Appendix 2 Receiving Environment

Surface water

The discharges enter several surface waterbodies. The applicant has characterised the waterbodies into the following classifications based on their size and nature:

- Large Lakes;
- Medium Lakes;
- Very large rivers;
- Moderate – large rivers;
- Small – moderate rivers; and
- Streams.

A description of each of these receiving water bodies is outlined in the following sections.

1. Large Lakes

Large Lakes as referred to by the applicant are Lakes Hāwea, Wakatipu and Wanaka. These are glacial lakes sourced by large alpine rivers. Their sizes vary between 141-291 square kilometres in area and 311-392 metres in depth. Their catchments are dominated by steep alpine areas that are very sparsely populated, with the only major settlements being located close to the outlets of each lake: Hāwea, Queenstown and Wanaka, respectively.

1.1 Water quality

These three large lakes are renowned for the high quality of their water, especially their clear waters and the blue hue of their water which, in part, results from the high clarity of their water.

Schedule 15 of the Regional Plan: Water for Otago (RPW) sets out targets and timeframes for achieving good water quality in Otago's lakes and rivers. Where water quality in the waterbody was not complying with the relevant standard in 2012 (when the plan change was notified), a timeframe of 31 March 2025 was set consistent with the requirements of the National Policy Statement for Freshwater Management 2014. The Schedule 15 targets and timeframes for each of the 'Large Lakes' is shown below in Table 1.

Table 1: Schedule 15 of the RPW targets and timeframes for Lakes Hāwea, Queenstown and Wanaka. Source: Schedule 15 of RPW.

	Total Nitrogen	Total Phosphorus	Ammoniacal nitrogen	*Escherichia coli*[3]	Turbidity
	0.1 mg/l	0.005mg/l	0.01 mg/l	10 cfu/100 ml	3 NTU
Lake Hawea	31 March 2012				
Lake Wakatipu	31 March 2012	31March 2025	31 March 2012	31 March 2012	31 March 2012
Lake Wanaka	31 March 2012				

As shown above, the only parameter that did not comply with the target in 2012 was Total Phosphorous in Lake Wakatipu. A review of Council's State of the Environment Surface Water Quality in Otago 2006 to 2017 confirms these 2012 results by concluding that water quality is the Upper Clutha catchment is excellent.

1.2 Aquatic ecology

According to the New Zealand Freshwater Fish Database (NZFFD), longfin eel (*Anguilla dieffenbachii*), kōaro (*Galaxias brevipinnis*), common bully (*Gobiomorphus cotidianus*), upland bully (*Gobiomorphus breviceps*), brown trout (*Salmo trutta*), rainbow trout (*Onchorhynchus mykiss*) and quinnat salmon (*Onchorhynchus tshawytscha*) have been recorded in the 'Large

Lakes'. Populations of kōaro and common bully are landlocked. Longfin eel and kōaro have a conservation status of 'at risk – declining'[1], while other native species are not considered to be threatened.

Macroinvertebrates

Macroinvertebrates identified by the applicant that are likely be present in the lakes include: snails (*Potamopyrgus antipodarum*, *Gyraulus*, *Lymnaea* and *Physa*), chironomid midges (*Chironomus*, Orthocladiinae, Tanypodinae), worms (Oligochaeta, Nematoda) and caddis flies (especially the purse-cased caddis *Paroxyethira*) among the most common taxa collected. In addition to these, Freshwater mussels (*Echydridella menziesii*) are present in Lakes Hāwea, Wakatipu and Wanaka and have a conservation status of 'at risk – declining'[2].

Macrophytes

Lake Submerged Plant Indicators (LakeSPI) is an information tool used for assessing the ecological condition of a lake. The LakeSPI score for Lakes Wakatipu and Wanaka indicate that they are in 'excellent' condition, although the macrophyte community of Lake Wakatipu is in better condition, with a very high native condition and a low level of invasive impact. In comparison, Lake Wanaka has a slightly lower overall LakeSPI, slightly lower native condition and higher invasive impact, with two invasive oxygen weeds present: *Elodea* and *Lagarosiphon*, while only *Elodea canadiensis* is present in Lake Wakatipu.

1.3. Schedule 1 of the Regional Plan Water (RPW)

Schedule 1 of the RPW outlines the natural and human use values of lakes and rivers throughout the Otago Region. This schedule is split into 4 parts: Schedule 1A – Natural Values; Schedule 1B – Water Supply Values; Schedule 1C – Registered Historic Places and Schedule 1D – Cultural Values. In accordance with Policies 5.4.1 and 5.4.2 of the RPW regard must be given to these values when considering an activity that may affect a lake or river identified in the Schedule. Lakes Hāwea, Wakatipu and Wanaka are identified in Schedules 1A, 1B and 1D. The specific values for each of the lakes are summarised in Tables 2-4.

Table 2: Schedule 1A values for Lakes Hāwea, Wakatipu and Wanaka. Source: Schedule 1 of RPW.

Ecosystem Values	Significant habitat of Indigenous Fauna	Outstanding natural feature or landscape
Lake Hāwea		
• Large waterbody supporting high numbers of specific species, which can provide for diverse life cycle requirements of a particular species, or a range of species; • Sand bed composition of importance to resident biota; • Absence of aquatic pest plants as identified in the Pest Management Strategy for Otago 2009;		Scenic values within the wider landscape context of the surrounding mountains, particularly colour of the water.

[1] N. R. Dunn; R. M. Allibone; G. P. Closs; S. K. Crow; B. O. David; J. M. Goodman; M. Griffiths; D. C. Jack; N Ling; J. M. Waters; and J. R. Rolfe (2018). Conservation status of New Zealand freshwater fish, 2017. New Zealand Threat Classification Series 24. Department of Conservation, Wellington, 11 p

[2] Grainger, N.; Collier, K.; Hitchmough, R.; Harding, J.; Smith, B.; Sutherland, D. 2014: Conservation status of New Zealand freshwater invertebrates, 2013. New Zealand Threat Classification Series 8. Department of Conservation, Wellington. 28 p.

• Significant presence of areas for development of juvenile trout and salmon;		
Lake Wakatipu		
• Large waterbody supporting high numbers of specific species, which can provide for diverse life cycle requirements of a particular species, or a range of species; • Plant bed composition of importance to resident biota; • Absence of aquatic pest plants as identified in the Pest Management Strategy for Otago 2009; • Significant presence of areas for development of juvenile trout and salmon; • Presence of riparian vegetation significant to aquatic habitats; • Significant presence of eels, trout and salmon; • Presence of significant indigenous aquatic vegetation; • Presence of indigenous fish species threatened with extinction; and • Presence of indigenous invertebrates threatened with extinction.	*Significant habitat* for koaro including many tributaries. *Significant vegetation*: Rare association of aquatic plants.	Outstanding: (a) as a fishery; (b) for its scenic characteristics; (c) for scientific value, in particular water clarity, and bryophyte community; (d) for recreational purposes, in particular boating; (e) for historical purposes; (f) for significance in accordance with tikanga Maori, in particular sites at the head of the lake, and the legend of the lake itself. Scenic values within the wider landscape context of the surrounding mountains, particularly: • clear blue colour of the water, • river deltas, and • beaches, particularly uncommon beach features between Rat Point and White Point.
Lake Wanaka		
• Large waterbody supporting high numbers of specific species, which can provide for diverse life cycle requirements of a particular species, or a range of species; • Sand bed composition of importance to resident biota; • Significant presence of eels, trout and salmon; • Presence of significant indigenous aquatic vegetation; • Presence of indigenous fish species threatened with extinction; and • Presence of indigenous invertebrates threatened with extinction.	*Significant vegetation*: Rare association of aquatic plants.	Scenic values within the wider landscape context of the surrounding mountains, particularly the unmodified lake level, water quality and colour of the water.

Table 3: Schedule 1B values for Lakes Hāwea, Wakatipu and Wanaka. Source: Schedule 1 of RPW.

Water body	Site Number	Water Supply Value
Lake Hāwea	20	Hāwea Water Supply at G40:123153
Lake Wakatipu	17	Queenstown Water Supply from E41:666653 and F41:719664
Lake Wanaka	19	Wanaka Water Supply at F40:033062 and F40:013057

Table 4: Schedule 1D values for Lakes Hāwea, Wakatipu and Wanaka. Source: Schedule 1 of RPW.

Water bodies	Mana Interests	Access/Customary Use Interests
Lakes Hāwea, Wakatipu and Wanaka	• **Kaitiakitanga** – the exercise of guardianship by Kai Tahu in accordance with tikanga Maori* in relation to Otago's natural and physical resources; and includes the ethic of stewardship • **Mauri** – life force; for example the mauri of a river is most recognisable when there is abundance of water flow and the associated ecosystems are healthy and plentiful; a most important element in the relationship that Kai Tahu have with the water bodies of Otago. • **Waahi tapu and/or Waiwhakaheke** – sacred places; sites, areas and values associated with water bodies that hold spiritual values of importance to Kai Tahu. • **Waahi taoka** – treasured resource; values, sites and resources that are valued and reinforce the special relationship Kai Tahu have with Otago's water resources.	• **Mahika kai** – places where food is procured or produced. Examples in the case of waterborne mahika kai include eels, whitebait, kanakana (lamprey), kokopu (galaxiid species), koura (fresh water crayfish), fresh water mussels, indigenous waterfowl, watercress and raupo. • **Kohanga** – important nursery/spawning areas for native fisheries and/or breeding grounds for birds • **Trails** – sites and water bodies which formed part of traditional routes, including tauraka waka (landing place for canoes). • **Cultural materials** – water bodies that are sources of traditional weaving materials (such as raupo and paru) and rongoa (medicines).

1.4 Drinking water supplies

The National Environmental Standard for Sources of Human Drinking Water (2007) requires the effects of discharge permits to be considered against community drinking water supplies that service 25 or more people with drinking water for not less than 60 days each calendar year. Within the 'Large Lakes', there are 7 identified drinking water supplies with 4 in Lake Wakatipu, 2 in Lake Wanaka and 1 in Lake Hawea. The general location of these drinking supplies in relation to the 47 sites identified by the applicant are outlined below.

Drinking water supply	Source	Distance from sites

Queenstown drinking water supply, located at NZTM 2000: E1256671 N 5003343	Lake Wakatipu	Approximately 1.8 km south west of site 23
Jacks Point drinking water supply, located at NZTM 2000: E1264240 N4998281	Lake Wakatipu	Greater than 5 km from any sites
Frankston and Kelvin Heights drinking water supply, located at NZTM 2000: E1261928 N5004721	Lake Wakatipu	Approximately 1.9 km south west of site 25
Walter Peak drinking water supply, located NZTM 2000: E1247052 N4994335	Lake Wakatipu	Greater than 5 km from any sites
Wanaka drinking water supply, located at NZTM 2000: E1293153 N5044349 and E1291441 N5044076	Lake Wanaka	Approximately 1 km north of site 4 and 900 metres north west of site 5
Glendhu Bay Motor Camp drinking water supply, located at NZTM 2000: E1284906 N5045509	Lake Wanaka	Approximately 500 metres west of site 46
Hawea drinking water supply, located at NZTM 2000: E1302446 N5053624	Lake Hawea	Approximately 800 metres west of site 33
Hawea drinking water supply, located at NZTM 2000: E1303347 N5053574	Groundwater directly adjacent Lake Hawea	Approximately 140 metres south east of site 33

With the exception of Jacks Point and Walter Peak, all of these water supplies are owned and managed by the applicant.

It is also noted that an individual's own domestic needs may be taken under Section 14(3)(b)(i) of the Act or under Rule 12.1.2.1 of the RPW. Council does not have a record of if such takes exist or the locations of these takes. It can however be assumed that such takes exist and in close proximity to wastewater infrastructure.

2. Medium Lakes

Medium Lakes as referred to by the applicant is Lakes Hayes. Lake Hayes is a medium sized glacial lake with an area of 276 hectares (ha) and a maximum depth of 33 m and located within the Wakatipu basin.

2.1 Water quality

Due to land-use intensification and the historic catchment development, the lake is nutrient rich which results in periodic algal blooms. Council has recognised this issue and is addressing water quality in the lake through the adoption of as the Lake Hayes catchment being a nitrogen sensitive zone in the RPW. The Council has also recognised local community concerns by implementing a Lake Hayes. water quality remediation a consultation programme

The Schedule 15 targets and timeframes for each of Lake Hayes is shown below in Table 5.

Table 5: Schedule 15 targets and timeframes for Lake Hayes. Source: Schedule 15 of RPW.

	Total nitrogen	Total phosphorus	Ammoniacal nitrogen	*Escherichia coli*	Turbidity
	0.55 mg/l	**0.033 mg/l**	**0.1 mg/l**	**126 cfu/100 ml**	**5 NTU**
Lake Hayes	31 March 2012	31March 2025	31 March 2012	31 March 2012	31 March 2012

Lake Hayes complied with all of the relevant targets with the exception of Total phosphorus in 2012. Council's State of the Environment Surface Water Quality in Otago 2006 to 2017 noted that for Total phosphorus Lake Hayes returned a probable decreasing (improving) trend. .

2.2 Aquatic Ecology

Fish

According to the NZFFD, common bully, kōaro, brown trout and perch (*Perca fluviatilis*) have been recorded from the Lake Hayes catchment. Populations of kōaro and common bully are landlocked. Kōaro has a conservation status of 'at risk – declining'.

Macroinvertebrates

Freshwater mussels (*Echydridella menziesii*) are recorded as present in Lakes Hayes in the New Zealand freshwater fish database and are listed as 'at risk – declining'.

Macrophytes

The LakeSPI score for Lake Hayes based on a survey in 2001 indicates that it was in 'moderate' condition, with an overall score of 26%, a native condition score of 14% and an invasive impact score of 69%. These scores represent the dominance of the macrophyte community of Lake Hayes by invasive species. Despite Schedule 1A of the RPW listing Lake Hayes as "Weed free", the invasive macrophytes *Elodea canadensis* and *Ranunculus trichophyllus* are present.

2.3 Schedule 1 of the RPW

Lake Hayes is identified in Schedules 1A, 1B and 1D of the RPW. These values are summarised in Table 6 below.

Table 6: Schedule 1A, 1B and 1D values for Lake Hayes. Source: Schedule 1 of RPW.

Ecosystem Values (Schedule 1A)	
• Sand and silt bed composition of importance to resident biota; • Absence of aquatic pest plants as identified in the Pest Management Strategy for Otago 2009; • Presence of riparian vegetation of significance for aquatic habitats; and • Significant presence of eels and trout.	
Water Supply Value (Schedule 1B)	
Site 18: Lake Hayes Water Supply at F41:794738.	
Mana Interests (Schedule 1D)	**Access/Customary Use Interests (Schedule 1D)**
• **Waahi taoka** – treasured resource; values, sites and resources that are valued and reinforce the special relationship Kai Tahu have with Otago's water resources.	• **Mahika kai** – places where food is procured or produced. Examples in the case of waterborne mahika kai include eels, whitebait, kanakana (lamprey), kokopu (galaxiid species), koura (fresh water crayfish), fresh water mussels, indigenous waterfowl, watercress and raupo.

2.4 Drinking water supplies

As outlined above, there is a drinking water supply identified under Schedule 1B of the RPW. This supply is located approximately 500 m west of site 30 (Figure 1)

There are no drinking water supplies located in Lake Hayes as identified under the NES.

As noted above, drinking water taken for individual's own domestic needs may be taken under Section 14(3)(b)(i) of the Act or under Rule 12.1.2.1 of the RPW.

3. Very large rivers

Very large rivers are referred to by the applicant as being the main stems of the Clutha River/Mata-Au and the Kawarau River that flow through the Queenstown Lakes District. The Clutha River/Mata-Au is the second largest flowing river in New Zealand and is the longest river in the South Island. The upper catchment of the Clutha River/Mata-Au flow through the Queenstown Lakes District starting from Lake Wanaka and terminating just south east of Luggate. The Kawarau River flows from Lake Wakatipu in an eastward direction passing through the Kawarau Gorge and until its confluence with Lake Dunstan. Its catchment from Lake Wakatipu to just east of Mt Gilroy is located within the Queenstown Lakes District.

3.1 Water quality

Both the Clutha River/Mata-Au and Kawarau River have very high water quality with low nutrients, E. coli and turbidity. The Schedule 15 targets and timeframes for both the Clutha River/Mata-Au and Kawarau River are shown in Table 7.

Table 7: Schedule 15 targets and timeframes for Clutha River/Mata-Au and Kawarau River. Source: Schedule 15 of RPW.

	Nitrate-nitrite nitrogen	Dissolved reactive phosphorus	Ammoniacal nitrogen	*Escherichia coli*	Turbidity
	0.075 mg/l	0.005 mg/l	0.01 mg/l	50 cfu/100 ml	3 NTU
Clutha River/Mata-Au above Luggate	31 March 2012				
Kawarau, upstream of the Shotover Confluence	31 March 2012				

Both rivers were meeting all of the relevant water quality targets in 2012. Council's State of the Environment Surface Water Quality in Otago 2006 to 2017 confirms these 2012 results by concluding that water quality in the Upper Clutha catchment is excellent.

3.2. Aquatic ecology

According to the NZFFD Longfin eel, kōaro, common bully, upland bully, brown trout have been recorded from both the upper Clutha/Mata-Au and Kawarau Rivers. Rainbow trout, and quinnat salmon have also been recorded from the upper Clutha/Mata-Au and are likely to also be present in the Kawarau River. Of the native fish present, longfin eel and kōaro have a conservation status of 'at risk – declining', while common and upland bully are classified as 'not threatened'.

The upper Clutha/Mata-Au is recognised as a nationally significant trout fishery[3]. Meanwhile, the Kawarau River supports a locally significant trout fishery with relatively consistent usage by anglers across the three most recent angler surveys.

3.3 Schedule 1 of the RPW

The Clutha River/Mata-Au is identified in Schedules 1A-1D of the RPW and the Kawarau River is identified in Schedules 1A, 1C and 1D of the RPW. These values are summarised in Tables 8-10.

Table 8: Schedule 1A values for the Clutha River/Mata-Au and Kawarau River. Source:

Schedule 1 of RPW.

Ecosystem Values	Significant habitat of Indigenous Fauna	Outstanding natural feature or landscape
Clutha River/Mata-Au between Alexandra and Lake Wanaka		
• Large waterbody supporting high numbers of specific species, which can provide for diverse life cycle requirements of a particular species, or a range of species; • Rock and gravel bed composition of importance to resident biota; • Significant presence of areas for development of juvenile trout and salmon; • Presence of riparian vegetation significant to aquatic habitats; • Significant presence of areas for development of juvenile trout and salmon; • Significant presence of eels, trout and salmon; • Presence of indigenous fish species threatened with extinction; and • Presence of significant range of indigenous waterfowl.	*Significant habitat* for flathead galaxiid (tributaries).	
Kawarau River between Lake Dunstan and Lake Wakatipu		

[3] Otago Fish & Game Council 2015. Sports fish and game management plan for Otago Fish and Game region 2015-2025. Otago Fish & Game Council, Dunedin. 98 p.

• Large waterbody supporting high numbers of specific species, which can provide for diverse life cycle requirements of a particular species, or a range of species; • Rock and gravel bed composition of importance to resident biota; • Absence of aquatic pest plants as identified in the Pest Management Strategy for Otago 2009 upstream of Lake Dunstan; • Significant presence of eels, trout and salmon; and • Presence of indigenous fish species threatened with extinction.	*Significant habitat* for koaro including many tributaries.	Outstanding: (a) for its wild, scenic characteristics; (b) natural characteristics, in particular the return flow in the upper section when the Shotover River is in flood; (c) for scientific values, in particular the return flow in the upper section when the Shotover is in flood; (d) for recreational purposes, in particular rafting, jet boating and kayaking. Spectacular and rugged river gorge, schistose landscape, fast flowing white water and rapids, old gold sluicing landscape, from confluence with Arrow River to Lake Dunstan

Table 9: Schedule 1B and 1C values for the Clutha River/Mata-Au and Kawarau River. Schedule 1 of RPW.

Water body	**Water Supply Value (Schedule 1B)**
Clutha River/Mata-Au between Alexandra and Lake Wanaka	• Site 13: Clyde Water Supply at G42:199521 • Site 14:Cromwell Water Supply at G41:120670
Water body	**Historic Places (Schedule 1C)**
Clutha River/Mata-Au between Alexandra and Lake Wanaka	Bridge Piers, SH8, Alexandra Earnscleugh Bridge and Piers, Clyde
Kawarau River	Kawarau Falls bridge and dam, Frankton, Queenstown Kawarau Gorge Suspension Bridge, SH 6, Gibbston

Table 10: Schedule 1D values for the Clutha River/Mata-Au and Kawarau River. Schedule 1 of RPW.

Water bodies	**Mana Interests**	**Access/Customary Use Interests**
Clutha River/Mata-Au between Alexandra	• **Kaitiakitanga** – the exercise of guardianship by Kai Tahu in accordance with tikanga Maori* in relation to Otago's natural and	• **Mahika kai** – places where food is procured or produced. Examples in the case of waterborne mahika kai include eels, whitebait, kanakana

and Lake Wanaka	physical resources; and includes the ethic of stewardship • **Mauri** – life force; for example the mauri of a river is most recognisable when there is abundance of water flow and the associated ecosystems are healthy and plentiful; a most important element in the relationship that Kai Tahu have with the water bodies of Otago. • **Waahi tapu and/or Waiwhakaheke** – sacred places; sites, areas and values associated with water bodies that hold spiritual values of importance to Kai Tahu. • **Waahi taoka** – treasured resource; values, sites and resources that are valued and reinforce the special relationship Kai Tahu have with Otago's water resources.	(lamprey), kokopu (galaxiid species), koura (fresh water crayfish), fresh water mussels, indigenous waterfowl, watercress and raupo. • **Kohanga** – important nursery/spawning areas for native fisheries and/or breeding grounds for birds • **Trails** – sites and water bodies which formed part of traditional routes, including tauraka waka (landing place for canoes). • **Cultural materials** – water bodies that are sources of traditional weaving materials (such as raupo and paru) and rongoa (medicines).
Kawarau River between Lake Dunstan and Lake Wakatipu	• **Kaitiakitanga** – the exercise of guardianship by Kai Tahu in accordance with tikanga Maori* in relation to Otago's natural and physical resources; and includes the ethic of stewardship • **Mauri** – life force; for example the mauri of a river is most recognisable when there is abundance of water flow and the associated ecosystems are healthy and plentiful; a most important element in the relationship that Kai Tahu have with the water bodies of Otago. • **Waahi taoka** – treasured resource; values, sites and resources that are valued and reinforce the special relationship Kai Tahu have with Otago's water resources.	• **Trails** – sites and water bodies which formed part of traditional routes, including tauraka waka (landing place for canoes). • **Cultural materials** – water bodies that are sources of traditional weaving materials (such as raupo and paru) and rongoa (medicines).

3.4 Drinking water supplies

The RPW identifies two drinking water supplies within the upper Clutha River/Mata-Au. Both of these supplies are located 20 km outside of the Queenstown Lakes District. These drinking water supplies are managed by Central Otago District Council. There are no drinking water supplies located in either of the very large rivers under the NES.

Drinking water taken for individual's own domestic needs may be taken under Section 14(3)(b)(i) of the Act or under Rule 12.1.2.1 of the RPW.

4. Medium - large rivers

Medium - large rivers is referred to by the applicant as being the main stems of the Shotover River and Hāwea River. The Shotover River is a 75 km fast flowing river. It flows from south from Shotover Saddle through the Skippers Canyon, draining the area between the

Richardson Mountains and the Harris Mountains, before flowing into the Kawarau River. The Hāwea River is a fairly short (approximately 14 km), but high flowing river. It flows from the southern end of Lake Hāwea south-westerly until its confluence with the Clutha River/Mata-Au. Due to modified nature for power generation, flows fluctuate significantly.

4.1 Water quality

Both the Hāwea River and Shotover River contain low levels of nutrients and E. coli, although the Shotover River can carry high loads of suspended sediments. The Schedule 15 targets and timeframes for both the Clutha River/Mata-Au and Kawarau River are shown below in Table 11.

Table 11: Schedule 15 targets and timeframes for the Shotover River and Hāwea River. Source: Schedule 15 of RPW.

	Nitrate-nitrite nitrogen	Dissolved reactive phosphorus	Ammoniacal nitrogen	*Escherichia coli*	Turbidity
	0.075 mg/l	0.01 mg/l	0.1 mg/l	260 cfu/100 ml	5 NTU
Shotover River	31 March 2012	31 March 2012	31 March 2012	31 March 2012	Exempt
	Nitrate-nitrite nitrogen	Dissolved reactive phosphorus	Ammoniacal nitrogen	*Escherichia coli*	Turbidity
	0.075 mg/l	0.005 mg/l	0.01 mg/l	50 cfu/100 ml	3 NTU
Tributaries to **Lake Hāwea**	31 March 2012				

Both rivers were meeting all of the relevant water quality targets in 2012. As previously noted, Council's State of the Environment Surface Water Quality in Otago 2006 to 2017 confirms these 2012 results by concluding that water quality in the Upper Clutha catchment is excellent.

4.2 Aquatic ecology

According to the NZFFD, kōaro, brown trout, rainbow trout and Longfin eel are present in the Shotover River. Of the native fish present, longfin eel and kōaro have a conservation status of 'at risk – declining'.

According to the NZFFD, brown trout, common bully and Longfin eel are present in the Hāwea River. Among the native species, Longfin eel currently have a conservation status of 'at risk – declining', while common bully are classified as 'not threatened'.

4.3 Schedule 1 of the RPW

The Shotover River is identified in Schedules 1A, 1B and 1C of the RPW. The Hāwea River is identified in Schedules 1A and 1D of the RPW. These values are summarised in Tables 12-14 below.

Table 12: Schedule 1A values for the Shotover River and Hāwea River. Source: Schedule 1 of RPW.

Ecosystem Values	Significant habitat of Indigenous Fauna	Outstanding natural feature or landscape

Shotover River		
• Large waterbody supporting high numbers of specific species, which can provide for diverse life cycle requirements of a particular species, or a range of species; • Boulder, gravel, rock and sand bed composition of importance to resident biota; • Absence of aquatic pest plants as identified in the Pest Management Strategy for Otago 2009 • Presence of riparian vegetation significant to aquatic habitats; • Presence of significant range of indigenous waterfowl; and • Presence of indigenous waterfowl threatened with extinction.	Lochnagar and Lake Creek, outstanding: (a) Essential characteristics that determine the ecosystem's integrity, form, functioning and resilience. *Significant habitat*: Areas of importance to internationally uncommon species - black fronted tern, banded dotterel - in main stem between Arthur Point and its source.	Outstanding: (a) for its wild and scenic characteristics; (b) for its natural characteristics, in particular the high natural sediment load and active delta at confluence with Kawarau River; (c) scientific value, in particular the high natural sediment load and active delta at confluence with Kawarau River; (d) for recreational purposes, in particular rafting, kayaking and jet boating; (e) for historical purposes, in particular gold mining. Spectacular and rugged river gorge, schistose landscape, fast flowing white water and rapids, old gold sluicing landscape, in main stem between confluence with Iron Stone Stream and Arthur Point. Wild and scenic characteristics, from confluence with Iron Stone Stream to its source.
Hāwea River		
• Large waterbody supporting high numbers of specific species, which can provide for diverse life cycle requirements of a particular species, or a range of species; • Absence of aquatic pest plants as identified in the Pest Management Strategy for Otago 2009; • Presence of significant fish spawning areas; • Presence of significant areas for the development of juvenile fish; and • Significant presence of eels, trout and salmon.		

Table 13: Schedule 1C values for the Shotover River. Source: Schedule 1 of RPW.

Registered Historic Places
Oxenbridge Tunnel, Arthurs Point, Queenstown Edith Cavell Bridge, Arthurs Point, Queenstown

Table 14: Schedule 1D values for the Shotover River and Hāwea River. Source: Schedule 1 of RPW.

Water bodies	Mana Interests	Access/Customary Use Interests
Shotover River	• **Kaitiakitanga** – the exercise of guardianship by Kai Tahu in accordance with tikanga Maori* in relation to Otago's natural and physical resources; and includes the ethic of stewardship • **Mauri** – life force; for example the mauri of a river is most recognisable when there is abundance of water flow and the associated ecosystems are healthy and plentiful; a most important element in the relationship that Kai Tahu have with the water bodies of Otago. • **Waahi taoka** – treasured resource; values, sites and resources that are valued and reinforce the special relationship Kai Tahu have with Otago's water resources.	• **Mahika kai** – places where food is procured or produced. Examples in the case of waterborne mahika kai include eels, whitebait, kanakana (lamprey), kokopu (galaxiid species), koura (fresh water crayfish), fresh water mussels, indigenous waterfowl, watercress and raupo. • **Kohanga** – important nursery/spawning areas for native fisheries and/or breeding grounds for birds • **Trails** – sites and water bodies which formed part of traditional routes, including tauraka waka (landing place for canoes). • **Cultural materials** – water bodies that are sources of traditional weaving materials (such as raupo and paru) and rongoa (medicines).
Hāwea River	• **Kaitiakitanga** – the exercise of guardianship by Kai Tahu in accordance with tikanga Maori* in relation to Otago's natural and physical resources; and includes the ethic of stewardship • **Mauri** – life force; for example the mauri of a river is most recognisable when there is abundance of water flow and the associated ecosystems are healthy and plentiful; a most important element in the relationship that Kai Tahu have with the water bodies of Otago. • **Waahi taoka** – treasured resource; values, sites and resources that are valued and reinforce the special relationship Kai Tahu have with Otago's water resources.	• **Mahika kai** – places where food is procured or produced. Examples in the case of waterborne mahika kai include eels, whitebait, kanakana (lamprey), kokopu (galaxiid species), koura (fresh water crayfish), fresh water mussels, indigenous waterfowl, watercress and raupo. • **Kohanga** – important nursery/spawning areas for native fisheries and/or breeding grounds for birds • **Trails** – sites and water bodies which formed part of traditional routes, including tauraka waka (landing place for canoes). • **Cultural materials** – water bodies that are sources of

		traditional weaving materials (such as raupo and paru) and rongoa (medicines).

4.4 Drinking water supplies

There are no drinking water supplies identified under the RPW nor the NES in the Shotover River or Hawea River.

Drinking water taken for individual's own domestic needs may be taken under Section 14(3)(b)(i) of the Act or under Rule 12.1.2.1 of the RPW.

5. Small – medium rivers

Small - medium rivers is referred to by the applicant as being the main stems of the Luggate Creek, Mill Creek, Arrow River and the Cardrona River. These rivers all receive reasonable average flows of between 1 and 5 cumecs, but are highly seasonal with large portions abstracted for water use. The receiving environments vary from urbanised areas to intensive farming.

5.1 Water quality

These rivers generally contain low levels of nutrients, *E. coli* and suspended sediments and due to their variable flows are susceptible to spikes in these concentrations during low flows. The Schedule 15 targets and timeframes for these rivers are shown below in Table 15.

Table 15: Schedule 15 targets and timeframes for the Luggate Creek, Mill Creek, Cardrona River and Kawarau River. Source: Schedule 15 of the RPW.

	Nitrate-nitrite nitrogen	Dissolved reactive phosphorus	Ammoniacal nitrogen	*Escherichia coli*	Turbidity
	0.075 mg/l	0.01 mg/l	0.1 mg/l	260 cfu/100 ml	5 NTU
Luggate Creek	31 March 2012				
Cardrona River	31 March 2012				
Mill Creek	31 March 2025	31 March 2012	31 March 2012	31 March 2012	31 March 2012
Kawarau River downstream of the Shotover River confluence (Arrow	31 March 2025	31 March 2012	31 March 2012	31 March 2012	31 March 2012

River is a tributary)					

As shown above, Luggate Creek and the Cardrona River were complying with all targets in 2012, whereas Mill Creek and the Arrow River were complying with all but nitrate – nitrogen. A review of Council's State of the Environment Surface Water Quality in Otago 2006 to 2017 report confirms these 2012 results except for Luggate Creek at SH6 which was identified as having elevated DRP above the ANZECC trigger value. However, the reasons for the slight elevation in DRP at this site are unknown.

5.2 Aquatic Ecology

According to the NZFFD there are a number of species present in each of the rivers. A summary of the fish present in each of the watercourse is shown in Table 16.

Table 16: Fish species identified as being present in Luggate Creek, Mill Creek, Cardrona River and Arrow River. Source: Application.

Watercourse	Species
Luggate Creek	Brown trout
	Rainbow trout
	Kōaro
Mill Creek	Brown trout
	Common bully
	Perch
	Kōaro
Cardrona River	Brown trout
	Rainbow trout
	Kōaro
Arrow River	Brown trout
	Rainbow trout
	Kōaro
	Upland bully
	Clutha flathead galaxias

Of the native species, Clutha flathead galaxias have a conservation status of 'threatened – nationally critical', kōaro are classified as 'at risk – declining' and upland bully are 'not threatened'.

5.3 Schedule 1 of the RPW

Luggate Creek and Mill Creek are identified in Schedules 1A and 1C of the RPW. The Cardrona River and Arrow River are identified in Schedules 1A and 1D of the RPW. These values are summarised in Tables 17-19 below.

Table 17: Schedule 1A values for the Luggate Creek, Mill Creek, Cardrona River and Arrow River. Source: Schedule 1 of the RPW.

Ecosystem Values	Significant habitat of Indigenous Fauna
Luggate Creek	

• Absence of aquatic pest plants as identified in the Pest Management Strategy for Otago 2009; • Presence of rare fish species threatened with extinction; and • Presence of rare invertebrate species threatened with extinction upstream of F40:050924.	*Significant habitat* for koaro.
Mill Creek	
• Gravel and sand bed composition of importance to resident biota; • Absence of aquatic pest plants as identified in the Pest Management Strategy for Otago 2009; • Presence of significant fish spawning areas; • Presence of significant areas for the development of juvenile fish; and • Presence of rare fish species threatened with extinction.	*Significant habitat* for roundhead galaxiid
Cardrona River	
• Boulder, gravel and sand bed composition of importance to resident biota; • Absence of aquatic pest plants as identified in the Pest Management Strategy for Otago 2009; • Presence of significant fish spawning areas; • Presence of significant areas for the development of juvenile fish; • Significant presence of eels and trout; • Presence of rare fish species threatened with extinction; and • Presence of rare invertebrate species threatened with extinction in the mid to upper reaches.	*Significant habitat* for flathead galaxiid
Arrow River	
• Large waterbody supporting high numbers of specific species, which can provide for diverse life cycle requirements of a particular species, or a range of species; • Gravel and sand bed composition of importance to resident biota; • Absence of aquatic pest plants as identified in the Pest Management Strategy for Otago 2009; • Access within the main stem of the catchment unimpeded by artificial means, such as weirs, and culverts; • Presence of significant fish spawning areas; • Presence of significant areas for the development of juvenile fish; and • Significant presence of trout.	

Table 18: Schedule 1C values for Luggate Creek and Mill Creek. Source: Schedule 1 of the RPW.

Water body	Historic Places (Schedule 1C)
Luggate Creek	Luggate Flourmill, Luggate
Mill Creek	Wakatipu Flourmill Complex, Speargrass Flat Road. Butel's Flourmill, Millbrook

Table 19: Schedule 1D values for the Cardrona River and Arrow River. Source: Schedule 1 of the RPW.

Water bodies	Mana Interests	Access/Customary Use Interests
Cardrona River	• **Kaitiakitanga** – the exercise of guardianship by Kai Tahu in accordance with tikanga Maori* in relation to Otago's natural and physical resources; and includes the ethic of stewardship • **Mauri** – life force; for example the mauri of a river is most recognisable when there is abundance of water flow and the associated ecosystems are healthy and plentiful; a most important element in the relationship that Kai Tahu have with the water bodies of Otago. • **Waahi tapu and/or Waiwhakaheke** – sacred places; sites, areas and values associated with water bodies that hold spiritual values of importance to Kai Tahu. • **Waahi taoka** – treasured resource; values, sites and resources that are valued and reinforce the special relationship Kai Tahu have with Otago's water resources.	• **Mahika kai** – places where food is procured or produced. Examples in the case of waterborne mahika kai include eels, whitebait, kanakana (lamprey), kokopu (galaxiid species), koura (fresh water crayfish), fresh water mussels, indigenous waterfowl, watercress and raupo. • **Kohanga** – important nursery/spawning areas for native fisheries and/or breeding grounds for birds • **Trails** – sites and water bodies which formed part of traditional routes, including tauraka waka (landing place for canoes). • **Cultural materials** – water bodies that are sources of traditional weaving materials (such as raupo and paru) and rongoa (medicines).
Arrow River	• **Kaitiakitanga** – the exercise of guardianship by Kai Tahu in accordance with tikanga Maori* in relation to Otago's natural and physical resources; and includes the ethic of stewardship • **Mauri** – life force; for example the mauri of a river is most recognisable when there is abundance of water flow and the associated ecosystems are healthy and plentiful; a most important element in the relationship that Kai Tahu have with the water bodies of Otago. • **Waahi taoka** – treasured resource; values, sites and resources that are valued and reinforce the special relationship Kai Tahu have with Otago's water resources.	• **Mahika kai** – places where food is procured or produced. Examples in the case of waterborne mahika kai include eels, whitebait, kanakana (lamprey), kokopu (galaxiid species), koura (fresh water crayfish), fresh water mussels, indigenous waterfowl, watercress and raupo. • **Kohanga** – important nursery/spawning areas for native fisheries and/or breeding grounds for birds • **Trails** – sites and water bodies which formed part of traditional routes, including tauraka waka (landing place for canoes). • **Cultural materials** – water bodies that are sources of traditional weaving materials (such as raupo and paru) and rongoa (medicines).

5.4 Drinking water supplies

There are two drinking water supplies located adjacent to the small-medium rivers identified under the NES. The general location of these drinking supplies in relation to the 47 sites identified by the applicant are outlined below.

Drinking water supply	Source	Distance from sites
Cardrona drinking water supply, located at NZTM 2000: E1284372 N5022311	Groundwater adjacent to the Cardrona River	Approximately 2 km south of site 42
Arrowtown drinking water supply, located at NZTM 2000: E1270647 N5015520	Groundwater adjacent to the Arrow River	Approximately 680 m south west of site 20

As noted above, drinking water taken for individual's own domestic needs may be taken under Section 14(3)(b)(i) of the Act or under Rule 12.1.2.1 of the RPW.

6. Streams

Streams are referred to by the applicant as all of the remaining smaller waterbodies which include Bullock Creek, Bush Creek, Stone Creek, Buckler Burn, Dead Horse Creek and unnamed tributaries of Lake Wakatipu. These rivers have small catchments and the flows are relatively low, with many of the unnamed tributaries being ephemeral. These streams flow through both urban and rural areas.

6.1 Water quality

There is limited water quality data available for these rivers and they are not specifically identified in Schedule 15 of the RPW. In the ecological assessment provided by Ryder, these streams are expected to contain low levels in nutrients *E.coli* and suspended sediment.

6.2 Aquatic Ecology

The NZFFD indicates a number of species present in many of the rivers. Native fish potentially present include Longfin eel, kōaro, common bully and upland bully . Of these, Longfin eel and kōaro have a conservation status of 'at risk – declining'. Ryder notes that Clutha flathead galaxias are potentially present in tributaries of upper Clutha River/Mata-Au, particularly where trout are absent. Clutha flathead galaxias have a conservation status of 'nationally critical'.

Ryder have also noted that many of the small tributary streams of the upper Clutha/Mata-Au and Lakes Hāwea, Wakatipu and Wanaka provide habitat for trout spawning and are likely to be recruitment sources for trout populations in larger receiving water bodies.

6.3 Schedule 1 of the RPW

Bullock Creek and the Buckler Burn are identified in Schedule 1A. The remaining four rivers are not identified in Schedule 1. The Schedule 1A values for Bullock Creek and the Buckler Burn are summarised in Table 20 below.

Table 20: Schedule 1A values for Bullock Creek and Buckler Burn. Source: Schedule 1 of the RPW.

Ecosystem Values
Bullock Creek
• Presence of significant trout spawning areas; • Presence of significant areas for the development of juvenile trout; and • Significant presence of trout.
Mill Creek

- Boulder bed composition of importance to resident biota;
- Absence of aquatic pest plants as identified in the Pest Management Strategy for Otago 2009;
- Presence of significant areas for the development of juvenile trout;
- Presence of significant trout spawning areas; and
- Presence of riparian vegetation significant to aquatic habitats.
- Presence of rare fish species threatened with extinction.

6.4 Drinking water supplies

There are no drinking water supplies identified under the RPW or the NES in, or adjacent to the streams. Drinking water taken for individual's own domestic needs may be taken under Section 14(3)(b)(i) of the Act or under Rule 12.1.2.1 of the RPW.