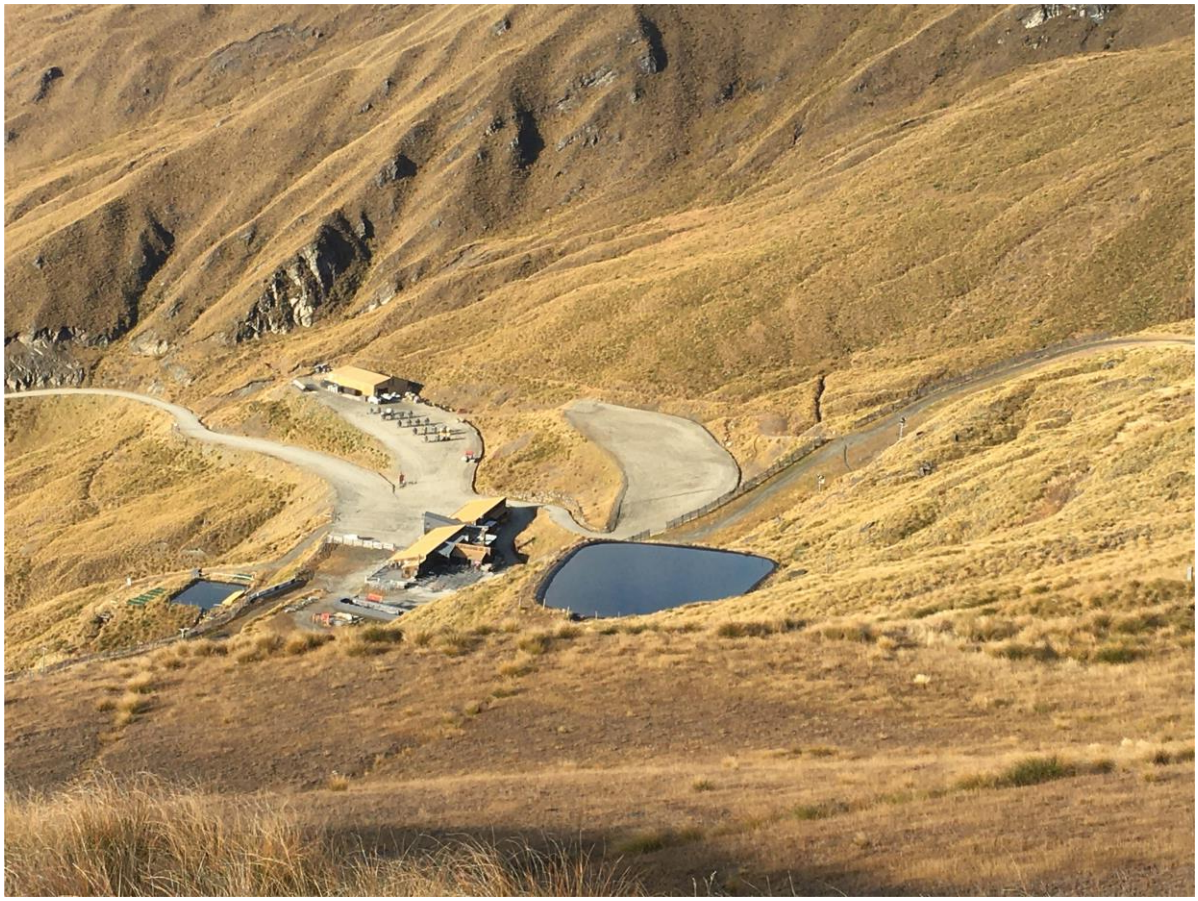
WATER WAYS
CONSULTING LTD

Treble Cone ski area assessment of aquatic ecological values



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1 INTRODUCTION

Treble Cone ski area is located in the Matukituki and Motatapu catchments west of Wanaka and is situated on land administered by the Department of Conservation. Cardrona Alpine Resorts Limited presently lease the ski area and this lease is due for renewal.

As part of the lease renewal process an assessment of the ecological values present within the ski area is required.

This report provides an assessment of the aquatic ecological values present in streams in the Home Basin overlooking the Matukituki and lower Motatapu Valleys.

An assessment of the aquatic values present in the streams in the tributary of the North Branch of the Motatapu River, including the Saddle Basin will be undertaken later in the year.

2 METHODS

The Home Basin was visited on the 6 May 2020 and a site walkover was conducted. The walkover ascended to approximately to 1550 m and involved a traverse of the Basin at this altitude. Once the traverse was completed the walkover descended along the major water course in the Basin.

At stream crossing points encountered during the traverse (sites CONE3 to 7) the state of the water course was recorded, the stream was searched for macroinvertebrates and small samples for identification were collected from two sites. Any modifications to the water course, either upstream of downstream of the were noted.

Kick net macroinvertebrate samples were collected at four sites near the Treble Cone base buildings (sites Cone11 to 14). Standard kick net practices could not be followed as the stream bed substrate was dominated by boulders and large cobbles that could not be easily disturbed. A sample at each sites was collected by disturbing the moveable substrate and brushing invertebrates (by hand) off the immobile substrate particles. All samples were preserved in 70% ethanol and returned to the laboratory for sorting, identification and full counts were made of the invertebrates collected.

Given the altitude of the Basin and the steep terrain downslope from the Basin no fish sampling was conducted as it was considered that fish will not be able to ascend to the ski field area in these eastern face streams. Koaro (*Galaxias brevipinnis*) is the only fish in the Matukituki catchment that could ascend the steep slope but to get to the ski field this would mean a 850 m vertical ascent which was considered extremely unlikely to occur.

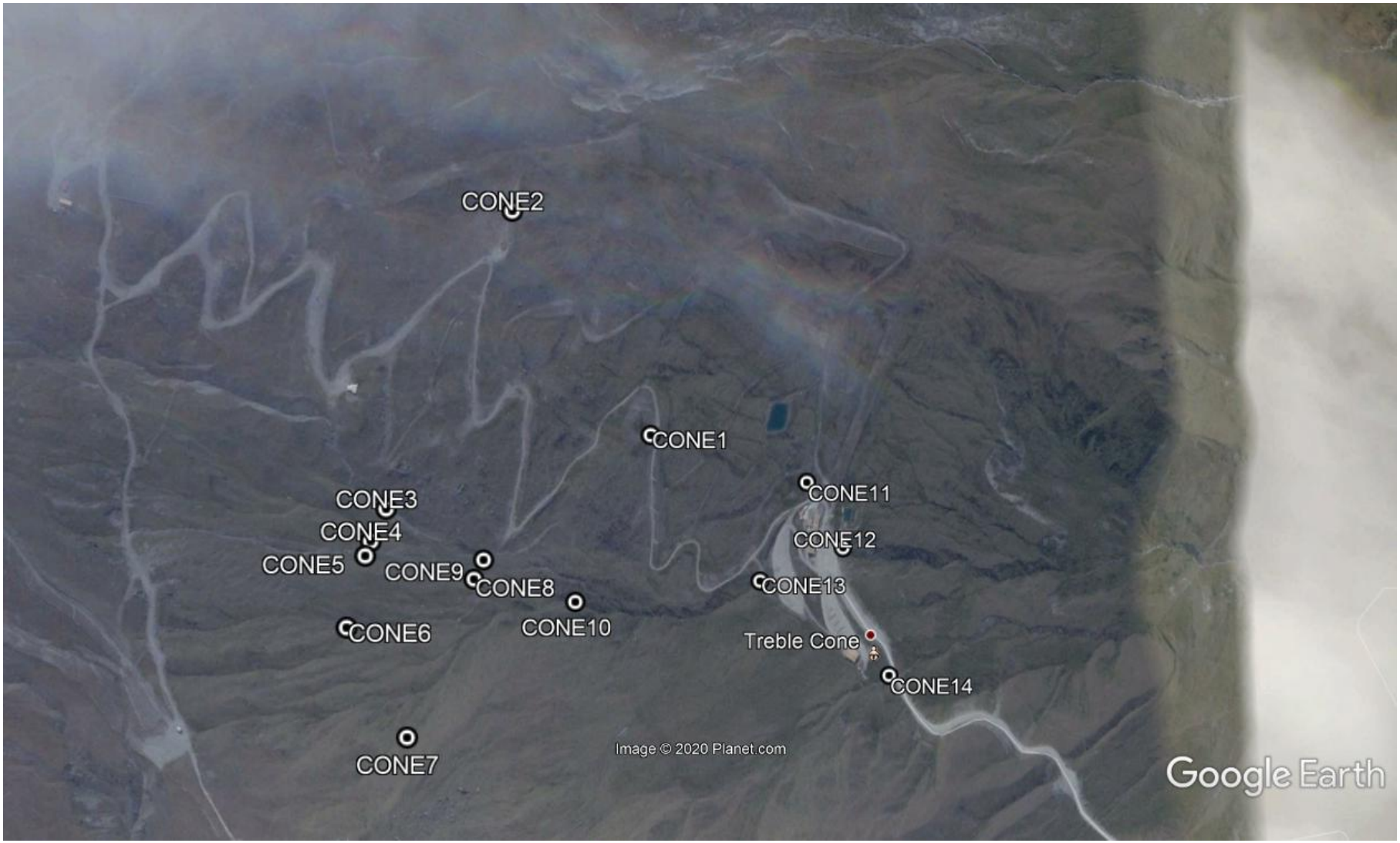

Figure 1: Survey locations on the Home Basin, Treble Cone.

3 RESULTS

3.1 General observations

The site walk over visited fourteen sites to record aquatic values (sites CONE1 to CONE14).

3.1.1 CONE 1

This site was a short section of modified stream channel flowing down the access track embankment (Figure 2). The channel was protected from erosion by the placement of flat schist slabs on the stream bed and by a well established riparian vegetation. Moss was present on the slabs indicating the channel is stable with little disturbance. *Deleatidium* mayfly nymphs were common on the rocks in this stream.

Figure 2: Site CONE1, a modified channel on the access track.

3.1.2 CONE2

Site CONE2 was at the top of a modified slope on the northern edge of the ski area. No water courses were present at this site confirming no perennial streams are present on this part of the Basin (Figure 3).

Figure 3: The view from Site CONE2 with no stream courses.

3.1.3 CONE3 to 7.

A series of five small streams flow from near the ridge line downslope in the Home Basin. At the 1500-1550 m altitude all the streams were small.

The stream at CONE3 was flowing at approximately 50 ml/s and it is possible this is an ephemeral stream, drying in the summer. It was in a steep V-shaped channel well incised into the hillside (Figure 4). The consisted of steep cascades and occasional very small pools with a maximum depth of 15 cm. No invertebrates were observed when the substrate, stream bed moss and riparian vegetation was searched. The stream channel appeared stable and had no modifications. The riparian vegetation was also intact along the stream edge restricting erosion.

CONE4 was sited on another small steep channel with a good riparian margin and no erosion. The stream was almost complete enclosed by its banks and it had a maximum width of 40 cm and the flow was estimated to be 50 ml/s or less. A search of the stream bed substrate and bank edge vegetation found no invertebrates. Small pools were present and these had a maximum depth of 10 cm (Figure 5). It is likely that this stream is also ephemeral.

CONE5 was sited on a larger stream and has had large debris flows coming downstream from the mountain top in the channel. This stream drains the highest slopes in the Basin so has the largest catchment upstream of the survey site. There was sediment (silt to boulder sized particles) deposited along the stream edge and the riparian vegetation was partially buried. Some channel erosion was present but this was limited and appears to be due to the channel being over loaded

with sediment due to the upstream debris flow. The stream was up to 1 m wide and 20 cm deep. A search of the stream bed substrate found macroinvertebrates; *Austrosimulium* larvae were the common and other Diptera and caddisfly larvae were present. Given the presence of invertebrate life and the larger size of this stream it is expected that it is a perennial stream.

Figure 4: The stream channel at Site CONE3.

There were two small stable streams at CONE6 site. Both were narrow, 20 cm and 40 cm wide and had well vegetated riparian margins with saturated moss growth along the stream edges (Figure 7). The smaller stream had a fine sediment stream bed and the larger stream had some gravel and cobble on the stream bed. No invertebrates were found in the smaller stream while flatworms, *Deleatidium*, chironomid larvae and stoneflies (not identified) were present in the larger stream. Both streams had sections where the stream was completely underground or overgrown and not visible from above.

Site CONE7 was sited on a channel depression on the hillside and there was no obvious surface flow at the site. A similar channel was crossed between Sites CONE6 and 7.

Figure 5: A small pool in the stream at site CONE4.

Figure 6: The stream channel at Site CONE5.

Figure 7: One of the small streams present at site CONE6.

3.1.4 Sites CONE8 and 9.

Sites CONE8 and 9 were located downstream of the previous sites near the confluences of the smaller streams. The streams at these two sites have undergone some very localised modification with a 4WD track crossing the streams using culverts. The stream at CONE8 downstream for site CONE5 and the 4WD track culvert is blocked by debris that has come down the stream. This culvert bloackage has diverted the stream and it flowsacross to the stream at site CONE9. The CONE8 stream has a stream bed comprised of silt through to boulders. Invertebrates are present in the stream including flatworms and *Deleatidium* and stony cased caddisflies, although the abundance was low. No invertebrates were observed in the stream at CONE9.

Figure 8: The stream at CONE8 looking upstream where sediment has accumulated upstream of the 4WD track.

3.1.5 Site CONE10

Site CONE10 was the water intake location for the Treble Cone base facility. At this location all the upstream tributaries sampled have joined to form this single stream channel. The channel is over 1 m wide and pools are up to 50 cm deep. The stream edge and bed is predominately bedrock and boulder with small areas of cobble, gravel and sand. The stream is incised in a narrow v shaped channel that has a well vegetated riparian zone. The steep is steep with the habitat generally a cascade with small plunge pools and runs. The water intake structure is the only modification and extends along about 10 m of stream.

Figure 9: Site CONE10 with the water intake looking upstream (left) and downstream (right).

3.2 Sites CONE11- 14

CONE11 is an artificial channel that flows alongside the learns slope and under the main chair lift before being culverted under the lower part of the Basin. The stream was sampled just upstream of the chairlift. At this site the stream has a stable boulder, cobble and gravel bed with some moss on the boulder and cobble. The riparian vegetation was intact and there was no erosion along the stream. Therefore, while an artificial channel this reach appears to be a natural channel aside from being straight.

Sites CONE12 and 13 are on the main stream located upstream (CONE13) and downstream (CONE12) of a long culvert section that flows under the ski area carpark. Both sites had a boulder, cobble and gravel stream bed that is stable with little erosion. The riparian zone is well vegetated at both sites with tall tussock grasses the most common vegetation. The stream width is approximately 1 m and the maximum channel depth is 25 cm.

Site CONE14 was on the upstream side of the access road on a stream just down the access road from the base buildings. This stream also steep cascading stream with a boulder, cobble bed stream and an intact tussock riparian zone.

The invertebrate communities at the four sites where diverse with a up to 21 taxa present and the macroinvertebrate community index (MCI) scores all greater than 120 indicating excellent water and habitat quality (Table 1). Pollution sensitive taxa were common with Ephemeroptera (mayflies), Plecoptera (stoneflies) and Tricoptera (caddisflies) (EPT taxa) common in the samples. Given the difficulty collecting standardised samples the total macroinvertebrate abundance data can only be considered an indication of abundance, but this does show macroinvertebrates are common in the streams on the lowest altitude parts of Basin.

Table 1: Invertebrate sample results

	CONE11	CONE12	CONE13	CONE14
Taxa richness	21	14	19	17
EPT taxa	8	6	7	9
Abundance in sample	549	447	567	209
% abundance EPT	38	43	37	53
MCI	125	129	126	133
MCI quality class	Excellent	Excellent	Excellent	Excellent

Figure 10: Invertebrate sample sites, CONE11 (top left), CONE12 (top right), CONE13 (bottom left) and CONE14 (bottom right).

4 DISCUSSION

4.1 Aquatic Ecological Values

No fish species are expected to occur in the streams visited. Altitude and access are obvious limiting factors, and also the streams that are above 1500 m are too small and often appear to be ephemeral so will not support fish life.

The macroinvertebrate community is diverse, and the MCI scores (Appendix A) show habitat and water quality is excellent. The invertebrate fauna includes a range of mayflies, stoneflies and caddisflies (Ephemeroptera, Plecoptera and Tricoptera, (EPT taxa)) that are indicators of good water and habitat quality. There was also a range of other taxa present that means the streams support a wide range of invertebrates. While this community is diverse the two megainvertebrates; koura

(freshwater crayfish) and kakahi (freshwater mussel) are not present. Koura has not been reported in the upper Clutha catchment so its absent is expected. Similarly, kakahi requires a freshwater fish as a host for its parasitic larval stage and the absence of fish means kakahi will not be present. In addition, habitat conditions are unsuitable for kakahi as there are few fine sediment stream bed areas for the mussel to burrow in.

4.2 Habitat condition

The stream habitats were generally unmodified and have been retained in a natural state. Most streams reaches have a natural stream bed and the riparian zones have intact native vegetation. Erosion is limited and one active slip at the top of the Basin is the only significant source of sediment in the streams. It is notable that the adjacent land area outside the ski Basin has a large active erosion area (Figure 11) indicating that these mountain slopes can be unstable. Small areas of stream alteration have occurred around vehicle tracks and there is a water take on the main stream. The streams are also culverted under the access road and base facility area. However, given the size of the ski area these alteration areas are small compared to its total area. The modified channels are all stable and support high quality macroinvertebrate communities (e.g., Site CONE11). The macroinvertebrate collections indicate that the water quality is excellent and therefore water draining from the Basin is of excellent quality and will have no detrimental effects on downstream ecosystems.

Figure 11: Erosion and landslip adjacent to Treble Cone.

5 SUMMARY

One major catchment drains much of the Home Basin. This catchment has a number of small streams at higher altitudes that converge to a single large stream on the lower slopes. This stream system is largely natural and undisturbed aside from one upper stream channel with a high bed load, a 4WD track crossing and a water take. The only major modifications are the culverted sections of

stream at the abse facility. There are no fish present in the stream on the Home Basin, and given the altitude and location this is to be expected. Macroinvertebrate communities are of high quality and indicate excellent habitat and water quality. Modified channel are also stable, have good riparian vegetation and high quality macroinvertebrate faunas.

APPENDIX A MACROINVERTEBRATE DATA

Taxa	MCI	Cone 5 Hand	Cone 6 Hand	Cone 11 Net	Cone 12 Net	Cone 13 Net	Cone 14 Net
Ephemeroptera (mayflies)							
Deleatidium	**8**			263	275	341	92
Nesameletus	**9**			73	21	60	14
Plecoptera (stoneflies)							
Austroperla	**9**						12
Halticoperla	**8**						8
Zelandobius	**5**			22	4	12	4
Zelandoperla	**10**		1	83	108	57	30
Trichoptera (caddisflies)							
Aoteapsyche	**4**						2
Hudsonema	**6**			3			
Hydrobiosis	**5**			14		3	1
Oeconesus	**9**			1	1	1	
Philorheithrus	**8**	2					
Zelolessica	**10**		2	14	7	1	2
Coleoptera (beetles)							
Elmidae	**6**			12	15	21	15
Hydraenidae	**8**			5		3	
Hydrophilid	**5**			4	3	1	2
Scirtidae	**8**			17	6	39	17
Diptera (flies)							
Austrosimulium	**3**	8		2		9	
Blephariceridae	**7**				3	4	1
Eriopterini	**9**			2		2	2
Limonia	**6**				1	1	1
Maoridiamesa	**3**		3	1	1	1	
Muscidae	**3**	1			1		
Paralimnophila	**6**			8			
Megaloptera (dobsonflies)							
Archichauliodes	**7**			1			
CRUSTACEA							
Isopoda	**5**			7			
ACARINA							
Acari	**5**					1	
ARACHNIDA							
Dolomedes	**5**			2			
OLIGOCHAETA	**1**			1	1	7	1
PLATYHELMINTHES							
Neppia	**3**		12	14		3	5
Taxanomic richness		3	4	21	14	19	17
EPT taxonomic richness		1	2	8	6	7	9

% EPT taxonomic richness		33	50	38	43	37	53
MCI score		93	130	125	129	126	133
MCI Quality Class		Fair	Excellent	Excellent	Excellent	Excellent	Excellent