

Water quality in Otago

July 2014 to June 2019



Introduction

The Otago Regional Council (ORC) is responsible for managing Otago's surface-water resources and carrying out regular and extensive long-term water-quality monitoring, as part of its State of Environment (SOE) programme. This report card documents the results of water-quality monitoring undertaken between July 2014 to June 2019.

Water quality

Schedule 15 (Regional Plan: Water) sets out the numerical limits for acceptable water quality for all catchments in the Otago region. The receiving water limits (outlined in Table 1) are applied as five-year, 80th percentiles, when flows are at or below median flow.

Table 1: Water quality standards (five-year, 80th percentiles, when flows are at or below median flow)

Schedule 15	Nitrite-nitrate nitrogen mg/l	Dissolved reactive phosphorus mg/l	Ammoniacal nitrogen mg/l	<i>Escherichia coli</i> cfu/100ml	Turbidity NTU	Total nitrogen mg/l	Total phosphorus mg/l
Group 1	0.444	0.026	0.10	260	5		
Group 2	0.075	0.010	0.10	260	5		
Group 3	0.075	0.005	0.01	50	3		
Group 4			0.10	126	5	0.55	0.033
Group 5			0.01	10	3	0.10	0.005

120 SOE sites were monitored every month, including four monitored by NIWA (as part of the National River Water Quality Network). To enable classification of each site into one of four groups (Table 2) ORC uses a water quality index. Table 2 shows how the grades are derived and Figure 1 shows the results.

Table 2: Water quality index

Grade	Number of parameters complying with water quality standards (June 2014 to July 2019)
Excellent	All five parameters (Table 1) comply
Good	Four (of the five) values comply
Fair	Three (of the five) values comply
Poor	Two or fewer (of the five) values comply

Nutrients: Nitrite-nitrate nitrogen (NNN) and dissolved reactive phosphorus (DRP) are the biologically available nutrients used for algae and plant growth. NNN is a form of nitrogen, mainly derived from land drainage, and DRP is a form of phosphorus, mainly sourced from effluent and fertiliser. Ammoniacal nitrogen (NH₄-N) can indicate the presence of effluent in water.

E. coli: *Escherichia coli* (*E. coli*) are a bacterium which is used as an indicator of the presence of harmful micro-organisms in water (e.g. human or animal faeces). This can be used to gauge whether water is suitable for stock drinking, swimming, surfing or other recreational activities.

Turbidity: Turbidity is a measure of the cloudiness of water, determined by how much light is scattered by suspended particles. Streams with 'high turbidity' often have high suspended sediment loads. Having high turbidity can reduce light penetration, which can affect photosynthesis. High sediment loading also tends to smother the streambed, which reduces macroinvertebrate and fish-spawning habitat.

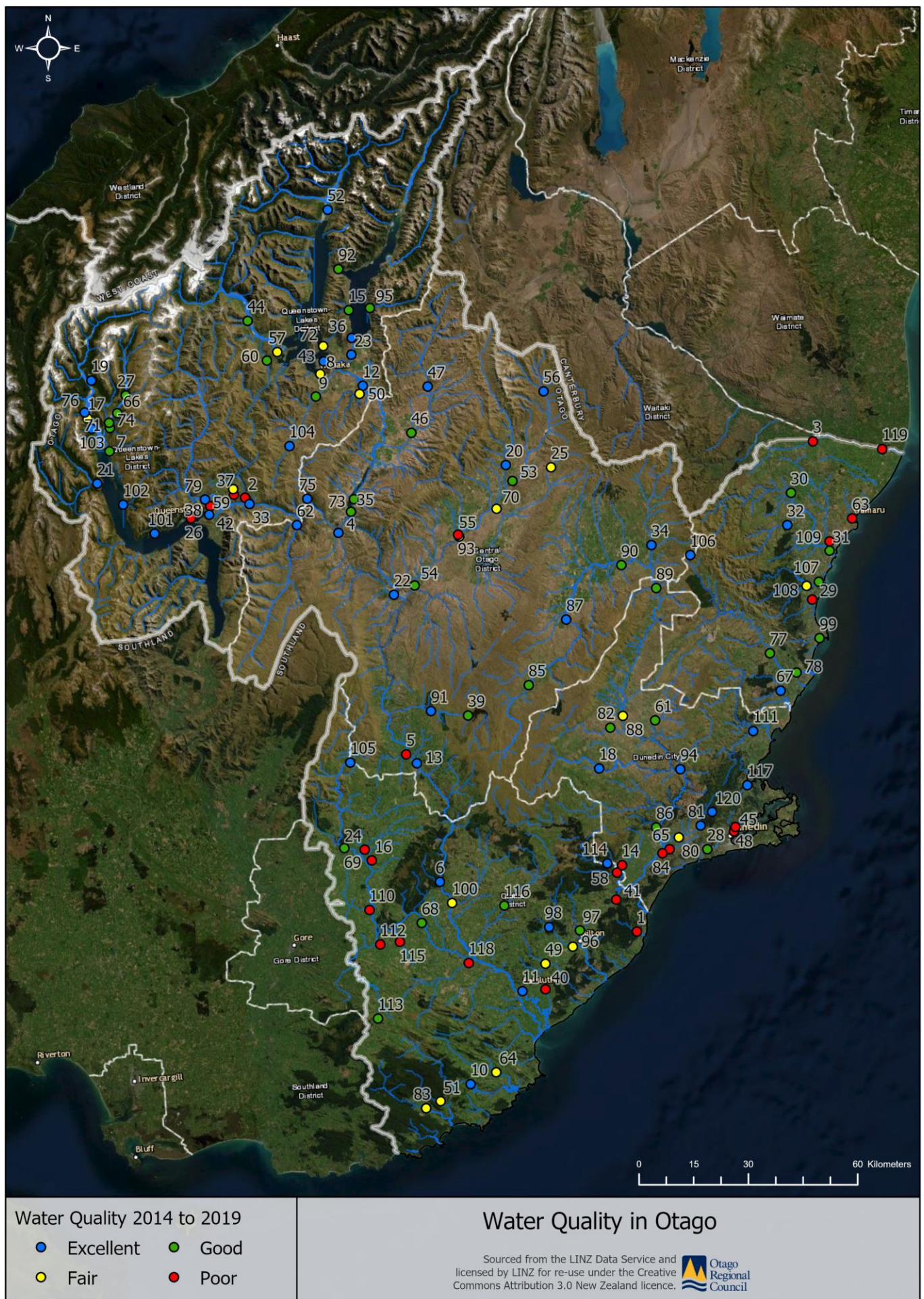


Figure 1: Results of five years (2014 to 2019) of SOE water-quality monitoring. Site numbers refer to sites in Tables 3, 4, 5 and 6.

Water-quality monitoring: Results

Table 3: Group 1 sites showing water quality results. The orange cells show where the 80th percentile below median flow exceeded the PC6A standards. The grey cells indicate the additional parameters to those in PC6A.

		Receiving Water Group 1	NH ₄ -N	E.Coli.	DRP	NNN	Turbidity	TP	TN
			mg/L	MPN	mg/L	mg/L	NTU	mg/L	mg/L
#		LIMIT	0.1	260	0.026	0.444	5	-	-
6	*	Blackcleugh Burn at Rongahere Road	0.0025	48	0.018	0.055	0.445	0.025	0.143
10		Catlins at Houipapa	0.016	250	0.0166	0.413	3.93	0.036	0.605
1		Crookston Burn at Kelso Road	0.0368	1870	0.0447	1.5	4.37	0.068	1.8
24		Heriot Burn at Park Hill Road	0.0377	1490	0.0545	1.478	5.6	0.096	1.888
28		Kaikorai Stream at Brighton Road	0.0195	747	0.0139	0.276	2.99	0.033	0.46
45		Leith at Dundas Street Bridge	0.0185	552	0.0329	0.505	2	0.046	0.653
48		Lindsays Creek at North Road Bridge	0.0248	635	0.0277	0.713	3.39	0.042	0.896
49		Lovells Creek at Station Road	0.0179	537	0.0183	0.6	3	0.039	0.93
51	*	Maclennan at Kahuiku School Road	0.0223	372.5	0.012	0.0166	5.53	0.027	0.309
64		Owaka at Katea Road	0.0177	430.5	0.0227	1.2	2.34	0.041	1.342
68		Pomahaka at Burkes Ford	0.019	150	0.0141	0.449	3.81	0.038	0.742
83	*	Tahakopa at Tahakopa	0.0037	921	0.006	0.338	6.79	0.027	0.625
96		Tokomairiro at Blackbridge	0.0274	1440	0.0314	0.355	4.51	0.064	0.658
97	*	Tokomairiro at Lisnatunny	0.0227	500	0.0237	0.291	4	0.053	0.474
98		Tokomairiro at West Branch Bridge	0.018	211	0.015	0.277	2.77	0.038	0.564
100		Tuapeka at 700m u/s bridge	0.0143	330.2	0.0273	0.1089	3.36	0.053	0.37
110		Waikoikoi at Hailes Bridge	0.023	937	0.0441	0.437	5.37	0.08	0.765
112		Waipahi at Cairns Peak	0.0367	829	0.019	0.69	7.66	0.07	1.2
113		Waipahi at Waipahi	0.0173	203	0.0253	0.872	2.46	0.054	1.23
115		Wairuna at Millar Road	0.0438	890	0.1248	0.897	11.69	0.233	1.489
116		Waitahuna at Tweeds Bridge	0.016	465	0.0179	0.1155	3.75	0.047	0.375
117	*	Waitati at Mt Cargill Road	0.009	129	0.0127	0.0181	1.47	0.018	0.212
118		Waiwera at Maws Farm	0.017	333	0.0358	0.715	2.83	0.071	1.1

* denotes sites that have not been monitored for five years, therefore the grade is interim.

Table 4: Group 2 sites showing water quality results. The orange cells show where the 80th percentile below median flow exceeded the PC6A standards. The grey cells indicate the additional parameters to those in PC6A.

		Receiving Water Group 2	NH ₄ -N	E.Coli.	DRP	NNN	Turbidity	TP	TN
			mg/L	MPN	mg/L	mg/L	NTU	mg/L	mg/L
#		LIMIT	0.1	260	0.01	0.075	5	-	-
1	*	Akatore Creek at Akatore Creek Road	0.0025	2171	0.0057	0.3708	12.043	0.039	0.691
2	*	Arrow at Morven Ferry Road	0.0025	435	0.002	0.112	5.7	0.004	0.147
3		Awamoko at SH83	0.022	558	0.0848	0.488	1.39	0.1	1.12
4		Bannockburn at Lake Dunstan	0.011	169.3	0.0076	0.001	4.51	0.017	0.1
5		Benger Burn at SH8	0.0153	1310	0.0183	0.279	2.15	0.049	0.643
8	*	Bullock Creek at Dunmore Street Footbridge	0.0025	575.9	0.002	0.649	0.342	0.002	0.757
9		Cardrona at Mt Barker	0.01	163.4	0.004	0.0852	1.81	0.009	0.15
13	N	Clutha River at Millers Flat	0.004	23.8	0.001	0.0422	1.862	0.006	0.097
14		Contour Channel at No. 4 Bridge	0.039	900	0.044	0.13	4.1	0.096	0.47
18		Deep Stream at SH87	0.007	202.5	0.0035	0.0017	1.2	0.017	0.235
20		Dunstan Creek at Beattie Road	0.008	116.5	0.0055	0.066	1.12	0.011	0.153
25	*	Hills Creek at SH85	0.0025	670.4	0.0047	0.1741	1.574	0.012	0.281
29	*	Kakaho Creek at SH1	0.0381	559.7	0.0371	0.1897	3.25	0.111	0.648
30		Kakanui at Clifton Falls Bridge	0.0105	498.5	0.0035	0.0375	0.51	0.008	0.149
31		Kakanui at McCones	0.0185	187	0.004	0.425	0.835	0.013	0.55
32		Kauru at Ewings	0.0075	150	0.004	0.0265	0.425	0.008	0.155
34		Kye Burn at SH85 Bridge	0.01	195	0.006	0.072	1.7	0.01	0.188
46		Lindis at Ardgour Road	0.0105	87.5	0.004	0.125	1.43	0.008	0.2
47		Lindis at Lindis Peak	0.007	74.5	0.005	0.0155	1.65	0.01	0.081
50		Luggate Creek at SH6 Bridge	0.0085	289	0.013	0.003	1.47	0.024	0.098
53		Manuherikia at Blackstone Hill	0.006	195	0.005	0.0041	5.6	0.016	0.125
54		Manuherikia at Galloway	0.0105	259.5	0.0175	0.0215	2.6	0.032	0.26
55		Manuherikia at Ophir	0.0195	352.5	0.0335	0.061	2.8	0.063	0.38
56		Manuherikia downstream of Fork	0.0025	61.7	0.006	0.004	0.545	0.013	0.056
58	*	Meggat Burn at Berwick Road	0.0097	1832	0.0121	0.3059	7.68	0.053	0.65
59		Mill Creek at Fish Trap	0.0133	378	0.008	0.399	4.13	0.028	0.56
61		Nenthorn at Mt Stoker Road	0.0165	117	0.0173	0.0029	1.7	0.057	0.535
62		Nevis at Wentworth	0.005	19.6	0.005	0.004	0.59	0.007	0.069
63	*	Oamaru Creek at SH1	0.0191	6729	0.266	1.034	9.99	0.393	1.897
65		Owhiro Stream at Riverside Rd	0.153	812	0.0492	0.349	22	0.14	0.871
67	*	Pleasant at Patterson Road Ford	0.0045	129	0.0029	0.0592	4.96	0.036	0.497
69		Pomahaka at Glenken	0.0124	454	0.0097	0.0477	3.22	0.022	0.257
70	*	Poolburn at Cob Cottage	0.0117	370.2	0.0554	0.0299	1.925	0.079	0.787

* denotes sites that have not been monitored for five years, therefore the grade is interim.

N denotes a site monitored by NIWA.

Table 4 continued: Group 2 sites showing water quality results. The orange cells show where the 80th percentile below median flow exceeded the PC6A standards. The grey cells indicate the additional parameters to those in PC6A.

		Receiving Water Group 2	NH ₄ -N	E.Coli.	DRP	NNN	Turbidity	TP	TN
			mg/L	MPN	mg/L	mg/L	NTU	mg/L	mg/L
#		LIMIT	0.1	260	0.01	0.075	5	-	-
73	*	Quartz Reef Creek at SH8	0.0025	230.4	0.002	0.0051	5.68	0.009	0.102
75	*	Roaring Meg at SH6	0.0025	105	0.0078	0.0271	1.854	0.012	0.07
77		Shag at Craig Road	0.007	123.3	0.005	0.1361	0.751	0.009	0.299
78		Shag at Goodwood Pump	0.0101	200.1	0.0071	0.281	0.782	0.017	0.5
79	N	Shotover River at Bowens Peak	0.003	6.3	0.001	0.0158	7.072^	0.035	0.095
80		Silverstream at Taieri Depot	0.0164	284.6	0.007	0.624	1.92	0.012	0.771
81	*	Silverstream at Three Mile Hill Road	0.0025	29.5	0.002	0.0268	0.74	0.002	0.111
82		Sutton Stream at SH87	0.0025	843	0.0097	0.0149	3.52	0.041	0.421
84		Taieri at Allanton Bridge	0.022	440	0.0145	0.061	5.1	0.048	0.38
85		Taieri at Linnburn	0.009	312	0.005	0.003	1.5	0.015	0.19
86		Taieri at Outram	0.0105	78	0.0115	0.043	2.25	0.033	0.32
87		Taieri at Stonehenge	0.009	160	0.008	0.0079	1.77	0.029	0.287
88		Taieri at Sutton	0.0166	461	0.0146	0.0499	2.85	0.044	0.316
89		Taieri at Tiroiti	0.0118	197.9	0.022	0.0328	4.51	0.05	0.289
90		Taieri at Waipiata	0.0137	254.7	0.04	0.0265	3.18	0.078	0.37
91	*	Teviot at Bridge Huts Road	0.005	81.6	0.002	0.0055	3.5	0.028	0.291
93		Thomsons Creek at SH85	0.0241	761	0.076	0.214	5.42	0.154	0.866
94		Three OClock Stream at Hindon	0.0099	37.2	0.005	0.0516	0.88	0.011	0.169
99		Trotters Creek at Mathesons	0.0162	196	0.007	0.455	2.19	0.02	0.638
104	*	Upper Cardrona at Tuohys Gully Road	0.0025	231.4	0.002	0.0348	2	0.006	0.1
105	*	Upper Pomahaka at Aitchison Runs Road	0.0025	90.9	0.002	0.0169	0.894	0.008	0.123
106	*	Upper Shag at SH85 Culvert	0.0111	84.7	0.002	0.0385	0.472	0.005	0.086
107		Waianakarua at Browns	0.0083	185.3	0.006	0.306	0.512	0.007	0.388
108	*	Waianakarua at South Branch SH1	0.0043	316.5	0.002	0.605	0.52	0.007	0.755
109		Waiareka Creek at Taipo Road	0.0395	435.5	0.2085	0.395	1.815	0.255	1.405
111		Waikouaiti at Confluence d/s	0.0118	54.6	0.003	0.0122	1.179	0.013	0.203
14		Waipori at Waipori Falls Reserve	0.007	41.5	0.003	0.032	1.76	0.016	0.255
119		Welcome Creek at Steward Road	0.0177	992	0.0286	1.4	0.905	0.042	1.604
120	*	Whare Creek at Whare Flat Road	0.0025	15.5	0.002	0.0351	0.58	0.005	0.174

* denotes sites that have not been monitored for five years, therefore the grade is interim.

N denotes a site monitored by NIWA.

Table 5 continued: Group 3 sites showing water quality results. The orange cells show where the 80th percentile below median flow exceeded the PC6A standards. The grey cells indicate the additional parameters to those in PC6A.

		Receiving Water Group 3	NH ₄ -N	E.Coli.	DRP	NNN	Turbidity	TP	TN
			mg/L	MPN	mg/L	mg/L	NTU	mg/L	mg/L
#		LIMIT	0.01	50	0.005	0.075	3	-	
7	*	Buckler Burn at Glenorchy Queenstown Road	0.0025	15.5	0.002	0.0383	10.34	0.013	0.073
11	N	Clutha at Balclutha	0.0044	62.06	0.002	0.0804	4.498	0.009	0.181
12	N	Clutha River at Luggate Bridge	0.004	13.68	0.001	0.043	0.968	0.003	0.091
15	*	Craig Burn at SH6	0.0025	58.9	0.002	0.0126	0.612	0.007	0.06
17		Dart at The Hillocks	0.0152	10.46	0.003	0.0372	13.67	0.022	0.116
19	*	Dundas Creek at Mill Flat	0.0025	0.5	0.002	0.0488	0.346	0.002	0.066
21	*	Greenstone at Greenstone Station Road	0.005	35.2	0.002	0.0244	0.427	0.003	0.048
26	*	Horn Creek at Queenstown Bay	0.0135	347.5	0.008	0.188	3.325	0.024	0.315
27	*	Invincible Creek at Rees Valley Road	0.0025	3.7	0.002	0.0125	7	0.004	0.026
33	N	Kawarau River at Chards	0.023	31.82	0.0023	0.0302	4.118	0.018	0.107
44	*	Leaping Burn at Wanaka Mt Aspiring Road	0.0025	156.4	0.002	0.0331	0.376	0.002	0.067
52	*	Makarora at Makarora	0.0025	13.5	0.002	0.0595	1.778	0.002	0.077
57		Matukituki at West Wanaka	0.0104	65.2	0.0042	0.0686	2	0.01	0.117
60	*	Motatapu at Wanaka Mt Aspiring Road	0.0025	63.8	0.002	0.0395	0.931	0.002	0.078
66	*	Ox Burn at Rees Valley Road	0.0025	8.8	0.002	0.0218	7.01	0.004	0.054
71	*	Precipice Creek at Glenorchy Paradise Road	0.0025	97.4	0.002	0.0134	1.626	0.006	0.068
72	*	Quartz Creek at Maungawera Valley Road	0.0025	59	0.002	0.1421	0.376	0.002	0.177
74	*	Rees at Glenorchy Paradise Road Bridge	0.0025	32.8	0.0034	0.0169	22.6	0.023	0.034
76	*	Scott Creek at Routeburn Road	0.005	31.7	0.0034	0.036	0.697	0.017	0.053
92	*	The Neck Creek at Meads Road	0.0025	248.6	0.002	0.0031	0.17	0.002	0.033
95	*	Timaru at Peter Muir Bridge	0.0025	5	0.0047	0.0154	9.532	0.007	0.039
103	*	Turner Creek at Kinloch Road	0.005	7.9	0.002	0.0527	0.9	0.005	0.066
101	*	Twelve Mile Crk at Glenorchy Queenstown Rd	0.005	11.1	0.002	0.0086	2.299	0.006	0.055
102	*	Twelve Mile Crk at Glenorchy Queenstown Rd	0.005	35.6	0.002	0.0116	1.186	0.004	0.053

* denotes sites that have not been monitored for five years, therefore the grade is interim.

N denotes a site monitored by NIWA.

Table 6 continued: Group 4 and 5 sites showing water quality results. The orange cells show where the 80th percentile below median flow exceeded the PC6A standards. The grey cells indicate the additional parameters to those in PC6A

		Receiving Water Group 4	NH ₄ -N	E.Coli.	DRP	NNN	Turbidity	TP	TN
			mg/L	MPN	mg/L	mg/L	NTU	mg/L	mg/L
#		LIMIT	0.1	126	-	-	5	0.033	0.55
40		Lake Tuakitoto at Outlet	0.07	180	0.0596	0.362	12	0.1436	1.452
39		Lake Onslow at Boat Ramp	0.0092	4.36	0.002	0.00252	5.02	0.0362	0.29
41		Lake Waiholoa at jetty	0.015	90	0.0086	0.08	19.1	0.078	0.67
37	*	Lake Hayes at Mid Lake 10m	0.056	2	0.01366	0.01842	*	0.0472	0.39
		Receiving Water Group 5	NH ₄ -N	E.Coli.	DRP	NNN	Turbidity	TP	TN
			mg/L	MPN	mg/L	mg/L	NTU	mg/L	mg/L
#		LIMIT	0.01	10	-	-	3	0.005	0.1
42	*	Lake Wakatipu Open Water 10m	0.0025	0.5	0.002	0.0306	*	0.005	0.0616
43	*	Lake Wanaka Open Water 10m	0.0025	0.5	0.002	0.031	*	0.002	0.0612
36	*	Lake Hawea South Open Water 10m	0.0025	0.5	0.002	0.0122	*	0.002	0.0396
35		Lake Dunstan at Dead Mans Point	0.005	4.98	0.002	0.0354	1.2	0.009	0.09

* monitored between 2016-19, others 2014-19. No turbidity data from 2016-2017 due to faulty equipment