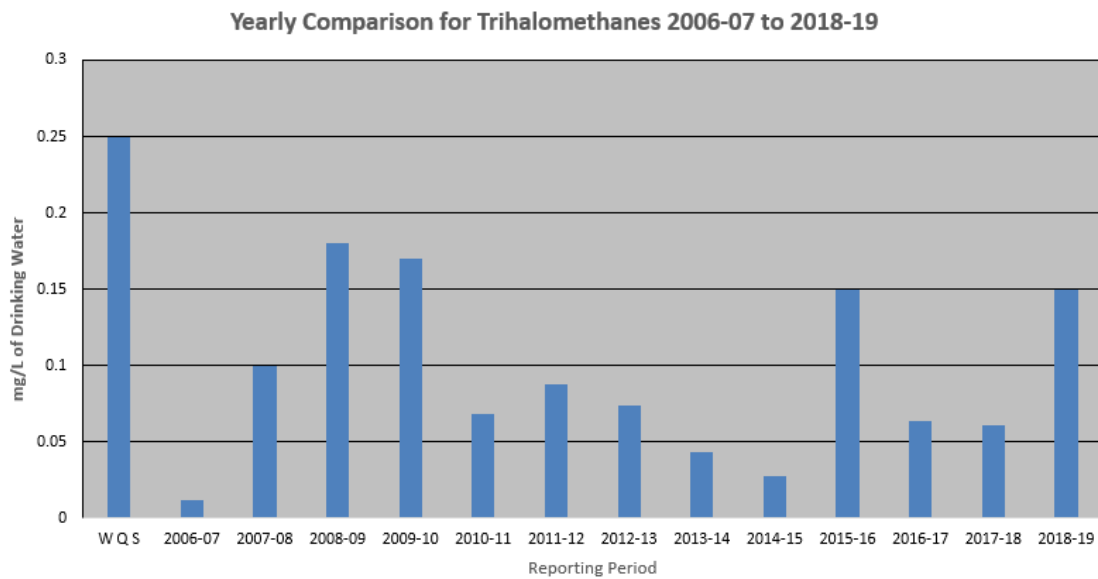
As shown below in Figure 8 there has been an increase in the level of trihalomethanes during the period 1 July 2018 to 30 June 2019 when compared to the previous 2017/2018 period.

The most notable issue in the more recent reporting periods being the level of trihalomethanes recorded during the 2015/2016 reporting period, being identical to the current period's result.

SECTION B - MOUNT BAW BAW ALPINE RESORT

The maximum result of 0.15mg/L was recorded during the month of May 2016 when it was difficult to undertake sluicing operations due to low catchment inflows. These low inflows restricted the amount of water available for use in the village reticulation system. This same issue occurred in February 2019. The 2018/2019 results are still below the water quality standard of 0.25 mg/L (Shown as WQS in Figure 8 below) for trihalomethanes.

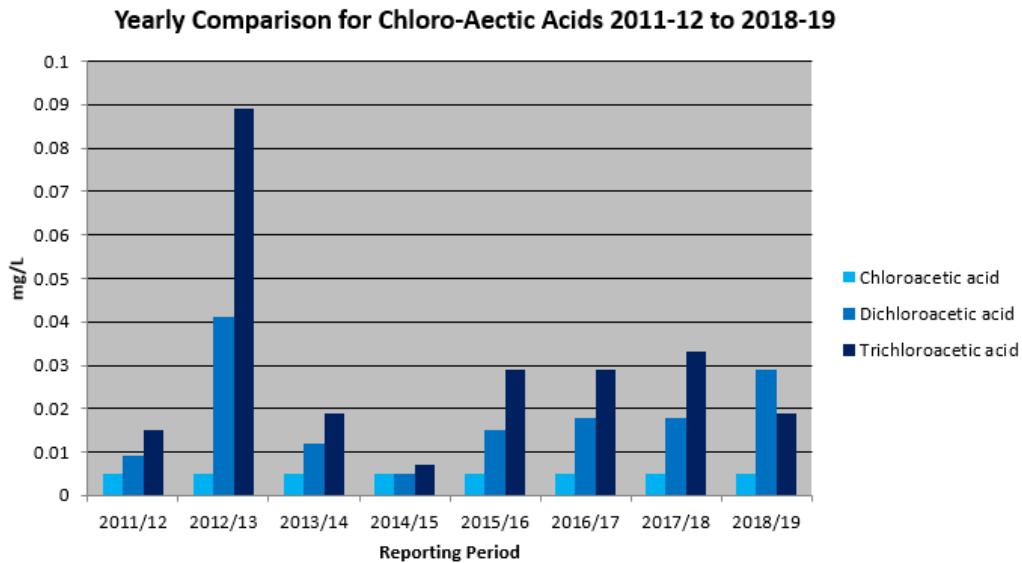
Figure 8: Results for maximum trihalomethanes showing the yearly trend. WQS = Water Quality Standard as specified in Schedule 2 of the Safe Drinking Water Regulations 2015.



The results for maximum other chlorine by-products (chloroacetic acids), have been relatively consistent as can be seen below in Figure 9, especially over the previous three reporting periods. There has been a slight change in levels when comparing the recent reporting periods to the 2018/19 period. However, it is negligible and well below the WQS thresholds.

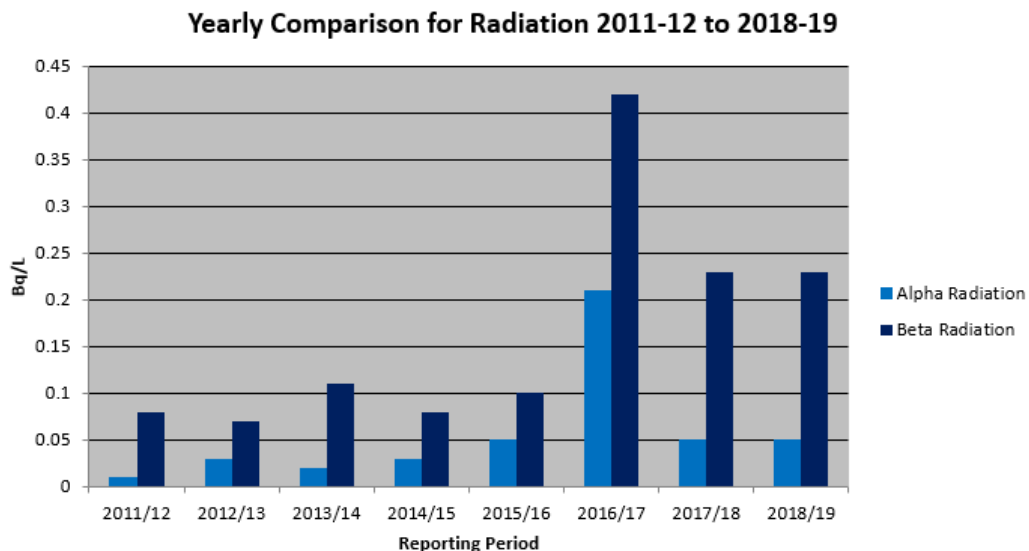
SECTION B - MOUNT BAW BAW ALPINE RESORT

Figure 9: Results for maximum chloroacetic acids over past eight reporting periods. Chloroacetic acid WQS: $\leq 0.15\text{mg/L}$, dichloroacetic acid WQS: $\leq 0.1\text{mg/L}$, trichloroacetic acid WQS: $\leq 0.1\text{mg/L}$



The results for radiation show a constant level for both alpha and beta radiation when comparing the 2017/18 period to the 2018/19 period (see Figure 10). Both of these years are below the WQS threshold.

Figure 10: Results for maximum radiation over past eight reporting periods. Radiation WQS: $\leq 0.5\text{ Bq/L}$.

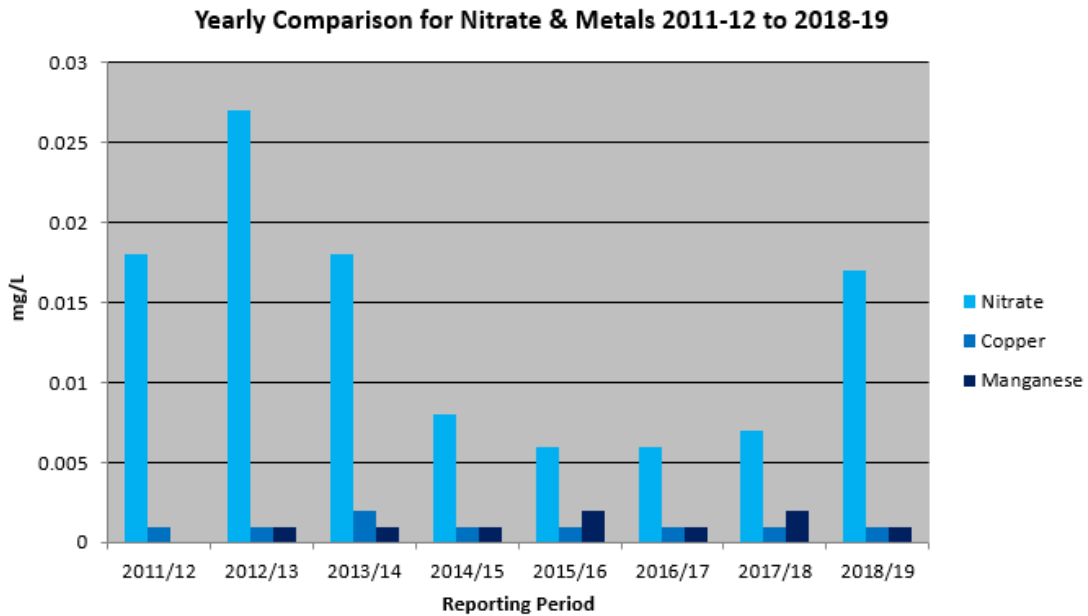


The levels of nitrate, copper and manganese in the past four reporting periods have stayed relatively low, with each parameter being well below the required WQS (see Figure 11). The nitrate results have increased for the current 2018/19 period compared to recent years.

SECTION B - MOUNT BAW BAW ALPINE RESORT

Figure 11: Results for maximum nitrate, copper and manganese for past eight reporting periods. Results unavailable for manganese until 2012/13.

Nitrate WQS: ≤ 50 mg/L, copper WQS: ≤ 2 mg/L, manganese WQS: ≤ 0.5 mg/L.



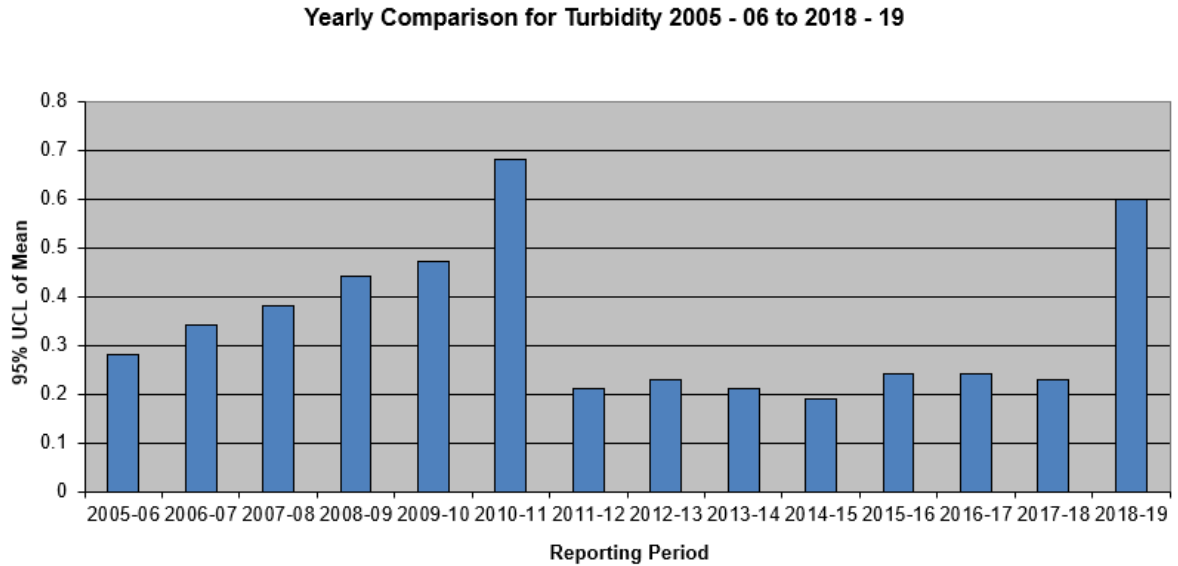
Turbidity levels for the period 1 July 2018 to 30 June 2019 increased significantly compared to the previous seven years. Full compliance was met for the turbidity water quality standard for the reporting period with 95th percentile of twelve month period being 0.6 for 2018/2019 (see Figure 9). This is still lower when compared with previous periods where the result was as high as 0.68, recorded in the 2010/2011 reporting period.

The high result for this reporting year would be due to pumping water into the supply tanks at Dam Valley. As mentioned in Table 2.1.1, water was carted in and also pumped from snowmaking tanks to maintain water supply to the village during late February and early March 2019. This process stirred up sediment in the bottom of the village supply tanks and remained suspended for some time within the system. However, the turbidity was still far below the water quality standard of 5 NTU.

The resort continues to undertake a regular reduction of intake flows, particularly with regard to major rain events. Major rain events have the potential to increase turbidity levels within the raw water catchment. The reduction in intake flows can reduce the incidence of turbid water entering the village potable water supply, resulting in the supply of a higher quality of drinking water.

SECTION B - MOUNT BAW BAW ALPINE RESORT

Figure 12: Results for Turbidity showing the yearly trends. The turbidity metric was changed to 95%ile of sample results, whereas the UCL was prior to 2015.



3.4.2 Analysis Issues

No major issues arose from analysis procedures during the period 1 July 2018 to 30 June 2019. All water samples collected as part of the monitoring programs conducted at Mount Baw Baw Alpine Resort have been independently analysed by a National Association of Testing Authorities, Australia (NATA) certified laboratory.

SECTION C – RISK MANAGEMENT PLAN

1. Review of the Risk Management Plan

In accordance with the Act, the Board as the responsible water supplier has:

- Prepared a risk management plan for the regulated water.
- That the risk management plan contains the matters detailed in Regulation 6 of the Safe Drinking Water Regulations (except those that specifically relate to drinking water only).
- Undertaken a risk management plan audit as required, by the Secretary to the Department of Health and Human Services by an approved auditor.

The Risk Management plan is reviewed on an annual basis. This review is coupled with a scheduled six-monthly meeting that assists in assessing and minimising risk to visitors to the resort. The scheduled meetings incorporate the monitoring of water quality results, signage of water outlets within the resort, equipment inspection and maintenance schedules.

2. Findings of the most recent risk management plan audit

DHHS required the Board to undertake an audit of the safe drinking water risk management plan (which encompasses both Lake Mountain Alpine Resort and Mount Baw Baw Alpine Resort) and were found to be compliant with section 7(1) of the *Safe Drinking Water Act 2003*.

The opportunities for improvement support the ongoing implementation of good risk management, and reinforce a culture of effective risk management in the Victorian water industry.

The findings and recommendations of the audit that occurred on the 9th of April 2018 are summarised in Table 6.1 below. A copy of the audit certificate can be seen in Figure 13 below.

3. Complaints or issues

Southern Alpine Resort Management Board did not receive any water related complaints or issues during this reporting period at Mount Baw Baw Alpine Resort or Lake Mountain Alpine Resort.

4. Emergency / Incident Management

There were no incidents of known or suspected contamination reportable under section 22 of the Safe Drinking Water Act 2003 during the reporting period. Further to this, there were no situations or events that occurred during the reporting period that were reportable under section 22 of the Act which impacted or had the potential to impact the water quality of the drinking water being supplied.

SECTION C – RISK MANAGEMENT PLAN

Table 6.1: Risk Management Plan Audit Outcome – Improvement actions

Auditor's opportunity for improvement	Alpine Resort	Actions to be undertaken	Expected completion date
1. We suggest an increased emphasis on training, especially as there have been staff changes. Possibly also consider using the consultant who assisted with your Safe Drinking Water Risk Management Plan assisting with this; including further standardising and developing site documentation. We suggest this, though we note that there is a training program upgrade as part of the merger integration of Baw Baw and Lake Mountain.	Mount Baw Baw	a) Key water operations staff to be identified. b) Staff training matrix to be completed by all key water operations staff to identify shortfalls in knowledge of potable water operations processes and procedures. c) Existing Standard Operating Procedures relating to potable water to be reviewed and updated as required.	Completed June 2018. Completed June 2018. Expected completion March 2020.
	Lake Mountain	d) Staff training to be offered as per point b) and c) above.	December 2019 (new environment and safety officer in place to drive review)
2. For your sampling taps, suggest considering a yearly audit, and replacement where required.	Mount Baw Baw	e) Existing operating procedures are currently in place as part of weekly potable water testing program. f) Standard Operating Procedure to be reviewed as per point c) above.	Relevant procedures are currently in place. Expected completion March 2020.
	Lake Mountain	g) As per point f) above.	December 2019 (new environment and safety officer in place to drive review)
3. Suggest considering further developing Standard Operating Procedure (SOP) for flushing of pipework systems. If there is a higher pH in the reticulating system, during	Mount Baw Baw	h) Existing operating procedures are currently in place as part of fortnightly potable water operations program should catchment inflows permit. i) Standard operating procedure to be developed to cover sluicing of village supply main.	Ongoing. Expected completion March 2020.

SECTION C – RISK MANAGEMENT PLAN

Auditor’s opportunity for improvement	Alpine Resort	Actions to be undertaken	Expected completion date
very low use periods, to consider, for example, a small bleed, when water permits.	Lake Mountain	j) Review Standard Operating Procedure.	December 2019 (new environment and safety officer in place to drive review)
4. Suggest further upgraded security measures near water systems. Possibly, also standardising between your two sites.	Mount Baw Baw	k) Village Supply Catchment is an open catchment with little ability to close due to operational constraints relating to trail usage. Monthly catchment inspections are in place to minimise the potential impact on potable water supply due to contamination l) All hatches, doors and entrances at Village Supply Tanks, Ultra Violet Treatment Plant and Chlorine Dosing Plant are kept secured (locked) at all times when unattended.	Ongoing. Ongoing.
	Lake Mountain	m) Further review of signage and fencing to improve security will be undertaken and installed where identified.	Ongoing.

SECTION C – RISK MANAGEMENT PLAN

Auditor's opportunity for improvement	Alpine Resort	Actions to be undertaken	Expected completion date
<p>5. It was encouraging to note C-Tech are managing your chlorine dosing system. Suggest C-Tech graph both pH and free active chlorine residual. Other parameters could also be considered to optimize water chemistry. Suggest, a yearly chemistry performance review with suggestions for upgrades and tightening Key Performance Indicators.</p> <ul style="list-style-type: none"> • Suggest C-Tech also provide a training course during the yearly overhaul of your chlorine dosing system. • Suggest also considering a yearly chemical alarm test. 	Mount Baw Baw	<p>n) Key Consult C-Tech Technicians to ascertain potential for provision of required data on an annualised basis. Suggest this data is provided to coincide with annual reporting period.</p> <p>o) Consult C-Tech Technicians to ascertain potential for regular training to be conducted for key water operations staff related to operation and maintenance of the chlorine dosing plant.</p> <p>p) Alarm tests conducted as part of regular servicing by C-Tech technicians.</p>	<p>Preliminary discussions with C-Tech underway.</p> <p>Already implemented.</p>
<p>6. Suggest considering a UPS or back up power system dedicated just to your chlorine dosing system.</p>	Mount Baw Baw	<p>q) UPS is currently linked to Ultra Violet Treatment Plant and Chlorine Dosing Plant and has covered all power outages experienced to date. Investigate potential for requirement of larger UPS across next reporting period.</p>	<p>Expected completion June 2019.</p>
<p>7. Suggest considering your UV over hauler also giving a yearly training course. During this time contingency procedures could also be further discussed and developed.</p>	Mount Baw Baw	<p>r) Consult Hanovia Technicians to ascertain potential for regular training to be conducted for key water operations staff related to operation and maintenance of the Ultra Violet Treatment Plant.</p>	<p>Ongoing discussion required regarding additional CAPEX funding for project.</p>

SECTION C – RISK MANAGEMENT PLAN

Auditor's opportunity for improvement	Alpine Resort	Actions to be undertaken	Expected completion date
8. We note that you are considering long-term plans to include an additional catchment to increase water resources. Suggest considering sampling from this catchment as well. Currently, utilised for snowmaking.	Mount Baw Baw	s) Consult ALS Laboratory Traralgon to perform additional testing at Snowmaking Supply Tanks on a quarterly basis commencing 1st January 2019. t) Investigate capital expenditure required and ability to install a new pipeline, pre- treatment from the existing 1.8 Megalitre Snowmaking Storage Supply Tanks into the Village Supply Main	Ongoing discussion required regarding additional CAPEX funding for project. Expected completion 2019.
9. Suggest considering using your current drone to assist with catchment inspections.	Lake Mountain	u) Undertake a trial using existing drone to identify if it can offer benefit to inspections.	December 2019 (new environment and safety officer in place to drive review)

SECTION C – RISK MANAGEMENT PLAN

Figure 13: Copy of the risk management plan audit certificate



Regulation 10

Schedule 1 - Risk Management Plan Audit Certificate

Safe Drinking Water Regulations 2015

Certificate Number: 154

Audit Period: 1st January 2017 to 9th April 2018

To: Mr Scott Goss
Mountain Operations Manager
Southern Alpine Resort Management Board
PO Box 117
Alpine Resort
Rawson 117, VIC 3825

Australian Business Number (ABN): 80 841 224 798

I, Thomas Teunissen, after conducting a risk management plan audit of the water supplied by Southern Alpine Resort Management Board, am of the opinion that:

Southern Alpine Resort Management Board has complied with the obligations imposed by Section 7(1) of the *Safe Drinking Water Act 2003* during the audit period.

Date: 9th April 2018

Signature of approved auditor:

Thomas Teunissen

Level 27, 101 Collins St, Melbourne VIC 3000
Mobile: 0410 624 604 Tel: 03 8609 1429 Fax: 03 864 00 581
Email: tom@rmpsystems.com

