Water takes from Lauder Creek and Clear Creek within Lauder Creek and Muddy Creek Sub-catchments, Manuherekia Catchment

Replacement of permits to take, use, retake and dam surface water

Resource Consent Application
and
Supporting Information

Prepared by McKeague Consultancy
January 2020

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PART ONE – Resource Consent Application Forms

Form 9 of the Resource Management Act

Application for Resource Consent under Section 88 of the Resource Management Act 1991.

To: Otago Regional Council
Private Bag 1954
Dunedin

Applicants' details:

Applicants	Address	Email	Phone
Omakau Area Irrigation Company	C/-Checketts Mackay, 31 Tarbert Street, Alexandra	Chairperson Jan Manson janmanson0@gmail.com	027 242 9947 (Jan Manson)
AW and KL Glassford	Dougalston, Glassford Rd, RD 2 Omakau	tonyandkaren@scorch.co.nz	027 283 6401 (Tony) or 03 447 3955
James Phillip Murray Heckler	Lauder Creek, 617 Glassford Road, RD2, Omakau	james@laudercreek.co.nz	03 447 3318 or 027 681 1000 (James)
Viewpoint Farm Ltd C/- Thomas and Jo Moran, Mike and Abby Moran	411 Muddy Creek Road, RD 2, Lauder, Omakau	viewpoint@netspeed.net.nz	027 261 1844 (Tom)
IR and MA Brown	Cloverdale, 136 Brown Rd, RD 2, Lauder, Omakau	cloverhill136@gmail.com	03 447 3606
Geoffrey Thomas Clouston	Avonrath, Shephard Road, Lauder, RD 2, Omakau	gclouston@xtra.co.nz	027 445 5125
James Armstrong Partnership	295 Lauder Flat Road, Becks, RD 2, Omakau	jwaa612@gmail.com	027 431 4062(James)
Richard James Tucker	Springburn, Becks, RD 2, Omakau		027 447 3373
Lilybank Company Ltd C/- Brad and Kirsty McEwan	81 Becks School Road RD2 Omakau	lilybank81@gmail.com	027 673 9904 (Brad)

Clive Allen Booth and Elizabeth Claire Booth	PO Box 5491, Dunedin	campbell.booth@xtra.co.nz	027 551 1990 (son Campbell)
Phada Industries Ltd Peter and Donna Morrison	55 Theodosia Street, Timaru	phada58@gmail.com	03 447 3009
Central Park Ltd, John O'Brien	168 Duncan Road, RD1, Bulls	ob@obgroup.co.nz	027 444 5574

Consultant: Ros Day
Resource Management Planner
McKeague Consultancy
ros@mckconsultancy.co.nz

The applicant applies for the resource consents described below:

- Primary Water Permits to take and use and retake surface water from waterways within the Lauder Creek and Muddy Creek Sub-Catchments in replacement of the permits described in Table 1 in Part Two – Supporting Information.
- Water Permits to dam surface water in replacement of the Permits described in Table 1 – Part Two – Supporting Information.
- A New Water Permit to take and use surface water from within the Lauder Creek sub-catchment as supplementary allocation.

1 The names and addresses of the owner and occupier which this application relates are:

The private right permit holders are owners and occupiers of the properties to which this application relates, detailed above and in Table 1 in Part Two – Supporting Information.

2 The location of the proposed activity is:

Grid/GPS Reference:
Various as described in Table 2 in Part Two – Supporting Information.

Legal description of land adjacent to point of take:
Various as described in Table 2 in Part Two – Supporting Information.

Legal Description of land where water will be used:
Various as described in Draft Permits in Part Two – Supporting Information. Certificates of Title are attached in Appendix A to this Report.

3 A description of the activities to which the application relates is:

The activities are summarised above, and the activities are described in more detail in the Supporting Information. In brief, this application is for activities related to the taking of water for the purpose of irrigation, storage, stock drinking water.

4 The following additional resource consents are required in relation to this proposal and have or have not been applied for:

No others are required.

5 Assessment of environmental effects

Attached in accordance with the Fourth Schedule of the Resource Management Act 1991, is an assessment of environmental effects in the detail that corresponds with the scale and significance of the effects that the proposed activity may have on the environment in accordance with Section 88 of, and the Fourth Schedule to, the Act.

6 Further Information

Attached is information (if any), required to be included in the application by the district plan, regional plan, the Resource Management Act 1991, or any regulations made under the Act or regulations.

By signing this form the signatory is:

a) agreeing to pay all actual and reasonable application processing costs incurred by the Otago Regional Council and,

b) stating that the information given in the application is true and correct to the best of his/her knowledge and belief.

…………………………………………………..

Signature of person authorised to sign on behalf of applicant

7 January 2020

Date

Address for Service:

McKeague Consultancy

Attention: Ros Day

Resource Management Planner

Email: ros@mckconsultancy.co.nz

Mobile No: Ros: 021 027 64705

Otago Regional Council Forms

The information required by Otago Regional Council Forms is included in Form 9 above and the supporting information and assessment of environmental effects following.

PART 2 Supporting Information

1. Background and overview

This application includes the replacement of water permits within the Lauder Creek and Muddy Creek sub-catchments and represents a subset of the full Manuherekia catchment applications relating to the water abstraction within the catchment. It is requested that this application be processed alongside the other OAIC applications to replace permits to take water in the Manuherekia Catchment.

A River Management Plan and comprehensive details regarding the wider Manuherekia Catchment referred to as the 'Overview Section' are being lodged concurrently with this application. Those two documents have been prepared by the Manuherikia Catchment Group (MCG). The Lauder Creek water users (including the permit and shareholders to which this application pertains) are members of MCG. MCG will be the coordinating body of all Manuherekia water users into the future.

All water users within the Lauder Creek sub-catchment (referred hereafter as the Lauder catchment) are committed to co-ordinating with other water users in the Manuherekia catchment to achieve adaptive management of abstraction to ensure the effects of taking and use of water are managed appropriately whilst retaining sufficient access to water. As such the applicants are members of the Manuherikia Catchment Group (MCG), an incorporated society with the purpose of developing and operating under a collectively agreed catchment management plan.

This application comprises the replacement of water rights located in various waterways within the Lauder Creek and Muddy Creek catchments, including Lauder Creek, unnamed tributaries of Lauder Creek, Shepherd's Creek, Doctor Creek, Millers Creek (also known as Mellors Creek), and Clear Creek.

2. Pre-Application Engagement with ORC

Pre-application engagement with the Otago Regional Council (ORC) has occurred over several years in relation to the Manuherekia catchment. The water users in the Lauder catchment have been active participants in the Manuherekia catchment initiatives including consultation held by the ORC. ORC science staff have participated in several ORC community meetings as well as two catchment field days organised by the water users in the catchment held in December 2018 and February 2019.

Most recently a series of specific pre-application meetings was held with ORC staff, ORC consultants, and applicant representatives throughout June – September 2020. A meeting for the Lauder Creek and sub-catchment was held on 6 August 2020. The minutes of this meeting are attached in Appendix B. The Science experts for the Lauder Catchment have met with the ORC and other affected party science representatives on a regular basis as part of the Technical Advisory Group (TAG) and on their own initiative to discuss Lauder and other Manuherekia matters.

3. Overview of Permits Sought

This application seeks to replace 20 water permits within the Lauder Creek and Muddy Creek sub-catchments as follows:

- 16 permits to take and use water in the Lauder Creek sub-catchment
- 1 permit to re-take water in the Lauder Creek sub-catchment
- 1 permit to take and use water in the Muddy Creek sub-catchment
- 2 permits to dam water in the Lauder Creek sub-catchment

The application also seeks one new supplementary water permit within the Lauder Creek sub-catchment. Associated with the new supplementary water permit being sought is the surrendering by the applicant of the existing Water Permit to take and use primary water (RM18.030.02).

Specifically, resource consent is sought for the following:

1. Replacement of the Deemed Permits and Water Permits as detailed in Table 1 below
2. Transfer of three take point locations
3. A new consent to take water as supplementary allocation
4. Concurrent replacement of Notice of Exemptions [WEX] with replacement permits

This application is being made more than six months prior to the expiry of these permits so that the applicants may continue to operate under the existing consents under s124 of the RMA until the new consents are granted.

Consent terms of 35 years are sought for all replacement permits subject to this application. Details for the request of a long-term duration are provided within the application document.

The tables below provide an overview of the permits being replaced by this application based on existing permit details.

3.1 Existing Permit Details

Table 1. Permits being replaced by this application based on existing permit details

Consent number	Permit Type	Name as per consent	Source	Date of first issue	Expiration date
WR380B	Deemed Permits	Anthony William Gordon-Glassford and Karen Lesley Gordon-Glassford and CM Law Trustees (2010) Limited as Trustees of the Dougalston Trust (74% share) Shirley Roylance Gordon-Glassford and Brian James Gordon-Glassford as Trustees of the SR Gordon-Glassford Number 2 Family Trust (26% share)	Lauder Creek	Sept 1904	1 October 2021
WR382B.V1					
WR378B.V1					
94548	Water Permit	Murray John Heckler	Lauder Creek	Issued Jan 1996 in replacement of Deemed Permit 2684A in substitution of WR631B	1 October 2021
96779	Deemed Permit	Murray John Heckler, and Annette Ester Heckler	Lauder Creek	Issued Sept 1997 in replacement of permit 3157A in substitution of WR1067B.	1 October 2021
2001.710	Deemed Permit	Omakau Area Irrigation Company Limited	Lauder Creek	Issued 2002 in replacement for water licenses WR7714B (1898); WR271B (1903) and WR513B (1906)	1 October 2021
WR432B	Deemed Permit	Ian Brown and JT Moran and JE Moran	Lauder Creek	Nov 1905	1 October 2021
2000.644.V2	Deemed Permit	Lilybank Company Ltd	Millers Creek	Issued 2001 in replacement of water race license 2013 (1905)	1 October 2021
RM19.448.01	Water Permit	Geoffrey Thomas Clouston	Lauder Creek	Issued Jan 2020 in replacement of 95525.	1 October 2021
98122	Deemed Permit			Issued April 1998 in substitution of water race license WR590B (1907).	1 October 2021
2004.788	Water Permit		An unnamed tributary of	Issued April 2005 in replacement of Permit 94490B	1 May 2025

			Lauder Creek	originally granted in 1994.	
2004.787	Water Permit [to dam]		An unnamed tributary of Lauder Creek	Issued April 2005 in conjunction with replacement of Permit 94490B originally granted in 1994.	1 May 2025
3707	Deemed Permit	James William Alexander Armstrong	An un-named tributary of Lauder Creek known locally as Mellors Creek	Issued 2012 in replacement for water race license WR2212N (1906)	1 October 2021
2002.399	Water Permit		Unnamed tributary of Lauder Creek	August 2002 in replacement of Permit 3922	1 September 2022
2002.387	Water Permit [to dam]	James William Alexander Armstrong	Unnamed tributary of Lauder Creek	August 2002 in replacement of Permit 3922	1 September 2022
2002.071.V1	Water Permit	Thomas Moran and Jo Anne Elizabeth Moran	Clear Creek	August 2002, in replacement of Permit 3999 granted in 1992	1 September 2022
93447.V2	Deemed Permit	Clive Allen Booth and Elizabeth Claire Booth	Lauder Creek	Issued Jan 1994, in replacement of Permit 2453A granted in substitution of WR611B	1 October 2021
2002.768	Water Permit [Retake]	Central Park Limited	An un–named tributary of Lauder Creek	Issued Dec 2002	1 October 2021
98488	Deemed Permit	George Frederick Tucker, Helen Ruth Tucker and Roger Norman Macassey	Millers Creek, locally known as Mellors Creek	Issued Nov 1988, in replacement of water right 3453A, granted in substitution of water race license 488, 1906.	1 October 2021
98572	Deemed Permit	Helen Ruth Tucker and Roger Norman Macassey (1/2 share); George Frederick Tucker, Helen Ruth Tucker and GCA Legal Trustee 2005 Limited (1/2 share)	Millers Creek	Issued May 1999 in replacement of water right 3492A, granted in substitution of water race licence 488, 1869.	1 October 2021

Table 2. Take point locations of permits being replaced within this application, using existing permit details

Consent	Description of Location of Point of Take	Map Reference on Permit	Legal Description Land Adjacent to Point of Take	Location of Use	WEX
WR380B	The left-hand branch of Lauder Creek, terminating at Blue Gully	NZTM2000 E1331246 N5016664	Not specified	Not specified	WEX0152
WR382B.V1	A tributary of Lauder Creek, terminating at workings in Drybread Thomsons	NZTM2000 E1331246 N5016664	Not specified	Not specified	
WR378B.V1	Commencing in Shepperd's Gully, and terminating in Sluices Gully	NZTM2000 E1332467 N5014317	Not specified	Not specified	
94548	Lauder Creek, Omakau	NZMS 260: G41: 432775	Run 226G, Block X, Lauder SD	Not specified	NA
96779	Lauder Creek, Omakau	NZMS 260: G41: 432775	Run 223M, Block X, Lauder SD	Not specified	NA
2001.710	Lauder Creek at the foot of the Dunstan Mountains	NZMS 260 G41:438-770	Section 1 Block IV, Lauder SD	Not specified	WEX0119
WR432B	Commencing at a point in Lauder Creek immediately below William William's Water Race running through Crown Lands and terminating at the Boundary Section 25 Block V Lauder District	Not specified	Not specified	Not specified	NA
2000.644.V2	Millers Creek, approximately 2 kilometres upstream from the Becks School Road	NZTM 2000 E1339791 N5014917	Sec 48 Blk III Lauder SD	Not specified	NA
RM19.448.01	Approximately 12 kilometres upstream of the confluence with the Manuherikia River	NZTM 2000 E1338976 N5012597	Pt Section 12 and Section 13 Blk V Lauder SD and Crown Land (tail Race reserve) Blk V Lauder SD, SO828 adjacent to Section 13 Blk V Lauder SD	Lot 2 Deposited Plan 329435, Section 21 Block V Lauder SD, Section 13 Block V Lauder SD, Section 5 Block V Lauder SD, Lot 3 Deposited Plan 436687 and Part Section 4 Block V Lauder SD	NA
98122	Lauder Creek, Approximately 550 metres north west of the intersection of Lauder Flat Road and Brown Road, Lauder	NZMS 260 H41: 504-731	Sec 5, Block V, Lauder SD	Not specified	NA

2004.788	An unnamed tributary of Lauder Creek, approximately 4 kilometres south west of Becks in the Manuherikia Valley, Central Otago.	NZMS 260 G41:499-718	Pt Sec 4 Blk V Lauder SD	Not specified	NA
2004.787 (To Dam)	An unnamed tributary of Lauder Creek, approximately 4 kilometres south west of Becks in the Manuherikia Valley, Central Otago.	NZMS 260 G41:499-718	Pt Sec 4 Blk V Lauder SD	Not specified	NA
3707	An un-named tributary of Lauder Creek known locally as Mellors Creek, approximately 800 metres south west of the intersection of Becks School Road and Lauder Flat Road	NZTM 2000 1339998E 5012442N	Sec 6 Blk V Lauder SD	Not specified	WEX0001
2002.399	Unnamed tributary of Lauder Creek, approximately halfway along Brown Road and to the north of that road, Omakau	NZMS 260 H41:515-728	Section 9 Block V Blackstone SD	Not specified	NA
2002.387 To Dam	Unnamed tributary of Lauder Creek, approximately halfway along Brown Road and to the north of that road, Omakau	NZMS 260 H41:515-728	Section 9 Block V Blackstone SD	Not specified	NA
2002.071.V1	Clear Creek, approximately 1.2 kilometres north northeast of the intersection of Muddy Creek Road and Mawhinney Road, Lauder	NZMS 260 G41:461-707	Sec 48 Blk III Lauder SD	Not specified	NA
93447.V2	Lauder Creek	NZMS 260: G41: 498704	Reserve adjacent to Sections 55 and 58 Block V Lauder SD	Not specified	NA
2002.768	Unnamed tributary of Lauder Creek, between two intake points located approximately 120 metres south southeast and 330 metres south of the intersection of Matakanui Road and Becks–Omakau Road (State Highway 85), Lauder, Central Otago	NZMS 260 G41:481–675 and G41: 484 - 678	Pt Sec 14 and Pt Sec 23 Blk IV Lauder SD	Pt Sec 14 and Pt Sec 23 Blk IV Lauder SD	NA

98488	Millers Creek, Locally known as Mellors Creek, approx. 5.4km Northwest of the intersection of Hamilton Rd and Glassford Rd, Becks, Central Otago	NZMS 260 G41:463-792	Sec 2 Blk III Lauder SD	Not specified	WEX0138
98572	Millers Creek, approximately 4.3 kilometres north west of the intersection of Lauder Flat Road and Mee Road, Becks	NZMS 260 G41:463-792	Sec 2 Blk XII Lauder SD	Not specified	WEX0138

The figure below shows the existing consented locations for these permits using grid references detailed on permits relative to Lauder water user command area and source water bodies.

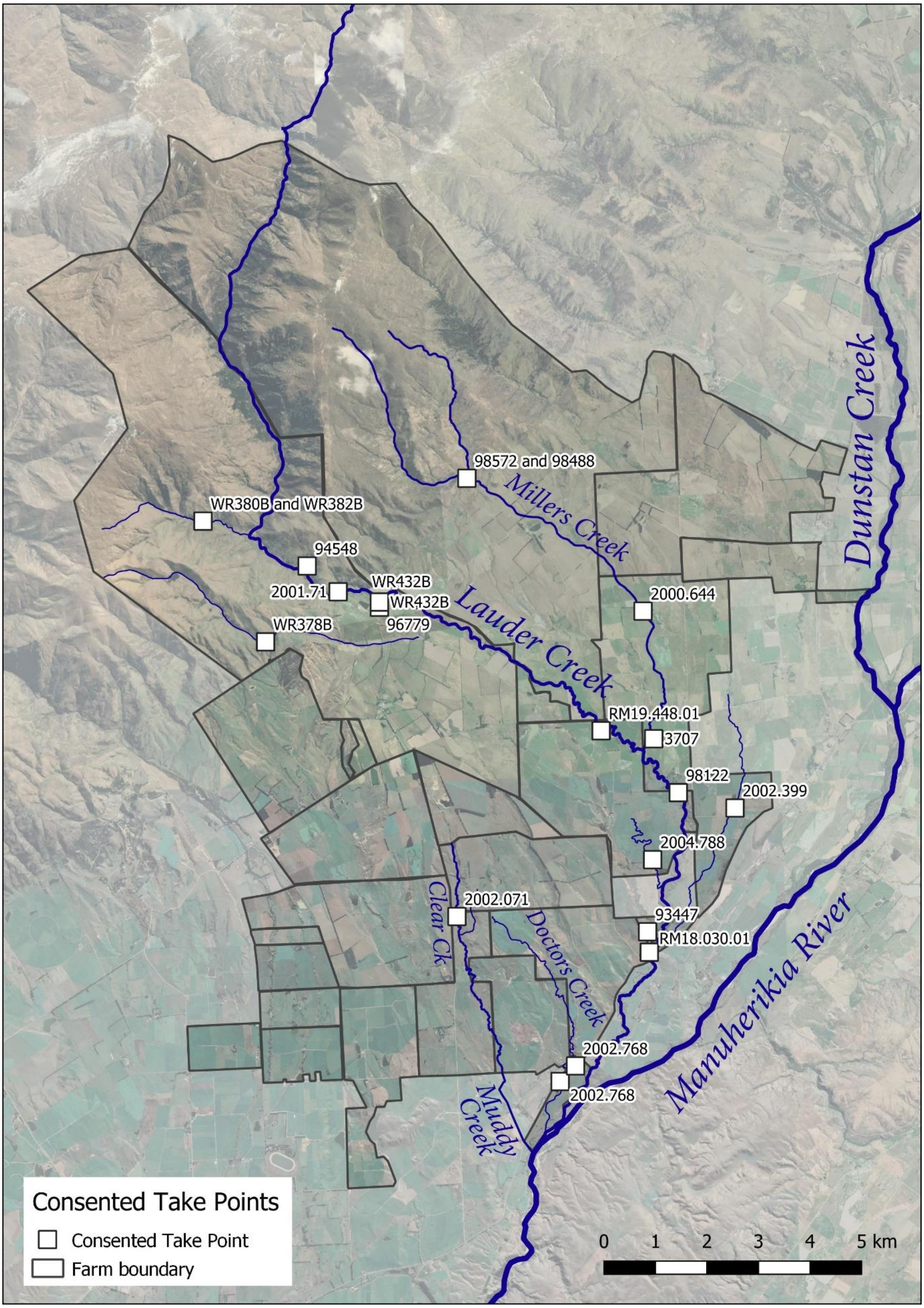

Figure 1 Consented Take Point Locations relative to Lauder water user command area and source water bodies

The table below shows the Permit being surrendered as part of this application.

Table 3 Permit being surrendered as part of this application

RM18.030.02	Water Permit	Phada Industries Limited	Lauder Creek	Issued March 2018 in replacement of RM14.299.02.	1 October 2021

3.2 Proposed Permits Sought

The table below sets out the replacement proposed permits as sought in this application. The descriptions of the point of take and legal descriptions of the point of take and irrigated areas are included in the draft permits in Appendix C.

Table 4. Details of permits sought by this application

Consent number	Permit holder	Intake Locations (NZTM 2000 E and N)	Location of Use	Source Water
WR380B	AW and KL Glassford Ltd	E1331243 N5016662	LOT 2 DP 337168 Section 8, 38, 44, 54-56, PT Section 33, 37, BLK VI, Section 9, 10, 12-14, PT Section 35 BLK X, Lauder SD	Unnamed tributary of Lauder Creek
WR382B.V1				
WR378B.V1		E1332467 N5014317		Shepherds Creek
94548 and 96779	James Phillip Murray Heckler	E1333132 N5015721	LOT 3 DP 422600, Section 1 SO 24145, Section 22-23, 46, 49 BLK V, Section 15 BLK X, Lauder SD	Mainstem of Lauder Creek
2001.710	Omakau Area Irrigation Company Limited	E1333870 N5015279	As specified in Section 8	Mainstem of Lauder Creek
WR432B	IR and MA Brown, and Viewpoint Farm Ltd	E1333870 N5015279	Section 26, 27, PT Section 19, BLK V Lauder SD Section 20, 25, 47 Block V Lauder SD	Mainstem of Lauder Creek
2000.644.V2	Lilybank Company Ltd	E1339791 N5014917	Sections 44, 48. 54, Block V Lauder SD Sections 58, 60, 65, 67 Block II Blackstone SD Section 1 Block XII Lauder SD.	Millers Creek (Middle take)
RM19.448.01	Geoffrey Thomas Clouston	E1338898 N5012697	Lot 2 Deposited Plan 329435, Section 5, 13, 16, 21, Part Section 4 Block V Lauder SD	Main stem of Lauder Creek
98122		E1340549 N5011435		
2004.788		E1340128 N5010000		Unnamed tributary of Lauder Creek (Lower Creek)

2004.787 (To Dam)		NA		Unnamed tributary of Lauder Creek (Lower Creek)
3707	James Armstrong Partnership	E1339998 N5012442	Sections 22-22, Block V, Blackstone SD Section 6, Block V, Lauder SD	Millers Creek (Bottom take)
2002.399		E1341578 N5011098		Unnamed tributary of Lauder Creek (Lower Creek)
2002.387 (To Dam)		NA		Unnamed tributary of Lauder Creek
2002.071.V1	Viewpoint Farm Ltd	E1336146 N5008990	Sections 20, 25, 47 Block V, Lauder SD	Clear Creek
93447.V2	Clive Allen Booth and Elizabeth Claire Booth	E1340187 N5008610	Lot 1, Deposited Plan 545384 Section 58 Block V Lauder SD	Mainstem of Lauder Creek
2002.768	Central Park Limited	E1338085 N5005457	Lot 1 Deposited Plan 433629, Lots 1,2,4 Deposited Plan 17392, Sections 7 and 33, Part Sections 14, 23, 43, Block IV Lauder SD	An un-named tributary of Lauder Creek
98488	Richard James Tucker	E1336429 N5017513	Section 3 Block XII Lauder SD Lot 2 Deposited Plan 22370 Sections 2, Block XIII Lauder SD Lots 1 and2, Deposited Plan 422600	Millers Creek, Top Take
98572	Richard James Tucker			Millers Creek
Proposed New Supplementary Permit	Phada Industries Limited	E1339913 N5008301	Lot 1 Deposited plan 504497, Lot 1 Deposited Plan 474827 Lot 1 DP 474116, Part Lot 1 Deposited Plan 24694 part Lot 5 Deposited Plan 17393	Mainstem of Lauder Creek

The intake locations proposed by this application are shown in the figures below.

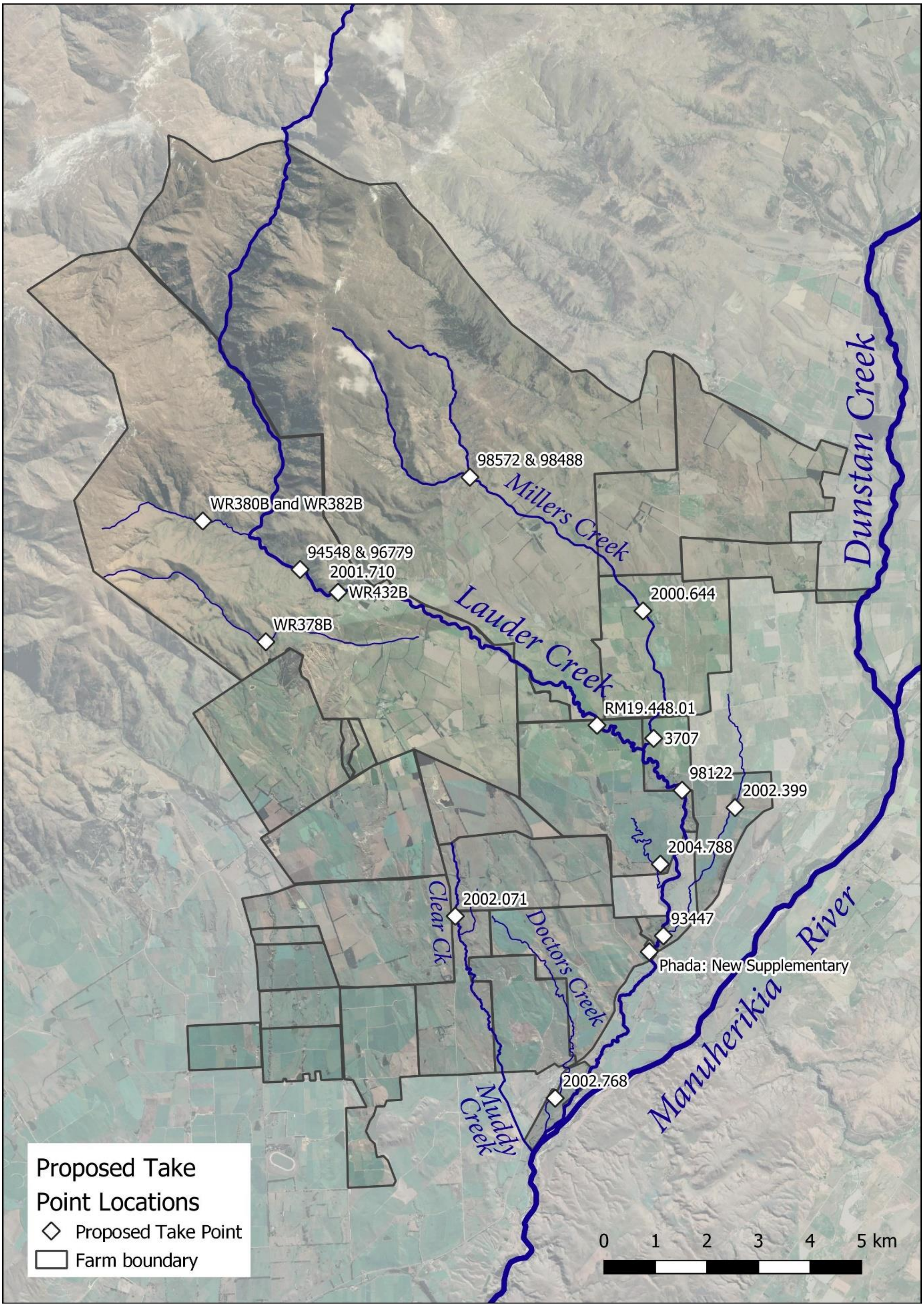

Figure 2. Take locations proposed by this application in relation to applicant property boundaries

4. Irrigation Context

4.1 OAIC Scheme Overview

A detailed background to the OAIC Scheme is set out in the OAIC Main Stem Application (prepared by Landpro Ltd) including details about shareholders, overall command area, and distribution and use of water.

4.2.1 Lauder Race Scheme

The 'Lauder Race' takes water from the intake at the mouth of Lauder gorge on the Lauder Creek and supplies water to the area south and south-west towards Thomsons Creek. This application focuses on the way in which OAIC shareholders use Lauder Creek water on their properties.

Some Lauder Creek water users also utilise other water sources within the Manuherekia Catchment. The Omakau Area Irrigation Company (OAIC) delivers water to shareholders via other race delivery systems, as follows:

- The 'Main Race' carries water from the main intake (near Blackstone Hill, approximately 4km upstream of Becks on the Manuherikia River) as far south as Tiger Hill.

- The 'Dunstan Race' takes water from Dunstan Creek near Cambrians, distributing water to the north-western area as far south as Lauder Creek.

- The 'Matakanui Race' takes water from Thomsons Creek and supplies water in two directions south and north along the Dunstan Range foothills. The race heading north delivers to users who also receive Lauder Scheme water.

Please note that the water use of other water sources may be the subject of other sub-catchment applications, including the Thomson catchment prepared by McKeague and the OAIC Dunstan and Main Stem applications prepared by LandPro.

Water abstracted from within the Lauder catchment can also be used in other sub-catchments.

Section 8 - provides a detailed description of the Lauder Scheme and associated water use by shareholders. If shareholders have access to other sources of water (such as private rights, or other OAIC water) then that is included in the water balance along with a description of use for completeness.

4.2 Private Right Water

The consent holders within this application variously abstract water from the following water sources:

- Lauder Creek
- Millers Creek (also known as Mellors Creek), a tributary of Lauder Creek
- Unnamed tributaries of Lauder Creek, including Doctors Creek
- Clear Creek, a tributary of Muddy Creek.

Some consent holders also receive water from the OAIC Main Race (source: Manuherikia River), Matakanui Race (source Thomson Creek), the Dunstan Race (source: Dunstan River) as shareholders of OAIC.

Section 9 - provides a description of water use activities by farm and sets out the way in which they use water received from their private water rights and the Lauder Scheme Race for OAIC. If those farms also have other sources of water such as Dunstan Race, Matakanui Race or Main race OAIC water, then that is included in the water balance along with a description of use for completeness.

4.3 Lauder Water Use Overview

4.3.1 Land Uses

Land uses within the Lauder Catchment (by water source) largely comprises a mixture of sheep and beef farms, one dairy farm, and some dairy support. All farms are family owned and operated. Other land uses represented in the Catchment are viticulture and lifestyle properties. Not all of these properties lie in the actual Lauder Catchment. One sheep and beef farm, part of a sheep and beef farm and the dairy farm are actually in the Thomson Catchment but utilise Lauder Creek water.

The OAIC water is used predominantly in association with farming activities for the irrigation of pasture and crops, for water storage and stockwater purposes.

Section 8 provides an overview of the use of water by irrigators who are members of the Lauder Race Scheme. Some shareholders also receive water via their private water rights. Where irrigators receive water from multiple sources, a water balance is provided to demonstrate that allocation volumes are within the reasonable irrigation use as assessed by Aqualinc (2017).

4.3.2 Irrigation

The total land area represented by the farms in this application is approximately 17,127 ha. Of this area, approximately 5,469 ha can be irrigated using OAIC water and water taken under private water permits.

Of the 5,469 ha irrigated, approximately 1,235 ha is under fixed spray irrigation, 1,681 ha is under moveable spray, and 2,710 ha under overland irrigation. This equates to approximately 52% of land irrigated by spray methods and 48% of the land irrigated by overland methods. Conveyance of water on farm largely occurs by a mixture of pipes and open races, reflecting the mixture of spray and overland systems currently in place.

The greater proportion of modern spray irrigation methods in the Catchment reflects the major investment by irrigators in recent years to convert irrigation systems from border dyke or contour flood irrigation to modern and efficient spray systems, including pivots, hard hosed gun and k-line. Over time it is anticipated the irrigators within the Catchment will undertake further conversion of remaining border dyke or contour flood irrigation, however, to a large extent this is dependent on the outcome of the permit replacement process.

4.3.3 Water Storage

Many farms have some form of storage if only to provide a buffer capacity to ensure spray irrigation systems and stock have a continuous supply of water. The ponds and dams are mostly used to store water received from OAIC and water taken under private water rights.

Water storage on farms within the catchment has increased as irrigators continue to develop spray irrigation, however, on the whole the dams are not large enough to carry a farm business through the dry period and need to be ‘topped up’ regularly.

4.3.4 Stock Water

Farming within the catchment as represented by this application predominantly consists of sheep and beef farms, deer, dairy support. There is one dairy farm that uses Lauder water. Several of the applicants rely on their water permits or OAIC water shares for stock water.

Stock water figures supplied in this application are subject to change from season to season due to a range of variables and are therefore indicative only. Water use figures and allocation includes allocation for stock drinking water for a large proportion of these stock units, although it is noted that smaller stock water schemes are set up under the permitted activity rules on individual farms.

4.3.5 Overview Lauder Catchment Maps

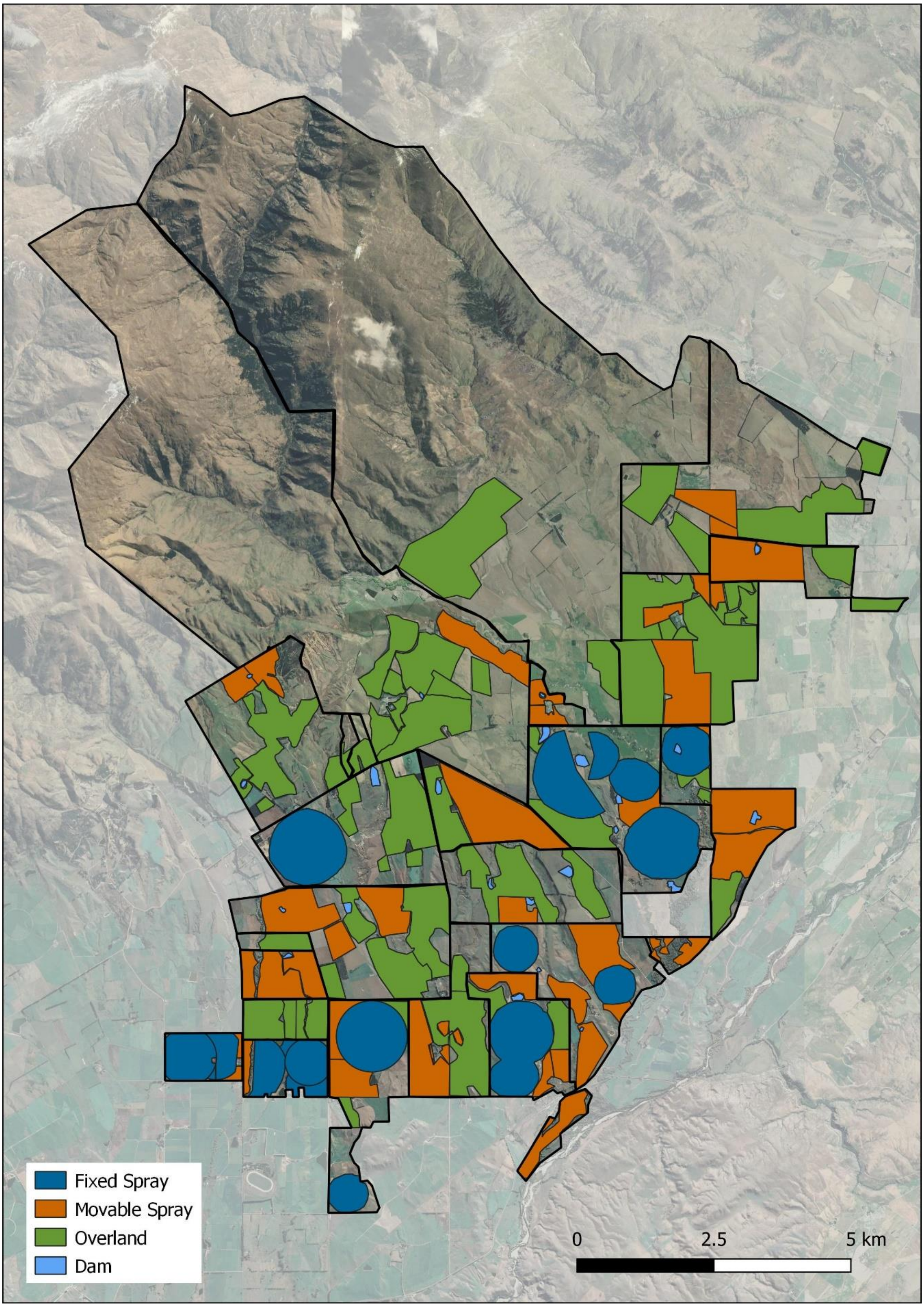

Figure 3 Irrigation Area by Type within the Lauder Catchment (Indicative Only)

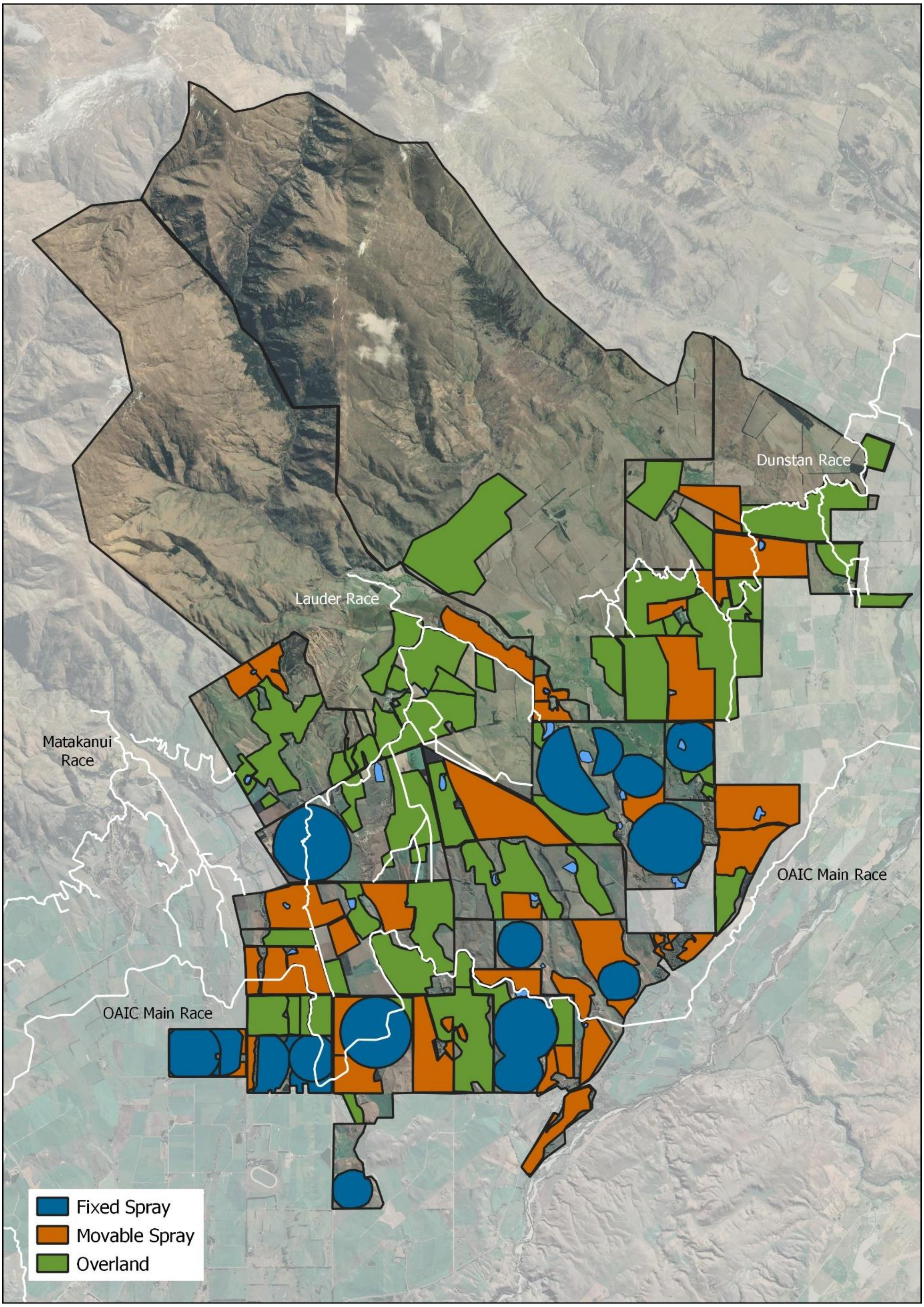

Figure 4 Irrigation Area by Type within the Lauder Catchment (Indicative Only) showing OAIC Races

5 Location of Activity

The proposed water takes are located in the Lauder Creek and Muddy Creek catchments, both being sub-catchments of the Manuherekia Catchment. The farms where water is used are located in the Lauder, Muddy Creek and Thomson catchments. The figures below show the location of the Lauder Water Use properties.

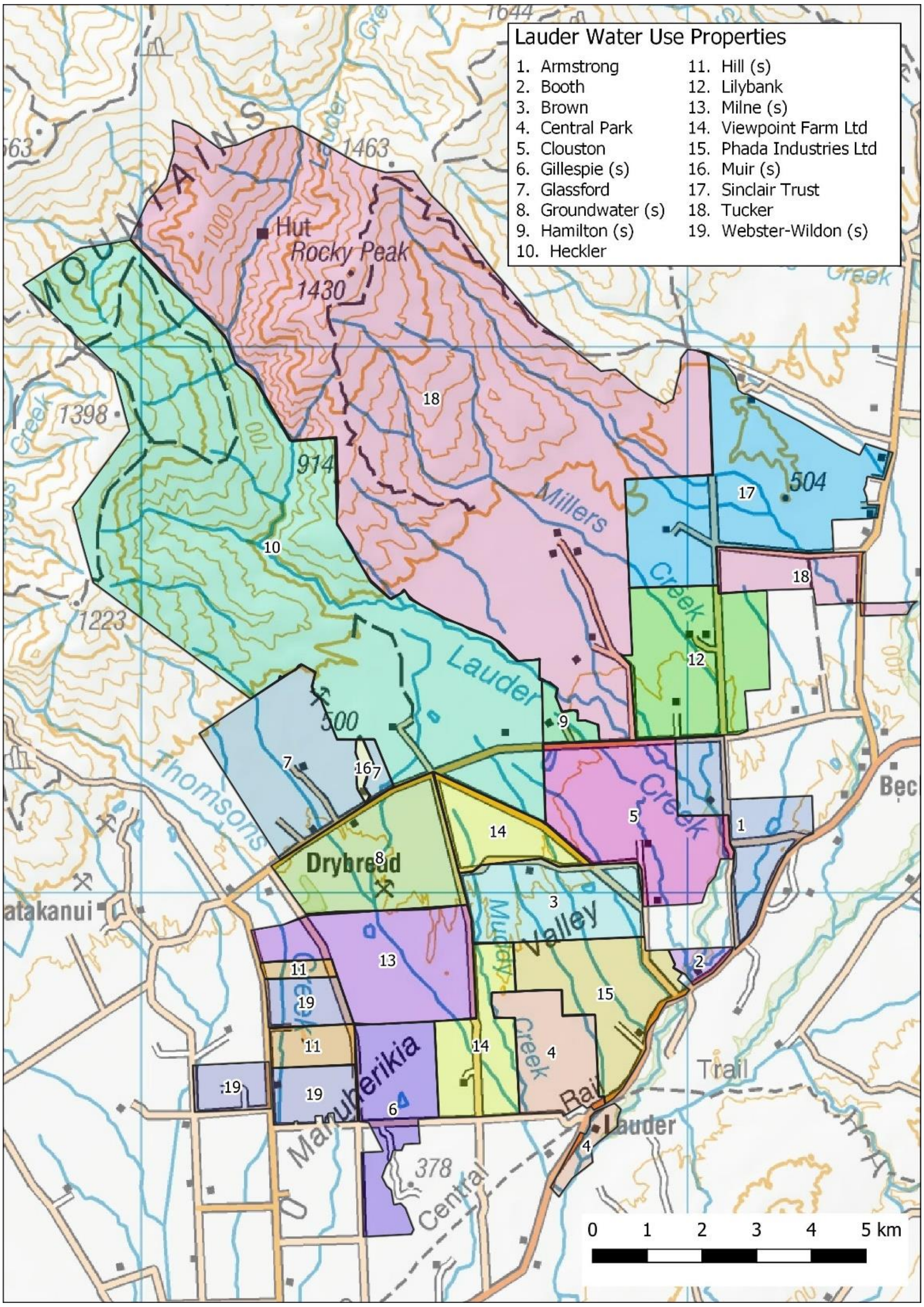

Figure 5 Location of Water Use Properties relative to key topographical features (Source: www.topomap.co.nz)

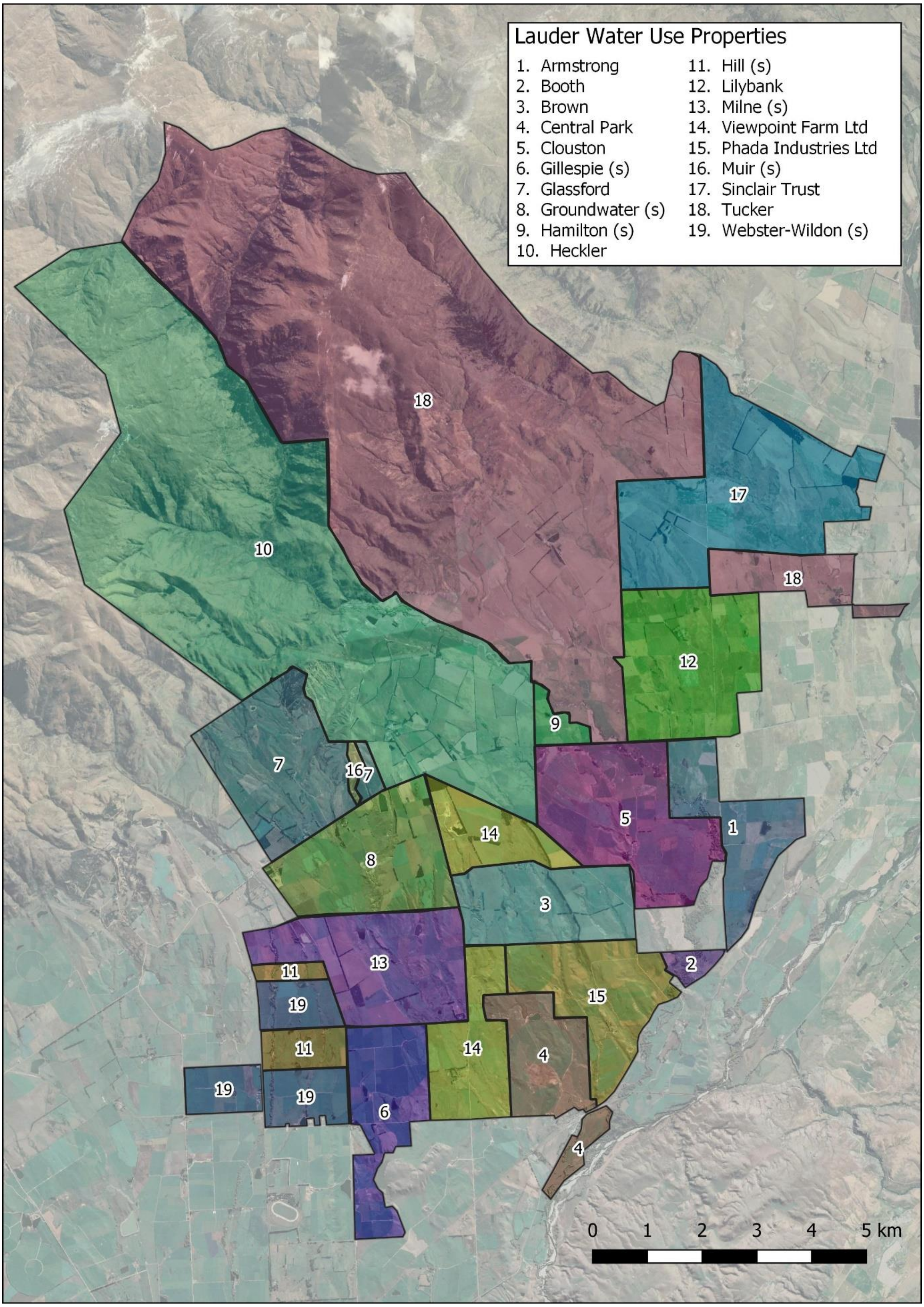

Figure 6 Location of Water Use Properties – Aerial View

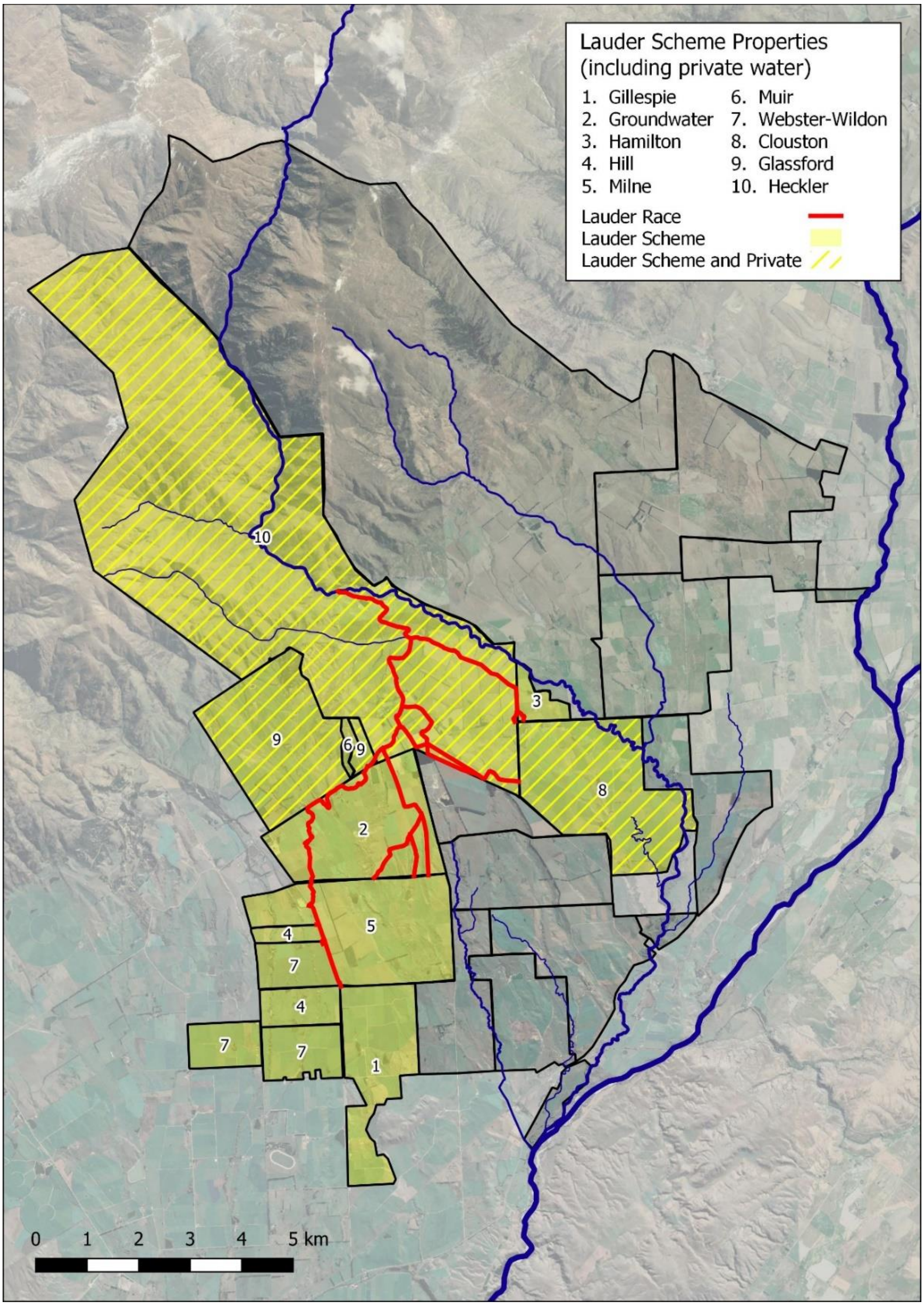

Figure 7 Location of Lauder Scheme Properties relative to the Lauder Scheme Race

The properties in the map above that are not represented in yellow, or yellow hashed markings, belong to Permit Holders who do not hold any OAIC Lauder Scheme water.

6 Physical Setting

6.1 Existing Environment

All but one of the permits subject to this application are located on the main stem of the Lauder Creek, unnamed tributaries of Lauder Creek, and named tributaries of Lauder Creek (including Shepherds Creek and Millers Creek). The one exception is a permit located on Clear Creek, a tributary of Muddy Creek, which is in turn a small tributary of the Manuherikia catchment. All water takes represented in this application are within the Manuherikia catchment, Central Otago Sub-Region of Otago.

Lauder is one of several smaller settlements in the catchment and the Lauder Creek is a significant tributary that contributes water to the main stem of the Manuherikia River from the Dunstan Mountains on the western side of the catchment. There are 18 existing primary water take permits and one retake permit in the Lauder catchment, consented to take up to 1,435 l/s[1].

The majority of the Lauder Creek catchment consists of agricultural grasslands with tall tussock (7,287 ha; 49%) and low producing grassland (2,093 ha; 14%) dominating the hill country and high-producing pasture grasslands (4,433 ha; 30%) dominate the valley floor. Much of the upper catchment of Lauder Creek is within the Lauder Basin Conservation area (3,753 ha), with a smaller portion of the catchment within the Neinei kura Conservation Area (34 ha) in the southwestern part of the upper catchment (Hickey and Olsen, 2020).

Currently, a minimum flow of 820 l/s applies to all takes in the Manuherekia catchment upstream of the Ophir flow site. This includes takes in the Lauder Creek and Muddy Creek catchments. Historically there has been few takes in the catchment with residual flows set to provide for ecological values and there has been no agreement between water users to roster to maintain flows in the lower reaches of Lauder Creek.

The water quality observed in Lauder Creek appears to be impacted by flood irrigation methods within the Lauder Creek catchment. The continued conversion of irrigation from flood to spray methods is expected to result in significant improvements to water quality in the Lauder Creek catchment, with substantial reductions in phosphorus, sediment and microbial contamination anticipated (Hickey and Olsen, 2020).

Water users of Lauder Creek are members of the Lauder Creek Water Users Group. The group works together to uphold the minimum flow and any residual flows of the creek. Water allocation within the Manuherekia catchment is fully allocated, with no more primary allocation water available under the Regional Plan: Water for Otago (RPW) provisions.

The Lauder Creek Water Users Group measure the flow of Lauder Creek in co-operation with the Council.

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[1] The retake is 28l/s where OAIC main race water is discharged to a small tributary to be abstracted downstream.

6.2 Overview of Waterways

The figure below shows the location of the waterways associated with this application relative to the Manuherikia River. Specifically, Lauder Creek and its tributary, Doctors Creek; and Clear Creek and its tributary, Muddy Creek. The Lauder Creek and Muddy Creek sub catchments are described in the following sections.

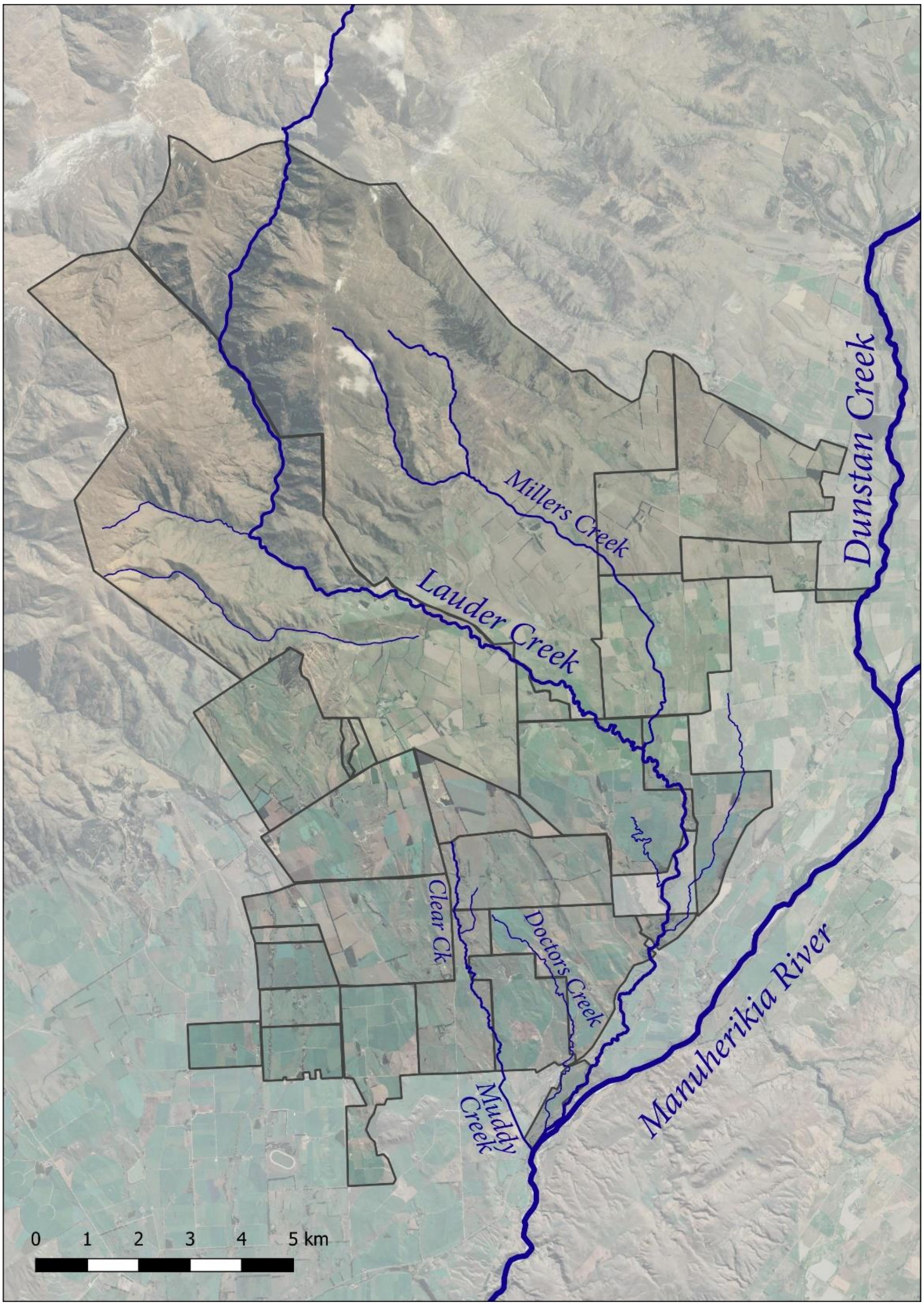


Figure 8 Relevant Waterways within the Manuherikia, Lauder and Muddy Creek Catchments

6.3 Lauder Creek Sub-Catchment

Lauder Creek is a significant tributary of the Manuherikia River entering on the true right bank at Lauder (upstream of Ophir). The hydrology of Lauder Creek is complex with both losing and gaining reaches, significant contributions to groundwater recharge from the use of water which has entered the catchment via the Omakau Irrigation Company race from Dunstan Creek. The report attached in Appendix D, entitled *'Assessment of Environmental Effects of water abstraction from the Lauder Catchment, Hickey and Olsen (2020)'* contains an overview of the hydrology of Lauder Creek.

The figure below shows the location of the Lauder sub-catchment within the broader Manuherikia Catchment.

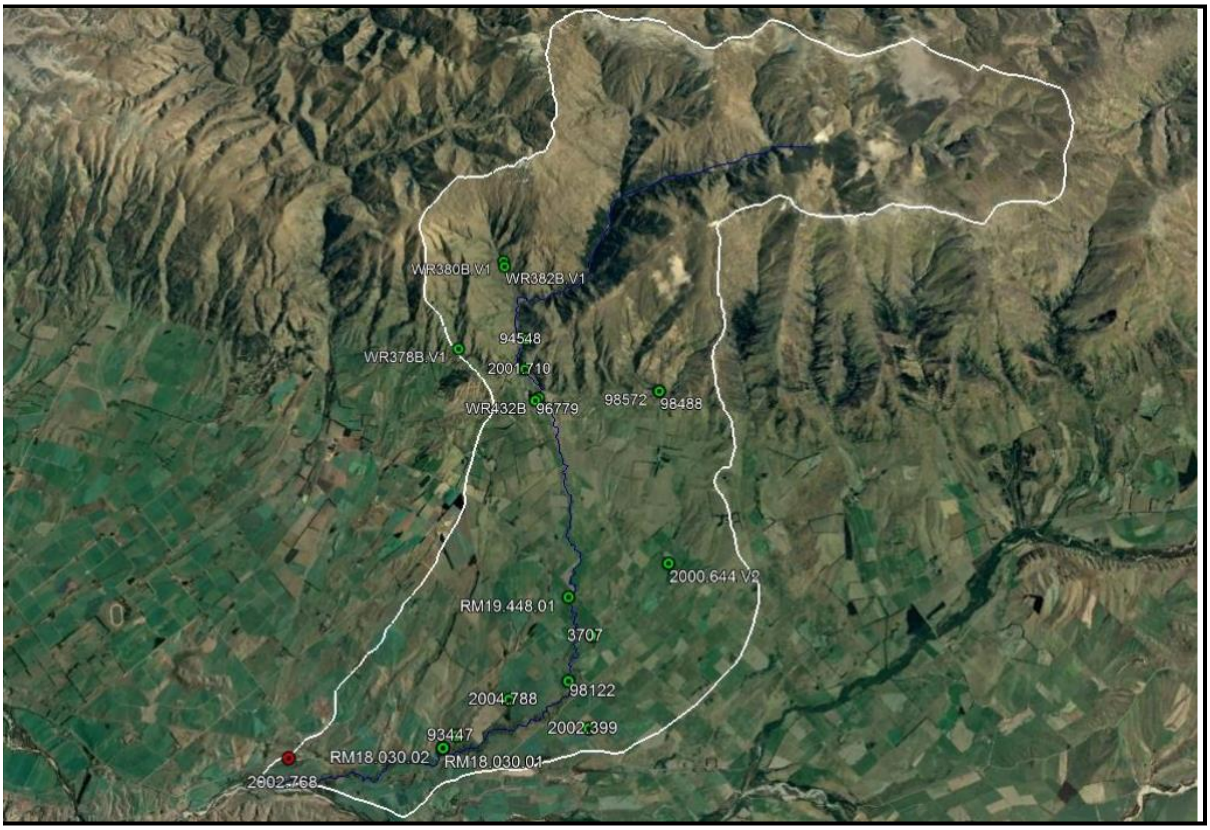


Figure 9. Location of Lauder Creek Catchment (in white outline) and location of water take locations (green) and the single re-take (red) in the Manuherikia Catchment (Source: Hickey and Olsen,2020, Appendix D)

Table 5. Overview of characteristics of Lauder Creek

Characteristics Lauder Creek and tributaries	Indicative characteristics at points of take (all depth and width figures are approximate)
Type of Waterbody	Lauder Creek and tributaries
Average channel width and depth upstream of the point of take	Lauder Creek varies in width from 1-2m to 10m+; and varies in depth from 20cm to 1m+ in the areas above and below the proposed points of take.
Average channel width and depth at point of take	
Average channel width and depth downstream of the point of take	
Average flow water velocity including source of flow data and any changes to flow velocity above and below the point of take	Refer Hickey and Olsen (2020) Appendix D.
Any flow gauging of the water body. A flow gauging report with photographs of the site and methodology to be attached.	Refer Hickey and Olsen (2020) Appendix D.
Bed of the water body upstream of the point of take	Gravelly
Bed of the water body at the point of take	
Bed of the water body downstream of the point of take	
Minimum flow rates	Refer Hickey and Olsen (2020) Appendix D.
Maximum flow rates	Refer Hickey and Olsen (2020) Appendix D.
Natural 7-day Mean Annual Low Flow	Refer Hickey and Olsen (2020) Appendix D.
Source of Flow Data	Refer Hickey and Olsen (2020) Appendix D.

6.4 Muddy Creek Sub-Catchment

Clear Creek is a small tributary of Muddy Creek, which runs into the Manuherikia River on the true right near Lauder. The catchment area above the take is approximately 3 km^2. There is one water take permit (2002.071) on this Creek authorising abstraction of a rate of 56 l/s.

The figure below shows the location of Clear Creek and the Muddy Creek sub-catchment within the broader Manuherikia Catchment.

Figure 10. Location of Clear Creek (blue line) within the Muddy Creek sub-catchment (in red) and water take location (yellow pin) within in the Manuherikia Catchment (Source: WRM, 2020 Appendix E)

Table 6 Overview of characteristics of Clear Creek

Characteristics of Clear Creek	**Indicative characteristics at point of take (all depth and width figures are approximate)**
Type of Waterbody	Clear Creek
Average channel width and depth upstream of the point of take	Upstream of the take can be often dry. This is a dry gully due to irrigation occurring above, however when it flows it is approximately 40cm width, 10cm depth.
Average channel width and depth at point of take	
Average channel width and depth downstream of the point of take	
Average flow water velocity including source of flow data and any changes to flow velocity above and below the point of take	Unavailable[2]
Any flow gauging of the water body. A flow gauging report with photographs of the site and methodology to be attached.	
Bed of the water body upstream of the point of take	Grassy upstream, and where there is flow it is also gravelly

[2] As discussed on pre-application site visit with ORC and processing officers held early December

Bed of the water body at the point of take	
Bed of the water body downstream of the point of take	
Minimum flow rates	Small upstream catchment of 3 km^2, considered to be naturally intermittent. Refer WRM (2020) (Appendix E).
Maximum flow rates	
Natural 7-day Mean Annual Low Flow	

6.5 Lauder Creek Water Quality

The water quality observed in Lauder Creek appears to be impacted by some on-farm management practices such as flood irrigation methods and grazing in critical source areas. Further detail on Lauder Creek water quality is provided in the report attached in Appendix D (Hickey and Olsen, 2020) and in Section 12.3 of this report.

6.6 Landscape

The majority of the Lauder Creek catchment consists of agricultural grasslands with tall tussock (7,287 ha; 49%) and low producing grassland (2,093 ha; 14%) dominating the hill country and high-producing pasture grasslands (4,433 ha; 30%) dominate the valley floor (Hickey and Olsen (2020), Appendix D.

Much of the upper catchment of Lauder Creek is within the Lauder Basin Conservation area (3,753 ha), with a smaller portion of the catchment within the Neinei kura Conservation Area (34 ha) in the southwestern part of the upper catchment.

The Lauder township is a small service centre on State Highway 85 between Omakau and Becks. Lauder is the closest settlement to the Poolburn Gorge, a popular site on the Otago Central Rail Trail. The Rail Trail crosses State Highway 85 at Lauder, making it a convenient meeting point for cyclists and support vehicles.

6.7 Climate

The climate of the Lauder Creek catchment area is characterised by long hot dry summers and cold dry winters, with a mean annual rainfall around 439mm/year. A detailed climate description for the Lauder catchment is contained in the report prepared by Hickey and Olsen (2020) (Appendix D).

6.7.1 Mean Annual Rainfall

Mean Annual Rainfall has been mapped for the Lauder catchment command area. The following figure shows the Mean Annual Rainfall in the Lauder Creek catchment to be between 450 mm-650 mm per year. This information is used by Aqualinc (2017) to assess reasonable irrigation use within Otago.

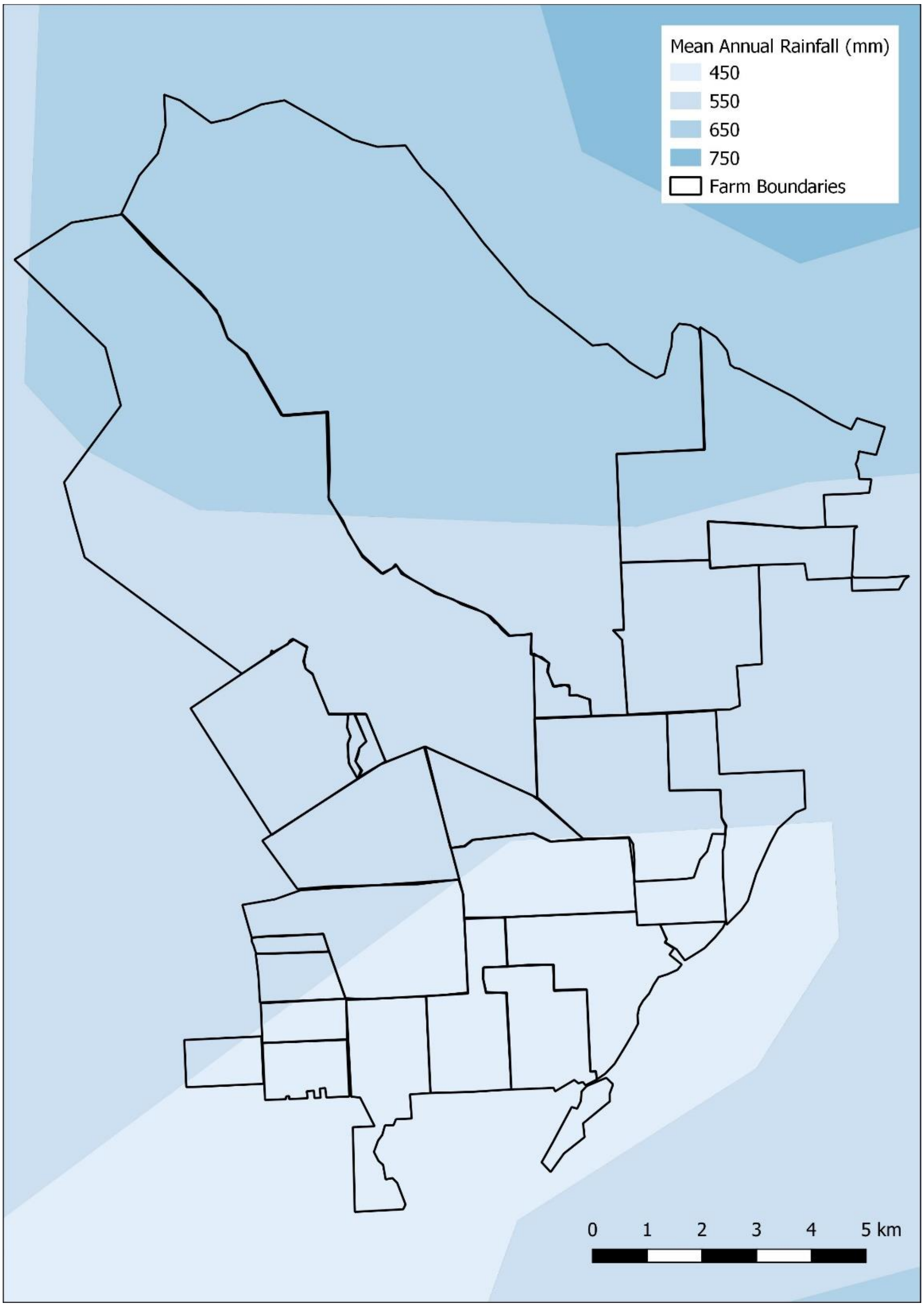


Figure 11 Mean Annual Rainfall in Lauder Creek Command Area (Refer Appendix F for Data Source and Methodology)

6.8 Soil Types

Landcare Research provides soil information relevant to the Lauder catchment (www.smap.landcareresearch.co.nz) to support scientific modelling. The information held shows that Lauder Creeks soils at the soil order scale are largely comprised of four prominent soil types.

- A small section of soils in the upper Lauder are recent soils, which are classified as weakly developed soils with distinct topsoil.

- The upper segment of Lauder Creek on the true right bank of the Lauder main stem are largely comprised of Pallic soils – pale coloured subsoils with a weak structure and high-density subsurface horizons.

- Following the main stem of Lauder Creek are mainly gley soils. These are soils strongly affected by waterlogging and have been chemically reduced. Gley soils have light grey subsoils, usually with reddish brown or brown mottles, extending to more than 90cm in depth. Water logging occurs in winter or spring, and some soils remain wet all year. Within this segment of the catchment, 40% of the area is comprised of very shallow, poorly drained, and sandy loam; and 60% consists of moderately deep, poorly drained, silty loam.

- To the true right bank of the main Lauder Creek stem, in the lower half of the catchment a segment of the soils are comprised of semiarid soils. These soils are weakly leached, with high slaking and dispersion potential, moderate to high bulk densities, and a weakly developed soil structure.

The figures below show the location of these soils within the upper and lower Lauder catchment.

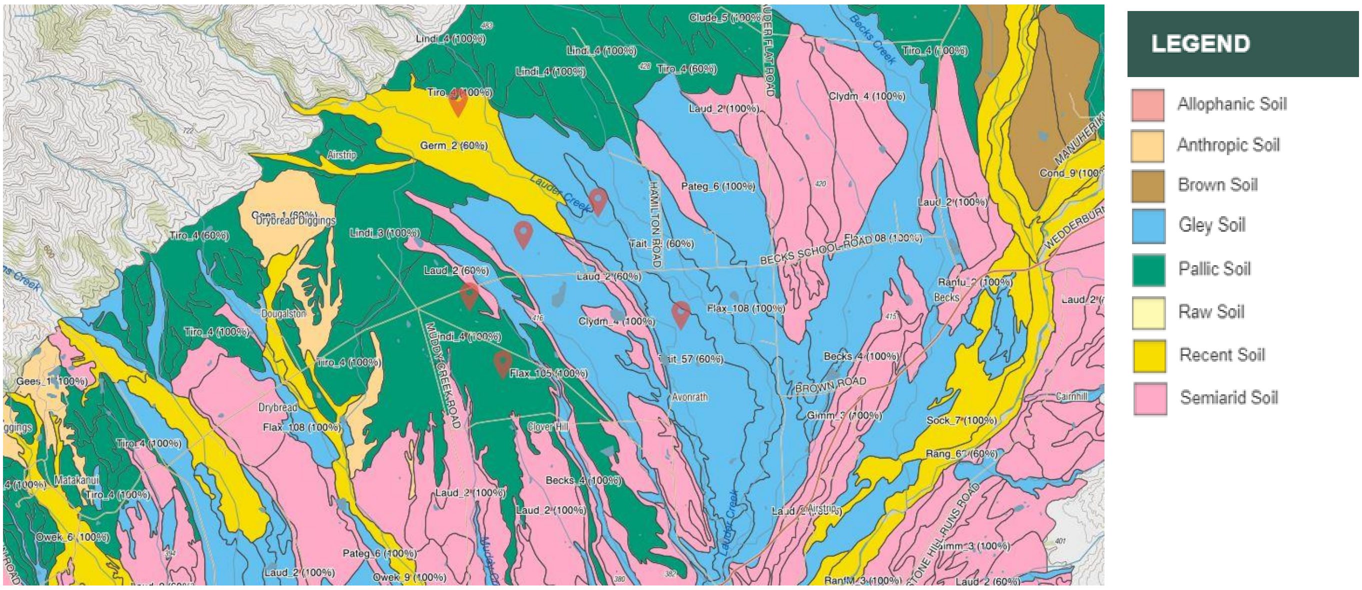


Figure 12 Location of soils at the soil order scale within the upper Lauder Catchment (Source: [https://smap.landcareresearch.co.nz)](https://smap.landcareresearch.co.nz)

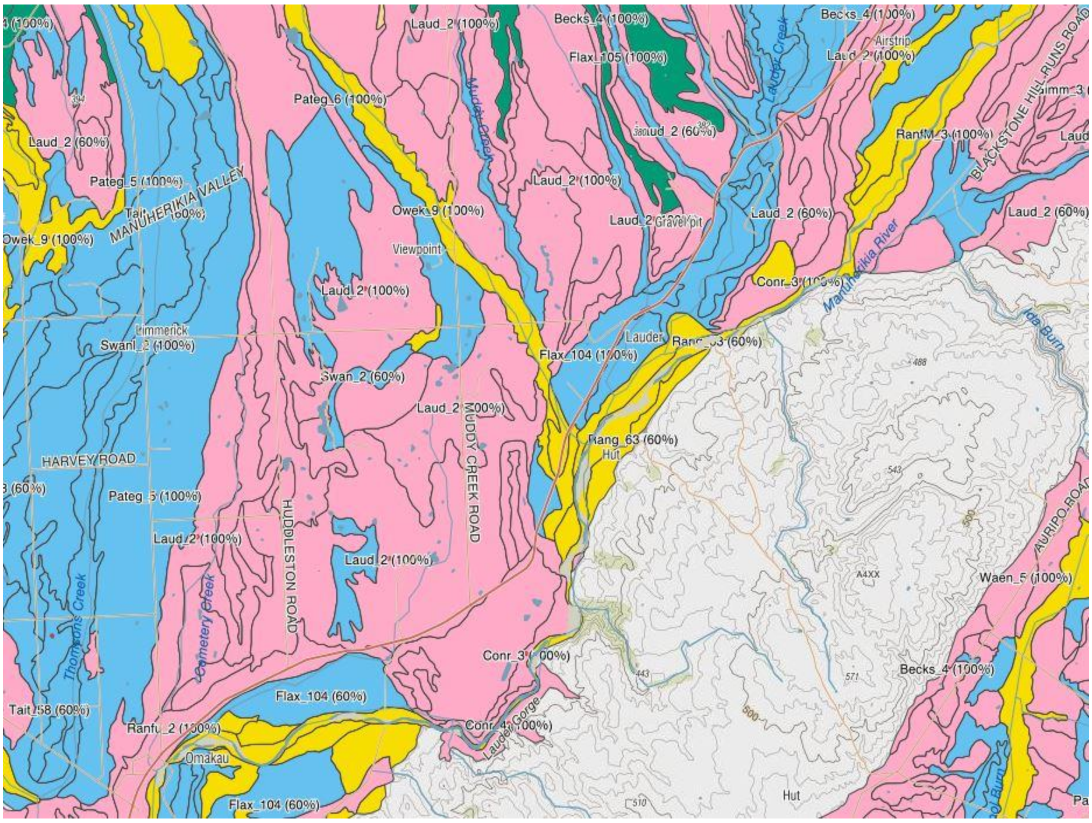


Figure 13 Location of soils at the soil order scale within the lower Lauder Catchment (Source: [https://smap.landcareresearch.co.nz)](https://smap.landcareresearch.co.nz)

6.8.1 Profile Available Water

Profile available water (PAW) is one of the indicators commonly used by the ORC to identify the volume of water needed to efficiently irrigate an area. In general terms PAW is the amount of water held in a soil that can be easily extracted by plant roots, within the potential rooting depth. This information is used by Aqualinc (2017) to assess reasonable irrigation use within Otago. The PAW values for the Lauder catchment command area have been mapped, as shown in the figure below.

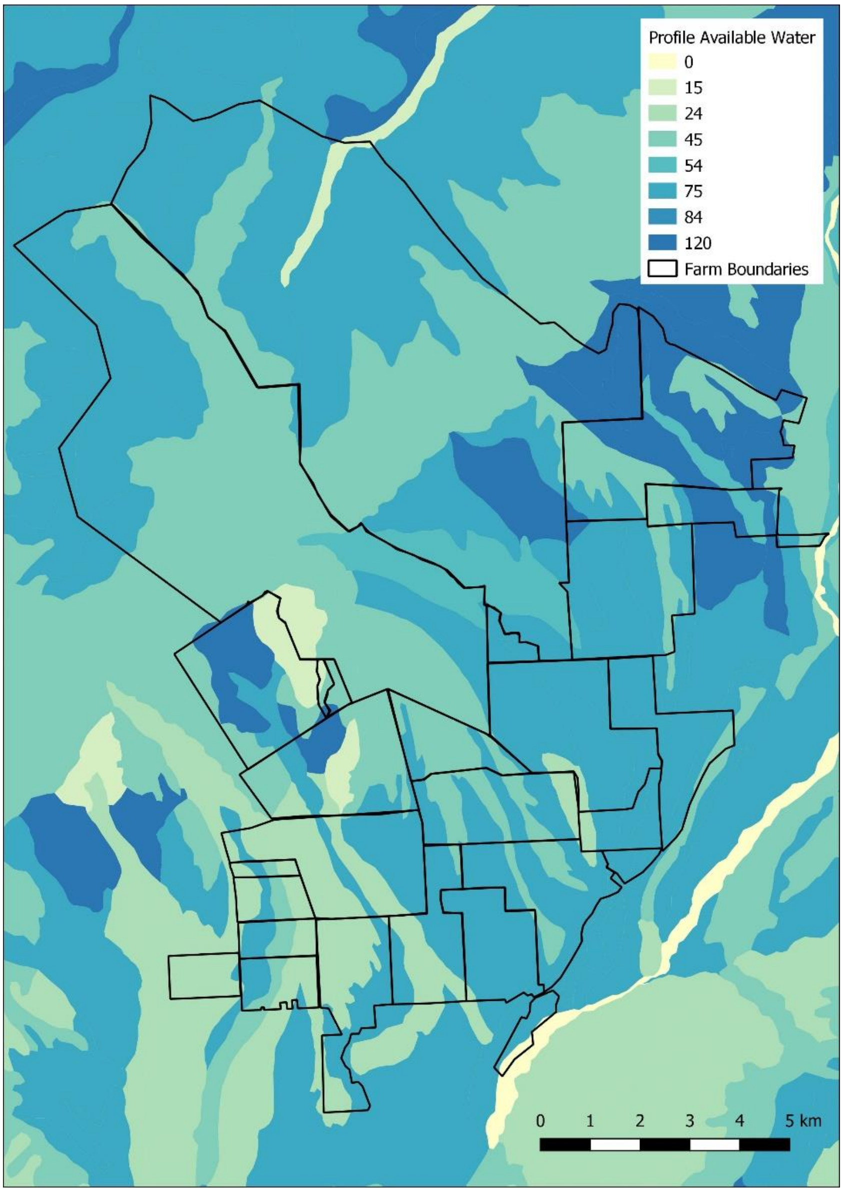


Figure 14 Profile Available Water in Lauder Creek Command Area (Refer Appendix F for Data Source and Methodology).

The figure above shows that the large majority of the command area has very low (<30), low (30-60), and low-moderate (60-90) PAW values. There are pockets with a moderately high PAW levels (up to 120) within the command area also.

7 Efficient Volume of Water for Irrigation

The Otago Regional Council utilise an approach developed by Aqualinc (2017) to assess an efficient volume of water for irrigation, taking into account climate, soil characteristics, rainfall and what the water is being used for. Utilising the approach in Aqualinc (2017), including the mapping layers used in that report (and overlaying these with the applicants' irrigated areas), the volume of water required to irrigate efficiently the pasture growing on each subject property has been calculated. This is set out in the table below. The methodology is attached in Appendix F.

Table 7. Areas irrigated by applicants and total reasonable max annual water demand) as calculated using Aqualinc 2017.

Farm	Total irrigated (ha)	Annual Water Demand (m^3)
Hill	136.3	1,223,834
Gillespie	265.9	2,432,753
Hamilton	40.0	305,452
Milmor (Milne)	401.1	3,552,038
Muir	7	58,735
Wildon (Webster)	373.4	3,355,060.
Groundwater	303.1	2,603,343
Glassford	245.4	1,991,639
Heckler	410.7	3,568,302
Brown	198.1	1,789,045
Viewpoint Farm Ltd (Moran)	478.1	4,254,844
Avonrath (G Clouston)	451.9	3,874,294
CA and EC Booth	26.4	237,316
Phada Industries Ltd (Morrison)	253	2,287,791
James Armstrong	313	2,705,926
Springburn (Tucker)	455.6	3,801,536
Lilybank Co	611	5,199,859
Central Park Ltd (O'Brien)	323.6	2,846,994

On many of the Lauder applicant properties the water sources are mixed. A summary table demonstrating the calculations underpinning total volume and the proportional volume from each source is included in Appendix K.

8 Lauder Scheme Water Take (OAIC)

The Lauder scheme takes water from the intake at the mouth of Lauder gorge on the Lauder Creek and supplies water to the area south and south-west delivering water to the Lauder, Muddy Creek catchment and eventually to properties in the Thomson catchment.

8.1 OAIC Lauder Creek Intake Scheme

The Lauder Scheme delivers water from the Lauder Creek to 10 water users located to the west of the Lauder Creek. The water is transported in a series of races utilising gravity. Water is delivered by race to the boundary of the shareholders' land according to an agreed Scheme management regime.

It is understood the OAIC hold rights to convey water over every parcel of land the Lauder race (and any feeder races) crosses. The OAIC is in the process of investigating whether any further authorisations are required for the intake structure and race under s417. Any authorisations required will then be sought as part of a separate process.

The OAIC Scheme Management Plan governs the operation and use of water from the Lauder Creek with regard to scheme management, water use efficiency, monitoring, and review (Appendix J). It is noted that Permit 2001.710 does not currently include a condition of consent requiring adherence to a scheme management plan. However, for consistency with other OAIC permits, the applicant anticipates a condition of consent to this effect be included on the replacement permit.

8.2 The Water Take – Permit 2001.710

The OAIC holds Deemed Permit 2001.710 to take and use up to 424.5 l/s from Lauder Creek for the purpose of irrigation, water storage and stock water. The point of take is located within Lauder Creek at the mouth of the Lauder Gorge and foot of the Dunstan Mountains.

The intake is a weir owned by the OAIC. A memo by Freshwater Science Dean Olsen is attached in Appendix G which details the nature and parameters of the Lauder weir. The weir is of concrete construction and 13.8m wide, 1.8m in height, with a rounded crest shape. The weir enables water to flow into the Lauder Race. Photos of the Lauder Race intake weir are provided in the memo contained in Appendix G.

The water taken is raced downstream to the point of metering where a bywash/overflow is installed to direct excess water back to Lauder Creek prior to metering. The measurement of water taken under Permit 2001.710 is away from the point of take and is authorised under Notice of Exemption WEX0119. Water use data is telemetered to the ORC using WM0107.

The figure below shows photographs of the point of take and associated infrastructure.

<table>
<tr><td></td><td></td></tr>
<tr><td>Point of take from Lauder Creek, showing weir structure
Source: ORC Compliance Sheet</td><td>Automated gate and flood protection measure installed down race
Source: ORC Compliance Sheet</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Point of metering located downstream of automated gate
Source: ORC Compliance Sheet</td><td>Water metering equipment installed down race, with an overflow structure installed to return excess water back to Lauder Creek
Source: ORC Compliance Sheet</td></tr>
</table>

Figure 15 Photographs showing 2001.710 Intake and measuring equipment

8.3 Schematic of Lauder Scheme Intake

The figure below shows a schematic of the Lauder Scheme intake and associated infrastructure.

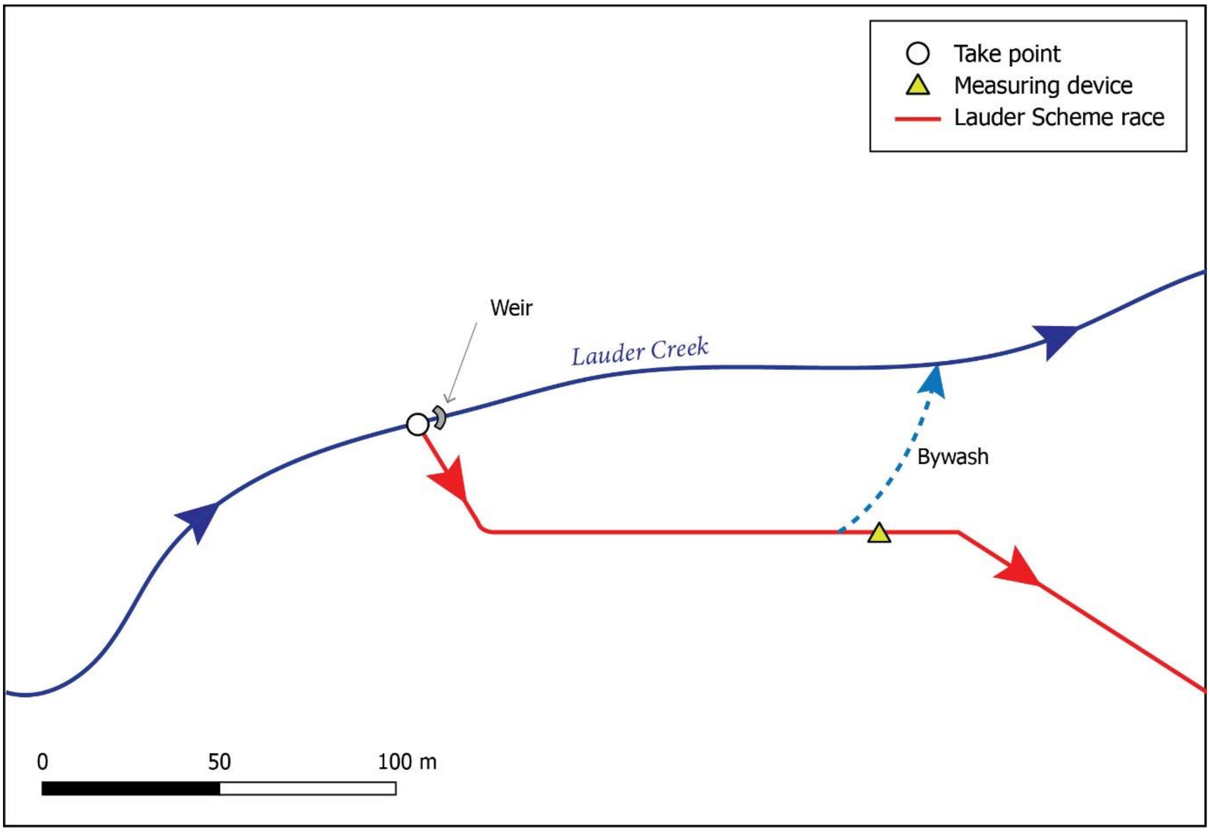


Figure 16 Schematic of Lauder Scheme Intake - Permit 2001.710

8.4 Water Use

The Lauder Scheme delivers water from Lauder Creek to 10 water users on the Lauder Race system. Some of these water users also receive private water authorised via water permits, and/or OAIC Main Race water, and in one case OAIC Thomson creek water. The table below provides details of the 10 water users receiving water from the Lauder Scheme.

Table 8 Summary of Water Users receiving water from Lauder Race

Lauder Race Water Users (Shareholder Name)	**Other water sources**	**Legal Description, Location of Use**
Hill, Dave	OAIC Main Race Private: RM17.203.01 to take from unnamed tributaries of Thomson Creek (Expiry 2044; not in this application).	Section 1A Matakanui SETT Block III Lauder SD (OT/13A/1282) Section 17 Block VI Lauder SD (OT/3D/1150)
Glassford, Tony and Karen	OAIC Matakanui Race Private: WR380B, WR382B.V1, WR378B.V1 to take from Lauder Creek.	LOT 2 DP 337168, Sections 8, 38 44 54-56, PT Section 33, 37 BLK VI, Section 9, 10, 12-14, PT Sec 35, BLK X Lauder SD (OT/9B/574)
Groundwater, Barbara and Alastair	No other sources of water	Section 6, 7 and 42 Block VI Lauder SD (OT/14C/195)
Avonrath (Clouston, Geoff)	Private: RM19.448.01, 98122. 2004.788 to take from Lauder Creek and Tributary of Lauder Creek.	LOT 2 Deposited Plan 329435, Section 5, 13, 16, 21, Part Section 4 Block V Lauder SD (OT/314/164)
Gillespie, Anna and Ben	OAIC Main Race Private: 2009.432.V1, 433, 462 to take, discharge, dam unnamed tributary of Manuherikia River (Expiry 2026; not in this application)	Sections 46, 47, 56, 60, Block III lauder SD LOT 2 Deposited Plan 428616 LOT 2 Deposited Plan 357148 (OT/9C/95)
Hamilton, Marcus	No other sources of water	LOT 1 DP 22370 (OT/14B/74)
Heckler, Murray (now James and Kelly)	Private: Permits 94548 and 96779, both to take water from Lauder Creek.	LOT 3 DP 422600, Section 1 SO 24145, Section 22-23, 46, 49 BLK V, Section 15 BLK X, Lauder SD (OT/6B/1217)
Milmor (Milne Family)	OAIC Matakanui Race OAIC Main Race	Section 5 Block VI Lauder SD LOTS 1, 2, 4, 5, 36 Deposited Plan 359982 (OT/14B/522) (0/0/244002)
Muir, Max	None	LOT 1 DP 23431 Lot 1 DP 16391 (OT/15C/85)
Wildon Dairy Ltd (C Webster)	OAIC Main Race Private: RM17.022.01 to take from Thomsons Creek (Expiry 2042; not in this application)	Sections 14, 15, 16, 32 Block VI Lauder SD (OT/14B/1114) Lot 2 Deposited Plan P 403585 Sections 4A 8A Matakanui SETT Sections 15, 20, 43 Part Sections 25 Block III Lauder SD (OT/7D/1319)

The figures below provide a map of the 10 water users receiving water from the Lauder Scheme in relation to the route of the Lauder Race and property boundaries, and indicative irrigation areas.

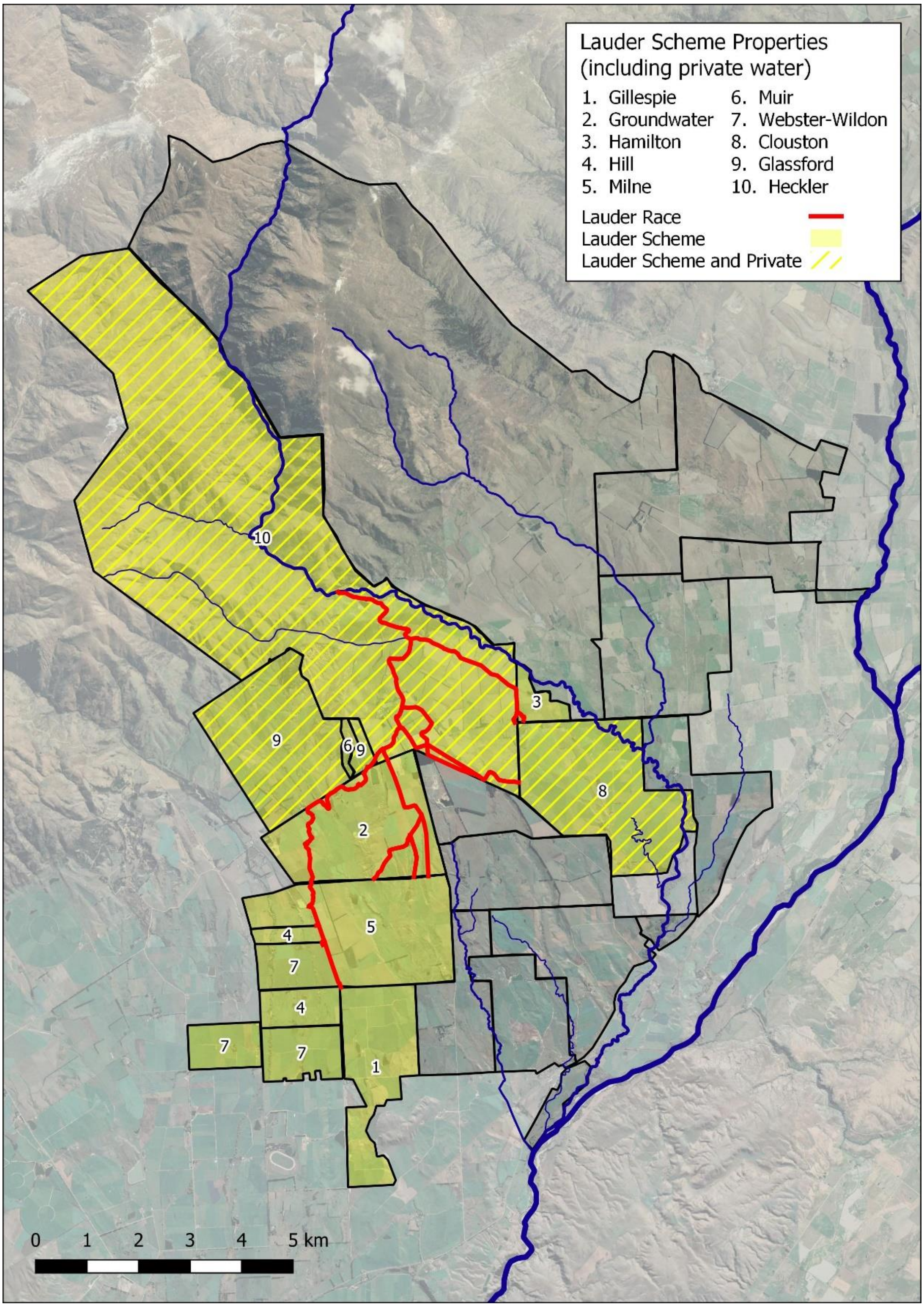


Figure 17 Map of Lauder Scheme Members' properties relative to Lauder Race

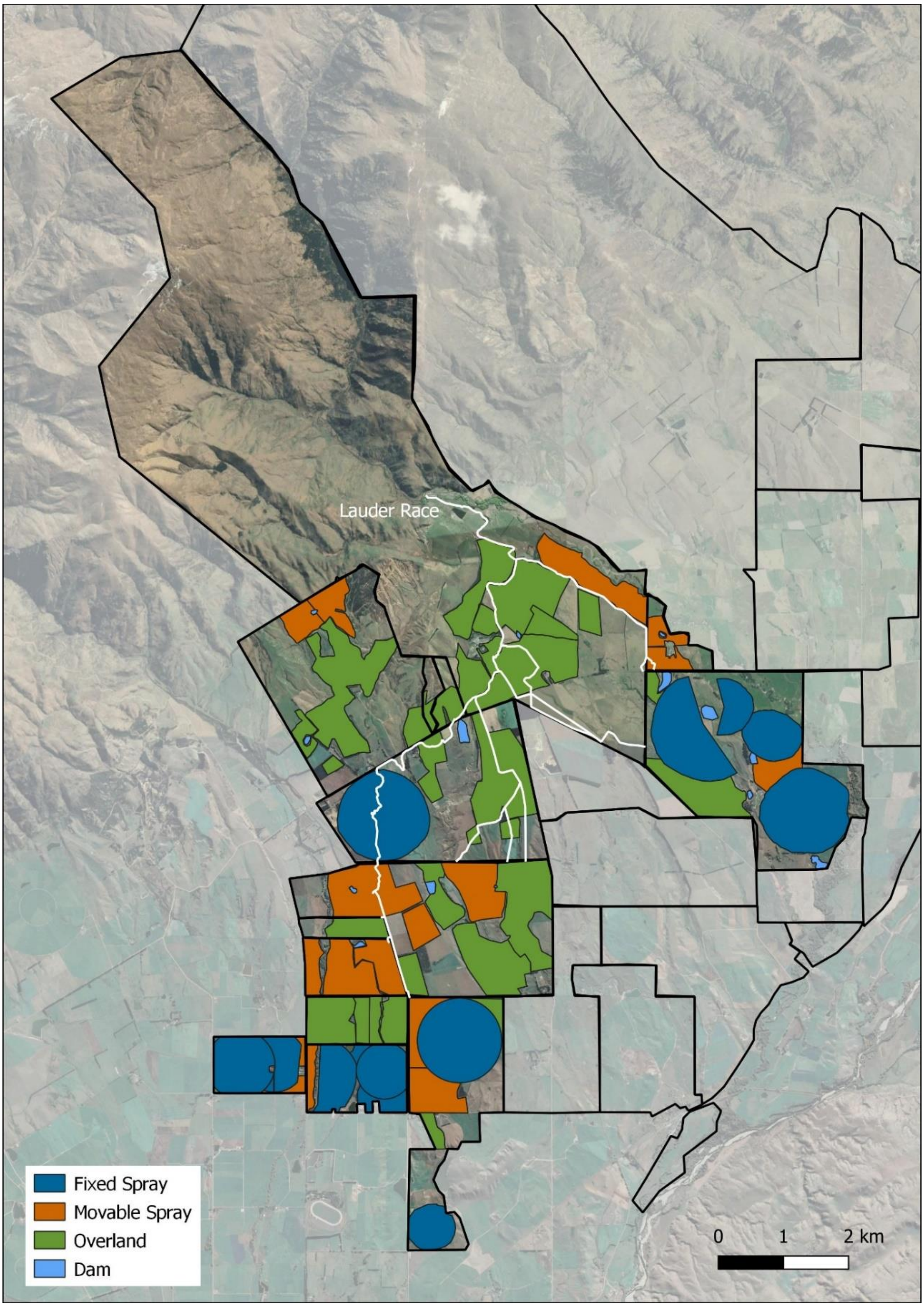


Figure 18 Map of Lauder Scheme Members' indicative Areas by type (indicative only)

An overview of Lauder Scheme members' use of water is provided below in the following sections.

8.4.1 Hill, David and Susan

Water Permits

David and Susan Hill hold the water permit detailed in the table below.

Table 9 Water Permit held by Hills

Permit	Location	Expiry
RM17.203.01	Unnamed Tributary of Thomson Creek	9 May 2044

RM17.203.01 does not form part of this application.

OAIC Shares

The Hills receive water from the Main Race and the Lauder Race.

Farming Operation

David and Susan Hill's 152.4 ha property is located at Mawhinney Road, approximately 6.5 km north of Omakau. There are two farm blocks, 'Top Block' and 'Home Block'. The two farm blocks are separated by a neighbouring property owned by Wildon Dairy Ltd.

The land in both blocks is undulating with predominantly pasture cover. The farming operation is livestock grazing and predominantly sheep. They have a breeding flock of around 1,200 ewes, and they fatten the lambs on the property. The Hills are able to irrigate up to 136.3 ha.

Water Use and Supply

The Lauder Race water is used on the 'Top Block'. The approximate area of this block is 41 ha. Of this, approximately 28 ha is irrigated by overland flow methods.

The 'Home Block' utilises both the private right water under RM17.023.01 and the Main Race water. The approximate area of this block is 108.3 ha, of which 73.3 ha is irrigated using Main race water and 35 ha is irrigated using the private water. All irrigation is applied via overland flow methods.

In the future, the Hills propose to upgrade the irrigation infrastructure on the entire property to spray irrigation (K-lines and fixed grid) methods and pumped from the storage dam.

Water Balance and Efficiency

It is important to consider the use of water against Aqualinc's calculation of an efficient annual use of water.

Table 10 Water Balance - Hills

Water Source	Aqualinc calculated annual demand m^3/year	Irrigation Area ha	Equivalent ha[3]	Volume allocated by OAIC m^3/year
OAIC Lauder Race delivery	392,774	136.3	28	366,878
OAIC Main Race delivery	562,770		70.3	377,077
Private water, Unnamed tributary Thomson Creek RM17.203.01	268,290		35	268,290 (as authorised on consent)
Total	**1,223,837**			**1,012,245**

The Aqualinc calculations estimate the efficient volume of water for the whole 136.3 ha irrigated would be 1,223, 837 m^3/yr. The table above demonstrates that the amount requested of 1,012,245 m^3/yr falls below the annual demand as calculated by Aqualinc.

[3] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

8.4.2 Gillespie / Two Farmers Farming

Water Permits

The Gillespies hold the water permits detailed in the table below.

Table 11 Water Permits held by the Gillespies

Permit	Location	Expiry
2009.432.V1	To take and use water as primary allocation from an unnamed tributary of the Manuherikia River	01/10/26
2009.433	To dam water in an un-named tributary of the Manuherikia River	01/10/26
2009.462	To discharge water from a dam to an unnamed tributary of the Manuherikia River for the purpose of operating a dam	01/10/26

These three permits do not form part of this application.

OAIC Shares

The Gillespies receive water from both the Lauder Race and Main Race. The way in which the water is used is described below, and this information also informs the OAIC Main Race Application prepared by Landpro consultancy.

Farming Operation

The Gillespies own and operate Two Farmers Farming as a beef finishing and grazing property. The property is 394 ha in total, of which approximately 265 ha is irrigated. All but 30 ha of irrigation is applied with spray methodology including centre pivots and hard hose guns. The flat finishing property is used to grow pasture and stock feed crops to run a beef finishing dairy grazing unit. The property runs 9,000 stocking units. The business uses local contractors and services for many on-farm tasks.

The Gillespies began leasing the farm in 2011 and have been developing and modernising the property ever since. They added storage dams and upgraded the irrigation system to spray application. There are three storage ponds. The medium dam holds 30,000 m^3, the small dam holds 4,000 m^3, and a dam shared with a neighbour holds 20,000 m^3. Total irrigation development costs including subdivision and stock water to fully utilise feed grown are estimated to be $2,000,000.

In 2020, the Gillespies were named regional supreme winners in the Otago Ballance Farm Environment Awards[4]. They were commended for their environmental improvements (new wetlands, on-site

[4] Ballance Farm Environment Awards Entrants 2020 (nzfeatrust.org.nz)

nursery to grow native plants for riparian planting) and preventing negative environmental impacts by utilising buffer zones, precision irrigation and a 'right pasture, right time, right place' philosophy.

Water Use and Supply

Both sources of water from the OAIC (Lauder Race and Main Race) arrive by race and are delivered to the dams. The irrigation system on the farm is all piped from the dams. Both sources of water are mixed on the farm.

The Gillespies strictly manage their water application with the use of soil moisture strips, soil temperature, and rainfall data to aid their decision making on farm. The centre pivot also has VRI technology so exact water depths can be delivered to different areas of each paddock. Stock water is sourced from a shallow bore on farm and is reticulated to troughs in every paddock.

Water Balance and Efficiency

It is important to consider the use of water against Aqualinc's calculation of an efficient annual use of water.

Table 12 Water Balance – Gillespies

Water Source	Aqualinc calculated annual demand m^3 /year	Irrigation Area ha	Equivalent ha[5]	Volume allocated by OAIC m^3/year
OAIC Lauder Race delivery	206,065	265	24.5	224,777
OAIC Main Race delivery	1,940,438		180	1,655,780.6
Private water (not in this application)	286,250		31.2	286,250 (consented)
Total	**2,432,753**		**235.7**	**2,166,808**

The Aqualinc calculations estimate the efficient volume of water for the whole 265 ha irrigated would be 2,432,753 m^3/yr. This is the equivalent of 9,180 m^3/ha/yr. Using that figure, the equivalent hectares each water source would support can be deduced.

The table above demonstrates that the total volume allocated by OAIC and consented for the irrigated area (2,166,808 m^3/yr) of the farm is less than the efficient volume for the property as calculated using Aqualinc.

[5] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

8.4.3 Hamilton

Water Permits

The Hamiltons do not hold any water permits.

OAIC Shares

The Hamilton receive Lauder race water.

Farming Operation

The Hamiltons have a small farm on the rolling hills and flats close to the foothills of the Dunstan Range at the top of the Lauder catchment. The total property area is 64 ha, of which 40 ha can be irrigated. The water is applied using k-line spray and a travelling irrigator. There is a small amount of contour flood on 5 ha that is used and leads to the pond filling up after application. The rest of the farm is then irrigated from the pond. The water on this farm provides a small amount of feed to make it productive. Without that it would be a dryland farm with little option to make a steady return on only 64 ha.

Water Use and Supply

There is one source of water on this small farm, the OAIC Lauder Scheme race water. It is delivered to the pond at the top of the irrigated area. The water is delivered to the paddocks via underground pipes. There are hydrants in each of the paddocks that the spray systems connect to.

The Hamiltons grow lucerne, pasture and kale for winter feed under their irrigation. They primarily use the winter crop to graze heifers for dairy farmers. They generally graze about 250 heifers through April to August.

The property is fully serviced with pipes and troughs for stock water which is not sourced from the Lauder Scheme water.

Water Efficiency

It is important to consider the use of water against Aqualinc's calculation of an efficient annual use of water.

Table 13 Water Efficiency - Hamilton

Water Source	Aqualinc calculated annual demand m^3/year	Irrigation Area ha	Volume allocated by OAIC m^3/year
OAIC Lauder Race delivery	305,452	40	250,614

The table above demonstrates that the total volume allocated by OAIC is less than the efficient volume for the property as calculated using Aqualinc.

8.4.4 Milmor – Milne Family

Water Permits

The Milnes do not hold any private water permits.

OAIC Shares

The Milnes receive water from three OAIC water sources, including the Lauder Race, Main Race and the Matakanui Race (Thomson Creek).

Farming Operation

'Milmor' is farmed by Scott and Briar Milne in partnership with Scott's parents Ralph and Nikki. Milmor is a sheep and beef breeding and finishing property. Currently 6,500 stock units are managed on this property. The farm consists of a flat/rolling block (615 ha) where the irrigation is used to improve the pasture production, with a support block of hill country (1,800 ha) in the Thomson creek area[6]. The Milnes aim to finish all their stock rather than sell them as store lambs or calves.

Of the 615 ha of the flat/rolling block, 400 ha can be irrigated. Of that 400 ha, 170 ha is currently set-up for spray application methods and the rest via overland flow. The Milnes are in a new development phase. By investing in the on-farm irrigation infrastructure, water storage and new pasture species, the Milnes aim to improve water use efficiency, produce a more reliable and consistent feed supply to finish their stock. On-farm storage evens out the water supply curve for the farm.

Water Use and Supply

The water is delivered to the farm via the OAIC race system on roster and goes straight to the dams. The Milnes are then able to pump from the dams to apply the water as little and as often as required (rather than the rostered flood irrigation system). Two new ponds were built last year to take the total number of storage ponds to four. Water storage capacity currently consists of 130,000 – 140,000 m^3 (110,000 m^3 of this is new, whilst 20 – 30,000 m^3 is old).

The water is conveyed around the property in pipes and races. Wherever new pipework has been installed it has been done to a standard that would suit the change from guns to centre pivots in the future.

The irrigation water is used to grow pasture for summer and winter feed for stock feed crops. There is a system of stock troughs throughout the farm. The Lauder scheme water supplies stock water.

[6] Milmor support block not mapped as part of this application.

Water Balance and Efficiency

It is important to consider the use of water against Aqualinc's calculation of an efficient annual use of water.

Table 14 Water Efficiency – Milmor

Water Source	Aqualinc calculated annual demand m^3 /year	Irrigation Area ha	Equivalent ha[7]	Volume allocated by OAIC m^3/year
OAIC Lauder Race	2,259,097	401.1	82.4	729,881
OAIC Main Race	1,129,548.4		30	263,207.5
OAIC Matakanui Race from Thomson Creek	163,394		4.4	39,294
Total	**3,552,039**			**1,032,382**

The Aqualinc calculations for Milmor show that the efficient volume for the irrigation on this property would be 3,552,038 m^3/yr. That is the equivalent of approximately 8, 858 m^3/ha/yr. Using that figure, the equivalent hectares each water source would support can be deduced.

The table above demonstrates that the total volume of water allocated by the OAIC is 1,032,382 m^3/yr which is well below the efficient volume as calculated using Aqualinc.

[7] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

8.4.5 Muir family

Water Permits

The Muir family does not hold any water permits.

OAIC Shares

The Muir family use a small amount of water from the Lauder Race.

Farming Operation

The Muir property is a small lifestyle block of 22 ha. The property was purchased by the Muirs in the early 1980s. It was a rocky gully with low productive value.

The Muirs have spent the last 32 years transforming the block into a forested haven for wildlife. There are now extensive plantings of trees, wetland areas, and regenerated pastures on the block. Speciality timber trees such as oaks and black walnut have been planted and pruned. Pines and a hazelnut orchard are also on the block.

The boggy area at the bottom of a slope has been enhanced to form a wetland. There are now frogs and other wildlife that inhabit the area.

The irrigation water is used to irrigate the hazelnut, other trees, some pasture and maintain the wetland area via flood irrigation over up to 7 ha. Further dryland pasture paddocks are leased for grazing.

The stock on the farm includes geese and goats.

Water Use and Supply

There is one small supply of water on this property from the OAIC Lauder Scheme. The water is delivered to the farm via the OAIC race system. The water is also relied on for irrigation, stock water purposes, and for ponds in the wetland area.

Water Efficiency

It is important to consider the use of water against Aqualinc's calculation of an efficient annual use of water.

Table 15 Water Efficiency - Muir family

Water Source	Irrigation Area ha	Aqualinc calculated annual demand m^3 /year	Requested allocated by OAIC m^3/year
OAIC Lauder Creek Race	7	58,735	25,836

The table above demonstrates that the total volume allocated by OAIC for the irrigated area of the farm is less than the efficient volume for the property as calculated using Aqualinc.

8.4.6 Webster - Wildon Dairy Ltd

Water Permits

Table 16 Water Permits held by Wildon Dairy Ltd

Permit	Location	Expiry
RM17.022.01	Thomsons Creek	2042
RM15.242.01	To abstract groundwater	2050

These two permits do not form part of this application.

OAIC Shares

Wildon Dairy Ltd receive water from both the Lauder Race and the Main Race. This application supports the OAIC Main Race Application prepared by Landpro.

Farming Operation

Wildon Dairy Limited operate two blocks that are located near each other. The block located at 521 Racecourse Road, Omakau, is used for the dairy farm known locally as 'Wildon Dairy'. The other block (known as 'Jacks Block') is located further north on Racecourse Road and operates as a support block.

In recent years, the applicant has upgraded irrigation infrastructure on the property with the complete phasing out of contour irrigation and installation of k-line, centre pivot and solid set sprinklers on the Wildon Dairy block. No additional upgrades are required on farm. The total area that can be irrigated on the farm including Jack's block is 373.4ha.

In the future, the remaining 15ha of border dyke will be phased out on the Jacks Block and the water users are looking at installing additional storage on farm in a location where gravity can be utilised to irrigate the property.

Water Use and Supply

<u>Wildon Dairy Block</u>

The Main Race irrigation water is delivered to Wildon Dairy along the northern property boundary via the Main Race directly. The water user has flexibility with how they access this water, either from the Main Race or a feeder race and can use it on demand. Usually, though, water is delivered directly to the 60,000 m^3 storage pond and pumped from there to the irrigable area via underground pipes. Main

Race water and private water enables irrigation for up to 261 ha. The water is applied using solid set, centre pivots and k-line. The whole farm has been modernised with efficient spray systems.

Up to 900 dairy cows are milked on Wildon Dairy and stock drinking water is provided from the bore located near to the dairy shed as authorised by way of a separate permit. The property supports a reticulated stock drinking water supply.

Jacks Block

Wildon Dairy Limited also own a block to the north called Jacks Block. This block is 127 ha, of which 112.5 ha is set up for irrigation. The block receives Lauder Water only and is one of the last properties on the Lauder Race.

Irrigation on Jacks block is via gun spray for approximately 96 ha and 15 ha of border dyke. Lauder race delivers water to the property and it can either be turned out from the race directly to border dyke the 15 ha or be delivered to the storage pond for pumping to the gun. This storage pond is approximated at 10,000 m^3. Irrigation water is used to irrigate crops and pasture. Surplus feed grown in summer is harvested for winter feed, with the Jacks Block running replacement stock for Wildon Dairy and Satinburn Dairy[8] (owned by the same owner).

Jacks Block provides stock drinking water from the Lauder Scheme. Stock drinking water is reticulated throughout the spray irrigation areas, and open races provide drinking water in the border dyke paddock.

Water Balance and Efficiency

It is important to consider the use of water against Aqualinc's calculation of an efficient annual use of water.

[8] Satinbury Dairy does not form part of this application

Table 17 Water Balance – Wildon Dairy Ltd

Water Source	Aqualinc calculated annual demand m^3 /year	Irrigation Area ha	Equivalent hectares[9]	Requested allocated by OAIC m^3/year
OAIC Lauder Race delivery	602,190	373	49.5	365,586
OAIC Main Race delivery	2,752,870		198	1,461,641.8
Private Water RM17.022.01	637,200		86	637,200 (as consented)
Total	**3,355,061**		**333.5**	**2,464,428**

Using Aqualinc the efficient volume of water for the 373 ha irrigated would be 3,355,061 m^3. That would be the equivalent of 7,380 m^3/ha/yr on average. Using that figure, the equivalent hectares each water source would support can be deduced. The table above demonstrates the volumes being requested or already consented for this farm are below the calculated efficient volume as calculated using Aqualinc.

[9] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

8.4.7 Groundwaters

Water Permits

Barbara and Alastair Groundwater do not hold any water permits for this farm.

OAIC Shares

This property receives water from the Lauder Race.

Farming Operation

The Groundwaters run a sheep and beef breeding and finishing operation. The property subject to this application is run in co-operation with Lilybank Co. Ltd (Refer Section 9.10) and Beggs Creek Station.[10]

The Groundwater family farming business supports three Groundwater families, including Barbara and Alistair Groundwater, their son's family (Mark and Kate Groundwater, and children) and their daughter's family (Kirstyn and Brad McEwan, and children).

As well as the family members there is one fulltime worker on Beggs Creek Station and another fulltime worker on Lilybank. The business uses local contractors and services for many on farm tasks. They also employ a Lincoln student over summer to assist with the summer wok programme which includes tailing, weaning, irrigation shifting, stock management, sowing crops, harvesting and selling.

Water Use and Supply

The OAIC Lauder Scheme water is delivered via the Lauder Race to the Groundwater's 'Home Block'. The total area is 556 ha of which 303 ha is set-up for irrigation. The Groundwaters have invested heavily in improving the efficiency of the Home Block irrigation systems, including the installation of a centre pivot covering 150 ha to replace some of the overland flow methods. A dam with 100,000 m^3 of storage capacity has been built to assist with levelling out the water supply for the pivot's continual use pattern.

[10] Beggs Creek Station is the subject of the Thomson Creek catchment application

Water Balance

It is important to consider the use of water against Aqualinc's calculation of an efficient annual use of water.

Table 18 Water Efficiency – Groundwater Home black

Water Source	Aqualinc calculated annual demand m^3 /year	Irrigation Area ha	Volume allocated by OAIC m^3/year
OAIC Lauder Race delivery	2,603,343	303	865,522

The summary above demonstrates the volume allocated by the OAIC is well below the calculated efficient volume as calculated using Aqualinc.

8.5 History of Use Records Permit Lauder Scheme 2001.710

Water use records are held at the ORC and the data is summarised here. No alternative water use records are provided.

Where required, abstraction records were sourced from the Otago Regional Council's Hilltop Database directly for data filtering and analysis purposes. Data was processed using excel software. The approach is consistent with recent hearing decisions (see: Long Gully Race Society RM17.176; and Queensbury Ridges Ltd (pending appeal) RM19.312), and the method proposed by the Otago Water Resources Group[11]. The water meter has been verified frequently and so this record of abstraction is true and accurate.

8.5.1 Water Use Records Permit 2001.710

a) Rate of Abstraction

The figure below shows the rate the rate of abstraction for this permit measured at WM0107.

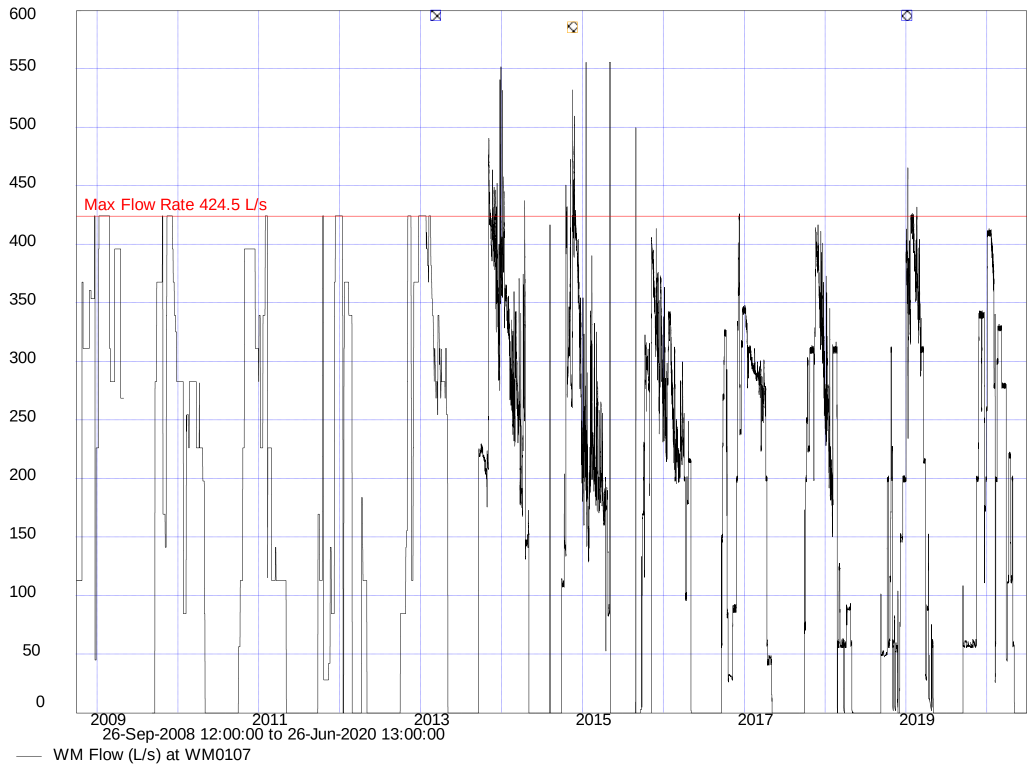


Figure 19 Rate of Abstraction measured at WM0107 for Permit 2001.710

[11] Submission by Otago Water Users Resource Group on Proposed Water Permits Plan Change (Plan Change 7) to the Regional Plan: Water for Otago.

The consented rate of abstraction for this Permit is 424.5 l/s. The history of use data demonstrates a maximum recorded rate of abstraction of 556.58 l/s. The ORC compliance sheet[12] notes several short-term abstraction exceedances during 2012-2013, 2013-2014, and 2014-2015, and because the 2018-2019 season was very wet, this resulted in less water being abstracted when compared to previous seasons. Overall, ORC notes the consented abstraction rate is complied with.

Incorrect readings, exceedances or zeros can often be the result of faulty equipment, flood or weather events, or other legitimate issues. In this case, and as noted in the ORC compliance water inspection sheet for this Permit, the exceedences are attributed to weather events, producing unreliable data returns.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum has been specified as the maximum recorded rate of take for exceedances within the water meter's margin of error, and these exceedances are acknowledged.

The maximum (filtered) rate of abstraction for this Permit is 424.5 l/s.

b) Monthly Volumes Abstracted

The figure below shows the monthly volumes abstracted for this permit measured at WM0107.

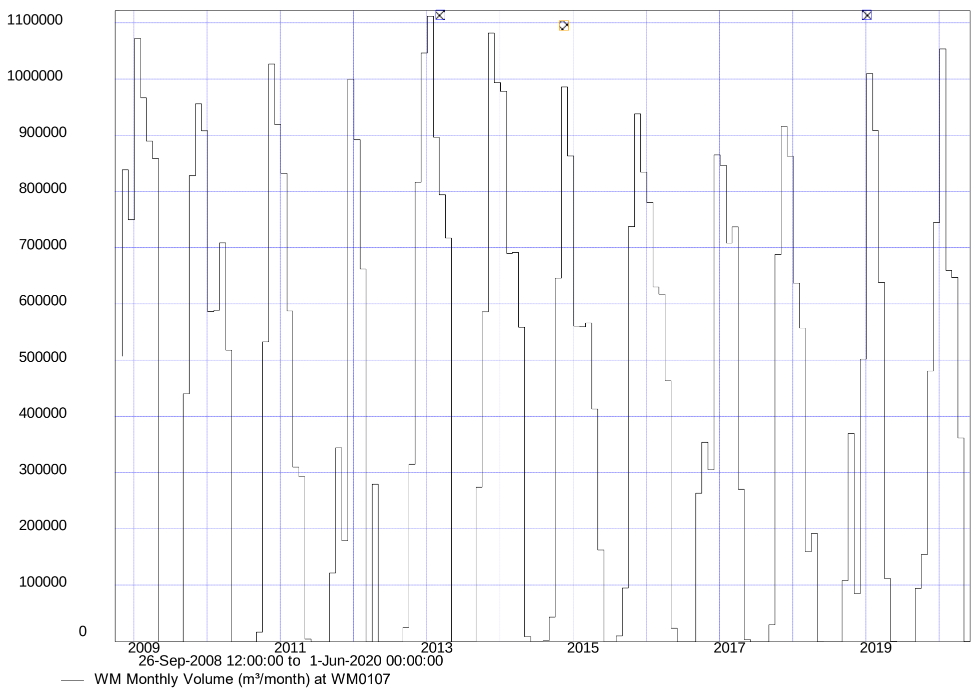


Figure 20 Monthly abstraction volumes measured at WM0107 for Permit 2001.710

[12] ORC Inspector Byron Pretorius, dated 19 January 2019

There is no monthly volume abstraction limit imposed on this Permit. The maximum recorded monthly volume is 1,116,256 m^3 in February 2013.

Due to the unreliable data returns, as discussed above, abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the (calculated) consented maximum has been specified as the maximum recorded monthly volume.

The maximum (filtered) monthly abstraction volume for this Permit is 1,114,975 m^3.

c) Annual Volumes Abstracted

The table below shows the annual volumes abstracted under this Permit.

Table 19 ORC held data showing annual volumes at WM0107

Yearly Volume at WM0107	(m^3/year)
2/09/2010	5,518,281
2/09/2011	4,528,636
2/09/2012	3,474,423
2/09/2013	5,728,688
2/09/2014	5,868,841
2/09/2015	4,817,753
2/09/2016	**5,137,153**
2/09/2017	4,360,282
2/09/2018	4,048,168
2/09/2019	3,739,500
2/09/2020	4,202,977

There is no annual volume abstraction limit imposed on this permit. This table shows that the maximum annual volumes abstraction 5,137,153 m^3 occurred in 2016.

Due to the unreliable data returns, as discussed above, abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the maximum annual volume abstracted under this permit is 5,848,090 m^3.

8.6 Summary of Water Use Records OAIC Lauder Race Intake

A summary of the water use records for Permit 2001.710 is provided in the table below.

Table 20.Summary of water use records for OAIC Permit 2001.710

Permit	Consented rate of take l/s	Max rate of take recorded l/s	Consented monthly volume m^3	Max monthly volume recorded m^3	Calculated Consented annual volume m^3	Max annual volume recorded m^3
2001.710	424.5	424.5 (Filtered)	1,114,975m*	1,114,975m^3 (Filtered)	13,379,697*	5,848,090 (Filtered)

8.7 Overall Water Balance – Permit 2001.710 Lauder Race Intake

The results of the water balance exercise undertaken for each property in the Lauder application is attached in Appendix K.

A summary from the Appendix highlighting the water demand that each farm has for their Lauder Scheme water is summarised below. All the properties except three (Muir, Groundwater and Hamilton) have at least one other source of water.

Table 21 Overall Water Balance Calculations Permit 2001.710 Lauder Race

Property	Total Area Irrigated per farm (ha)	Total demand volume per farm as determined by aqualinc m^3	Calculations of demand for Lauder Race water m^3
Clouston	451.9	3,874,294.58	2,268,806.00
Gillespie	265.9	2,432,753.14	206,065.00
Glassford	245.4	1,991,639.01	256,820.00
Groundwater	303.1	2,603,343.05	2,603,343.05
Hamilton	40.0	305,452.18	305,452.18
Heckler	410.7	3,568,301.96	1,969,092.96
Hill	136.3	1,223,836.70	392,774.00
Milmor (Milne)	401.1	3,552,038.97	2,259,097.00
Muir	7.0	58,735.89	58,735.89
Wildon (Webster)	373.4	3,355,060.63	602,190.00
Total	**5,468.9**	**22,965,456.11**	**10,922,376.08**

The table above demonstrates the following key points:

I. the volume of water available to the OAIC Lauder Scheme water users of 5,848,090 m^3 is well below the total efficient volume as calculated by Aqualinc of 10,922,376 m^3 required for the proportional area on farms irrigated by Lauder water.

II. the total annual volume requested of 5,848,090 m^3 is sufficient to efficiently irrigate approximately half the area it currently covers.

III. All Lauder Scheme properties actually require more water to optimally irrigate the areas already being irrigated as calculated by Aqualinc.

8.8 Water use Efficiency – Permit 2001.710 Lauder Race Intake

The OAIC Scheme Management Plan (Appendix J) sets out the measures to improve water use efficiency across all of its sub-schemes, including the Lauder Race Scheme. A central objective of the OAIC is to supply shareholders with their water entitlement whilst operating the Scheme as efficiently as possible by minimising water loss from the system. Key water use efficiency measures include:

- All shareholders sign a water agreement that governs the efficient use of water allocated for each property
- Ongoing conversions to spray irrigation using centre pivots and other modern spray systems within the command area
- Water is supplied to shareholders using a roster system based on the number of irrigable hectares on their properties
- Increasing awareness and development of on-farm water storage
- Replacement of aged infrastructure to minimise losses, for example PE pipe being introduced to replace steel and concrete siphons
- Installation of automated water meters to ensure the Scheme can be effectively monitored.

Combined, these measures reduce any water losses and improves efficiencies.

8.8 Allocation Requested / Outcome Sought

As discussed in Section 9.3, it is proposed to shift the intake location for Permit WR432B upstream to the location of the OAIC Permit 2001.710 Lauder Race intake. This applicant requests a two-year transition period to complete this transfer – including the abstraction and delivery of water into the OAIC intake site and delivery race. Once transferred, the combined rate of take will be reduced, as reflected in the draft permit in Appendix C.

Table 22 Allocation Request, OAIC, Permit 2001.710

One consent	1 point of take
Purpose	Irrigation, water storage, stock water and domestic supply
Point of take:	As per existing consent
Rate of take l/sec:	424.5 for 2 years then 450 (in combination with Moran Brown Permit)
Monthly limit m^3:	1,114,975 for two years and then 1,205,280
Maximum annual volume m^3:	5,848,090 for two years and the + 1,469,226 (Moran Brown) = 7,317,316
Residual flows at Point of Take	NA
Lauder Residual:	Applicant to comply with sub-catchment residual of 100 l/s at OAIC Weir
Abstraction:	1 July to 30 June following year
Minimum flow:	Operative minimum flow

A draft permit with proposed conditions is provided in Appendix C.

8.8.1 Number of permits

The OAIC requests one permit with one point of take. The actual permit will have two points of take to allow for the two-year transition of the Moran Brown permit into the OAIC intake site.

8.8.2 Point of take and measuring

No changes to the existing point of take and measuring equipment are proposed. This permit has an exemption to measure away from the point of take.

8.8.3 Fish screens

A fish screen is recommended for this take to comply with the fish screening standard guidelines. A draft condition is included in the draft permits.

8.8.4 Residual flows

Based on the assessment undertaken by Hickey and Olsen (2020) (Appendix D), a residual flow of 100 l/s is proposed at the OAIC weir.

9. Private Water Permits being Replaced

9.1 Glassford, AW and KL

9.1.1 Water Permits

The Glassfords hold three deemed permits, as detailed below:

Table 23. Permits held by Glassfords

Permit No.	Location	Consented Abstraction Limits	Combined Consented Abstraction Limits	Total Combined Consented Abstraction Limit
WR380B	The left-hand branch of Lauder Creek, terminating at Blue Gully	41.7 l/s 150,000 l/hr	Total volume of water taken under WR380B and WR382B does not exceed 350,000 l/hr at any time.	Total combined volume of water taken under all three deemed permits shall not exceed 450,000 l/hr at any time.
WR382B.V1	A tributary of Lauder Creek, terminating at workings in Drybread Thomsons	55.5 l/s 200,000 l/hr		
WR378B.V1	Commencing in Sheppard's Gully, and terminating in Sluices Gully	27.8 l/s 100,000 l/hr		

9.1.2 OAIC Shareholder

The Glassfords receive water from the Lauder Scheme Race and the Matakanui Race.

9.1.3 Farming Operation

'Dougalston Farm' has been in the Glassford family since 1903. It is a sheep and beef fattening farm. The property is 603 ha of which up to 246 ha can be irrigated.

This property has both private right water and a small amount of water from OAIC via two race systems, the Lauder Scheme and the Matakanui Scheme. Unlike many other farms in the catchment the different sources of water are not mixed and are used on different paddocks. This property lies at the top of the catchment's rolling land in the foothills of the Dunstan mountains.

The water is used to grow pasture for stock feed. The Glassfords aim to finish all their own stock and in a good year bring in extra store lambs to fatten. The property typically carries 5,000 stock units.

This property supports the Glassford family and one part time staff member. Contractors and rural agents are also used by the business.

The property has an interesting water use history. As part of Matakanui Station the water rights were used for gold mining from as early as 1864. In 1903, Dougalston was subdivided and the water was used for gold mining and irrigation. In 1936, the gold mining ceased, and the irrigation continued.

The figure below provides an overview of the Glassford's property.

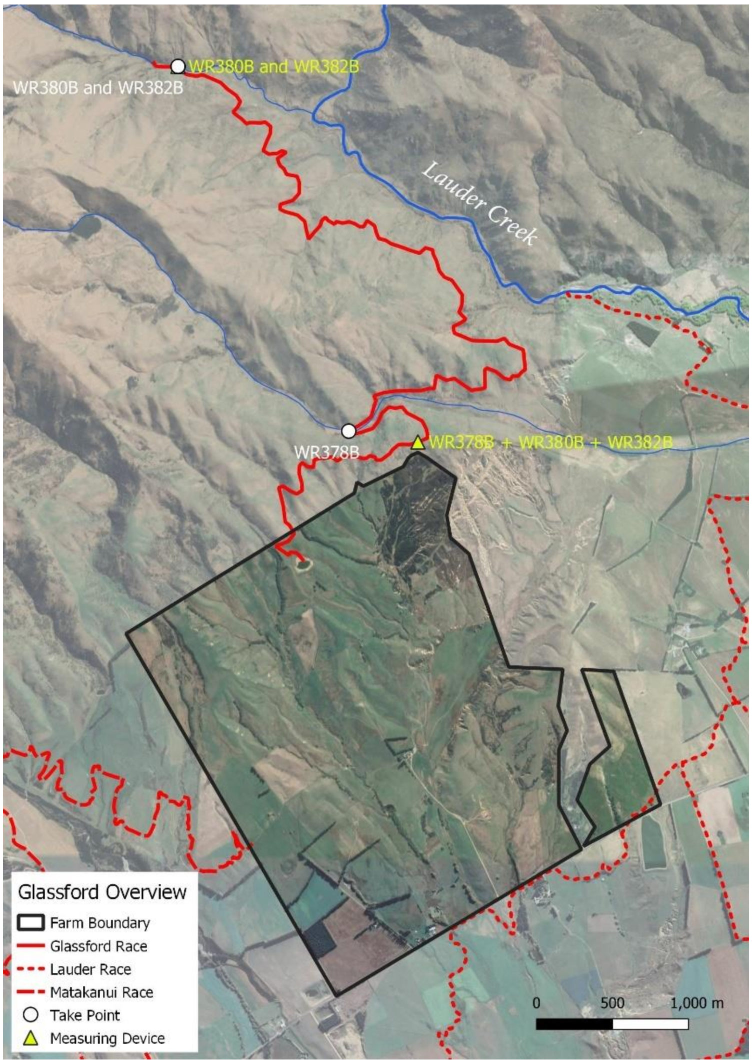


Figure 21. Overview map of Glassford's property and existing irrigation set up

9.1.4 Irrigation and Investment

The property is 603 ha, of which approximately 246 ha can be irrigated. Approximately 55 ha is irrigated by a gravity spray system called 'Ezirain' (similar to k-line application) and up to 191 ha irrigated using border dyke and contour flood. There is a small pond at the top of the farm that assists in providing a buffer for the spray irrigation. The private water is raced into the dam which was constructed in 1982.

In recent years, the Glassfords have focussed on upgrading their irrigation systems to modern spray systems, incurring the following investment costs:

Recent Infrastructure	Costs
Ezirain spray system	$140,000
Measuring equipment on intake sites	$20,000
TOTAL	**$160,000**

The measuring equipment also requires the annual servicing by specialised hydrologist.

The reliability of the water and the elevation of the property is such that any further investment in spray systems would not be financially viable for the Glassfords. The spray system already installed does not have the water supply to operate all season however the Glassfords can still make the investment pay as Ezirain was a lower cost investment compared to centre pivot or fixed grid spray options.

The water that is available during Spring and early Summer significantly improves the feed available from the paddocks.

9.1.5 Water Take and Water Use

The water supplied by the three private water rights is from two tributaries of the Lauder Creek, via two intake sites that feed water into the one race. There is a Section 417 Certificate for the intakes and races as these are located on the property above the Glassford's owned by the Hecklers (Appendix H).

The shared intake associated with Deemed Permits WR380B and WR382B is located in the unnamed tributary (also known as Welshmans Creek) approximately 950 m north-east of its confluence with Lauder Creek. The intake consists of sandbags with a control gate. An open channel weir is located down the race and includes a staff gauge for manual records under WM1260. This water is raced to the second intake.

The intake associated with the second site from Deemed Permit WR378B is located in Shepherds Gully, approximately 3.5 km north-north-east of the intersection with Muddy Creek. All the water the conveyed via one race that delivers to the farm. The water is electronically measured in this race. There is a water level sensor, data logger and telemetry. Water use data is telemetered to the ORC from water meter number WM0718, which represents all three permits in combination. Please note the ORC Exemption Report WEX0152 and the WEX Certificate itself incorrectly detail the coordinate reference for the combined metering site. However, ORC Compliance[13] advises the mapped location within that report is correct and is confirmed as being E1332925 N5014265. The intake sites are shown in the photographs below.

	
Photo showing Point of Take for Permits WR380B and WR382B on Welshmans Creek. *Source: ORC Inspection Sheets*	Photo showing concrete weir with staff gauge at point of take on Welshmans Creek *Source: ORC Inspection Sheets*
	
Photos showing raced intake location in Shepherds Gully – Creek flowing into race *Source: ORC Inspection Sheets*	Photo of race downstream of Creek *Source: ORC Inspection Sheets*
	Photo to the left showing combined metering location authorised under WEX0152 for all three permits.[14] *Source: ORC Inspection Sheets*

[13] Email correspondance with Alenka Abazovic dated 22/10/2020

[14] *Note correct metering location as confirmed with ORC, Oct 2020, is E1332925 N5014265.*

Figure 22 Photographs showing Point of Take, races, and measuring equipment for Permits

The water availability is variable throughout the irrigation season. During spring and early summer, the flow is the highest and the maximum abstraction rate is available. During these times the Glassfords are able to apply water with both their spray methods and use the contour irrigation systems. At the lower flows only the spray system is left operating. This provides crucial stock feed for their business. The small dam at the top of the farm captures the private right water.

As the private right water flow decreases the farm then relies more heavily on the company water (both Lauder Scheme and Matakanui race water) that is delivered to other paddocks during summer.

There are several little storage dams on the farm that assist the functioning of the irrigation system, with a total volume of approximately 60,000 m^3. These dams were all lawfully constructed at the time with the one at the top of the farm built most recently in 1982 and the smaller pond near the Matakanui Race in 1965.

Figure 23 Photograph showing dam at the top of the farm

9.1.6 Water Use Summary

The applicant uses multiple sources of water including water delivered via the OAIC Lauder and Matakanui Races, and water abstracted under private water rights. The different water sources are not mixed.

The table below provides a summary of water use for this property.

Table 24. Water Use Summary for Glassfords

Information	Property Details
Size of property	Dougalston Farm 603 ha
Size of area irrigated from all water sources	Up to 246 ha
Sources of Water	Lauder Creek - OAIC delivered water via the Lauder Race Lauder Creek – private water rights WR378B, WR380B, WR382B Thomson Creek – OAIC delivered water via the Matakanui Race
Maximum recorded rate of take (from metering data)	Private right 125 l/sec (Filtered)
Maximum recorded annual volume (from metering data)	Private Right 1,163,188 m^3 (Filtered)
Aqualinc calculation of maximum efficient use	1,991,639 m^3
Number of Stock	Uo to 5,000 stock units
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	Stock water is supplied from many of the water sources and delivered to paddocks through a pipe and trough system. Some of the races and small ponds are also used for stock drinking purposes.
Frequency of water take (average and maximum)	Maximum = 24 hours per day, 7 days per week, 4 weeks per month Average – varies depending on season, but usually continuously when water is available.
Months during which water is expected to be taken in a dry year	Private water: Generally, water is taken from Sept to May however the smallest amount of abstraction may occur outside the season due to very local catchment run-off in a large rain event.
Months during which water is expected to be taken in an average year	As above
Application timing	Water will be applied to the paddocks as the soil moisture starts to drop towards wilting point. Return intervals to paddocks will depend on water supply. As flows allow, the applicant will endeavour to keep the return intervals closer than 2.5 weeks. Some paddocks particularly the contour irrigated paddocks will be dropped out of the irrigation when flows are very low or rationed.
Does use of water provide recharge back into catchment?	A small amount of the contour flood application methods would recharge back. Caution is exercised with this system to avoid water quality impacts.
Is take from re-charge or is an augmented take?	No

Information	Property Details
On farm infrastructure	There has been some irrigation upgrading in recent years and the water is transported by a mixture of open races and pipes.
Storage for irrigation	Yes. Maximum of 60,000 m^3
Monitoring in place	Yes. Refer to the following section.
WEX required and obtained	Yes - existing WEX0152
s417 Certificate required and obtained	Yes – attached in Appendix H.

The figure below provides an overview of the irrigation by type on the Glassford's property.

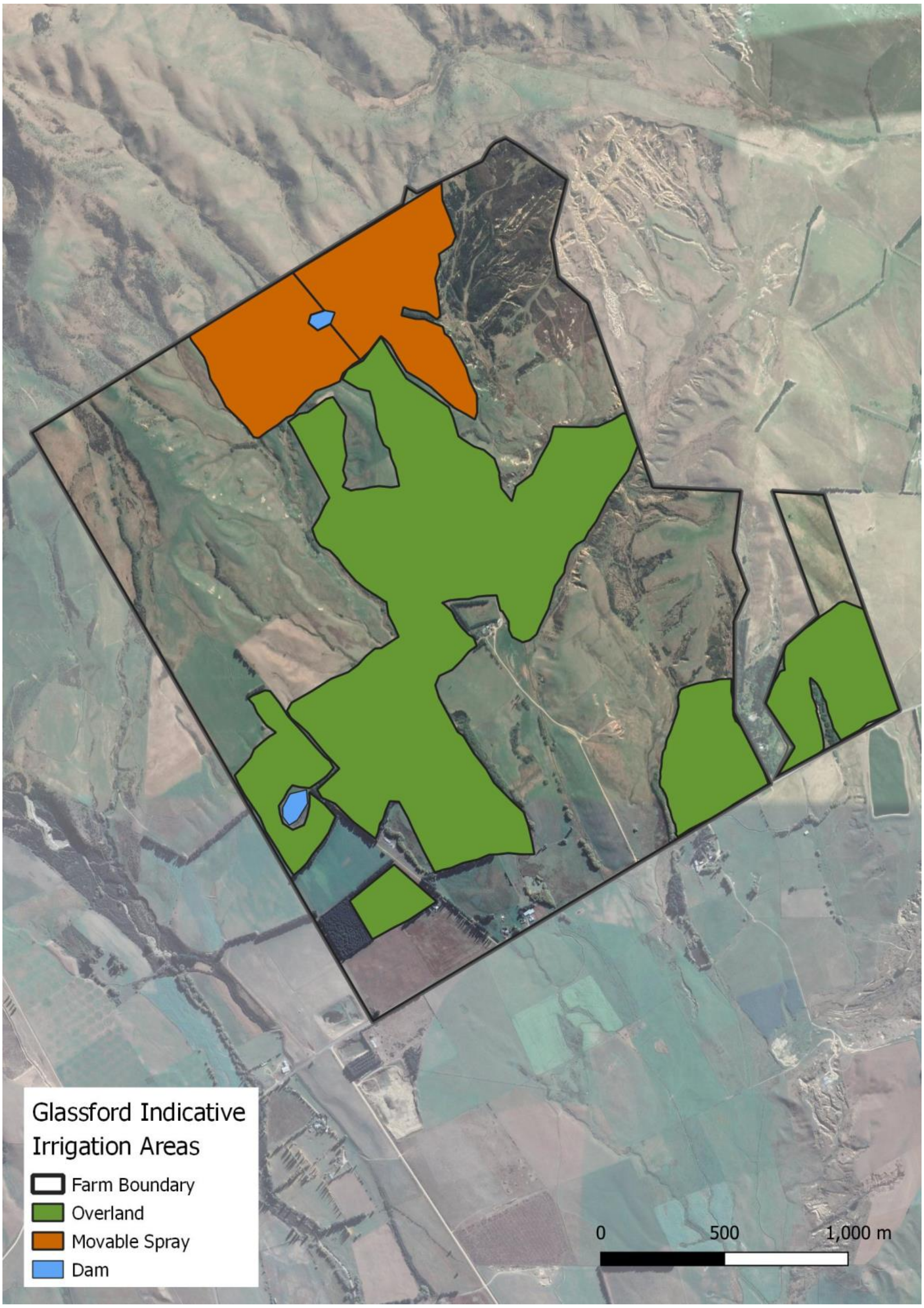


Figure 24. Irrigation on Glassford Property (note irrigation extents are indicative only)

9.1.7 Water Use Records

Water use records are held at the ORC and the raw data is summarised here.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for interrogating abstraction exceedances and for further data filtering and analysis purposes. Data was processed using excel software. The approach is consistent with recent hearing decisions (see: Long Gully Race Society RM17.176; and Queensbury Ridges Ltd (pending appeal) RM19.312), and the method proposed by the Otago Water Resources Group[15]. The water meter has been verified frequently and so this record of abstraction is true and accurate.

There are two verified water meters WM0718 and WM1260, installed by Cen Eng Ltd. Data from WM0718 is electronically recorded, logged, hosted by Aqualinc, and then telemetered to the ORC for compliance purposes.

Combined WR380B and WE382B intake site on Welshman's Creek

WM1260 measures the shared WR380B and WR382B intake site. It is a manual measuring device.

a) Rate of Abstraction WM1260

The figure below shows the combined rate of abstraction water use data for Permits WR380B and WR382B measured at WM1260.

15 Submission by Otago Water Users Resource Group on Proposed Water Permits Plan Change (Plan Change 7) to the Regional Plan: Water for Otago.

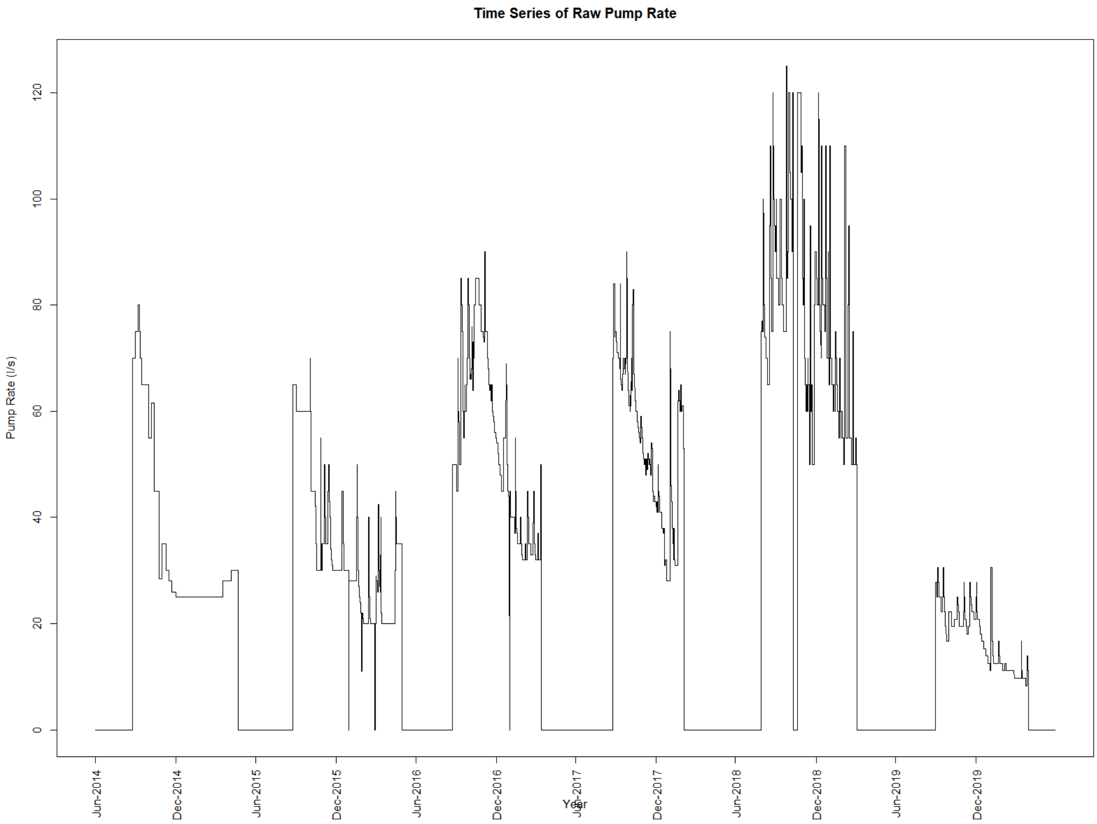


Figure 25 Rate of Abstraction data for WR380B and WE382B measured at WM1260

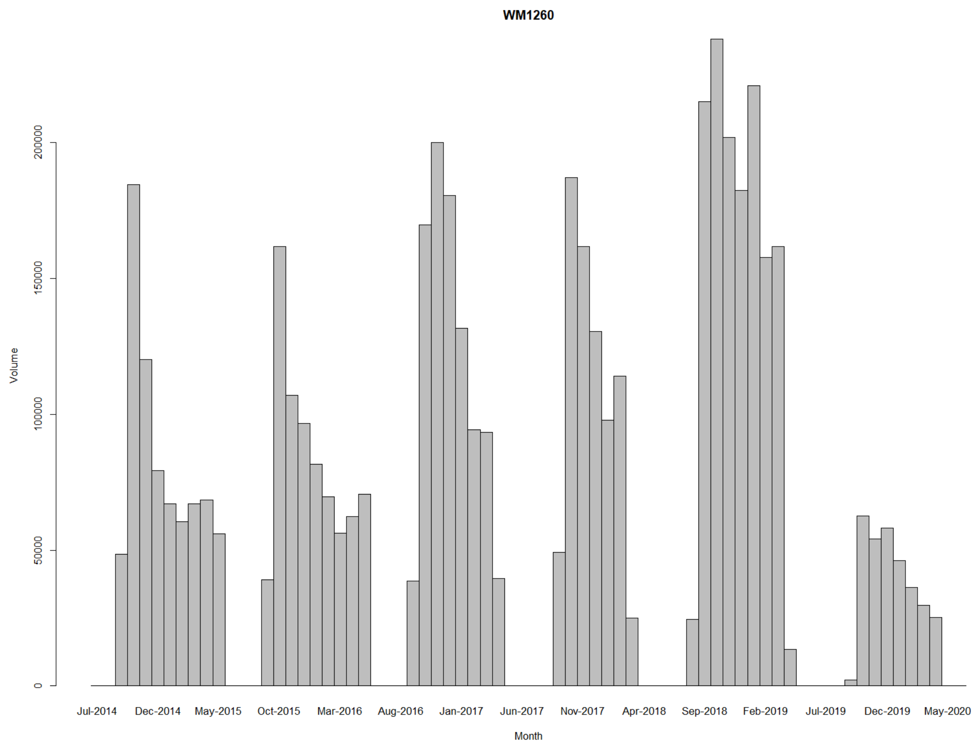
The authorised volume of water to be taken under WR380B and WR382B is 350,000 l/hr at any time, equivalent to 97.22 l/s.

The maximum recorded combined rate of abstraction for WR380B and WR382B is 125 l/s.

The electronic record as captured by the measuring device further downstream is a more accurate record of this water and the next take.

b) Monthly Volume WM1260

The figure below shows the combined monthly abstraction volume water use data for Permits WR380B and WR382B measured at WM1260.



The authorised volume of water to be taken under WR380B and WR382B is 350,000 l/hr at any time, equivalent to 260,400 m^3 per month. The raw maximum combined monthly abstraction volume on record for Permits WR380B and WR382B measured at WM1260 is 237,924m^3 in 2018. The filtered data reduced this monthly volume to 228,696 m^3

c) Annual Volume WM1260

Table 25 Annual combined volume abstraction data for Permits WR380B and WR382B measured at WM1260

From 2014/2015 to 2019/2020	
Date	Volume
2014/2015	751,334.4
2015/2016	744,390
2016/2017	947,462.4
2017/2018	765,072
2018/2019	1,415,232
2019/2020	314,520

The raw maximum combined annual abstraction volume on record for Permits WR380B and WR382B measured at WM1260 is 1,415,232m^3 in 2018-2019.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the maximum annual volume of water abstracted reduces to 1,341,911m^3.

Combined WR380B, WR378B, and WR382B – Welshmans and Shepherds Gully takes

WM0718 measures WR378B, WR380B and WR382B. This site has an exemption to represent the three water permits recorded in combination.

a) Rate of Abstraction WM0718

The figure below shows the total rate of abstraction water use data for Permits WR378B, WR380B and WR382B measured at WM0718.

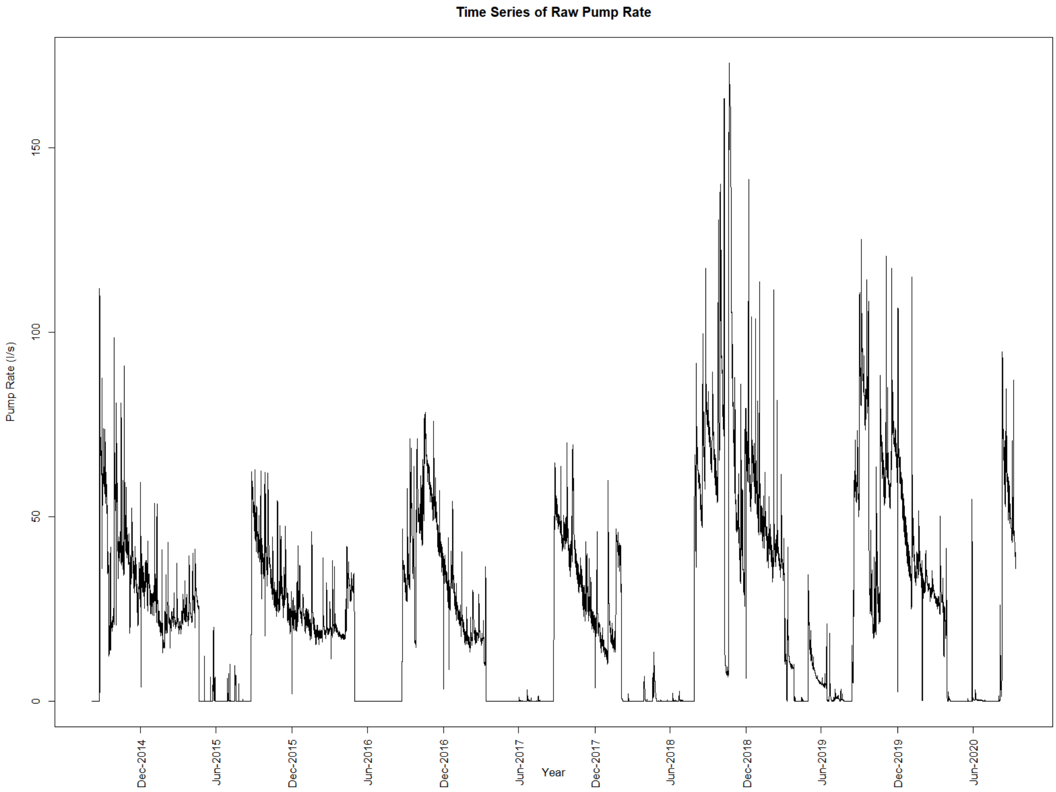


Figure 26. Graph showing rate of abstraction based on raw water use data for WR378B, WR380B and WR382B measured at WM0718

The consented combined maximum rate of abstraction for the three permits is 450,000 l/hr, equivalent to 125 l/s. The maximum recorded rate of abstraction under WM0718 is recorded as being 172.94 l/s.

Incorrect readings, exceedances or zeros can often be the result faulty equipment, flood or weather events, or other legitimate issues. In this case, the exceedances are attributed to weather events, producing unreliable data returns. Given these errors it was decided this data should be filtered.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum has been specified as the maximum recorded rate of take for exceedances within the water meter's margin of error, and these exceedances are acknowledged.

The maximum (filtered) rate of abstraction for this Permit is 125 l/s.

b) Monthly Volume Abstracted WM0718

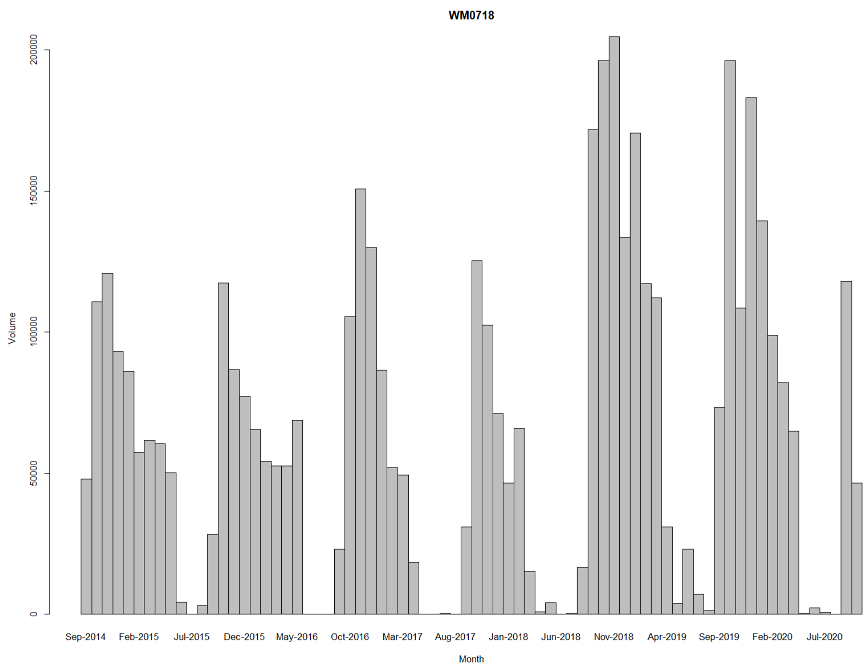


Figure 27 Graph showing monthly abstraction volumes based on raw water use data for WR378B, WR380B and WR382B measured at WM1718

The raw maximum total monthly abstraction volume recorded under WM1718 is 204,600 m^3 in November 2018.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the maximum monthly volume of water abstracted reduces to 199,666 m^3.

c) Annual Volume Abstracted WM1718

Table 26 Annual abstraction volumes based on water use raw data for WR378B, WR380B and WR382B measured at WM1718

WM1718 From 2014/2015 to 2020/2021	
Date	Volume
2014/2015	693,000.66
2015/2016	606,527.44

2016/2017	615,665.51
2017/2018	463,304.7
2018/2019	1,180,653.3
2019/2020	957,257.07
2020/2021 (Incomplete)	165,287.97

The raw maximum total annual abstraction volume recorded under WM1718 is 1,180,653.3 m^3 in 2018-2019.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the maximum annnual volume of water abstracted is reduced to 1,163,188 m^3.

9.1.8 Summary of Water Use Records Glassfords

A summary of the water use records for WR378B, WR380B and WR382B is provided in the table below.

Table 27. Summary of water use records for Glassfords Permits WR378B, WR380B and WR382B

Permit	Combined Consented rate of take l/s	Max rate of take recorded l/s	Consented monthly volume m^3	Max monthly volume recorded m^3	Calculated Consented annual volume m^3	Max annual volume recorded m^3
WR378B WR380B WR382B	125	125* Filtered	328,320*	199,666 Filtered	3,939,840*	1,163,188 Filtered

9.1.9 Water Balance

Using the soil and rainfall maps and efficient water allocation volumes from the Aqualinc Report 2017 the 246 ha irrigated on the applicant property requires a total volume of 1,991,639 m^3 to be watered efficiently. On average that is 8,096 m^3/ha/yr.

The Glassfords have access to Lauder scheme and Matakanui Scheme water as summarised below.

Table 28 Glassford water balance

Water Source	Aqualinc efficient allocation for the farm (m³/year)	Equivalent area (ha)[16]	Volume requested (m³/year)
OAIC Lauder	1,991,639	24	197,649
OAIC Matakanui (Thomson)		41	332,032
Private		144	1,163,188
Total	**1,991,639**	**209**	**1,692,869**

The volume of water available to the Glassfords is well below the total efficient volume as calculated by Aqualinc.

9.1.10 Allocation Requested / Outcome Sought

This application seeks the replacement of Permits WR378B, WR380B and WR382B on the following basis:

One consent	2 points of take
Purpose	Irrigation, water storage, and stock water supply
Point of take:	Tributary of Lauder (locally known as Welshmans Creek) and Shepherds Creek
Rate of take L/sec:	125
Monthly limit m^3:	199,666
Maximum annual volume m^3:	1,163,188
Residual flows:	Tributary of Lauder (Welshmans): 10 l/s at intake location Shepherds Creek: 5 l/sec or visual surface flow below intake
Lauder Residual:	Applicant to comply with sub-catchment residual - and 100 l/s at the OAIC weir
Abstraction:	1 July to 30 June following year
Minimum flow:	Operative minimum flow

A draft permit with proposed conditions is provided in Appendix C.

Number of permits

The Glassfords request one permit to replace the existing permits.

[16] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

Point of take and measuring

The Glassfords request one permit with two points of take. There is no change to the existing water measuring set up. These permits have an exemption to measure away from the point of takes.

Fish screens

A fish screen may be recommended for this take however an assessment to determine the need, practicalities and suitable design is requested before requiring implementation. A draft condition is included in the draft permits.

Residual flows

Based on the assessment undertaken by Hickey and Olsen (2020) (Appendix D), the following residual flows are recommended:

- 10 l/s at Lauder tributary intake (Welshmans)
- 5 l/sec or visual surface flow below Shepherds Creek intake
- 100 l/s at the OAIC weir for both points of take

9.2 Heckler Family

9.2.1 Water Permits

The Heckler Family hold the water permits outlined in the table below.

Table 29. Water permits held by Heckler Family

Permit	Location	Consented Abstraction
94548	Lauder Creek	117,000,000 l/month 200,000 l/hr
96779	Lauder Creek	100,000 l/hr

9.2.2 OAIC Shareholder

The Heckler Family utilise water from the Lauder Scheme Race.

9.2.3 Farming Operation

'Lauder Creek' is a family farming business that has been run by the Heckler family for the last 40 years. The family recognises the need to balance environmental, economic and social sustainability so that the farming business can be viable for future generations.

The Heckler family's farming business is predominantly a sheep and beef breeding and finishing operation. James and Kelly Heckler farm alongside James' parents Murray and Annette Heckler. The farm is primarily a breeding unit with the finishing of stock occurring on another farm lower down in the Manuherekia catchment. The combination of irrigation and hill and high country provides an ideal property for breeding of cattle and sheep. The property typically runs 13,000 stock units.

The farm is 4,500 ha, of which approximately 411 ha is irrigated using a combination of spray, and contour irrigation systems. The irrigation water is used to grow pasture, lucerne and winter feed crops for stock and reduces the over grazing of any of the tussock country during long dry spells. Lucerne and pasture are used to make supplement which is fed out to stock at times when pasture growth supply is lower than stock demand.

The property has extensive established shelter belts. The irrigation methodology enables the retention of these tree belts surrounding many of the paddock fences which provides animal shelter, soil protection, and biodiversity.

Figure 28 Photograph of Shelter Belts on 'Lauder Creek' Farm

This family farm supports James and Kelly and their young family along with James' parents Murray and Annette and one fulltime worker and their family. A nanny is also employed by the Hecklers to enable both parents to be involved in the business. Shearers, many contractors for lamb marking and stock carriers are also used by the business.

An overview of the Heckler farm is shown in the figure below.

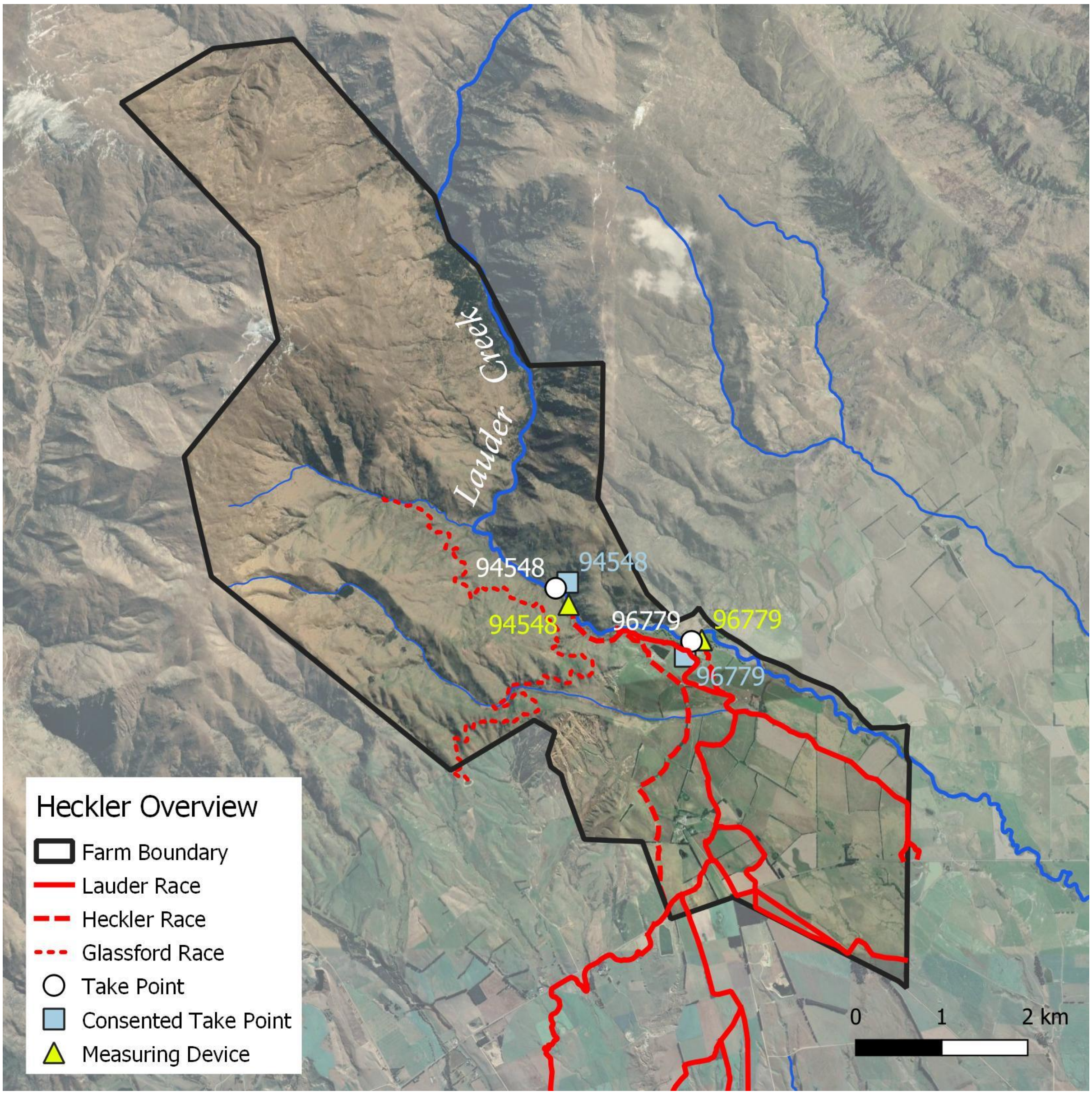


Figure 29 Overview of Hecker farm

9.2.4 Irrigation and Investment

Kelly and James have taken over the management of this exceptionally tidy and aesthetically attractive property in recent years. They are continuing to implement the sound business and management practices of the previous generation while considering the challenges that are ahead and the choices they will make for the farm.

The replacement of the two private water rights is crucial to the sustainability of the farming business. Water access through irrigation is a key element to growing feed for animals not only during the summer but also during the winter months. Irrigation allows farmers to utilise the high number of growing degree days available in the Central Otago summer. During this time water is the most limiting factor and hence why many farmers are able to grow enough feed for the entire year during the summer months with irrigation.

Investigations have been undertaken for irrigation infrastructure upgrades. Currently these investigations are on hold. The Hecklers have determined that it would not be prudent to outlay significant capital expenditure when water supply is currently not assured. When certainty of water is confirmed then investigations can proceed further.

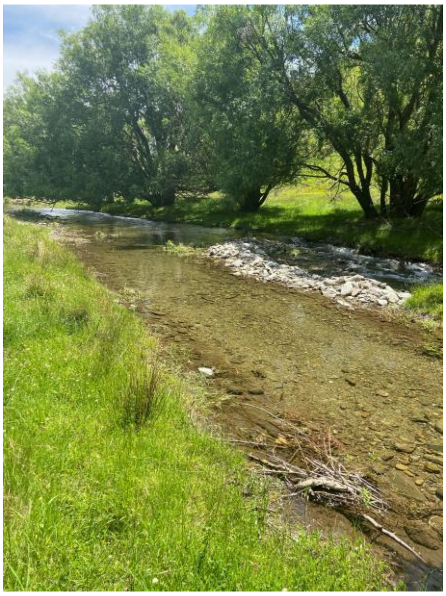
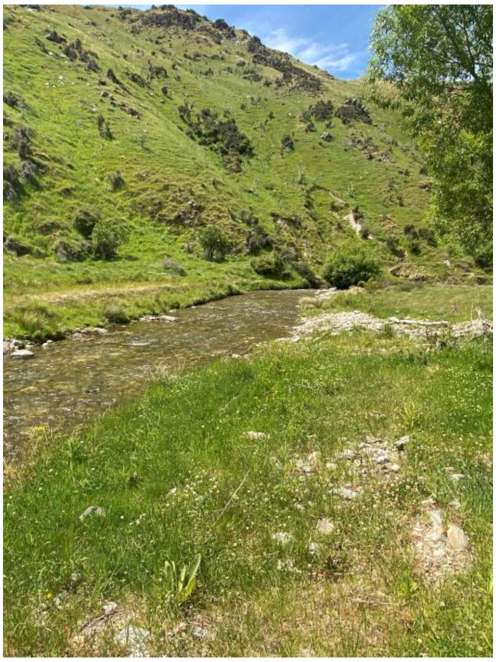
Initial estimates (investigated in 2016-2017) have indicated that the overall infrastructure costs will be in the vicinity of $5,348 - $12,036 per ha depending on options chosen. These costs will be different now but the cost to farming business could range from $2,192,680 to $4,934,760.

Investigation into water storage has also been conducted. Once again, implementation will occur when the water permit replacement process has concluded, and decisions can be made with certain parameters.

9.2.5 Water Take and Water Use

Permit 94548

The intake for Permit 94548 is located in the mainstem of Lauder Creek and is constructed of rocks and gravel to guide the flow into the intake race. Water flows from the creek into the open races and travels to the irrigated areas on the farm. The intake and delivery races are located on the Heckler's property. After the intake the water flows a short distance down a race. Before the measuring device there is a by-wash structure to return excess flow that may enter the race during freshes or floods.

	
Permit 94548 Intake location consisting of gravel and rock bund guiding the flow to the intake race	Permit 94548 Intake showing control gate and outlet back to Lauder Creek
	
Permit 94548 Downstream of water take	Permit 94548 Upstream of water take

Lauder Creek showing bywash outlet on RHS

Photos of open race on the property delivery water to paddocks

Figure 30 Photographs of Intake and associated infrastructure for Permit 94548

Water taken from this take is used to contribute to the full irrigated area of the farm of 411 ha area on the flat western paddocks of the property. The water is applied using contour irrigation systems.

In some paddocks the system is set-up so that two possible (private right) sources can be used depending on supply at the time, but other paddocks are only able to be watered by the one source. If a paddock does have two source options, it means they chose one or the other but not at the same time. Having the flexibility to move water around gives the irrigation manager more choice to respond to crop or pasture needs or drop out selected paddocks once water availability reduces in the middle of summer.

Some of this water is used for stock drinking. There are some troughs on the farm and the stock water system is continually being upgraded. Stockwater from this take may be needed on occasion to supply 10,000 sheep and 200 head of cattle.

The water taken under Permit 94548 is measured at the point of take via an open channel weir of rectangular shape with a gate that can control the flow of water during low flows. Water use data is telemetered to the ORC from water meter number WM0694.

Photos showing 94548 measuring device locations. LHS shows location of gate structure

Source: ORC Inspection Sheets

Figure 31 Photographs of measuring device for Permit 94548

Permit 96779

The intake for Permit 96779 is located in the mainstem of Lauder Creek and is constructed of rocks and gravel to guide water into the intake race. Water flows from the creek into open races to the irrigated areas on the farm. The intake and delivery races are located on the Heckler's property. The water taken under Permit 96779 is currently measured at the point of take via an open channel weir of rectangular shape with a gate that can control the flow of water during low flows. Water use data is currently telemetered to the ORC from water meter number WM0696.

One year after the issuing of this consent this intake will be shifted upstream to the same location as the Heckler's other Permit 94548. The applicant requires one-year transition post consent issue to ensure the races and intake set up is commissioned before the change can occur. Consequently, the water taken under this Permit will be measured together with water abstracted under Permit 94548 at WM0694.

The water abstracted at this take contributes to the total irrigated area of 411 ha. Most of this water is applied using a travelling irrigator spray system the rest through contour flood.

The Schematic below shows the water take set up as proposed for Permits 94548 and 96779.

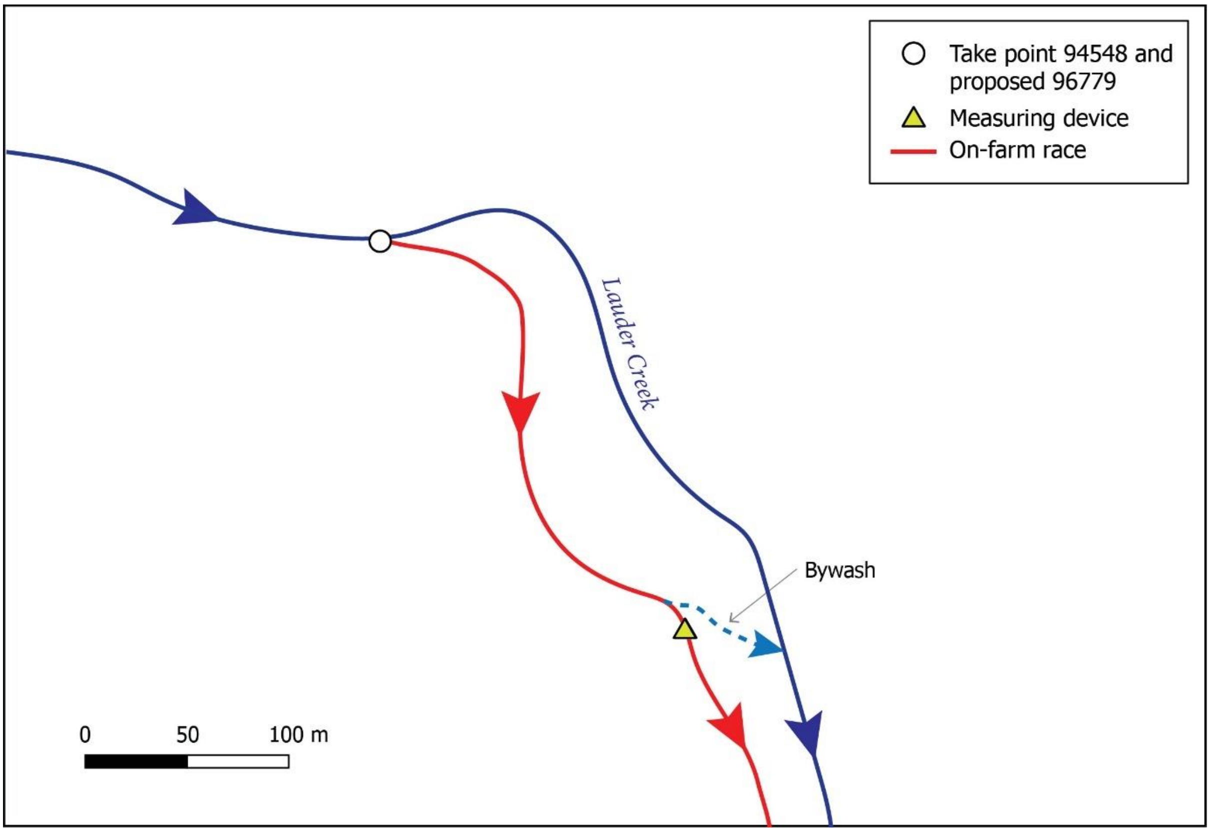


Figure 32 Schematic of Water Take Set Up under Permits 94548 and 96779

9.2.6 OAIC Water

The farm receives water from OAIC via the Lauder Race.

The water supplied by OAIC Lauder Scheme is used primarily on the paddocks in the middle of the irrigated area of the farm. It is transported around the farm via a series of open races.

The property has some water storage capacity to assist in managing irrigation application. The storage capacity is estimated to be 10,000 m³. Water supplied by OAIC is used to fill the applicant's dam for irrigation use on the paddocks in the middle of the irrigated area of the farm.

The OAIC Lauder Scheme intake and race are located on the Heckler's property. This race delivers water to the farm and is transported around the farm via a race system. The paddocks are irrigated using contour flood with this water source.

9.2.7 Water Use Summary

The applicant uses both private and OAIC Lauder scheme water.

The table and figure below provide a water use summary for this property.

Table 30 Water Use Summary for Heckler Family

Information	Property Details
Size of property	4,500 ha
Size of area irrigated	411 ha
Sources of Water	Lauder Creek - OAIC delivered water via the Lauder Race Lauder Creek – Private water rights 94548, 96779
Maximum recorded rate of take (from metering data)	Permit 94548: 55.6 l/s (filtered history of use data) Permit 96779: 27.8 (filtered history of use data)
Maximum recorded annual volume (from metering data)	Permit 94548: 1,388,136 (filtered history of use data) Permit 96779: 211,073 (filtered history of use data)
Aqualinc calculation of maximum efficient use m^3/yr	3,385,643
Number of stock	6,800 Ewes 3500 Hoggets 200 Cattle
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	10,300 sheep @5 l/sec = 51,500 l/day 200 cattle @ 45 l/sec=9000 l/day Total = 0.7 l/sec
Frequency of water take (average and maximum)	Maximum = 24 hours per day, 7 days per week, 4 weeks per month Average – varies depending on season, but usually continuously when water is available.
Months during which water is expected to be taken in a dry year	Water will be abstracted all year from the private right takes reducing in flow during the dry summer months. The introduction of the residual flow will further restrict abstracted rates in summer.
Part of day water when water will typically be taken:	Water will be abstracted anytime of the day it is available for 24hrs, 7 days a week. It depends on availability.
Does use of water provide recharge back into catchment?	Yes a small portion of the water applied with the border dykes and contour irrigation would recharge back to the catchment
Is take from re-charge or is an augmented take?	No

Information	Property Details
Storage for irrigation	Yes – a small amount of storage is available in several small ponds of approximately 10,000 m^3
Monitoring in place	Yes. Refer to the following Section.
WEX required and obtained	None required. Water takes measured at point of take.
s417 Certificate required and obtained	Not relevant. Water take and race delivery located on applicant's property.

The figure below shows the irrigation by type on the Heckler property.

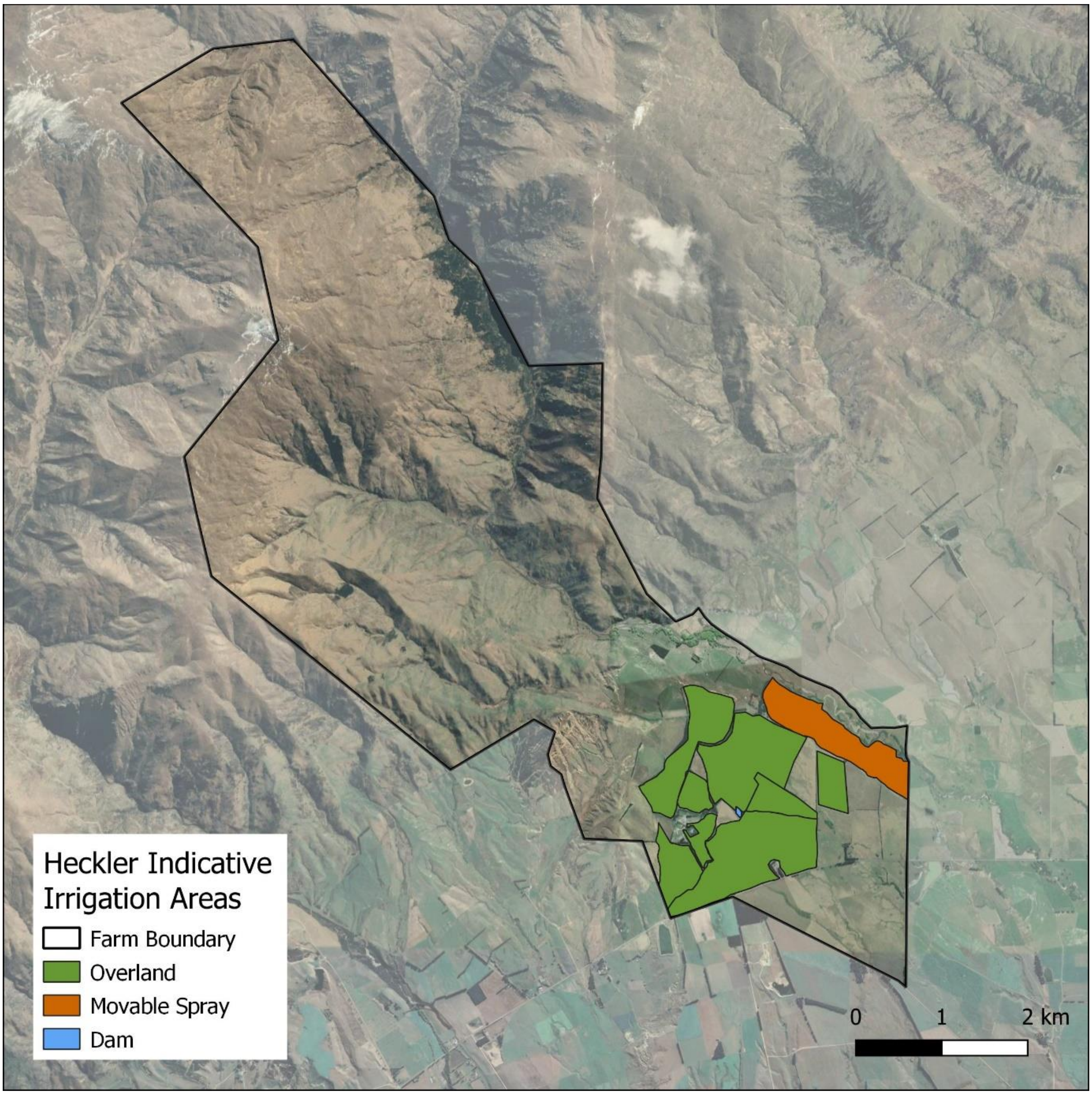


Figure 33 Overview of irrigation by type on Hecker farm (Irrigation extents are indicative only)

9.2.8 Water Use Records

Water use records are held at the ORC and the data is summarised here. No alternative water use records are provided.

Where required, abstraction records were sourced from the Otago Regional Council's Hilltop Database directly for data filtering and analysis purposes. Data was processed using excel software. The approach is consistent with recent hearing decisions (see: Long Gully Race Society RM17.176; and Queensbury Ridges Ltd (pending appeal) RM19.312), and the method proposed by the Otago Water Resources Group[17]. The water meter has been verified frequently and so this record of abstraction is accurate.

Permit 94548

a) Rate of Abstraction

The figure below shows the rate of abstraction water use data for this permit measured at WM0694.

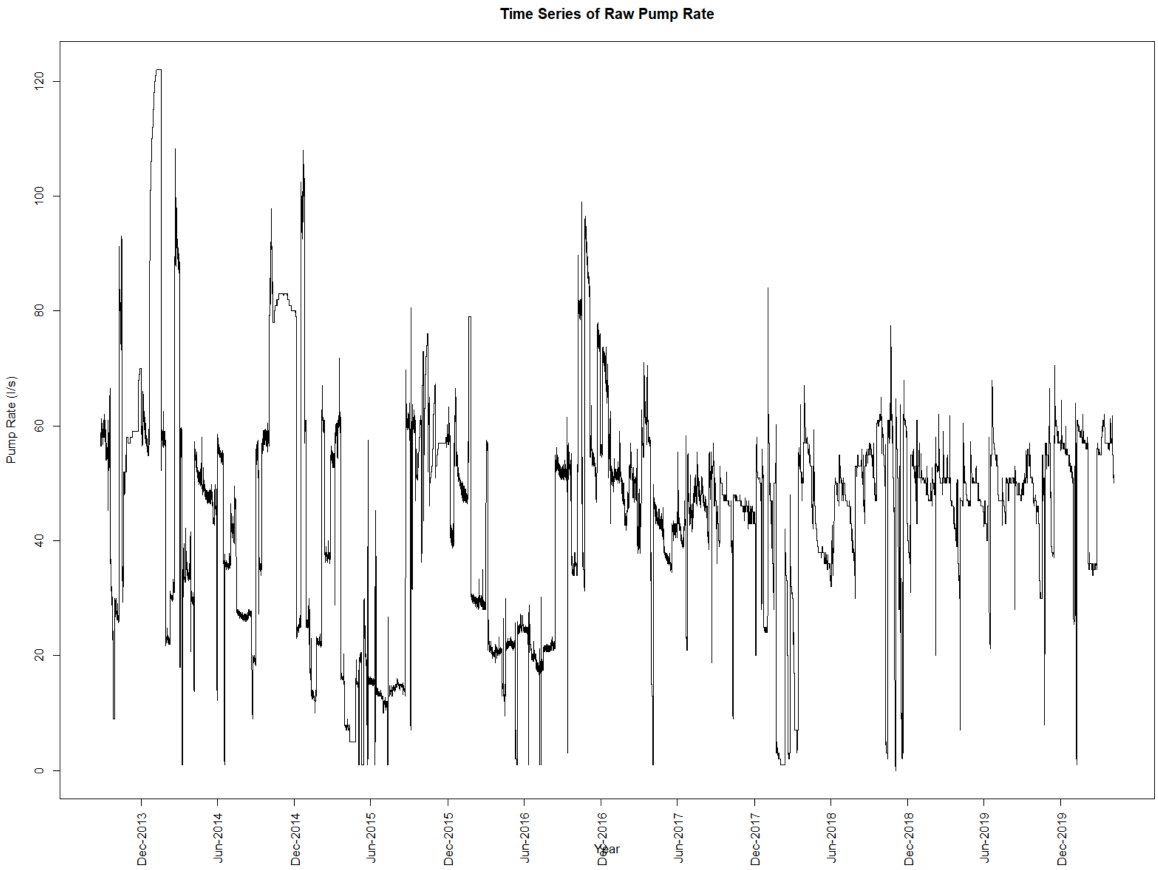


Figure 34 Graph showing ORC held data for rate of abstraction for Permit 94548

[17] Submission by Otago Water Users Resource Group on Proposed Water Permits Plan Change (Plan Change 7) to the Regional Plan: Water for Otago.

The authorised rate of abstraction for this permit is 200,000 l/hr, equivalent to 55.55 l/s. However, the records indicate a consistent exceedance of the authorised limit with a maximum recorded rate of abstraction of 122 l/s.

Incorrect readings, exceedances or zeros can often be the result faulty equipment, flood or weather events, or other legitimate issues. In this case, and as noted in the ORC compliance water inspection sheet[18] for this Permit, the hydrologger has been known to fluctuate significantly, producing unreliable data returns. The ORC compliance officer notes that the applicant's service provider, NIWA, has fixed the hydrologger.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum has been specified as the maximum recorded rate of take for exceedances within the water meter's margin of error, and these exceedances are acknowledged.

The maximum (filtered) rate of abstraction for this Permit is 55.6 l/s.

b) Monthly Volume Abstracted

The figure below shows the authorised monthly abstraction volume for this permit measured at WM0694.

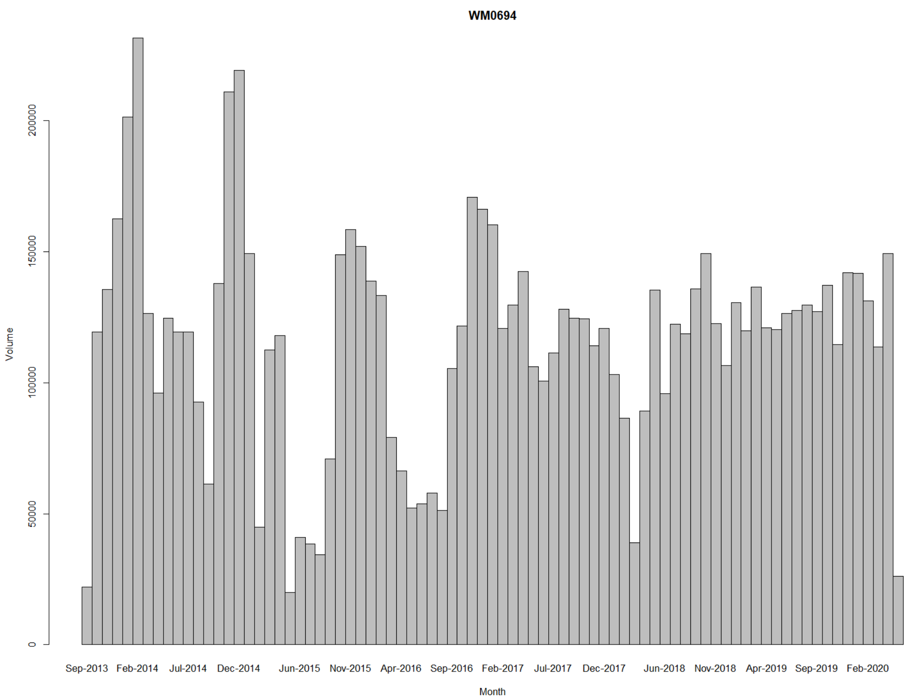


Figure 35 Graph showing ORC held monthly abstraction volume records for Permit 94548

[18] Inspected by Byron Pretorius, dated 16 April 2019

The consented maximum monthly abstraction volume for this permit is 117,000,000 l/month, equivalent to 117,000 m^3. The maximum recorded volume 231,397.2 m^3 in February 2014. As noted above, the hydrologger has been known to fluctuate significantly, producing exceedances and unreliable data returns.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum has been specified as the maximum recorded monthly volume for exceedances within the water meter's margin of error, and these exceedances are acknowledged. Data was processed using excel software.

The maximum (filtered) monthly volume recorded for this permit is 117,000 m^3.

c) Annual Volume Abstracted

The table below shows the annual volumes abstracted between September 2013 and 2020 based on the raw data.

Table 31 Table showing annual raw abstraction volumes of Permit 94548

Annual Volume (m^3/year) at WM0694	m^3/year
2013/2014	1,338,390.9
2014/2015	1,326,475
2015/2016	1,125,949.52
2016/2017	1,432,257.53
2017/2018	1,271,686.45
2018/2019	1,509,305.4
2019/2020	1,339,317

The raw maximum annual volume recorded is 1,509,305.4 in 2018-2019. However, as noted, the hydrologger has been known to produce unreliable data returns. Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude justified exceedances and spikes in the data, the maximum (filtered) annual volume recorded reduced to 1,388,136 m^3.

The maximum (filtered) annual volume recorded for this permit is 1,388,136 m^3.

Permit 96779

a) Rate of Abstraction

The figure below shows the rate of abstraction water use data for this permit measured at WM0696.

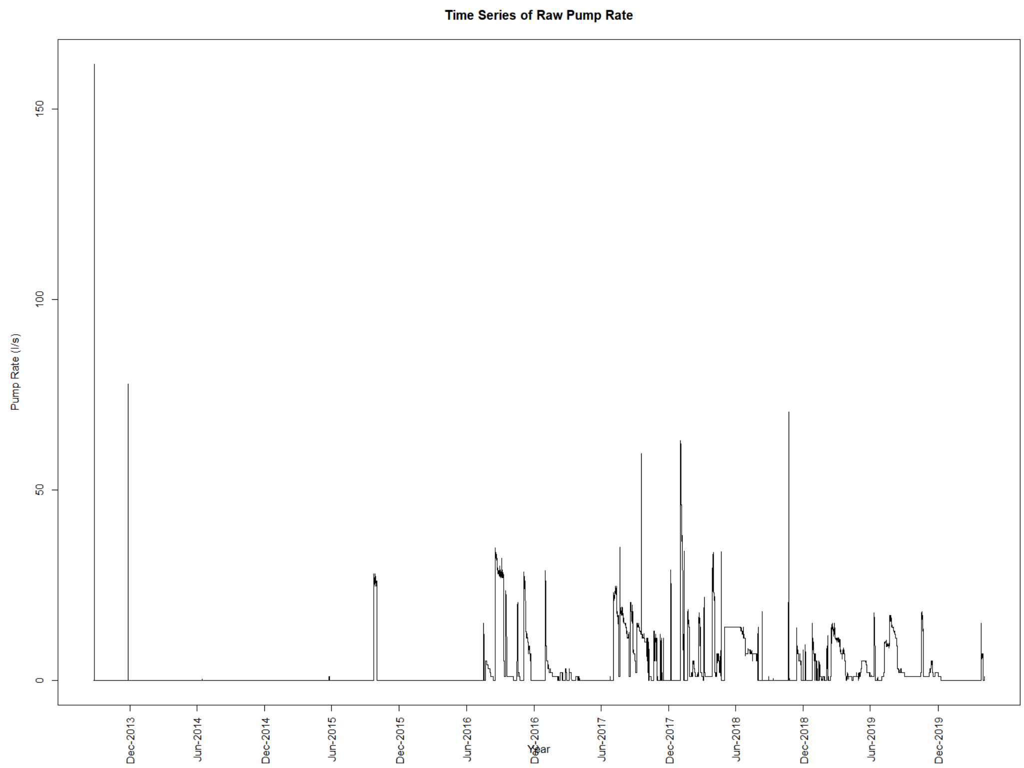


Figure 36 Graph showing ORC held data for rate of abstraction for Permit 96779

The authorised rate of abstraction for this permit is 100,000 l/hr, equivalent to 27.7 l/s. However, the records indicate a consistent exceedance of the authorised limit, with a maximum recorded rate of take 165.75 l/s. Incorrect readings, exceedances or zeros can often be the result faulty equipment, flood or weather events, or other legitimate issues. In this case, as noted in the ORC compliance water inspection sheet[19] for this Permit, these exceedances can be attributed to high rainfall events and resultant high flows in Lauder Creek, producing unreliable data returns.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum has been specified as the maximum recorded monthly volume for exceedances within the water meter's margin of error, and these exceedances are acknowledged. Data was processed using excel software.

The maximum (filtered) rate of abstraction for this Permit is 27.8 l/s.

[19] Inspected by Byron Pretorius, dated 01/07/2018

b) Monthly Volumes Abstracted

The figure below shows the authorised monthly abstraction volume for this permit measured at WM0696.

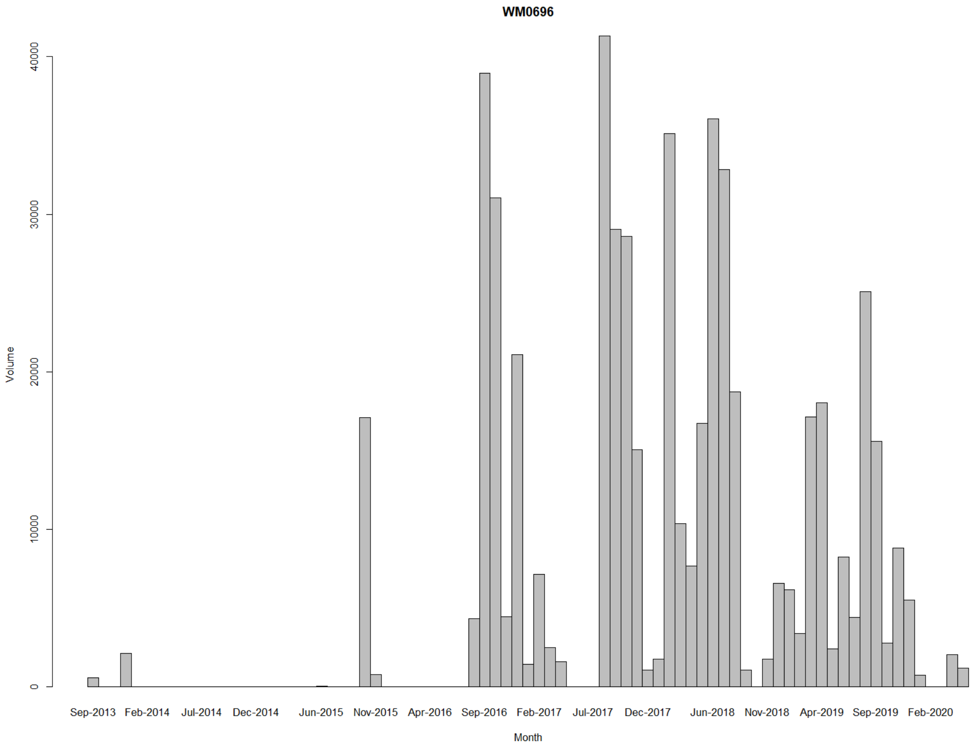


Figure 37 Graph showing ORC held monthly abstraction volume records for Permit 96779

There is no monthly abstraction limit specified on Permit 96779. The maximum recorded volume abstracted is 41,310 m^3 in August 2017.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the maximum recorded volume is 40,034 m^3.

c) Annual Volume Abstracted

The table below shows the annual volumes abstracted between September 2013 and 2020.

Table 32 Annual abstraction volumes for Permit 96779

Annual Volume (m^3/year) at WM0696	m^3/year
2013/2014	2,702.7
2014/2015	75.6
2015/2016	17,905.5

2016/2017	112,644.9
2017/2018	222,803.1
2018/2019	116,402.4
2019/2020	66,241.8

The maximum recorded annual volume is 222,803.1 m^3 in 2017-2018. Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the maximum recorded annual volume is 211,073 m^3.

9.2.9 Compliance / Future Solutions

Compliance records indicate consistent exceedances of the authorised limit under both Permits 94548 and 96779. In both cases, the exceedances have been explained and where appropriate, remedied.

9.2.10 Summary of Water Use Records Heckler Family

Permit	Consented rate of take l/s	Max rate of take recorded (filtered) l/s	Consented monthly volume m^3	Max monthly volume recorded (filtered) m^3	Consented annual volume m^3	Max annual volume (filtered) m^3
94548	55.6	55.6	117,000	117,000	1,404,000	1,388,136
96779	27.8	27.8	72,960	40,034	875,520	211,073
					TOTAL	**1,599,209**

9.2.11 Water Balance

Using the soil and rainfall maps and efficient water allocation volumes from the Aqualinc Report the 411 ha irrigated on the Heckler property requires a total volume of 3,563,336 m^3 to be watered efficiently.

On average Aqualinc recommends 8670 m^3/ha/yr. The total volume being requested for the two private water consents in this application is 1,599,209 m^3 which is enough for 184 ha.

The summary of the farm's efficiency of use is below.

Table 33 Heckler water balance

Water Source	**Aqualinc efficient allocation for the farm (m^3/yr)**	**Equivalent area (ha) [20] of volume requested**	**Volume Requested (m^3/yr)**
OAIC Lauder	3,568,302	160.9	1,395,171
Private		184.5	1,599,209
Total	3,568,302	**345.4**	**2,994,380**

The volume of water available to the Hecker family is well below the total efficient volume as calculated by Aqualinc.

9.2.12 Allocation Requested / Outcome Sought

The applicant seeks the following allocation:

Table 34 Primary allocation sought by Hecker Family

Point of take	Proposed combined point of take (at location consented under 94548) Take Point B at current site of 96779.
Rate of take l/sec	Take Point A and B: 83.4 Take Point B that expires after one year 27.7 L/sec
Maximum monthly volume m^3	Take Point A and B Combined 157,034 *(Maximum from filtered data)* Take Point B: 40,034
Maximum annual volume m^3/yr	Take Point A and B: Combined 1,599,209 *(Maximum from filtered data)* Take Point B: 211,073
Residual flow at the Point of Take	NA
Lauder Creek residual	Applicant to comply with sub-catchment residual - 100 l/s at the OAIC weir
Abstraction	1 July to 30 June following year
Minimum flow	Compliance with operative minimum flow

A draft permit with proposed conditions is provided in Appendix C.

[20] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

Number of permits

The applicant requests one permit to replace the two water rights. The purpose of use is irrigation and stock water.

Points of take and Measuring

The applicant requests one take point location on the mainstem of the Lauder Creek (reflecting the existing take point consented under the Heckler's Permit 94548). However, they request a one-year transition window to complete the work required to enable this transfer.

The applicant therefore requests two points of take as detailed in Table 34 based on the proviso that Take Point B remains in use for one year and will be measured by the existing measuring device WM0696. After one year the permits will be measured together at WM0694.

Fish screens

A fish screen may be recommended for this take however an assessment to determine the need, practicalities and suitable design is requested before requiring implementation. A draft condition is included in the draft permits.

Residual flows

Based on the assessment undertaken by Hickey and Olsen (2020) (Appendix D), a residual flow of 100 l/s at the OAIC weir is recommended.

9.3 IR and MA Brown – Clover Hill

9.3.1 Water Rights

The Browns hold a half share of the following water permit:

Table 35 Water permit held by IR and MA Brown

Permit	Location of intake	Consented Abstraction
WR432B	Lauder Creek	½ Share 112 l/s 400,000 l/hr

9.3.2 OAIC Shareholder

No OAIC water is used on this farm

9.3.3 Farming Operation

The Browns own and operate 'Clover Hill', a sheep and beef breeding farm. The total property area is 436 ha, of which up to 198 ha can be irrigated. Irrigation application methods include a gravity fed K-line system and contour irrigation. The irrigation water is used to grow pasture for stock feed, and stock water supply. There are approximately 900 ewes, 900 hoggets and 475 beef cattle (including cows and calves) on farm. There are several small ponds that assist with stock drinking and irrigation management throughout the farm.

This is an extensively run operation that can be managed by Ian and Mary-Anne Brown primarily working on their own with their son on a part time basis. They do not do any intensive grazing or strip graze forage crops. They enjoy the less intensive farming option and have a low input policy which means in this case they do not apply fertiliser.

Their adult family have moved off farm and onto other professions but visit and assist on occasion with farm work.

There is a stock water scheme on the property that also relies on the abstracted water. The irrigation water also tops up the domestic supply.

Winter water supply is key to the functioning of this business. As mentioned above it is required for stock water but also used for replenishing the soil moisture levels early in the season when the water is plentiful in the stream. As this take reduces and often ceases in the dry summers the winter and shoulder season water is vital.

The figure below shows an overview of Clover Hill property.

Figure 38 Overview of Clover Hill Farm

9.3.4 Irrigation and Investment

The Browns only have one water source, their private take. The reliability of the take decreases in the middle of summer and can sometimes cease abstracting altogether in a dry year during January or February. This pattern has reduced the Browns' confidence to invest too heavily in expensive spray systems. So far, they have added two storage ponds that can hold 10,000 m^3 each and where gravity is available, they are utilising piping and k-line pods to apply the water via spray systems. K-line pods irrigate 34 ha on farm with 160 pods. This is done without pumping. On the irrigation map you can see the pond that was installed at the lower end of the farm to capture any run-off or unused race water and apply through the spray system.

Costs incurred in relation to irrigation development include expensive open channel measuring equipment and ongoing maintenance and verification by NIWA, storage ponds and the k-line pod system. The Browns have a small farm business so these investments of up to $40,000 in the last 10 years are significant costs overall.

9.3.5 Water Take and Water Use

WR432B

The point of take under this Permit is currently located in the Main Stem of Lauder Creek in the upper catchment area on the property owned by the Heckler family. The water is raced across Heckler's farm and delivers water to the applicant's property. A Section 417 Certificate is attached in Appendix H. The Browns share this water permit with the Morans.

The water taken under Permit WR432B is currently measured at the point of take via an open channel weir of rectangular shape with a gate that can control the flow of water during low flows. An overflow channel allows excess water to be returned to the Lauder Creek. Water use data is telemetered to the ORC from water meter number WM0711.

It is proposed to shift the intake location for this permit upstream to the location of the OAIC's Lauder Scheme intake location under Permit 2001.710. The applicant requests two years after the consent is issued to make this transition. Once shifted the water taken under Permit WR432B will be measured in combination with water abstracted under Permit 2001.710. As described in Section 9, the measurement of water taken under Permit 2001.710 away from the point of take is authorised under Notice of Exemption WEX0119. Water use data is telemetered to the ORC using WM0107.

The photos of the current intake set-up are included below but this set-up is intended to be closed within two years of the consent is issued.

WR432B Point of take location from Lauder Creek *Source: ORC Inspection Sheets*

WR432B Race leading water from Lauder Creek to the gate structure *Source: ORC Inspection Sheets*

Gate structure in the mid ground, with overflow channel shown on the left-hand side
Source: ORC Inspection Sheets

Figure 39 Photographs showing existing intake location and gate structure of WR432B

9.3.6 Water Use Summary

Irrigation on Clover Hill is outlined in the table below.

Table 36 Irrigated areas on Clover Hill

Water source	**Irrigation type**	**Area (ha)**
WR432B – Lauder Creek	Contour irrigation	164
WR432B – Lauder Creek	K-line	34
	TOTAL	198

The table and figure below provide a water use summary for this property.

Table 37.Overview of water use on Clover Hill

Information	Property Details
Size of property	436 ha
Size of area irrigated	198 ha
Sources of Water	WR432B: Lauder Creek
Maximum recorded rate of take (from metering data)	113.3 l/sec (Filtered from history of use data)
Maximum recorded annual volume (from metering data)	1,469,226 (Filtered from history of use data) (half for this farm)
Aqualinc calculation of maximum efficient use m^3/yr	1,789,045
Number of stock	900 ewes, 900 hogget 475 beef cattle
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	1800 sheep at 5 l/day per head = 9000 l/day 475 beef cattle at 45 l/day per head = 21,375 l/day Total = 30,375 l/day, equivalent to 0.35 l/s
Frequency of water take (average and maximum)	The water is abstracted when available and the paddocks are dry.
Months during which water is expected to be taken in a dry year	When water is available in both wet and dry years abstraction will occur all year round. In a dry year the rate available for abstraction decreases in the summer months. The Browns need the water in the winter and early spring to keep the stockwater available, wet the soil profile and augment the domestic take. As the water availability declines in the middle of summer the early season water that tops up storage is vital to this farm.
Months during which water is expected to be taken in an average year	As above
Part of day water when water will typically be taken:	Anytime in the 24 hours. The water will be abstracted while it remains available and the residual flow is being achieved.
Does use of water provide recharge back into catchment?	In the paddocks that have contour irrigation systems the water will travel into the on-farm water races. There is storage at the lower end of the farm to capture any flow that can then be reused through the spray. However, on a farm with only one source of water it is crucial for the Browns that they utilise as much of their water as possible.
Is take from re-charge or is an augmented take?	No
Hectares in a day	This varies greatly depending on the flow available. The Browns are careful not to over water and return to paddocks where the soil moisture is adequate.
Storage	Three small buffer ponds can approx. $10,000m^3$ each

The figure below shows the irrigation by type occurring on Clover Hill.

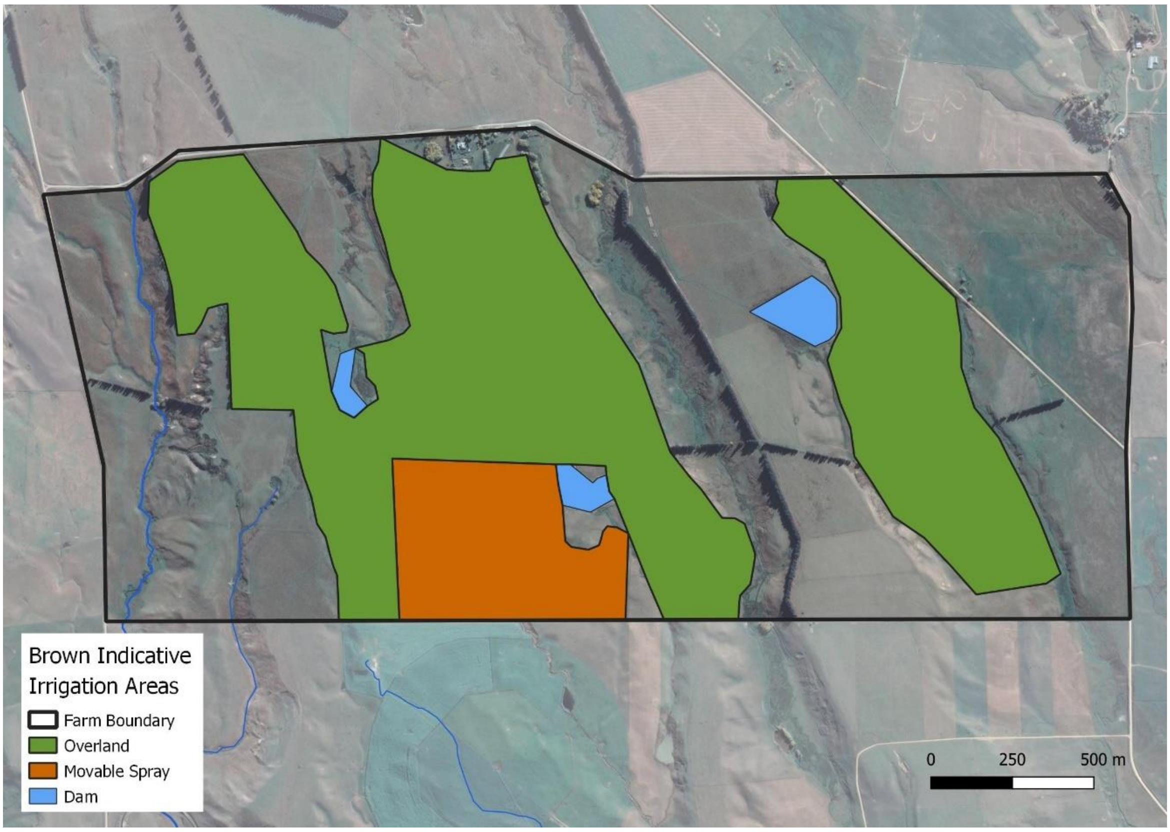


Figure 40 Irrigated area by type on Clover Hill (note irrigation extents are indicative only)

9.3.7 Water Use Records WR432B

Water use records are held at the ORC and the data is summarised here. No alternative water use records are provided.

Where required, abstraction records were sourced from the Otago Regional Council's Hilltop Database directly for data filtering and analysis purposes. Data was processed using excel software. The approach is consistent with recent hearing decisions (see: Long Gully Race Society RM17.176; and Queensbury Ridges Ltd (pending appeal) RM19.312), and the method proposed by the Otago Water Resources Group[21]. The water meter has been verified frequently and so this record of abstraction is true and accurate.

21 Submission by Otago Water Users Resource Group on Proposed Water Permits Plan Change (Plan Change 7) to the Regional Plan: Water for Otago.

a) Rate of Abstraction

The applicant has 1/2 share of Permit WR432B measured at WM0711. The figure below shows the rate of abstraction from metering data for this permit.

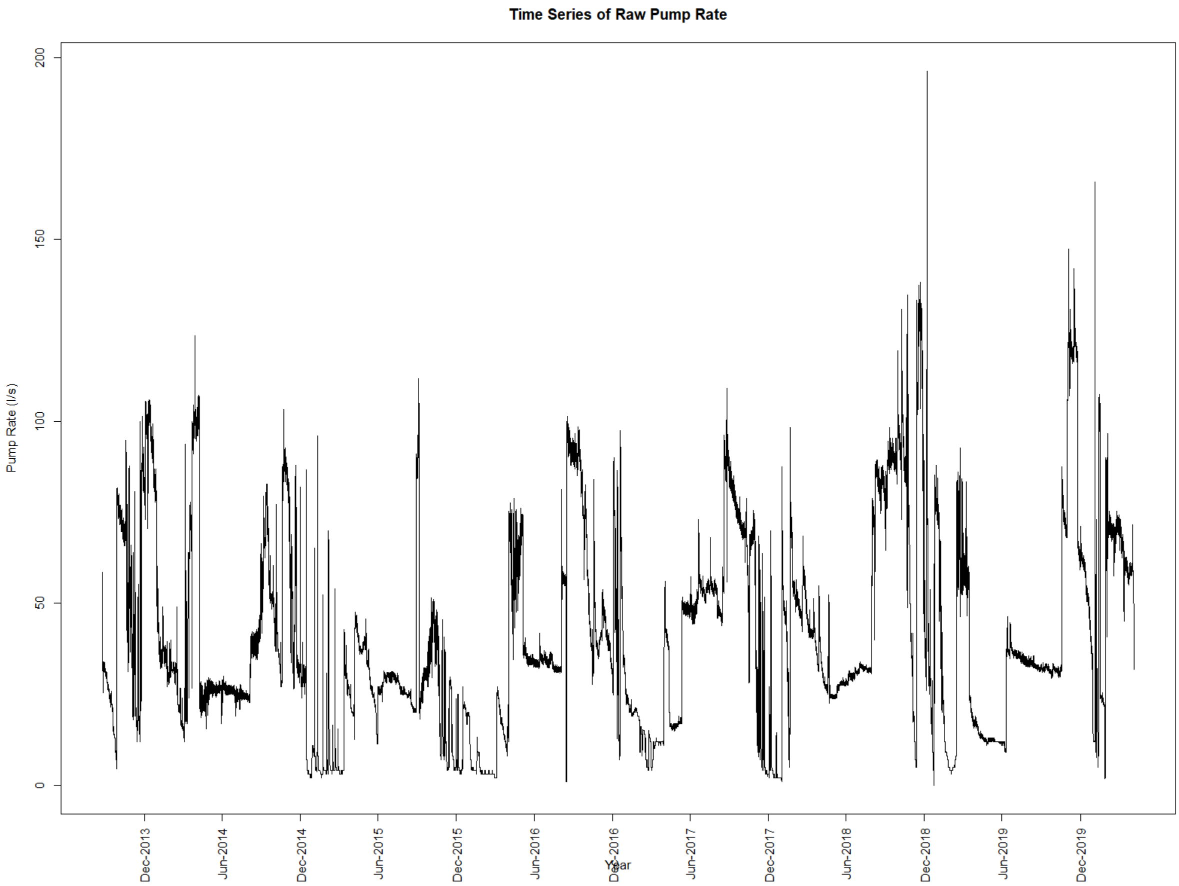


Figure 41 Graph showing rate of abstraction for water use data for Permit WM0711

The authorised rate of abstraction for this permit is 113.3 l/s. In recent years, the abstraction records indicate a consistent exceedance of the authorised limit with a maximum recorded rate of abstraction of 196.25 l/s. Incorrect readings, exceedances or zeros can often be the result faulty equipment, flood or weather events, or other legitimate issues. In this case, these exceedances can be attributed to high rainfall events, resulting in organic material blocking the system, producing unreliable data returns.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum has been specified as the maximum recorded rate of abstraction for exceedances within the water meter's margin of error, and these exceedances are acknowledged. Data was processed using excel software.

The maximum (filtered) rate of abstraction for this Permit is 113.3 l/s.

b) Monthly Volume Abstracted

The figure below shows the monthly volume of abstraction for this permit.

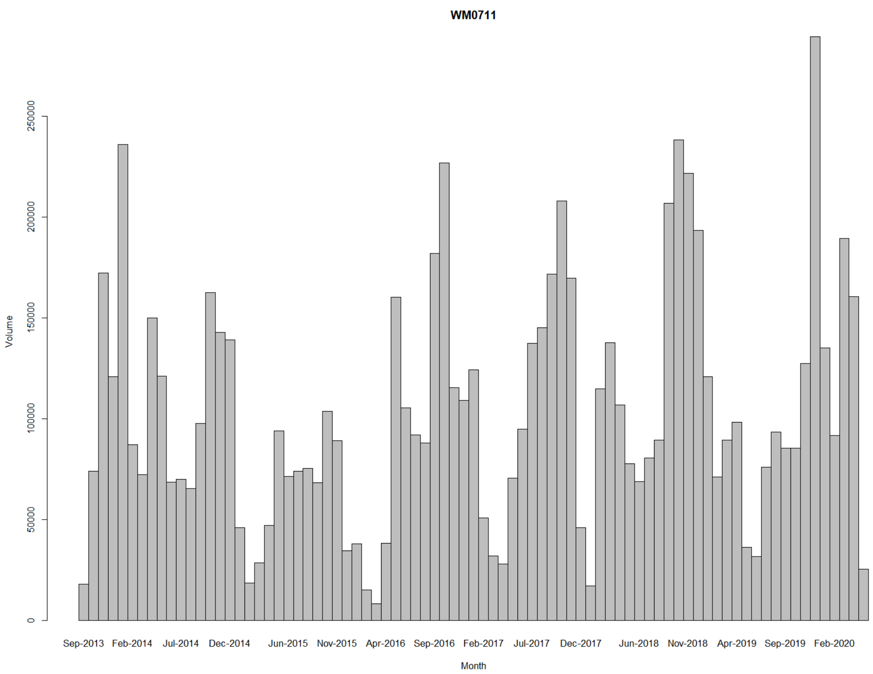


Figure 42 Graph showing monthly volume water use data for Permit WR432B

There is no monthly abstraction volume limit for this Permit. The raw maximum monthly volume abstracted on record is 289,315.8 m^3 in December 2019.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum has been specified as the maximum recorded monthly volume for exceedances within the water meter's margin of error, and these exceedances are acknowledged. Data was processed using excel software.

The maximum (filtered) monthly volume recorded for this permit is 275,913 m^3.

c) Annual Volume Abstracted

The table below shows the annual volumes abstracted under this Permit.

Table 38 Table showing annual abstraction volumes raw water use data for Permit WR432B

Annual (m^3/year) at WM0711	m^3
2013/2014	1,120,494.6
2014/2015	984,172.5

2015/2016	811,880.1
2016/2017	1,215,195.3
2017/2018	1,402,014.6
2018/2019	1,478,675.7
2019/2020	1,359,694.8

The maximum recorded annual abstraction volume for this permit is 1,478,675.7 m^3 in 2018-2019. When the raw data is filtered to exclude outliers and spikes in the data, the maximum recorded annual volume is 1,469,226 m^3.

9.3.8 Compliance / Future Solutions

Data records indicate exceedances of the authorised limits. These spikes are due to freshes and floods flowing down the race and the gear not functioning correctly. Once the water abstraction for this permit is transferred to the Lauder Scheme site, these non compliance issues will no longer be a problem.

9.3.9 Summary of Water Use Record

Table 39.Summary of Water Use Records WR432B

Permit	Consented rate of take (l/s)	Max rate of take recorded (l/s)	Calculated Consented monthly volume (m^3)	Max monthly volume recorded (m^3)	Calculated Consented annual volume (m^3)	Max annual volume recorded (m^3)
WR432B ½ share	113.3	113.3	297,537	275,913* Filtered	3,579,441*	1,469,226 Filtered (1/2 share)

9.3.10 Water Balance

Using the soil and rainfall maps and efficient water allocation volumes from Aqualinc (2017) the 198 ha irrigated on Clover Hill require a total volume of 1,789,045 m^3 to be watered efficiently. On average this is 9035.6 m^3/ha/year.

Water Source	Aqualinc efficient allocation for the farm (m^3/yr)	Equivalent area (ha)[22] of volume requested	Volume Requested (m^3/yr)
OAIC Lauder	1,789,045	198	½ share of 1,469,226

The volume being requested represents the use on both the Moran and Brown properties and is well within the total efficient volume as calculated by Aqualinc.

The total requested is well below what would be optimal for the Brown property. That illustrates the low surety of supply experienced by this farm. The Browns make decisions throughout the year on which paddocks will get reduced water.

9.3.11 Allocation Requested / Outcome Sought

An overview of the allocation and flow limits proposed for the replacement permit is provided in the table below.

The Moran Brown permit site may operate for up to two years post consent issue. The maximum rate and volume will be available for abstraction for those two years. Once combined with the OAIC intake the rate available for the two intakes will decrease to 450 l/sec. That is a reduction from the possible maximum of 538 l/sec. The maximum volume will remain.

[22] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

Table 40 Overview of allocation and flow limits proposed for replacement of WR432B

Consent	WR432B
Site location	Existing for up to two years. Intake then as authorised under Permit 2001.710
Measuring device	Existing for up to 2 years and then in combination with the Lauder Scheme
Rate of take l/s	113 at existing site for 2 years 450 in combination with the Lauder Scheme
Maximum Monthly Volume m^3	275,913 at existing site for 2 years 1,205,280 in combination
Maximum Annual Volume m^3	1,469,226 at site for up to 2 years 6,996,957 in combination
Residual at Point of Take l/sec	100 l/sec at existing site while operational
Lauder Creek Residual Flow l/sec	Applicant to comply with sub-catchment residual – 100 l/s at OAIC weir
Minimum Flow l/s	Compliance with operative minimum flow

A draft permit with proposed conditions is provided in Appendix C. It is the same permit described for OAIC and one of Viewpoint Farm's permit.

Number of permits

The Permit holder requests one replacement permit held jointly with OAIC and Viewpoint farm Ltd in their respective names.

Point of Take and Measuring

Existing Moran Brown point of take to be measured for two-year duration. After two years the permits will be measured together at the OAIC measuring site.

Fish screens

No fish screen required on existing Moran/Brown point of take for the maximum 2-year duration.

A fish screen may be recommended for this take however an assessment to determine the need, practicalities and suitable design is requested before requiring implementation. A draft condition is included in the draft permits.

Residual flows

Existing Moran Brown take point also to have a residual flow of 100 l/sec while in operation.

Based on the assessment undertaken by Hickey and Olsen (2020) (Appendix D), a residual flow of 100 l/s at the OAIC weir is recommended.

9.4 Viewpoint Farm Ltd, Moran Family

9.4.1 Water Permits

Viewpoint Farm Ltd hold the water permits in the table below.

Table 41 Water Permits held by Viewpoint Farm Ltd

Permit	Location	Consented Abstraction
WR432	Lauder Creek	½ Share 112 l/s 400,000 l/hr
2002.071	Clear Creek	56 l/s; 200 m^3/hr; 33,600 m^3/week; 216,000 m^3/month

9.4.2 OAIC Shares

Viewpoint Farm Ltd receives water from the OAIC Main Race. This application supports the application on the OAIC Main race intake as prepared by Landpro.

9.4.3 Farming Operation

Viewpoint Farm Ltd is owned and operated by the Moran family as a sheep breeding, bull beef, and crop farm. The total property area is 540 ha, comprising two separate blocks (Top Place at 227.4 ha and Home Place at 312.6 ha). Up to 478 ha is irrigated across the two blocks, and the irrigation water is used to grow lucerne, pasture and stock feed for winter. Irrigation water is applied using a combination of gun, k-line, border and contour irrigation methods. The farm carries up to 3,800 stock units at any one time. There is approximately 256 ha under spray and 222 ha under border dykes or contour irrigation techniques.

The farm supports two families, Tom and Jo Moran and their son Mike and his wife Abby and family. They use contractors for shearing, and other farm tasks.

This property has a combination of water sources including two private permits and OAIC Main race shares. The use of storage dams ensures the pasture and crop can be irrigated as required not only when the water is available.

The figure below provides an overview of the Viewpoint Farm property.

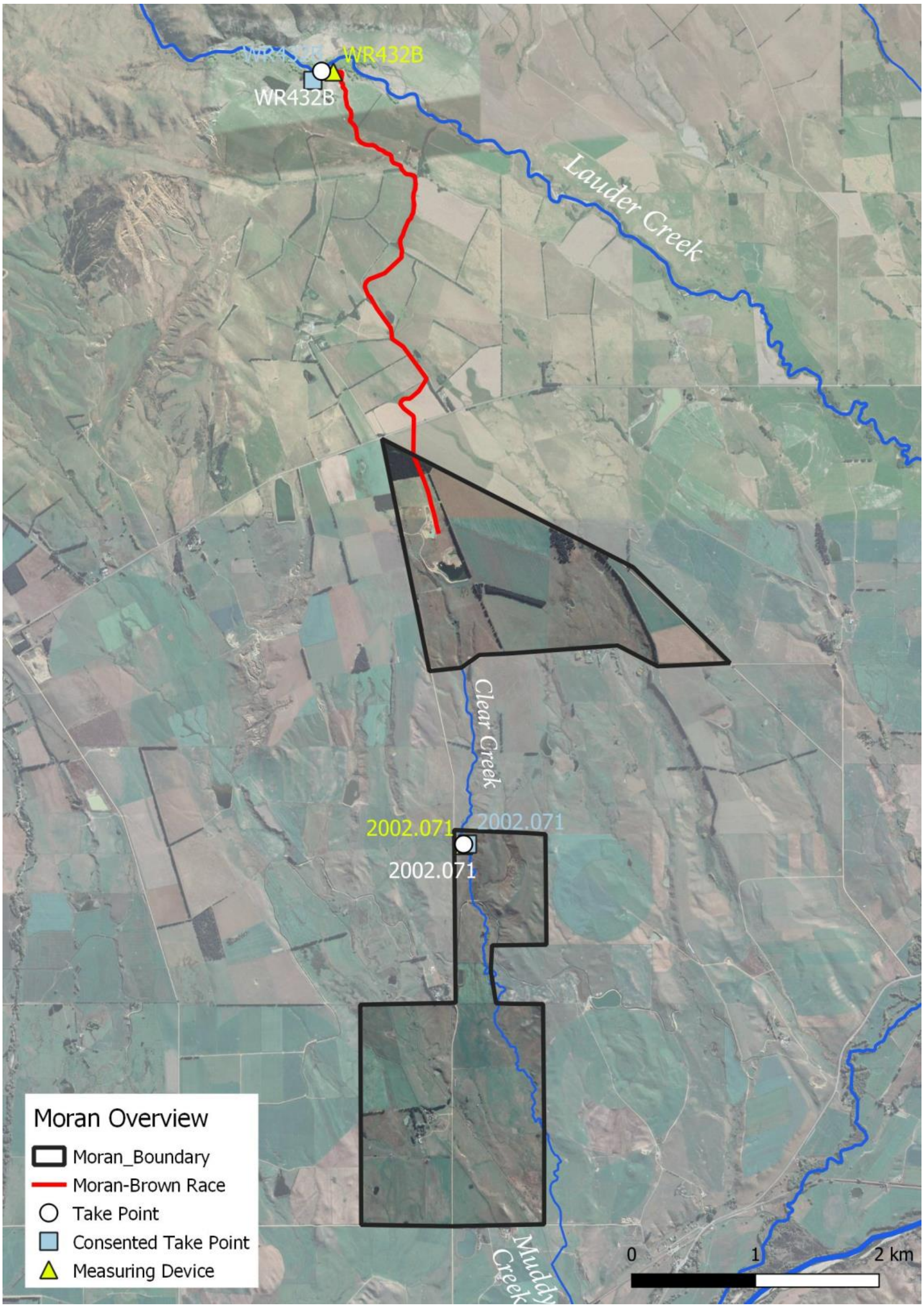


Figure 43 Overview of Viewpoint Farm

9.4.4 Irrigation and Investment

In recent years, the applicant has invested significantly in upgrading their irrigation systems from overland flow techniques to spray methods, with ongoing development centred around piping the water delivery around the farm.

The water is currently transported around the farm using a combination of both races and pipes. Delivery to hydrants for the k-line and the gun spray systems is done with underground piping.

Water storage on farm includes four ponds. Three of the ponds hold approximately 15,000 m^3, and there is a larger dam (as picture below) with a capacity of approximately 100,000 m^3.

Figure 44 Photograph of Top Dam

9.4.5 Water Take and Water Use

Permit WR432B

The applicant has ½ share in Permit WR432B.

As described in Section 9.3, the point of take under this Permit is in the mainstem of Lauder Creek in the upper catchment area on the property owned by the Heckler family. The water is raced across others' properties and delivers water to the applicant's property. A Section 417 Certificate is attached in Appendix H.

The water taken under Permit WR432B is currently measured at the point of take via an open channel weir of rectangular shape with a gate that can control the flow of water during low flows. An overflow channel allows excess water to be returned to the Lauder Creek. Water use data is telemetered to the ORC from water meter number WM0711.

It is proposed to shift the intake location for this permit upstream to the location of the OAIC's intake location under Permit 2001.710. In the future, the water taken under Permit WR432B will be measured in combination with water abstracted under Permit 2001.710. As described in Section 9, the measurement of water taken under Permit 2001.710 away from the point of take is authorised under Notice of Exemption WEX0119. Water use data is telemetered to the ORC using WM0107.

The water race delivers water to the farm where it is used to irrigate up to 200 ha on the 'Top Place' block using a mixture of gun and border dyke methods. Historically, irrigation on this area occurred using only open races and border dyke application. The dam on the top block assists in levelling out the application timing by storing some of the early season water for application at a later date.

The water supply is most reliable in spring and then through summer the ability to abstract the full rate decreases. The on-farm storage is crucial to make the most of the time the flow is available for abstraction. On occasion, the water from the WR432B source can also be dropped into a gully and is then retaken at the Clear Creek intake and used on the Home Block.

Refer to photos of the intake, supplied in Section 9.3.

Permit 2002.071

The water take location for Permit 2002.071 is located in a tributary of Clear Creek, approximately 1.2 kilometres north northeast of the intersection of Muddy Creek Road and Mawhinney Road, Lauder.

Water is taken via a raced intake and conveyed to the applicant's smaller storage pond. From here it is used for irrigation and stock water supply on the 'Home Block'. It is applied using k-line and big gun spray irrigation and contour application methods.

The water taken under Permit 2002.071 is measured at the point of take via an open channel weir of rectangular shape with a gate structure that controls the rate and quantity of water taken from the Creek. Water use data is telemetered to the ORC from water meter number WM0111.

	
Point of take location under Permit 2002.071, showing tributary of Clear Creek on the LHS, and gate structure on the RHS *Source: ORC Inspection Sheets*	Water from Creek running through the race
	
Gate structure on tributary of Clear Creek	Water metering at the point of take measuring flow running through the race

Tributary of Clear Creek above point of take

Figure 45 Photographs of Point of take and associated infrastructure under Permit 2002.071

The tributary of Clear Creek is primarily fed by run off from contour and border dyke irrigation on the properties upstream of Morans or by water deliberately released into the creek for abstraction by Morans. This water supply will most likely reduce over time as the irrigation application methods above are upgraded.

OIAC Water

The farm receives water from the OAIC via the Main Race. This water is used primarily on the west side of the 'Home Block' where the water is irrigated by k-line, big gun and contour methods.

This water can be released into the small dam or used directly from the race at locations around the farm.

Schematic of Irrigation Set up

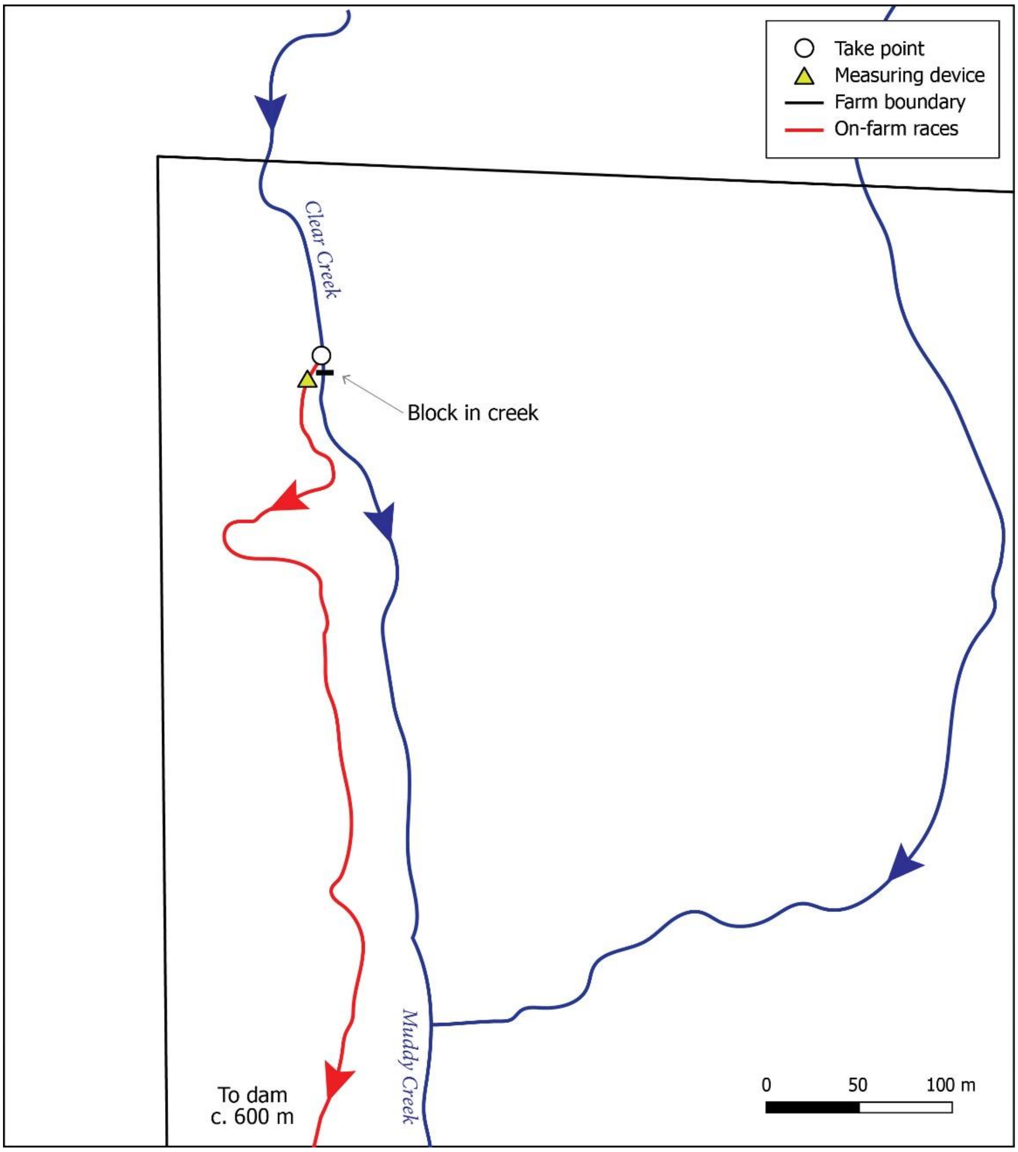


Figure 46 Schematic of Viewpoint Farm Ltd 2002.071 intake and measuring device

9.4.6 Water Use Summary

The irrigated areas on Viewpoint Farm are summarised below:

Table 42 Irrigated areas on Viewpoint Farm Ltd

Block	**Water source**	**Irrigation type**	**Irrigated area Area (ha)**
Top Place	Permit WR432B Lauder Creek	Big Gun Border dyke and contour	200
West side and East side of Home Block	OAIC Main Race water Permit 2002.071(which includes retake of 432B)	K-line, big gun and contour	278
Total			**478**

Water use on Viewpoint Farm is summarised below.

Table 43. Overview of water use on Viewpoint Farm

Information	**Property Details**
Size of property	540 ha
Size of area irrigated	478 ha
Sources of Water	Permit WR432B Lauder Creek Permit 2002.071 Trib of Clear Creek OAIC Manuherikia River via Main race
Maximum recorded rate of take (from metering data)	Permit WR432B Lauder Creek: 112 l/sec(in co-operation with Browns) Permit 2002.071 Trib of Clear Creek: 56 l/sec
Maximum recorded annual volume (from metering data)	Permit WR432B Lauder Creek Permit 2002.071 Trib of Clear Creek
Aqualinc calculation of maximum efficient use m^3	4,254,844
Number of stock	3800 Stock units: 1000 sheep, 1300 lambs and 650 cattle.
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	2300 @ 5 l/day = 11500 l/day 650 @45 l/day = 45,000 l/day Total = 56,500 l/day = 0.65 l/s
Frequency of water take (average and maximum)	24hrs day whenever the water is available and can be sent to the storage dams to be used as needed

Information	Property Details
Months during which water is expected to be taken in a dry year	As the two permits are used to fill storage dams the water is taken when it is available in any of the 12 months of the year
Part of day water when water will typically be taken:	Water is abstracted when it is available at any time of the day for up to 24hours
Does use of water provide recharge back into catchment?	Yes sometimes the water abstracted under 432B is delivered to the intake for 2002.071 in Clear Creek. The areas that are contour irrigated will result in some water moving to properties below. However, these areas are slowly being reduced.
Is take from re-charge or is an augmented take?	Yes the Clear Creek take relies on recharge from other contour irrigated paddocks and water delivered from the 432B permit
Hectares in a day	Depends completely in the water available and paddocks that require watering.
Storage	Yes approximately 145,000 m^3

The figure below shows irrigation by type occuring on the Viewpoint Farm property.

Figure 47 Irrigated areas by type on Viewpoint Farm (note that irrigation extent is indicative only)

9.4.7 Water Use Records

Water use records are held at the ORC and the data is summarised here. No alternative water use records are provided.

Water Use Records WR432B

The applicant has ½ share of Permit WR432B.

The water use records for this Permit are set out in Section 9.3 and these are also adopted here.

Table 44 Water Use Records WR432B

Permit	Consented rate of take (l/s)	Max rate of take recorded (l/s)	Calculated Consented monthly volume (m^3)	Max monthly volume recorded (m^3)	Calculated Consented annual volume (m^3)	Max annual volume recorded (m^3)
WR432B ½ share	113.3	113.3	297,537*	275,913 Filtered	3,579,441*	1,469,226* Filtered

Water Use Records 2002.071

a) Rate of Abstraction

The figure below shows the rate the rate of abstraction for this permit measured at WM0111.

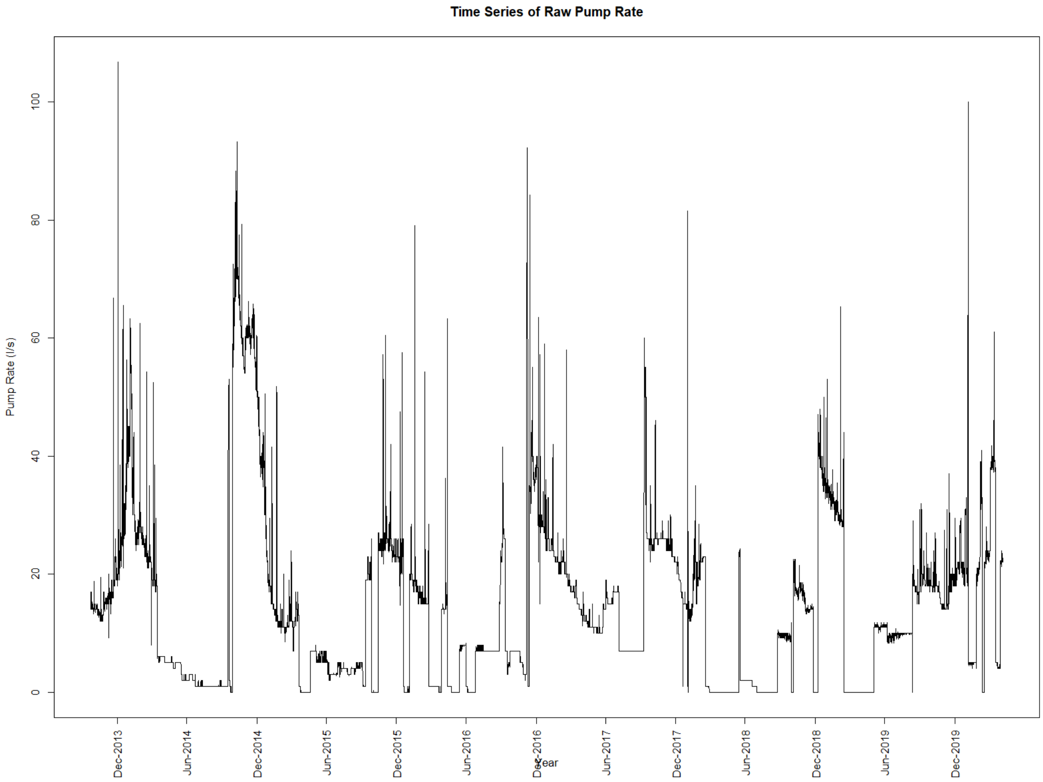


Figure 48 ORC held metering data for rate of abstraction for Viewpoint Farm under Permit 2002.071

The consented maximum rate of abstraction for this permit is 56 l/s.   However, the records indicated a consistent exceedance of the authorised limit, with a maximum recorded rate of take of 106.75 l/s. These exceedances are noted in the ORC compliance water inspection sheet[23] for this Permit. It is thought that these exceedances could be attributed to high rainfall events and resultant high flows in the trib of Clear Creek, producing unreliable data returns.

The consented rate of abstraction for this Permit is regularly achieved.

b) Monthly Volume Abstracted

The figure below shows the monthly volume of abstraction for this permit.

[23] Inspector Byron Pretorius, dated 6 December 2018.

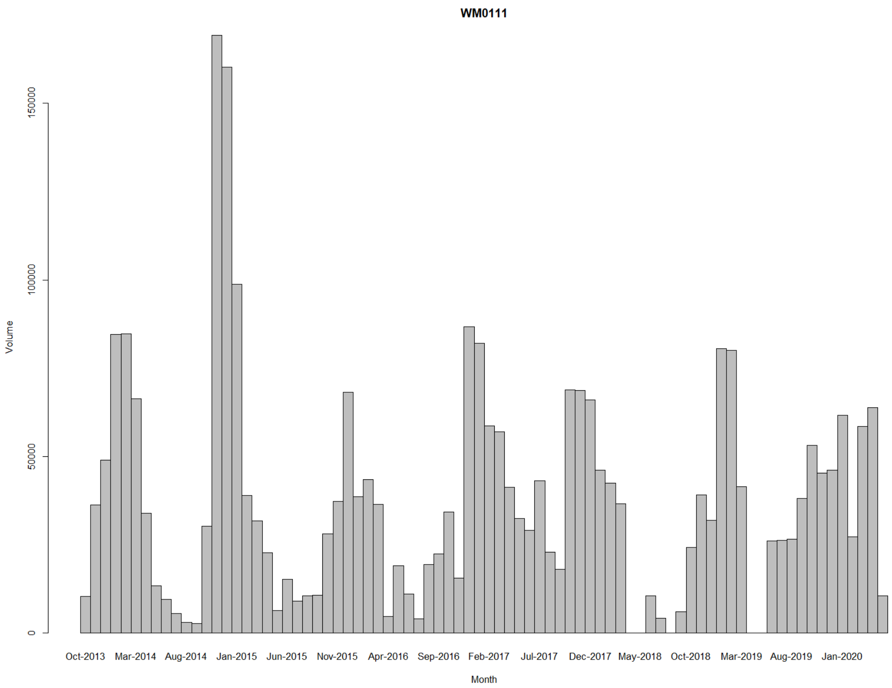


Figure 49 Graph showing monthly volume water use data for Permit 2002.071

The consented maximum monthly abstraction volume for this permit is 216,000 m^3. The maximum recorded volume 169,188.3 m^3 in February 2014.

The volume abstracted achieves the monthly abstraction limit.

c) Annual Volume

The table below shows the annual volumes abstracted under this Permit.

Table 45 Annual abstraction volumes water use data for Permit 2002.071

Annual Volume at WM0111	m^3
2013/2014	388,632.6
2014/2015	**584,963.1**
2015/2016	317,475
2016/2017	483,288.3
2017/2018	423,395.1
2018/2019	334,109.7
2019/2020	457,594.2

The maximum recorded annual abstraction volume under this Permit is 548,963.1 in 2014-2015.

9.4.8 Summary of Water Use Records

Table 46 Summary of Water Use Records for Viewpoint Farm Ltd

Permit	Consented rate of take (l/s)	Max rate of take recorded (l/s)	Consented monthly volume (m^3)	Max monthly volume recorded (m^3)	Calculated Consented annual volume (m^3)	Max annual volume recorded (m^3)
WR432B ½ share	112	113.3 Filtered	297,537*	275,913 Filtered	3,579,441*	1,469,226 (half) Filtered
2002.071	56	61.6[24]	216,000	169,188.3	2,592,000[25]	584,963.1

9.4.9 Water Balance

Using the soil and rainfall maps and efficient water allocation volumes from the Aqualinc Report the 478 ha irrigated on the Viewpoint property requires a total volume of 4,254,844 m^3 to be watered efficiently. That is the equivalent of 8901 m^3/ha/yr.

The total annual volume being requested in replacement of their half share of WR432B is 734,613 m^3 and in replacement of permit 2001.071 is 1,319,576 m^3. Along with 697,219.9 m^3 of OAIC water is requested. This is summarised in the table below.

[24] Capped at 10% above the consented rate of abstraction
[25] Derived by extrapolating the consented monthly volume to an annual volume (216,000 x 12)

Table 47 Moran water balance

Source	Aqualinc efficient allocation for the farm (m^3/yr)	Equivalent area (ha)[26]	Volume requested (m^3/year)
Private water portion of WR432	4,254,844	82.5	734,613
2002.071		65.7	584,963
Main Race		78.3	697,220
Total	**4,254,844**	**226.5**	**2,016,796**

The total volume requested of 2,016,796 m^3 is well within the total efficient volume as calculated by Aqualinc.

9.4.10 Allocation Requested / Outcome Sought

A summary of the allocation and limits sought by Viewpoint Farm Ltd is provided in the table below.

Viewpoint Farm are seeking the replacement of their two sources of water however as the details of 432B has been described in the Brown Section above and the OAIC it has not been repeated in the table here.

The Moran Brown permit (WR432B) is proposed to be changed within two years of the permits being issued. The existing site may operate for up to two years post consent issue and then the take will be combined with the OAIC site and the rate of take reduced. The maximum rate and volume will be available for abstraction at the original site for those two years. Once combined with the OAIC intake the rate available for the two intakes will decrease to 450 l/sec. That is a reduction from the possible maximum abstraction rate of 538 l/sec. The maximum volume of the two combined will remain. This permit has been described in both the OAIC and Brown Sections. Please note the Viewpoint Farm Ltd share in this take.

For clarity, just the Clear Creek consent for Viewpoint is below.

[26] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

Table 48 Allocation and limits proposed for Viewpoint Farm under replacement permits

	Primary Permit 1	**Primary Permit Clear Creek**
Consent	½ share WR432B which translates to a 13.4% share of volume in the combined take See OIAC and Brown sections for details.	2002.071
Rate of take l/sec		56
Maximum monthly volume (m³)		169,188.3
Maximum annual volume (m³)		584,963.1
Residual flow at intake l/sec		NA
Minimum flow		Applicant to comply with operative minimum flow

The draft permits with proposed conditions are provided in Appendix C.

Number of permits

The applicant seeks 2 replacement permits:

1. A jointly held permit with OAIC, Brown and Moran

2. A permit for 2002.071.

Point of take and monitoring

1. See Brown Section

2. Point of take for Clear Creek: same as current location.

Fish screens

A fish screen may be recommended for this take however an assessment to determine the need, practicalities and suitable design is requested before requiring implementation. A draft condition is included in the draft permits.

Residual flows

Based on the assessment undertaken by Hickey and Olsen (2020) (Appendix D), a residual flow of 100 l/s at the OAIC weir is recommended for WR432B.

Given Clear Creek is likely to be naturally intermittent and the recent fish surveys show no species present no residual flow is recommended for this take.

9.5 Avonrath, Geoff Clouston

9.5.1 Water Permits

Geoff Clouston holds the following permits:

Table 49 Permits held by Geoff Clouston

Permit	Location	Consented Abstraction
RM19.448.01	Lauder Creek	56 l/s 145,152m^3/month 980,890m^3/year
98122	Lauder Creek	200,000 l/hr
2004.788	An unnamed tributary of Lauder Creek	22 l/s 40,000 m^3/month 360,000 m^3/year
2004.787	To dam an unnamed tributary of Lauder Creek	NA

9.5.2 OAIC Shares

Avonrath receives water from the Lauder Scheme Race.

9.5.3 Farming Operation

Avonrath is a family farm that is currently producing pasture and crop for cattle grazing. The total property area is 560 ha, of which approximately 452 ha is irrigated. Much of the irrigation occurs using spray (pivot) irrigation, with the remainder irrigated by k-line and border dyke methods.

The farm is currently carrying 8,000 stock units. Avonrath is leased to another farmer however the owner Geoff Clouston assists the lessee with the day-to-day management of the property.

There are two sources of water on this farm, the private rights from the Lauder Creek and a tributary and the shares of OAIC water delivered via the Lauder Scheme race. All the water is combined on the farm to be used as and where required.

There are a series of storage ponds/dams that assist in providing an even water supply so the pivots and k-line can operate efficiently and apply water as it is needed not necessarily when it is available.

The farm supports Geoff Clouston and his family. There are usually three full time workers on the farm over summer, increasing to five full time workers in winter. The Clouston's employ stock carriers, vets, and other local contractors in the day to day running of this farm.

The figure below provides an overview of the Avonrath property.

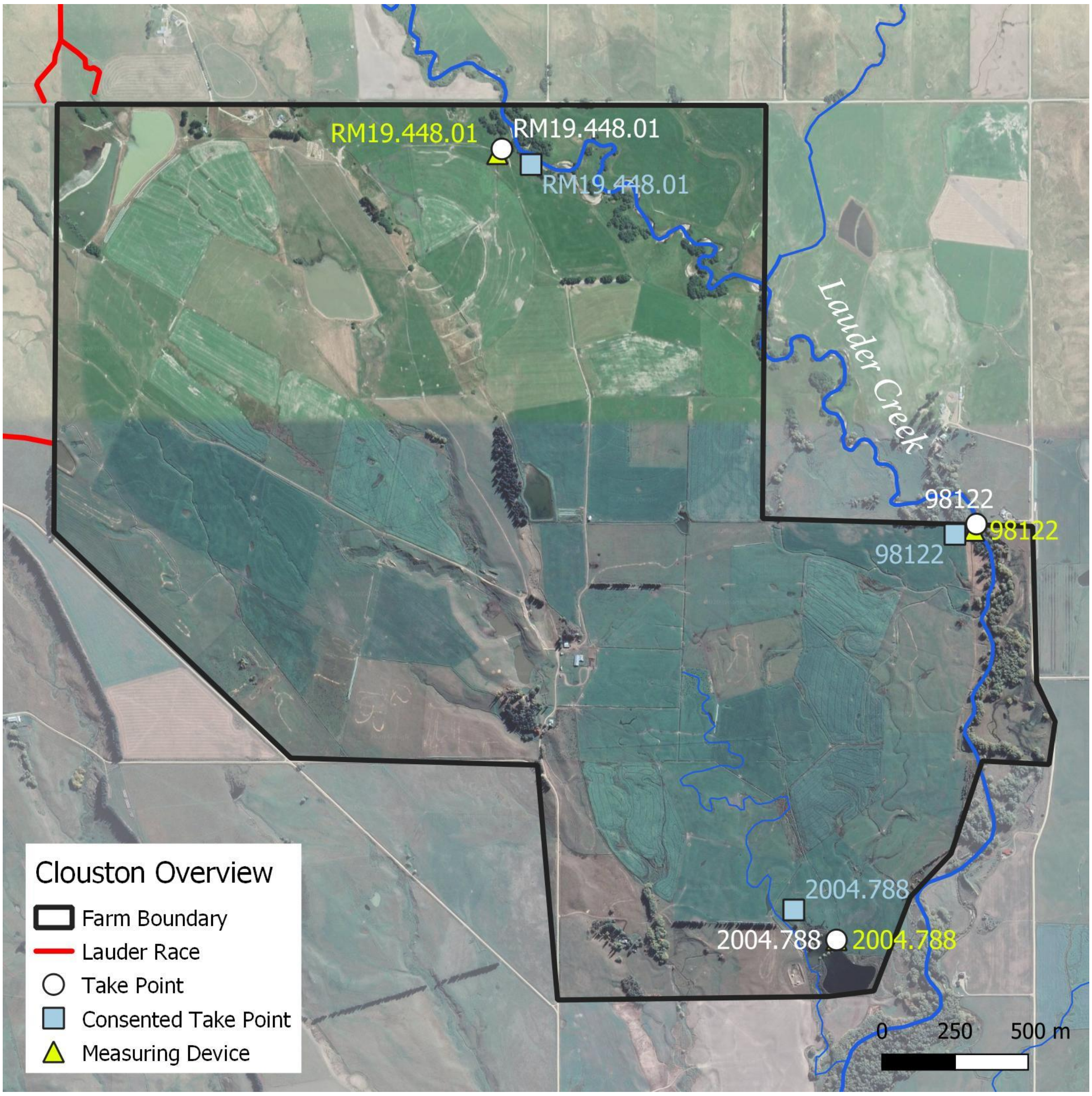


Figure 50 Overview of Avonrath

9.5.4 Irrigation and Investment

The applicant has upgraded and invested significantly in the farm to stay up with modern expectations of water use and efficiency. The property has undergone significant upgrades in the last 10 years. Including the conversion of 350 ha of the property from border dyke and contour flooding to pivot spray irrigation systems and 25 ha to k-line. The upgrade of the property has been substantial and includes new irrigation systems, storage ponds, altered paddock design, fencing, laneways and improved pastures. There was a clear message from the ORC that irrigation water needed to be applied and transported in an efficient manner that did not result in effects on water quality. The Cloustons undertook their farm irrigation upgrade to ensure their farm met modern water use expectations.

The costs of the storage and pivots is significant. The storage is used to smooth the delivery to the pivots. There is a small amount of contour flood and k-line that are turned off if water is scarce. Further loss of water surety will have a significant impact on the viability of this business.

Since 2010 the systems on Avonrath have been upgraded and efficiency improved. The programme has included:

- 4 pivots installed from 2010 to 2016,
- 6 integrated storage dams and undergrounds pipes connecting them to each other and the pivots,
- New fences and laneways
- New stock troughs through-out
- Renewed pastures to respond to the efficient water application.

Between 2010 and 2016 over $2.5 Million was spent on the upgrades. The stock troughs, fencing and pasture has come along since. The open channel water measuring equipment costs $10-15,000 each.

9.5.5 Water Take and Use

The intakes for all three private permits are located in Lauder Creek and its tributaries, on the applicant's property. The water taken under the three permits is conveyed around the farm using a combination of open races and underground pipes. The water is mixed, stored in a series of interconnected storage dams, and then used for irrigation over the whole farm. Approximately 350 ha is irrigated using centre pivots, k-line, and border dyke application. A few paddocks of border dyke remain as the surety of the replacement water is unknown and the risk of upgrading every paddock to spray was not considered a wise choice until after the consents are issued. When water becomes scarce the border dyke paddocks are the first not to be irrigated.

The water is also used for stock drinking for approximately 1000 head of cattle.

Permit 98122

The intake for Permit 98122 is located in Lauder Creek, approximately 550 metres north west of the intersection of Lauder Flat Road and Brown Road, Lauder. The intake comprises a gated structure with a piped culvert which supplies water to an open race. From here the race delivers water to a dam for storage and irrigation purpose.

	
Point of take location on Lauder Creek *Source: ORC Inspection Sheets*	Intake structure, including piped culvert intake and gate structure. Source*: ORC Inspection Sheets*
	
Weir, and measuring devices installed on race *Source: ORC Inspection Sheets*	Weir structure with staff gauge *Source: ORC Inspection Sheets*

Figure 51 Photographs of intake and associated infrastructure under Permit 98122

The water taken under Permit 98122 is measured at the point of take via a calibrated open channel weir as pictured above. Water use data is telemetered to the ORC from water meter number WM0700.

Permits 2004.788 (Take) and 2004. 787

Permits 2004.788 and 2004.787 were issued together and conditions of consent require they be exercised in conjunction with one another.

The intake for Permit 2004.788 is located in an unnamed tributary of Lauder Creek, approximately 4 kilometres south west of Becks in the Manuherikia Valley, Central Otago. The water is taken from an unnamed tributary of Lauder Creek into a consented dam (Permit 2004.787) where it is stored and used for irrigation. It is a very small dam, storing no more than 2,000 m^3 under the existing conditions of consent.

The water taken under Permit 2004.788 is measured at the point of take via a calibrated open channel weir (cipoletti weir) with an electronic flow measuring device. Water use data is telemetered to the ORC from water meter number WM1192. It was installed by NIWA and John Anderson and is maintained by the applicant and NIWA.

Water is abstracted from the dam via a pipe and delivered directly to the centre pivot nearby. The unnamed tributary flows under the centre pivot and therefore carries a small amount of water that has been irrigated by the centre pivot back towards the dam. The tributary flows when the centre pivot is operating. This water is primarily retake water. See schematic below for 2004.788.

Downstream of the abstraction site the creek flows across the dam in a pipe as photographed below and down the unnamed tributary creek bed. A discharge from the dam joins this flow on occasion as well.

The consent to dam is being replaced with this application. At the time this consent was issued the Permit Holder allowed all the flow to enter the dam and then measured as water was abstracted from the dam. Consequently, an existing condition of consent on Permit 2004.787 required the Permit Holder to ensure that 5 l/s is always flowing from the dam. However, this Condition of Consent is now unworkable because the measuring set up has since changed. Water is now measured as it is abstracted from the Creek and leaves the rest of the Creek to flow out across the dam and off the farm. Water is also delivered to the dam from a race that transports water from one of the other dams on the farm from the intake associated with 98122.

The dam is pictured below and clearly illustrates it is primarily a pond with a small bund just above ground level. The bulk of the water is stored below the ground rather than above.

	
Dam location, showing centre pivot pump shed in background. *Source: ORC Inspection Sheets*	Waterway running between two dam structures, carrying residual flow of unnamed tributary of Lauder Creek natural flow. *Source: ORC Inspection Sheets*
	
Raced intake location of unnamed tributary into dam. *Source: ORC Inspection Sheets*	Bywash from the dam back into the unnamed tributary of Lauder Creek. *Source: ORC Inspection Sheets*

Figure 52 Photographs of Consented Dam under Permit 2004.787

Permit RM19.448.01

The intake for Permit RM19.448.01 is a gated structure in Lauder Creek, approximately 12 km upstream of the confluence with the Manuherikia River. It is located just downstream of the Glassford Rd crossing on Lauder Creek. Water is raced from the point of take to the nearby storage dam.

	
Consented point of take from RM19.488.01 Mainstem of the Lauder Creek *Source: ORC Inspection Sheets*	High flows in Lauder Creek, and first gate intake structure. *Source: ORC Inspection Sheets*
	
Second gate structure, governing the rate and quantity of water taken from Lauder Creek *Source: ORC Inspection Sheets*	Measuring equipment *Source: ORC Inspection Sheets*

Figure 53 Photographs of intake and associated infrastructure for Permit RM19.448.01

The water taken under Permit RM19.448.01 is measured at the point of take via a calibrated and permanent open channel weir. As pictured above the flow is electronically measured and telemetered to the ORC. NIWA assist in maintaining the site. Water use data is telemetered to the ORC from water meter number WM0702.

The water is applied to land via spray that is piped directly from the storage.

OAIC Water

The applicant farm receives water from the OAIC via the Lauder Race. This water is directed from the top of the property to the storage dams first. It is then piped from the storage to the spray systems on the farm via underground pipes.

Schematics of Irrigation Set Ups

A series of figures below show the irrigation set up under the applicant's water permits.

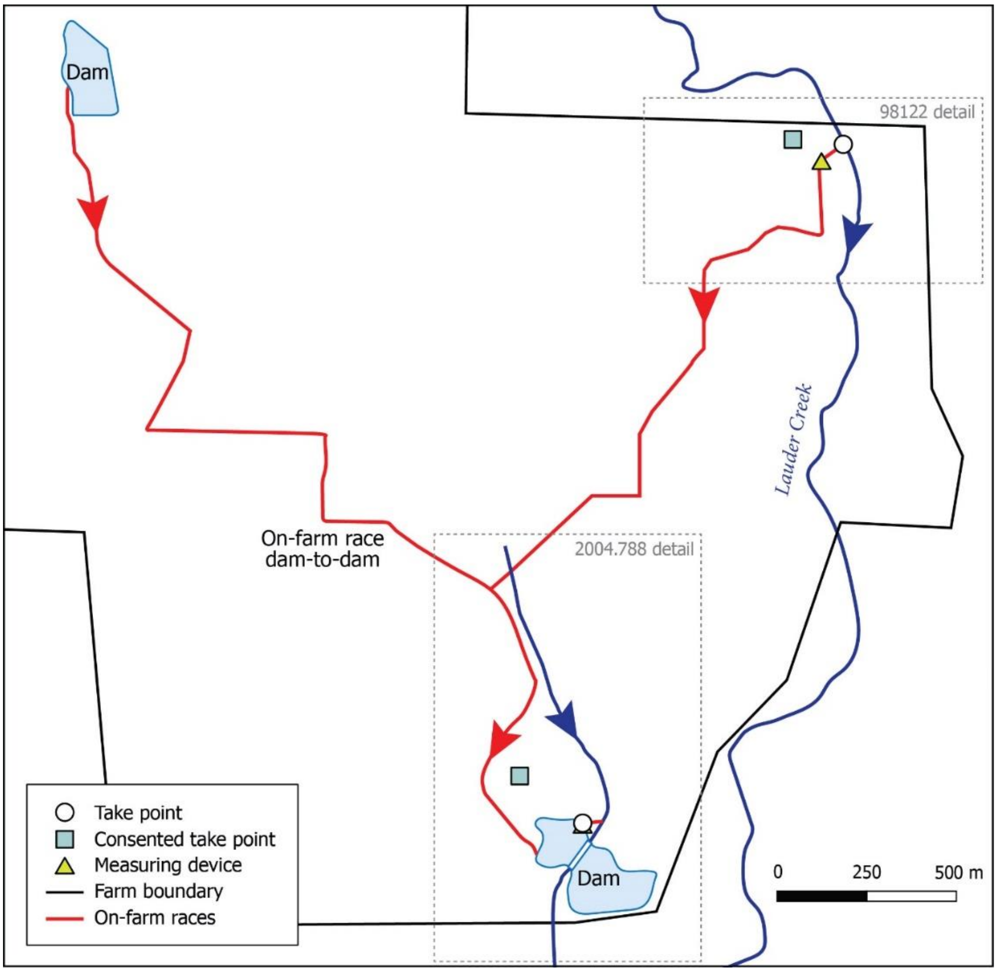


Figure 54 Overview Schematic of the two most southern takes in the Avonrath Irrigation Set up

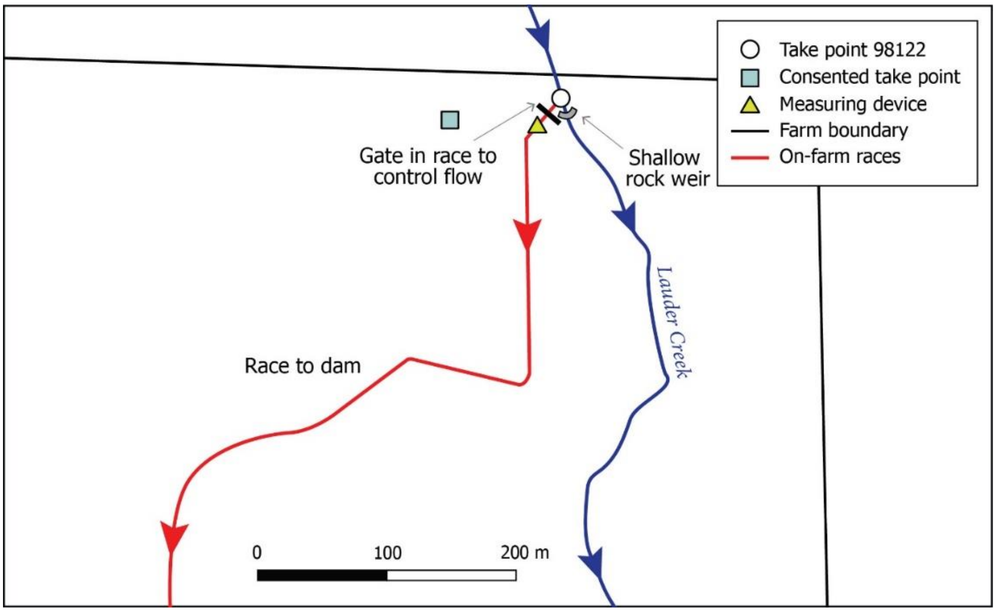


Figure 55 Close up schematic of the intake for 98122

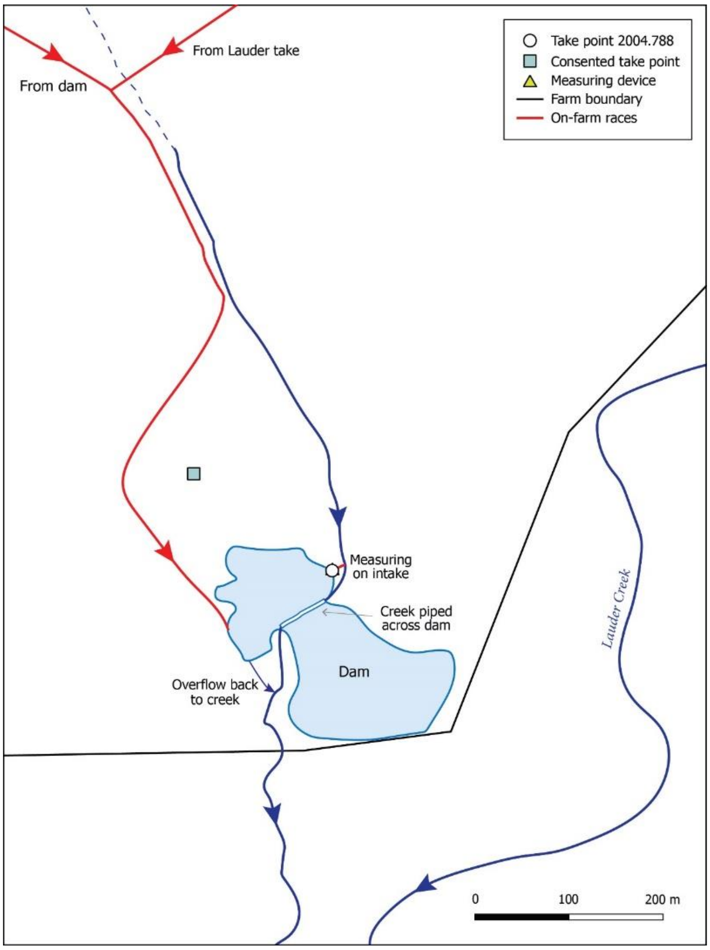


Figure 56 Close up schematic of the intake for RM2004.788 and Consented Dam 2004.787

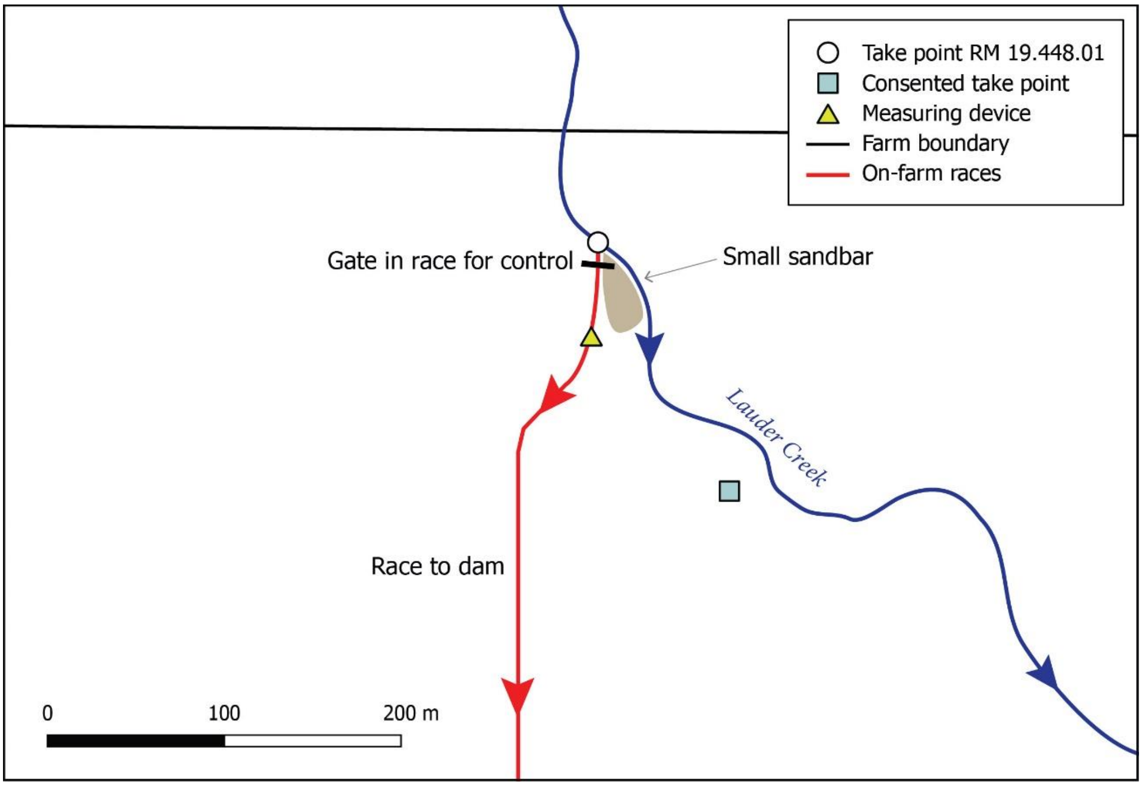


Figure 57 Schematic for RM19.448.01 which is the third take and the most northern

9.5.6 Water Use Summary

The tables and figure below provide a water use summary for this property.

Table 50 Irrigated areas on Avonrath

Block	Water source	Irrigation type	Total Area (ha)
Mixed and used on whole farm	Permit 98122 Permit 2004.788 Permit RM19.448.01 OAIC Lauder Race	350 ha centre pivots 25 ha kline 77 ha border dyke	452 ha

Table 51. Water Use Summary for Avonrath

Information	Property Details
Size of property	560 ha
Size of area irrigated from all water sources	Up to 452 ha
Sources of Water	OAIC Lauder Race Unnamed tributary of Lauder Creek: Permit 2004.788 Lauder Creek: Permits 98122 and RM19.448.01
Maximum recorded rate of take (from metering data) l/sec	2004.788: 22 98122: >56 RM19.448.01: 56
Maximum recorded annual volume (from metering data) m^3	2004.788: >360,000 98122: 440,119.73 RM19.448.0:1 769,369
Aqualinc calculation of maximum efficient use for the whole farm.	3,874,294
Number of Stock	1000 cattle
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	1000 @45 = 45,000 l/day = 0.52 l/sec
Frequency of water take (average and maximum)	Maximum = 24 hours per day, 7 days per week, 4 weeks per month Average – varies depending on season, but usually continuously when water is available.
Months during which water is expected to be taken in a dry year	The applicant has abstracted during all months of the year. The flows in the Lauder creek decrease over summer so consequently the amount available for abstraction also decreases. In a dry year the flows may drop sooner in the season. The applicants will continue to abstract while the flows allow. Two of the takes are operated all year as they will be filling storage. 2004.788: 12 months of the year as water allows and the dam has space 98122: Sept to May inclusive, regardless of the year 19.448.01: 12 months of the year as flows allow
Months during which water is expected to be taken in an average year	As above but the flows during the summer months may be a little higher. 2004.788: 12 months of the year as water allows and the dam has space 98122: Sept to May inclusive, regardless of the year 19.448.01: 12 months of the year as flows allow
Application timing	Water will be applied to maintain reasonable soil moisture for crop and pasture growth while avoiding wilting point. In the spring that

Information	Property Details
	may mean a slightly longer return interval of a two to three weeks. In summer if only 15-20mm is being applied in one pivot pass the water may need to be applied to each paddock once every 3 days. If the pivots are set to do a full rotation every 3 days then it won't be off in the middle of summer. As water becomes restricted the border dyke paddocks will be left as dryland and the k-line paddocks may also be left unwatered.
Does use of water provide recharge back into catchment?	Unlikely with pivot and k-line irrigation. However the pivot on the most southern paddock does travel over the unnamed tributary so does provide some recharge to the tributary. This farm has undergone complete upgrade of irrigation application methods in recent years so will have made large improvements in addressing any losses.
Is take from re-charge or is an augmented take?	The take point for 2004.788 is benefiting from some irrigation water flowing through the soil profile and contributing to the flow in the unnamed tributary and being applied directly over the small tributary.
On farm infrastructure	The water is transported to and between the storage ponds with open races however all spray systems are connected to underground pipes. The farm is extensively developed with stockwater systems and hydrants for irrigation.
Storage for irrigation	There are six storage dams on farm, as described in the application above. Total capacity is approximately 180,000m^3
Monitoring in place	Yes
WEX required and obtained	No WEX required.
s417 Certificate required and obtained	No section 417 required. Intake and races located on applicant's land.

The figure below provides an overview of the irrigation occurring on Avonrath property.

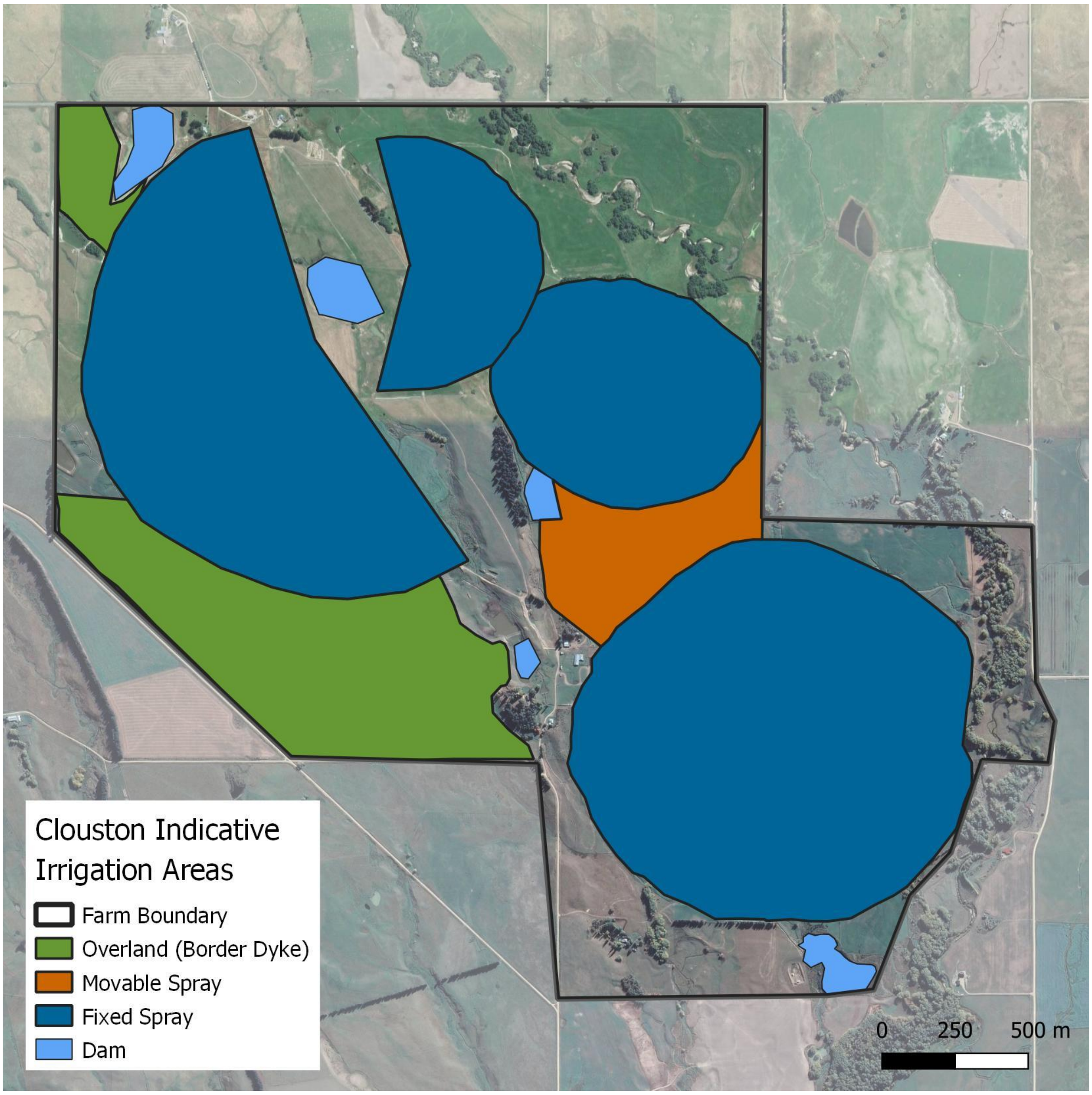


Figure 58 Irrigation on Avonrath Property (Note, irrigation extents are indicative only)

9.5.7 Water Use Records

Water use records are held at the ORC and the data is summarised here. No alternative water use records are provided.

Where required, abstraction records were sourced from the Otago Regional Council's Hilltop Database directly for data filtering and analysis purposes. Data was processed using excel software. The approach is consistent with recent hearing decisions (see: Long Gully Race Society RM17.176; and Queensbury Ridges Ltd (pending appeal) RM19.312), and the method proposed by the Otago Water

Resources Group[27]. The water meter has been verified frequently and so this record of abstraction is true and accurate.

Permit 98122

a) Rate of Abstraction

The figure below shows the rate the rate of abstraction for this permit measured at WM0700.

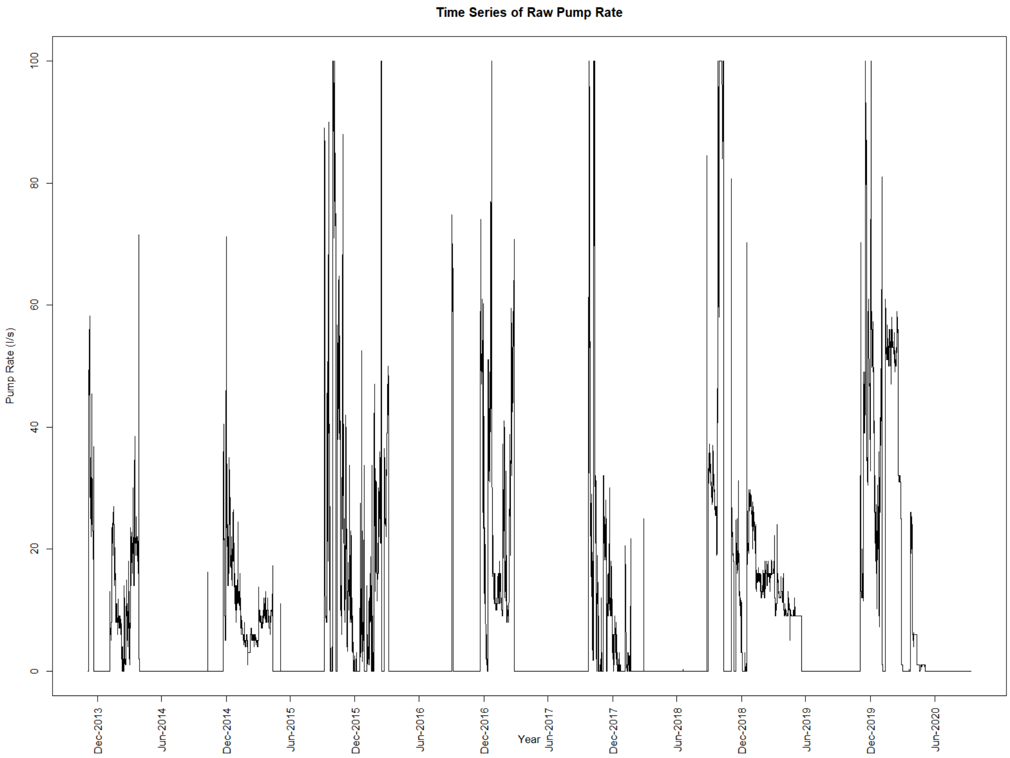


Figure 59 ORC held metering data for rate of abstraction for Permit 98122

The consented maximum rate of abstraction for this permit is 56 l/s. However, the records indicate exceedances of the authorised limit. This can be due to faulty meters or freshes and floods spiking the rate of take. This will require more careful management in the future..

Overall, the consented rate of abstraction is achieved.

b) Monthly Abstraction Volume

The figure below shows the monthly volume of abstraction for this permit.

27 Submission by Otago Water Users Resource Group on Proposed Water Permits Plan Change (Plan Change 7) to the Regional Plan: Water for Otago.

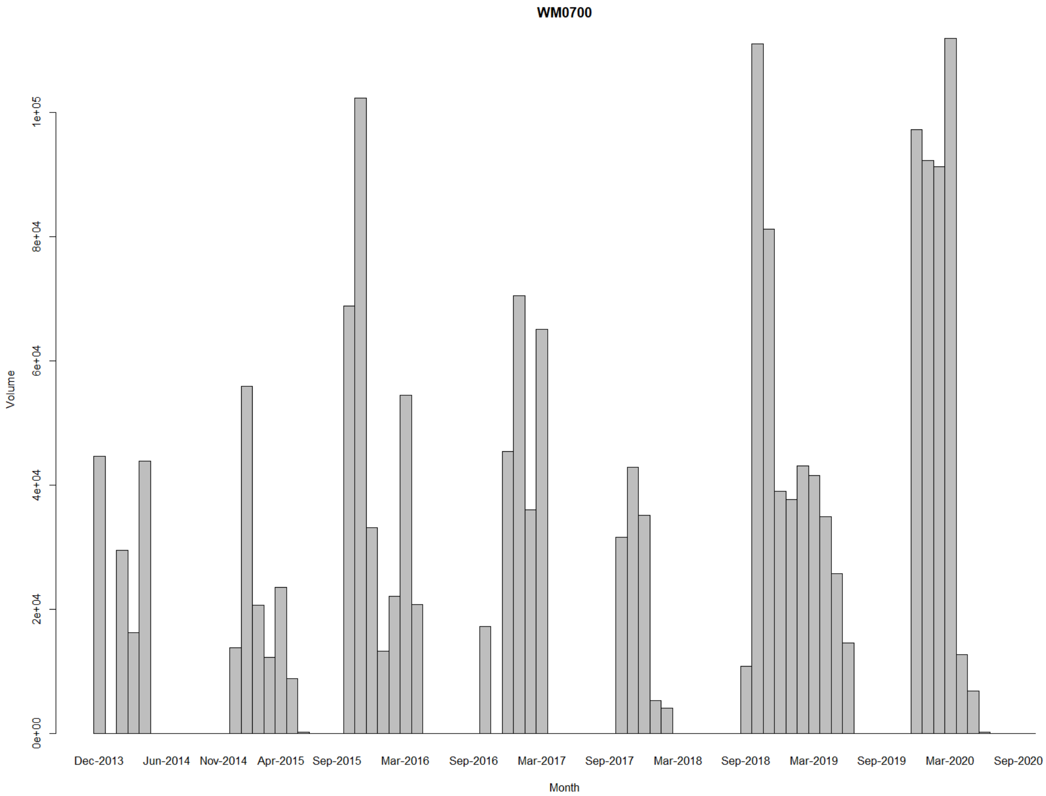


Figure 60 Graph showing monthly volume water use data for Permit 98122

There is no maximum monthly abstraction volume specified on this permit. The maximum recorded volume is 111,951m^3 in March 2020.

c) Annual Abstraction Volume

The table below shows the annual volumes of abstraction for this permit.

Table 52 Annual abstraction volumes water use data for Permit 98122

Annual Volume at WM0700	m^3
2013/2014	134,441.1
2014/2015	135,813.6
2015/2016	315,258.3
2016/2017	234,559.8
2017/2018	119,331
2018/2019	**440,119.73**
2019/2020	412,884.9
2020/2021	0

There is no maximum annual volume specified on this Permit. The maximum recorded annual volume is 440,119.73m^3 in 2018-2019.

Permit 2004.788

a) Rate of Abstraction

The figure below shows the rate of abstraction water use data for this permit measured at WM1192.

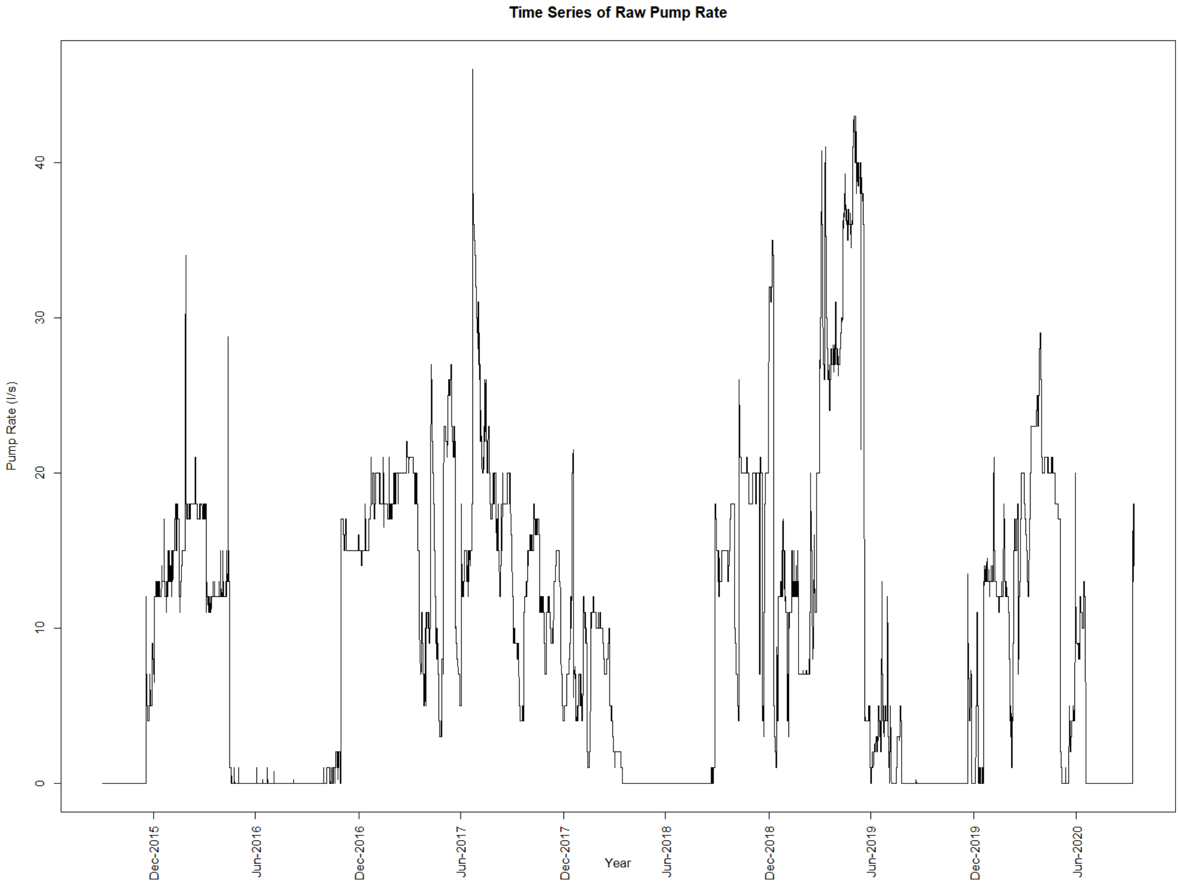


Figure 61 ORC held metering data for rate of abstraction under Permit 2004.788

The consented maximum rate of abstraction for this permit is 22 l/s. However, the records indicate a consistent exceedance of the authorised limit, with a maximum recorded rate of take of 40 l/s. This was due to the lack of steady flow passing through the open channel measuring device. The dam height was causing the water to back up into the measuring channel which distorted the data. This has been corrected and NIWA have re-verified the site.

The authorised rate of abstraction for this permit is achieved.

b) Monthly Volumes Abstracted

The figure below shows the monthly volume of abstraction for this permit.

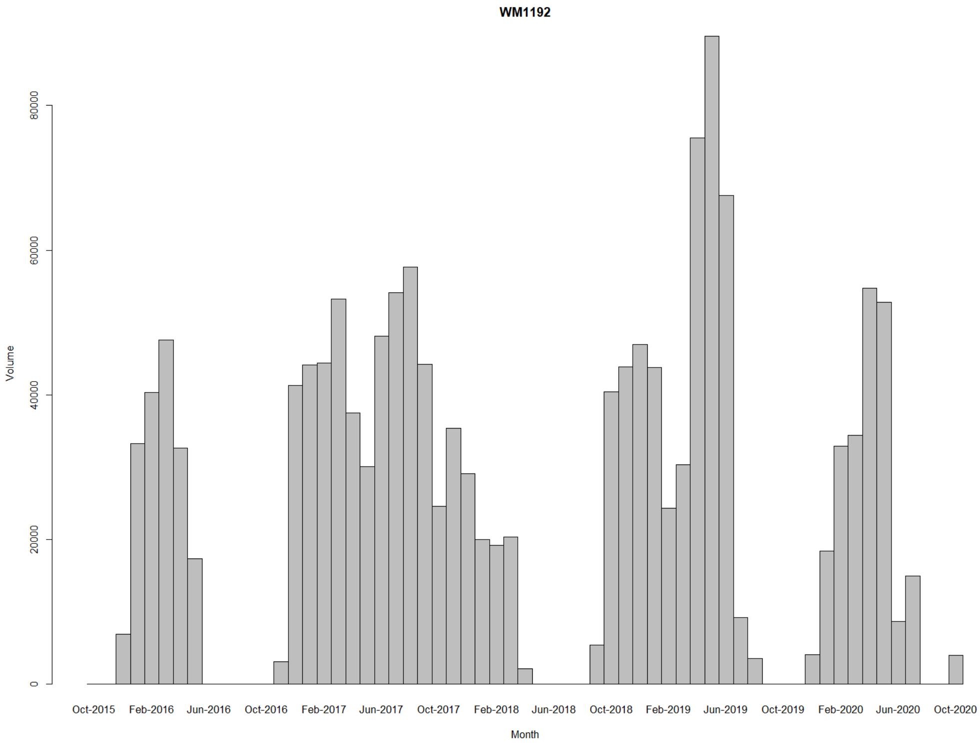


Figure 62 ORC held metering data for monthly abstraction volumes under Permit 2004.788

The consented maximum monthly abstraction volume for this permit is 40,000m^3. The exceedances have been explained above.

The consented monthly abstraction volume is achieved.

c) Annual Abstraction Volume

The figure below shows the annual abstraction volumes for this permit.

Table 53 Annual Volumes abstracted under Permit 2004.788

Annual Volume at WM1192	m^3/year
2015/2016	178,378.2
2016/2017	302,111.1
2017/2018	307,103.4
2018/2019	**467,870.02**
2019/2020	219,065.4
2020/2021	18,945.9

The consented maximum annual volume for this Permit is 360,000 m^3/year. The maximum recorded annual volume is 467,870.02 m^3 in 2018-2019. This take is primarily a retake. Only a portion of this water is new water. The applicant will look at a way to alter the measuring set up to avoid measuring the water that has already been measured onto the farm.

Water Use Records RM19.448.01

a) Rate of Abstraction

The figure below shows the rate of abstraction water use data for this permit, measured at WM0702.

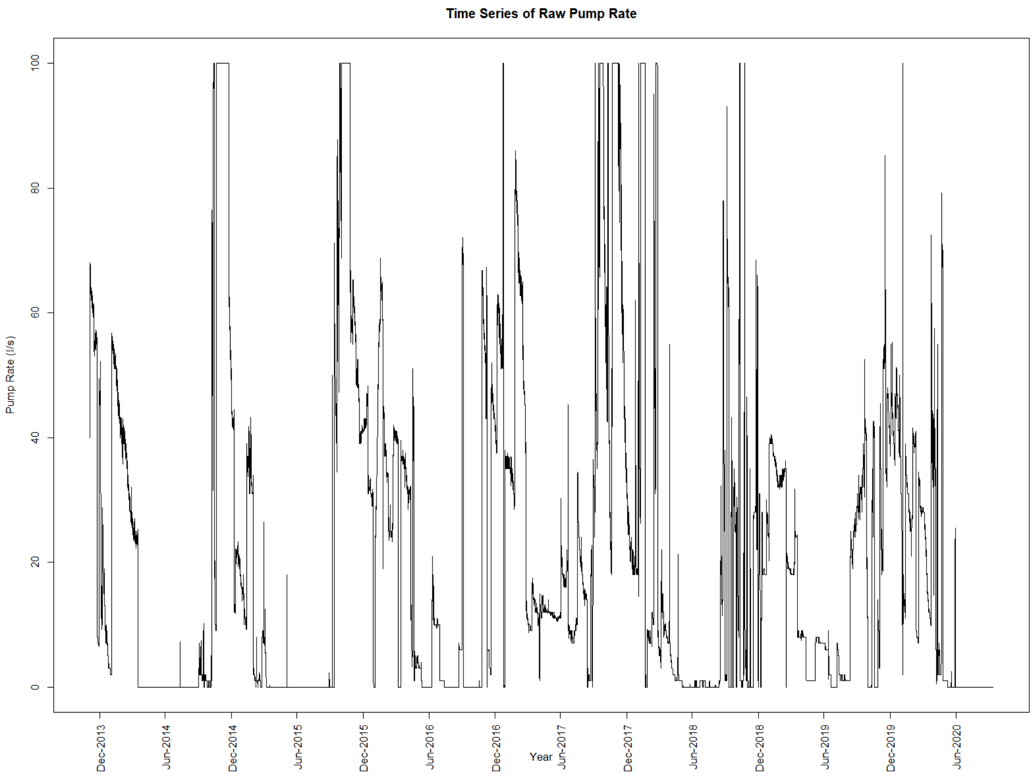


Figure 63 ORC held data for rate of abstraction under RM19.448.01

The consented maximum rate of abstraction for this permit is 56 l/s. On occasion due to the meter error or floods and freshes, the abstraction data spiked above the 56 l/sec. Gate structures have been installed to offer finer control of the intake.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum has been specified as the maximum recorded rate of abstraction for exceedances within the water meter's margin of error, and these exceedances are acknowledged. Data was processed using excel software.

The maximum (filtered) rate of abstraction for this Permit is 56 l/s.

b) Monthly Volumes Abstracted

The figure below shows the monthly rate of abstraction measured at WM0702.

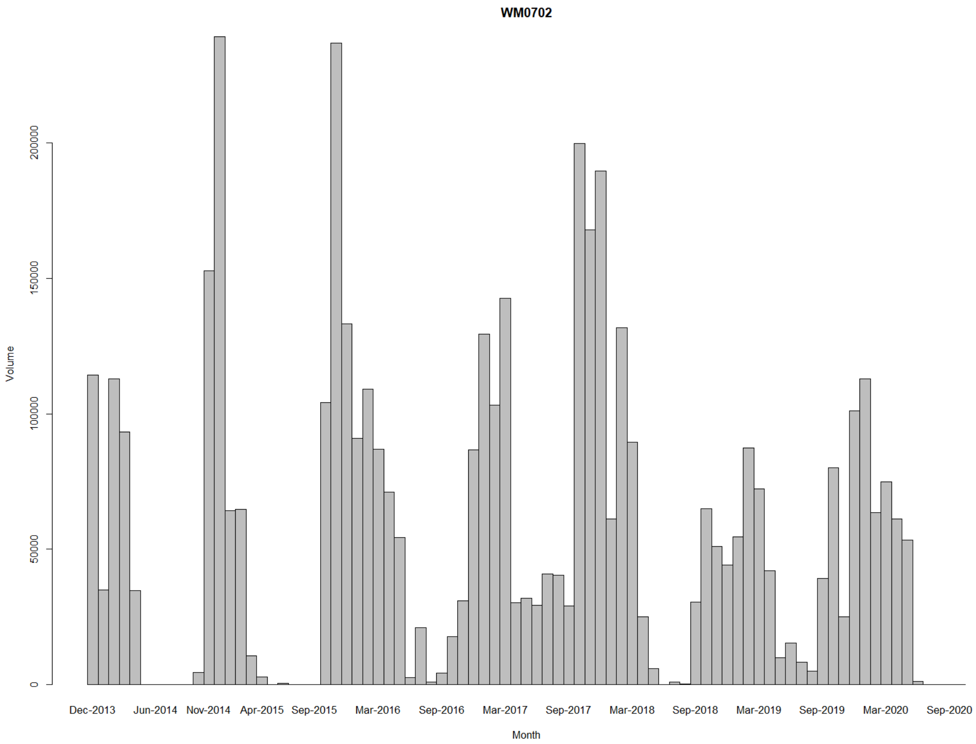


Figure 64 Figure 41 ORC held data for monthly volumes abstraction under RM19.448.01

The consented raw maximum monthly abstraction volume for this permit is 145,152 m^3. Due the frequency of errors the data was filtered.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum has been specified as the maximum recorded monthly volume for exceedances within the water meter's margin of error, and these exceedances are acknowledged. Data was processed using excel software.

The maximum (filtered) monthly volume of abstraction for this Permit is 145,152m^3.

c) Annual Abstraction Volumes

Table 54 Raw data for Annual Volumes abstracted under Permit RM19.448

Annual Volume at WM0702	m^3
2013/2014	390,382.2
2014/2015	540,128.7
2015/2016	888,943.5
2016/2017	628,683.3
2017/2018	980,930.7
2018/2019	474,244.2
2019/2020	626,412.71
2020/2021	0

The consented maximum annual volume for this Permit is 980,890 m^3. The maximum recorded annual volume is 980,930.7 m^3 in 2018-2019. Given the questions around data accuracy, abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum annual volume is reduced to 769,369 m^3.

9.5.8 Summary water use records

Table 55 Summary of water use records for Avonrath

Permit	Consented rate of take (l/s)	Max rate of take recorded (l/s)[28]	Consented monthly volume (m^3)	Max monthly volume recorded (m^3)	Consented annual volume (m^3)	Max annual volume (m^3)
98122	55.6	61.16	148,919.04[29]	111,951	1,753,401.6[30]	440,119.73
2004.788	22	24.3	40,000	44.000[31]	360,000	396,000[32] 360,000 consented max
RM19.448.01	56	56*	145,152	145,152 * (filtered)	980,890	769,369* (filtered)

[28] Capped at 10% above authorised rate of abstraction
[29] Derived by extrapolating consented l/s abstraction rate to a monthly volume (55.6 x 60 x 60 x 24 x 31)/1000
[30] Derived by extrapolating conseted l/s abstraction rate to an annual volume (55.6 x 60 x 60 x 24 x 365)/1000
[31] Capped at 10% above authorised monthly volume
[32] Capped at 10% above authorised annual volume

9.5.9 Water Balance

Total volume required to irrigate the full 452 ha as calculated by Aqualinc (2017) is 3,874,294 m^3. This is equivalent to 8571 m^3/ha/yr.

This applicant requests the volumes listed below for the replacement of the three water permits and OAIC Lauder Scheme water.

Table 56 Clouston water balance

Water Source	Aqualinc efficient allocation for the farm (m^3/yr)	Equivalent area (ha)[33]	Volume Requested (m^3/yr)
OAIC Lauder	3,874,294	166.40	1,426,174
Private 98122		51.35	440,119.73
2004.788		42	360,000
RM19.448		90	769,369
Total	**3,874,294**	**350**	**2,995,663**

The total volume is well within the total efficient volume as calculated by Aqualinc.

9.5.10 Allocation Request / Outcome Sought

An overview of the allocation and flow limits proposed for the replacement permits is provided in the table below.

Table 57 Table 23 Overview of allocation and flow limits proposed for replacement of permits

Consents	98122, 2004.788, RM19.488.01
Site location	Utilise existing take point locations
Measuring device	No change to existing measuring device locations but the set-up on permit 2004.788 may be altered to avoid measuring the water already measured previously
Rate of take l/s	As below
Maximum Monthly Volume m^3	As below
Maximum Annual Volume m^3	As below
Residual at Point of Take	NA
Lauder Creek Residual Flow	Applicant to comply with sub-catchment residual - 100l/s at Rail Trail Flow Site
Minimum Flow l/s	Compliance with operative minimum flow

[33] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

Fish Screen	98122: as below 2004.788: There is already a screen on the pumped intake from the dam RM19.488.01: as below

Draft permits with proposed conditions is provided in Appendix C.

Number of permits

The applicant seeks three water take and use permits and one water permit to dam.
Point of take locations and associated rates and volumes

Table 58 Take point locations and associated abstraction rates and volumes

Permit	Location	l/s	m^3/month	m^3/year
1 RM19.488.01	Lauder Creek	56	145,152	769,369
2 98122	Lauder Creek	55.56	111,951	440,119.73
3 2004.788	Unnamed tributary Lauder Creek	22	40, 000	360,000

Fish screens

A fish screen may be recommended for the two Lauder Creek takes however an assessment to determine the need, practicalities and suitable design is requested before requiring implementation. A draft condition is included in the draft permits.

There is already a screen on the intake for the pumping system from the dam for the pivot associated with 2004.788 on an unnamed tributary of the Lauder Creek.

Residual flows

Based on the assessment undertaken by Hickey and Olsen (2020) (Appendix D), a residual flow of 100 l/s at the Rail Trail Flow Site is recommended.

Dam permit

The details in the permit to dam mostly remain consistent with the current permit. As the take is now measured from the Creek (and not when abstracted from the dam) and there is a continual residual flow below the point of take, the residual flow condition on the existing permit is considered unnecessary. A draft permit with proposed conditions is provided in Appendix C.

9.6 CA and EC Booth

9.6.1 Water Permit

The Booths hold the following permit:

Table 59 Permit held by the Booths

Permit	Location	Consented Abstraction
93447.V2	Lauder Creek	28,500,000 l/month at a maximum rate of 150,000 l/hr

9.6.2 OAIC Shareholder

The Booths do not receive any OAIC water.

9.6.3 Farming Operation

The Booth family own a small farm towards the downstream end of the Lauder catchment. The operation includes sheep breeding, fattening of cattle, lucerne production, and a racehorse breeding programme. The property is 45 ha in size, of which 26 ha can be irrigated using a k-line and spray irrigation systems. The irrigation water is used to irrigate pasture and lucerne, and to irrigate fruit trees.

The applicant estimates the farm holds 300 stock units (representing 11.5 stocking units per hectare plus balance of dryland).

Prior to upgrading the whole farm with underground pipes and hydrants for the k-line and towable aluminium sprinkler system, the Booths used flood irrigation. There are three small ponds on the property that are topped up with water during the year for maintaining waterfowl habitat and for duck shooting in May.

The farm supports the Booth family who live on the farm and are assisted in the daily management of irrigation and stock by a workman.

The applicant uses only one source of water on the farm from Lauder Creek.

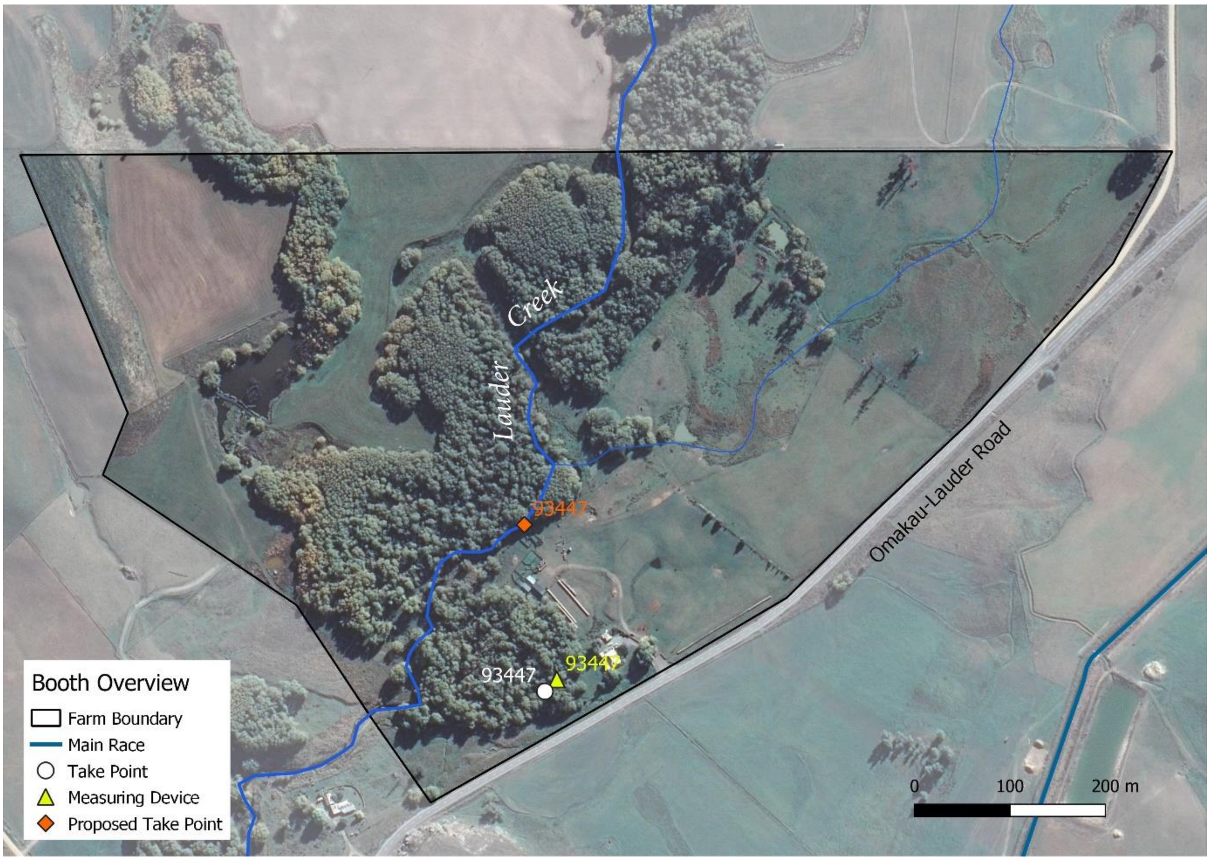


Figure 65 Overview of Booth Farm Property (including consented take points)

9.6.4 Irrigation and Investment

The applicant has upgraded and invested significantly in upgrading the whole farm from flood irrigation to a k-line system with underground pipes and hydrants. Key investment costs to date total approximately $135,000, as itemised below:

- Upgraded from PTO tractor pump and flood irrigation to more efficient Ford Industrial Diesel with Murphy Switchgauge protection – monitored engine and low flow protection, fish screened intake, approx. $50,000

- Upgraded Euromag Flow Metering, inverted u tube pipework at point of take, calibration and compliance approx. $20,000

- Upgraded main line reticulation to PE with 100mm risers Hydrants, associated fittings and installation approx. $30,000

- Upgraded irrigation method to Towable aluminium pipes with sprinklers, towable k-line pods, fittings and new pipe trailer approx. $20,000

- Upgraded western branch connection at flow meter, install Watercheck Telemetry, system calibration and Compliance approx. $15,000

The Booths intend to undertake further upgrades including – replacement of western main line (removable aluminium pipes) with more efficient PE and associated hydrants and fittings. Gradual replacement of aluminium sprinkler lines with k-line - however, these upgrades are dependent on the replacement permit process and water surety.

9.6.5 Water Take and Use

The take point location is in Lauder Creek within the applicant's property. The piped intake is screened and connects to a diesel pump on the side of the stream bank. The water is then piped around the farm where it is used to irrigate approximately 26ha under a k-line and moveable spray system. The pump is portable so it can be hauled back from the creek in the event of floods. The measuring equipment has been installed into the permanent section of the piping as illustrated below. That allows for the shifting of the pump while not impacting on the functioning of the meter and telemetry equipment.

Applicant site observations suggest that the water always flows past the intake site. In the event of a dry season the pump switchgear is calibrated to ensure residual flow is always maintained below the intake. This is not a drying stretch of the creek.

The Lauder Creek water is also used for stock water in the paddocks via a reticulated trough system as the stream is fenced to exclude stock.

The water taken under Permit 93447.V2 is measured at the point of take using a compliant water meter and datalogger on the intake pipe. Water use data is telemetered to the ORC from water meter number WM0381.

Lauder Creek at Permit 93447 Intake location where pipe is placed in the Creek

Lauder Creek below intake site

Pump set up at intake
Source: ORC Inspection Sheets

Meter
Source: ORC Inspection Sheets

Meter location alongside Lauder Creek
Source: ORC Inspection Sheets

Outlet
Source: ORC Inspection Sheets

	
Branch lines after flow meter	Main line hydrants
	
Towable aluminium spray irrigation	Relocatable aluminium sub-lines, pipe trailor

Figure 66 Photographs of intake and associated irrigation infrastructure

The figure below shows the set up on the Booth's property.

Figure 67 Schematic of Irrigation Set Up on Booth Property

9.6.6 Water Use Summary

The tables and figure below provide a water use summary for this property.

Table 60 Irrigated areas on Booth's farm

Block	Water source	Irrigation type	Total Area (ha)
	Lauder Creek	K-line spray	26 ha

Table 61. Water Use Summary for Booth's farm

Information	Property Details
Size of property	45 ha
Size of area irrigated from all water sources	26 ha
Sources of Water	Lauder Creek: 93447.V2
Maximum recorded rate of take (from metering data)	29 l/sec
Maximum recorded annual volume (from metering data)	90,193.81 m^3

Information	Property Details
Aqualinc calculation of maximum efficient use for the whole farm. m^3	237,317
Number of Stock	Ewes: 300 plus 1000 lambs Horses: 5 plus 5 foals
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	Sheep maximum 1300@5 l/day = 6500 l/day Horses maximum 10 @45 l/day = 450 l/day 6950 l/day = 0.08 l/sec
Frequency of water take (average and maximum)	Maximum = 24 hours per day, 7 days per week, 4 weeks per month Average – varies depending on season, but usually continuously when water is available.
Months during which water is expected to be taken in a dry year	All year for stock drinking but Sept to May inclusive, regardless of the year for irrigation. As flows drop in the middle of summer then some paddocks will not be irrigated but historically there has always been some flow at this site.
Months during which water is expected to be taken in an average year	As above Sept – May inclusive, regardless of year for irrigation
Application timing	Water will be applied 24hrs/day by k-line when watering. If the soil moisture is already high, then irrigation will not be turned on.
Does use of water provide recharge back into catchment?	No
Is take from re-charge or is an augmented take?	No
On farm infrastructure	There is a diesel pump that abstracts water directly from the creek. The water flows through pipes to the k-line sprinklers in the paddocks.
Storage for irrigation	Three small ponds only for ducks not as irrigation storage.
Monitoring in place	Yes.
WEX required and obtained	No WEX required.
s417 Certificate required and obtained	No section 417 required. Intake located on applicant's land

The figure below shows the irrigation occurring on the Booth property.

Figure 68 Overview of irrigation by type on Booth property (indicative irrigation areas only)

9.6.7 Water Use Records

Water use records are held at the ORC and the data is summarised here. No alternative water use records are provided.

Where required, abstraction records were sourced from the Otago Regional Council's Hilltop Database directly for data filtering and analysis purposes. Data was processed using excel software. The approach is consistent with recent hearing decisions (see: Long Gully Race Society RM17.176; and Queensbury Ridges Ltd (pending appeal) RM19.312), and the method proposed by the Otago Water Resources Group[34]. The water meter has been verified frequently and so this record of abstraction is true and accurate

34 Submission by Otago Water Users Resource Group on Proposed Water Permits Plan Change (Plan Change 7) to the Regional Plan: Water for Otago.

Permit 93447

a) Rate of Abstraction

The figure below shows the rate the rate of abstraction for this permit measured at WM0381.

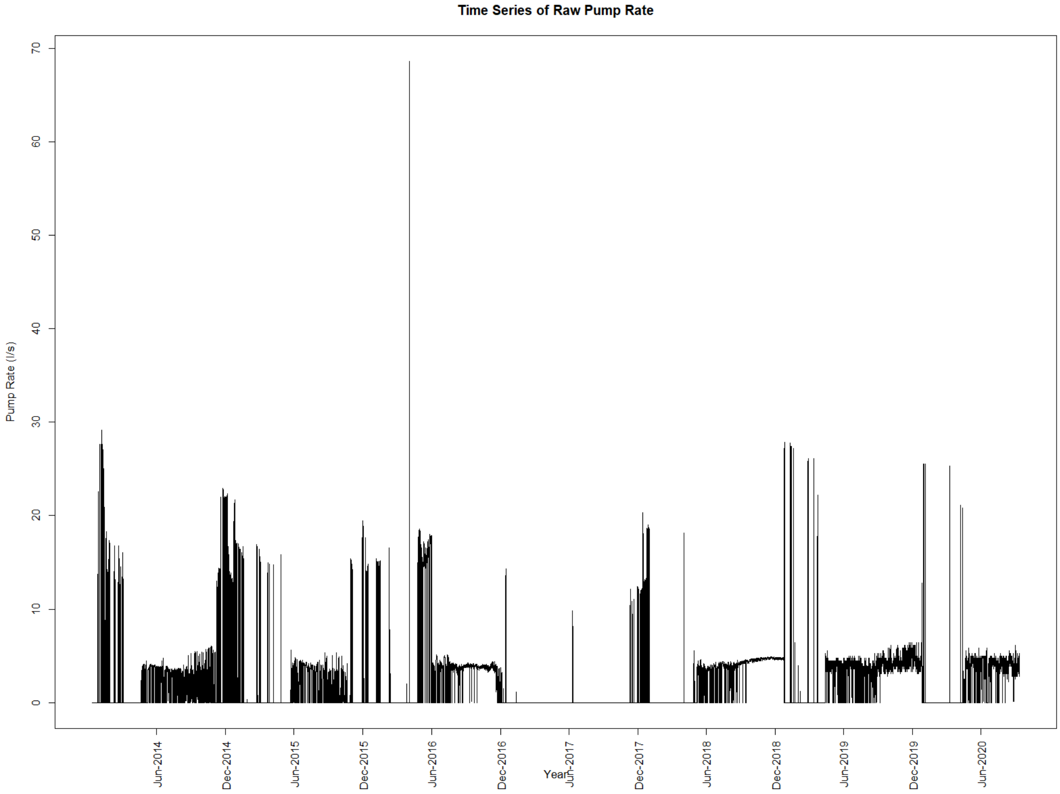


Figure 69 ORC held metering data for rate of abstraction for Permit 93447

The consented maximum rate of abstraction for this permit is 41.7 l/s. Several exceedances occurred in May 2016 with a maximum rate of abstraction recorded as being 68.6 l/s. In this case the applicant attributes these exceedances to the pump drawing at a higher rate on the initial start-up. Once fully operational, the rate settles down.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum has been specified as the maximum recorded rate of abstraction for exceedances within the water meter's margin of error, and these exceedances are acknowledged. Data was processed using excel software.

The applicant notes they rarely use the maximum rate of take as it is more efficient to use a lower rate but apply water more often as the monthly maximum does not allow for the take to operate 31 days per month.

The maximum (filtered) rate of abstraction for this Permit is 41.7l/s.

b) Monthly Abstraction Volume

The figure below shows the monthly volume of abstraction for this permit.

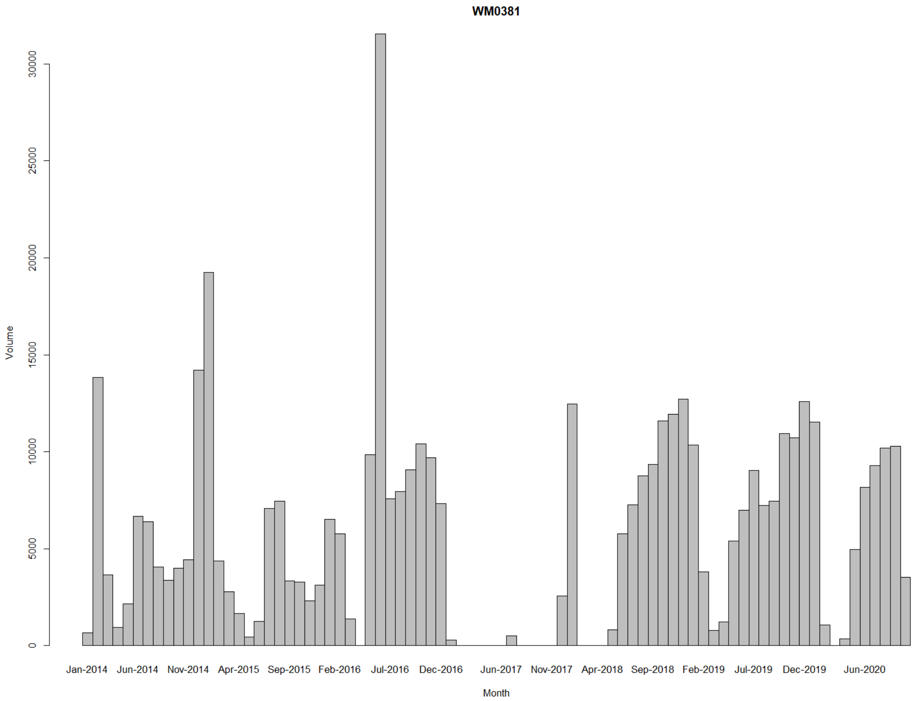


Figure 70 ORC held data showing raw monthly volume water use data for Permit 93447

There is a maximum monthly abstraction volume specified on this permit of 28,500 m³. This figure was exceeded in June 2016 at 31,542.89 m³. Please note that at least a small amount of abstraction occurs in all months to cater for stock water.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the consented maximum has been specified as the maximum recorded volume of abstraction for exceedances within the water meter's margin of error, and these exceedances are acknowledged. Data was processed using excel software.

The maximum (filtered) monthly volume for this permit is 31,950 m³.

c) Annual Abstraction Volume

The table below shows the annual volumes of abstraction for this permit.

Table 62 Annual abstraction volumes water use data for Permit 93447

Annual Volume at WM0381	m³/year
2013/2014	27,964.3
2014/2015	66,273.26
2015/2016	81,684.35
2016/2017	52,343.41
2017/2018	22,155.09
2018/2019	90,193.81
2019/2020	84,160
2020/2021	33,290

There is no maximum annual volume specified on this Permit. But the monthly volume multiplied up would assume a maximum of 342,000 m³. The raw maximum recorded annual volume is 90,193.81 m³ in 2018-2019.

Abstraction records were also sourced from the Otago Regional Council's Hilltop Database directly for further analysis. When the raw data is filtered to exclude outliers and spikes in the data, the maximum (filtered) annual volume is 90,006 m³.

9.6.8 Compliance / Future Solutions

As with many pumps the initial start-up requires the filling of the lines. This requires a push of water that very briefly elevates the abstraction rate. Hence the spikes in the rate of take data. Once the lines are full the rate settles back.

9.6.9 Summary water use records

Table 63 Summary of water use records for Booth

Permit	Consented rate of take (l/s)	Max rate of take recorded (l/s)[35]	Consented monthly volume (m³)	Max monthly volume recorded (m³)	Consented annual volume (m³)	Max annual volume (m³)
93447	41.67	41.67	28,500	31,950	342,000	90,006 (filtered)

9.6.10 Water Balance

Total volume required to irrigate the 26 ha as calculated by Aqualinc (2017) is 237,317 m³

This applicant requests a total volume for the replacement of the one water permit of 90,006 m³.

[35] Capped at 10% above authorised rate of abstraction

The total volume is well within the total efficient volume as calculated by Aqualinc.

9.6.11 Allocation Request / Outcome Sought

An overview of the allocation and flow limits proposed for the replacement permit is provided in the table below.

Table 64 Overview of allocation and flow limits proposed for replacement of permit

Consent	93447
Site location	Utilise existing take point location
Measuring device	No change to existing measuring device location
Rate of take l/s	29.16
Maximum Monthly Volume m^3	28,500
Maximum Annual Volume m^3	90,006
Residual at Point of Take	NA
Lauder Creek Residual Flow	Applicant to comply with sub-catchment residual - 100 l/s at Rail Trail Flow Site
Minimum Flow l/s	Compliance with operative minimum flow
Fish Screen	On pumped intake

A draft permit with proposed conditions is provided in Appendix C.

Number of permits

The applicant seeks one permit to replace the existing permit.

Point of take location

No changes to the existing take location are sought.

Fish screens

A screen is already in place on the intake.

Residual flows

Based on the assessment undertaken by Hickey and Olsen (2020) (Appendix D), a residual flow of 100 l/s at the Rail Trail Flow Site is recommended and the applicant will share flows in accordance with the Lauder Water Users Flow Sharing regime to maintain this residual.

9.7 Phada Industries Ltd

9.7.1 Water Permits

Phada Industries Ltd hold the water permits outlined in the table below.

Table 65 Permits held by Phada Industries Ltd

Permit	Location	Consented Abstraction
RM18.030.02	Lauder Creek	42 l/s 28,750 m^3 / month 230,000 m^3 / year 1,246, 064 m^3/year in conjunction with RM18.030.01[36]
RM18.030.01 (not in this application)	Lauder Creek	56 l/sec 149,990 m^3 / month 1,016,064 m^3/year
RM11.383.09 and RM11.383.08 (not in this application)	Unnamed Tributaries of Lauder Creek small takes and augmented takes	40 l/sec 40 l/sec 1,728 6,048 m^3 / month 11,664 19,440 m^3/year
RM11.383.06	Unnamed tributary discharge from a dam	NA
RM11.383.07	To dam an unnamed tributary	NA

No primary permits are being replaced in this application. RM18.030.02 will be surrendered and a supplementary take is proposed to replace it.

9.7.2 OAIC Shareholder

Phada Industries Ltd receive Main race water. This application describes the property use of the water and is supported by the OAIC Main Race application as prepared by Landpro.

9.7.3 Farming Operation

The Morrisons (trading as Phada Industries Ltd) grow pasture and crop to feed cattle on their property. They finish beef cattle and provide some dairy support by growing weaners through to rising 2-year olds when they are ready to leave the farm and enter a milking herd. The property is 460 ha in area, located close to Lauder township, lower in the catchment.

Of the 460 ha, up to 253 ha is irrigated using spray application under centre pivots, rotor rainer, and k-line.

[36] RM18.030.01 is not subject to this application.

The cattle numbers vary on the farm throughout the seasons, but the water supply may be relied on to provide drinking water for up to 800 heads.

This property utilises shares from the OAIC Main Race, private water from the Lauder Creek and supplementary water stored in on-farm dams. Water can be mixed on the farm.

The farm supports the Morrison family, and numerous contractors including stock transport companies, vets and farm machinery operators.

An overview of the farm is shown in the figure below.

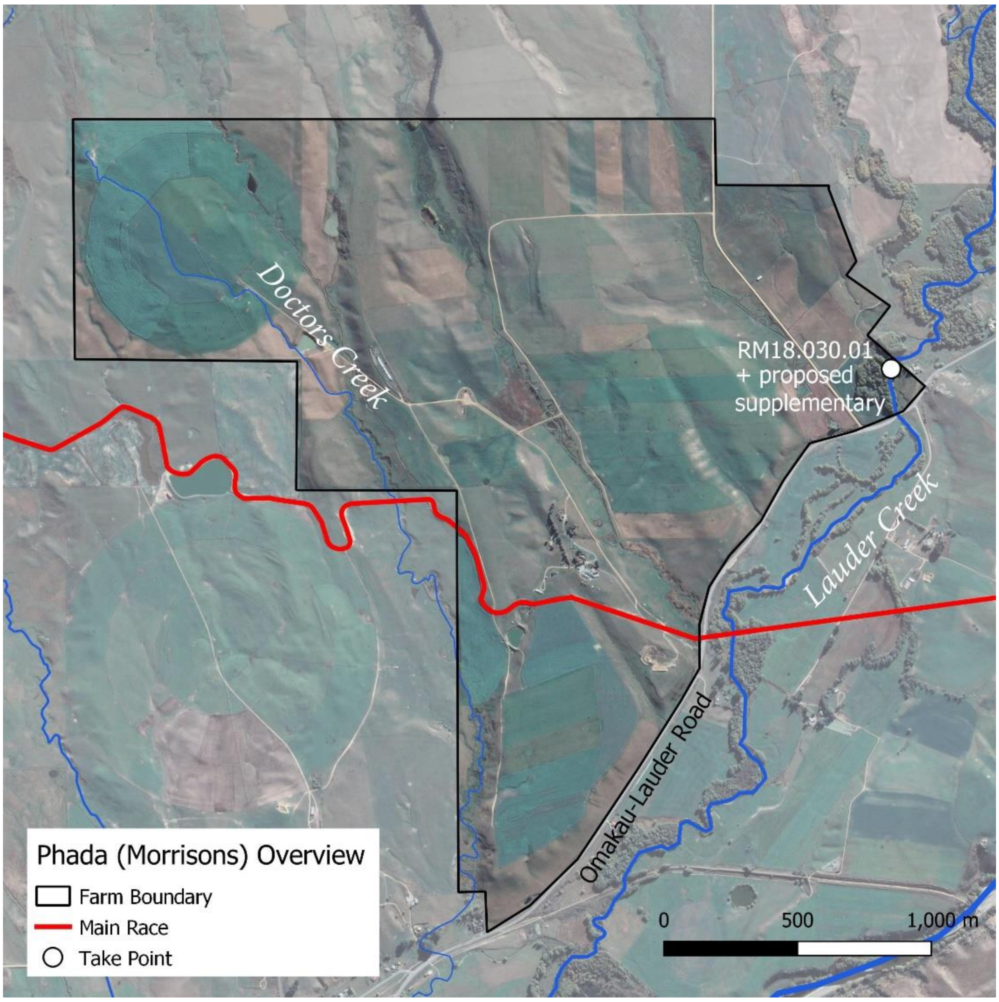


Figure 71 Overview of Phada Industries Ltd Farm

9.7.4 Irrigation and Investment

The applicant has upgraded and invested significantly in the farm to stay up to date with modern expectations of water use and efficiency. They started their upgrading in 2010. Many of the irrigated paddocks have been completely upgraded from contour to spray irrigation methods. There are a few paddocks that are yet to be modernised but that will depend on water availability.

The upgrading of the property has involved new fences, lanes, storage dams and pastures over the whole farm. The investment costs have been high and include two pivots at $500,000, lanes and power at $150,000, complete re-grassing and re-fencing of the farm. A new stock water scheme has been installed over the whole farm at $150,000. One of the pivots has Variable Rate Irrigation (VRI) system installed at $40,000.

There is a storage dam on the farm that holds the Main race water delivering a smooth supply of water to the top centre pivot and other irrigated areas as supply allows.

Phada Industries have secured permits to dam and take a small amount of water from unnamed tributaries of the Lauder Creek. These dams are yet to be built but the plan is to direct the supplementary water to these dams to be used during the season in support of their primary water permit and Main race allocation.

9.7.5 Water Take and Use

Permit RM18.030.02

The intake for this permit is shared with RM18.030.01[37] and is located in Lauder Creek on land owned by the applicant approximately 170m north west of the intersection of Becks-Lauder Road and Leask Road, Lauder.

Permit RM18.030.02 is proposed to be surrendered. The low flow nature of the Lauder Creek means this permit cannot access any water in the summer season. Phada Industries request a supplementary permit at this location. They plan to abstract during high flow times and pipe the water to larger storage dams for later use.

At present a race from the Creek directs flows into the pond. The beginning of this race in the Creek consists of a small pipe that then flows into an almost level race. Once the pond level is at the same as the creek, the flow into the pond will naturally cease. The intake from the pond through the pumping system is screened. The pond only holds the equivalence of 24 hours of water supply, so does not create any significant buffer for dry times, however, does ensure the pivot pump is not left dry.

[37] RM18.030.01 is not subject to this application, and has an expiry date of 1 May 2030

	
Photo of pond showing race guiding water from the Lauder Creek.	Photo of race upstream of take on Lauder Creek
	
Photo of race downstream of take on Lauder Creek	Photo of intake pipe from pond connecting to the pumping system

<table>
<tr><td></td><td></td></tr>
<tr><td>Photo of pumping system supplying irrigation infrastructure</td><td>Photo inside of pumping shed</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Photo of existing fish screen on pond intake</td><td></td></tr>
</table>

Figure 72 Photographs of intake and associated infrastructure under Permit RM18.030.02

The current intake system may need slight adjustment for the supplementary take such as if the supplementary and primary (RM18.030.01) are operating together when the flows are high the pump may need to be slightly more powerful.

9.7.6 OAIC Water

In addition to the private right water sourced from the Lauder Creek, the applicant utilises water from the OAIC Main Race. The OAIC water is delivered to the farm via the Main Race and drops straight into the dam that then supplies the spray irrigation systems.

The following figure provides a Schematic of the Phada Industries Ltd set up.

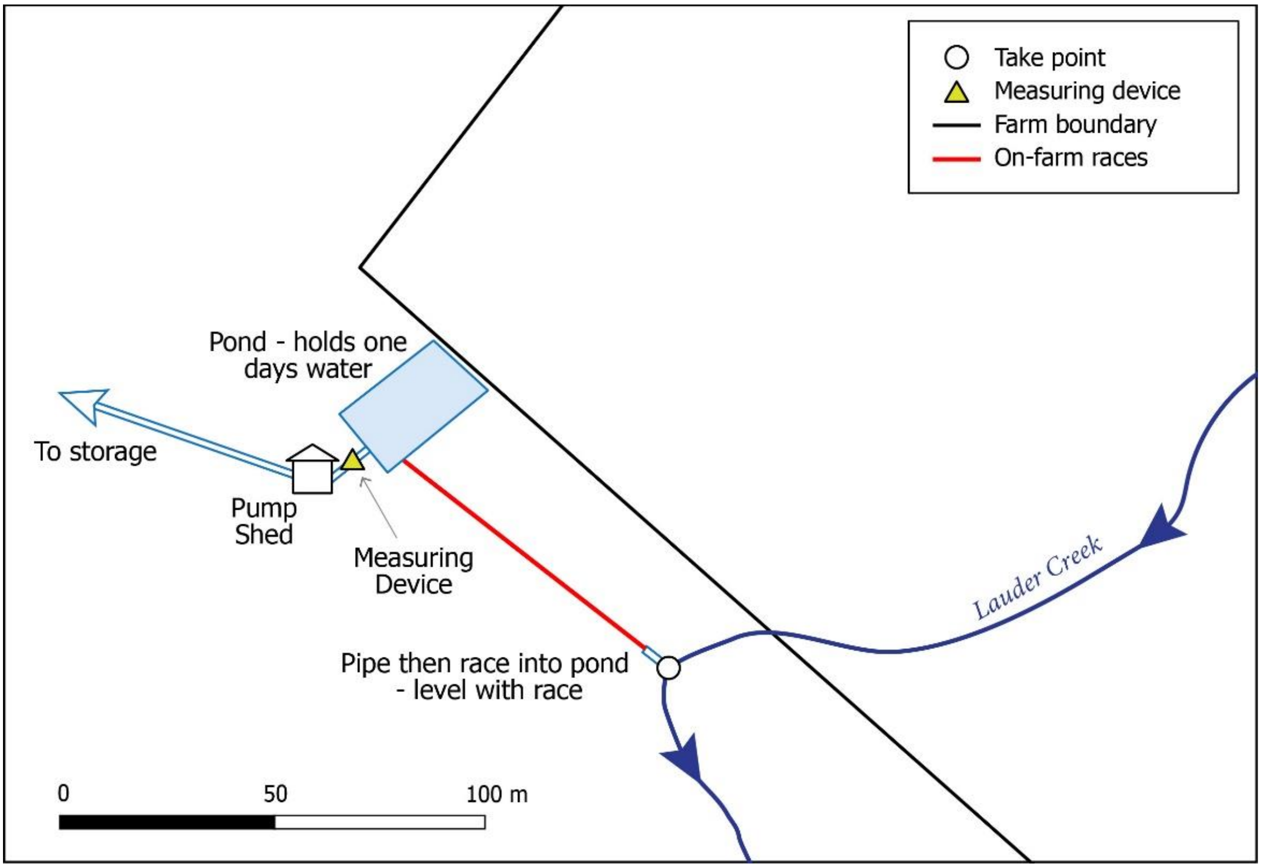


Figure 73 Schematic of Irrigation Set Up Phada Industries

9.7.7 Water Use Summary

The tables and figure below provide a water use summary for this property.

Table 66 Water Use Summary for Phada Industries

Information	Property Details
Size of property	460 ha
Size of area irrigated from all water sources	253 ha
Sources of Water	Lauder Creek: • RM18.030.02 (primary, surrendered in this application) • RM18.030.01 (primary, not subject to this application) Unnamed tributary of Lauder Creek: • RM11.383.09.V1 (supplementary, not subject to this application) • RM11.383.08.V2 (supplementary, not subject to this application) OAIC: • Manuherikia River via Main Race
Maximum recorded rate of take (from metering data)	N/A new permit
Maximum recorded annual volume (from metering data)	N/A new permit
Aqualinc calculation of maximum efficient use for the whole farm. m^3	2,287,791
Number of Stock	1,200 head of cattle
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	1,200 at 45 l/sec = =54,000 = 0.54 l/sec
Frequency of water take (average and maximum)	Supplementary water to be abstracted when flows are high 24hrs/ day 7 days per week until storage is full or flows decrease.
Months during which water is expected to be taken in a dry year	Any month the flow at Campground Manuherikia River is above mean flow
Months during which water is expected to be taken in an average year	Any time the flow at Campground is above Mean Flow

Information	Property Details
Application timing	Water will be applied 24hrs/day by the pivot or other spray systems during the season.
Does use of water provide recharge back into catchment?	Not really except maybe a little as pivot crosses smaller gullies
Is take from re-charge or is an augmented take?	No
On farm infrastructure	There are spray application methods used on the farm, underground delivery pipes, stock troughs throughout. One pivot has VRI.
Storage for irrigation	One 24hr pond at Lauder Creek intake and slightly larger pond for Main race water.
Monitoring in place	Yes.
WEX required and obtained	No WEX required.
s417 Certificate required and obtained	No section 417 required. Intake located on applicant's land

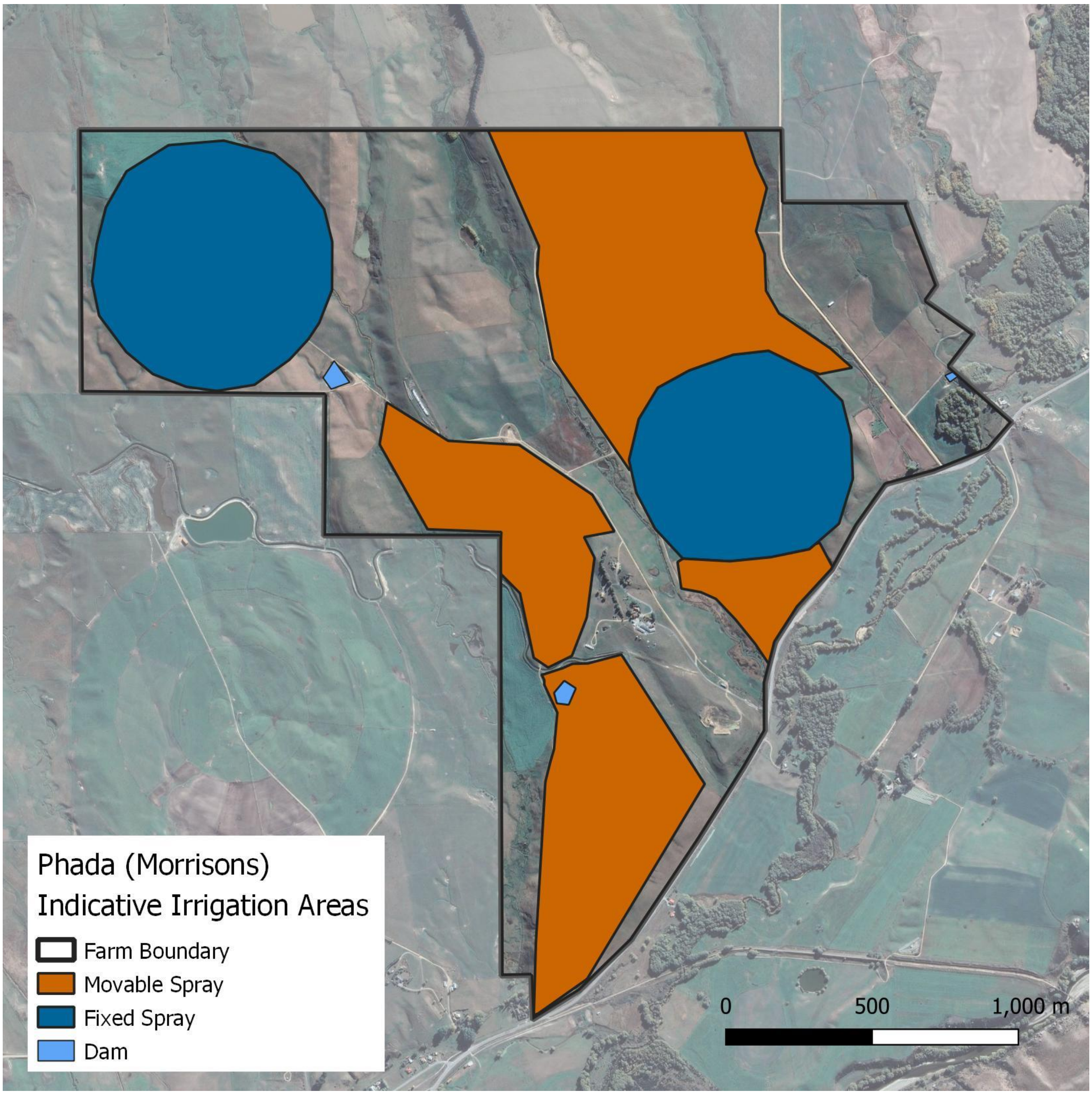


Figure 74 Overview of irrigation by type - Phada Industries Ltd

9.7.8 Water Use Records

The new supplementary permit will be located at the same intake as RM18.030.02 and the metering device number will be WM1101.

The applicant requests a supplementary rate of take of 56 l/sec and a total volume of 300,000 m^3.

9.7.9 Water Balance

The applicant utilises two sources of water to achieve their reasonable and efficient seasonal irrigation requirements.

Total volume required to irrigate the full 253 ha as calculated by Aqualinc (2017) is 2,287,791 m^3. That equates to 9042.6 m^3/ha/yr.

Table 67 Phada Industries Water Balance

Water source	Aqualinc efficient allocation for the farm (m^3/yr)	Equivalent area (ha)[38]	Annual volume consented (m^3/yr)
RM18.030.01 Lauder Creek (not in application)	2,287,791	112.4	1,016,064
New Supplementary (requested)		33.2	300,000
RM18.030.02 (surrendered)		n/a	surrender
RM11.383.09 RM11.383.08 (not in application)		3.4	31,104
Manuherikia River (OAIC Main Stem delivery) (requested)		34.1	308,009
Total	**2,287,791**	**183**	**1,655,177**

This applicant requests a new supplementary permit for 300,000 m^3 from the Lauder Creek. They can also substantiate their portion of the OAIC Main race request of volume at 1,655,177 m^3.

[38] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

The total volume requested and consented of 1,655,177 m^3 is well within the total efficient volume as calculated by Aqualinc.

9.7.10 Allocation Request / Outcome Sought

An overview of the allocation and flow limits proposed for the new supplementary permit is provided in the table below.

Table 68 Overview of allocation and flow limits proposed for new supplementary permit

Consent	New supplementary
Site location	Utilise existing take point location (shared with RM18.030.02, being surrendered)
Measuring device	No change to existing measuring device location
Rate of take l/s	56 l/sec
Maximum Monthly Volume m^3	145,152
Maximum Annual Volume m^3	300,000
Residual at Point of Take	NA
Lauder Creek Residual Flow	Applicant to comply with sub-catchment residual - 600 l/s at Rail Trail Flow Site
Minimum Flow l/s	Compliance with operative supplementary minimum flow

A draft permit with proposed conditions is provided in Appendix D.

Number of permits

The applicant seeks one supplementary permit.

Point of take location

Utilise existing take point location (shared with RM18.030.02, being surrendered)

Fish screen

The point of take from the pond into the pumping system is already screened.

Residual flow

600 l/sec at the Lauder Rail trail is recommended and the applicant will share flows in accordance with the Lauder Water Users Flow Sharing regime to maintain this residual.

9.8 Armstrong Family

9.8.1 Water Permits

The Armstrong Family hold the water permits outlined in the table below.

Table 69 Water permits held by Armstrong Family

Permit	Location	Consented Abstraction
3707	Unnamed tributary of Lauder Creek (Mellors Creek[39])	55.55 l/s 200,000 l/hr 4,800 m^3/day
2002.399	Unnamed tributary of Lauder Creek	56 l/s 300 m^3/hr 33,600 m^3/week 148,800 m^3/month
2002.387	To dam an unnamed tributary of Lauder Creek for water storage purpose for irrigation	NA

9.8.2 OAIC Shareholder

The Armstrong Family also receive Dunstan and Main Race water. The water use description of all water sources is in this application and support the Dunstan Catchment Group and the OAIC Main Race Application as prepared by Landpro.

9.8.3 Farming Operation

The Armstrong family farm Burnside, a 374 ha sheep and beef operation. The majority of the farm (up to 313 ha) is irrigated using a mixture of pivot 66 ha, gun 189 ha, k-line 2 ha and contour irrigation 56 ha. The water is used to grow pasture and crop for animal feed. Lucerne is cut for baleage for winter feed, and feed crops such as kale and swedes are grown for animals to eat in the paddock. Barley is also grown and the grain harvested for feed in late summer.

The Armstrongs breed their own lambs and endeavour to finish as many lambs to slaughter weight as possible. They bring in cattle at weaner age to grow out as well. They have also moved into a new system of finishing stock over winter which is working for their set-up. They currently run 2200 ewes, 700 hoggets and 200 cattle.

[39] Referred to across different consent documents as Mellors Creek or Millers Creek. They are the same Creek.

The farm supports parents James and Linda Armstrong and two of their adult sons with their families. They also have a small contracting business that is run in co-operation with the farm. The Armstrongs use local contracting companies for stock handling work such as shearing and carting.

The sources of water on the farm include shares from the OAIC Dunstan Race delivered to the top of the farm and options of the two dams, private water from Mellors Creek water and the unnamed tributary of Lauder and a small number of OAIC Main Race water to the lowest paddocks on the farm.

An overview of the Armstrong farm is shown in the figure below.

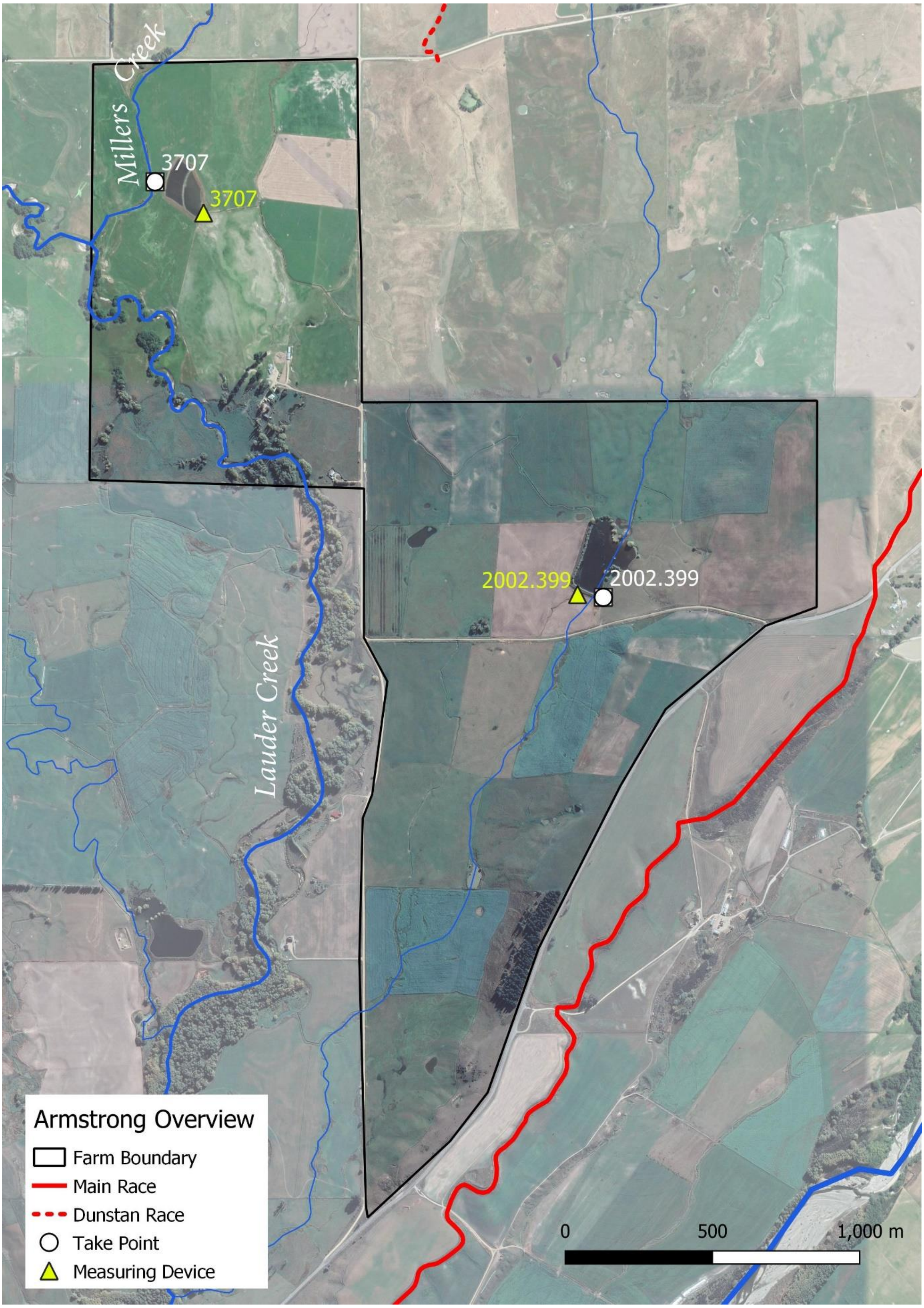


Figure 75 Overview of Armstrong Farm

9.8.4 Irrigation and Investment

The Armstrongs have upgraded and invested significantly in recent decades to stay up to date with modern expectations of water use and efficiency. In the 1980s, the Armstrongs installed underground hydrants throughout half the farm to supply water to a gun irrigator. At the same time, they built the dam on the eastern side of the farm which holds approximately 40,000 m^3. The pipe and pump for the irrigation system comes directly from this storage. It means the water delivered on roster from the company or as available from the creek can be stored and applied by pressured spray application methods when it is needed.

There is a much smaller buffer type pond near the Millers Creek take. It holds approximately 10,000 m^3. Mostly it is used to provide a small holding area and create a little pressure on the water that is then transported either directly to irrigation systems on this side of the farm or across to the other pond to be applied through the gun irrigator.

The most recent upgrade is a gravity-fed pivot system, supplied using the OAIC delivered water via the Dunstan race. The new pivot cost at least $200,000. The storage required to utilise the Mellor Creek water has been completed in the last few years at a cost of at least $50,000.

There are two open race systems on the farm transporting water between the dams and to some of the paddocks while the rest is piped underground.

Some flood irrigation and border dyke systems totalling up to 56 ha are still used as the Armstrongs wait to see what surety of supply they end up with after the permits are replaced.

The Armstrongs manage a sheep and beef operation on a relatively small farm with diverse crops and pasture feed options. The ongoing access to water is critical for their business. The investment in the pivot and the storage to assist with the smoothing out of supply to the pivot and show a commitment to continue farming and advancing their systems.

The Armstrongs are also replacing their dam permit 2002.387 in this application. This dam was constructed in the early 1980s. It is located in a small tributary of the Lauder Creek. The majority of the water in the dam is either Dunstan Race water or water abstracted from the Miller Creek.

9.8.5 Water Take and Water Use

Permit 3707

The intake is located on the applicant's property in a tributary of Lauder Creek known locally as Mellors Creek (Millers Creek), approximately 800 metres south west of the intersection of Becks School Road and Lauder Flat Road.

The intake structure consists of a culvert and boarded gate structure which controls the flow and volume of water in the Creek. Water is raced a short distance of approximately 15m from the Creek to a storage pond where it is used for irrigation and stock water purposes.

The water is used to irrigate on both the house side of the farm and across the other side via the dam and through the gun irrigation system.

The water taken under Permit 3707 is measured away from the point of take (as authorised under WEX0001) located approximately 740 metres south southwest of the intersection of Becks School Road and Lauder Flat Road, Becks. Water is measured on the pipe as it leaves the storage pond. Water use data is telemetered to the ORC from water meter number WM0514.

The storage pond is mostly an in-ground basin. The level of the water in the pond is almost level with the creek.

	
Photo showing approved metering device location on pipe – measuring water as it leaves the dam *Source: ORC Inspection Sheet*	Photo showing culvert in the Creek with board gate structure. The raced intake is on the LHS in the mid ground.

	
Photo of Mellors Creek (Miller), upstream of the Point of Take	Photo of storage dam supplied by water taken under Permit 3707

Figure 76 Photographs of intake and associated features – Armstrongs

Millers Creek flow gets very low in summer and has been known to dry up naturally. The low to no flow means the take has low security of supply in the middle of summer. The farm then relies more heavily on the OAIC water delivered via the Dunstan Race. Some of the paddocks such as the k-line and some of gun or contour irrigated ones are dropped out of the irrigation rotation when the water supply is lower.

Permit 2002.399 and Permit 2002.387

This intake is located in an unnamed tributary of Lauder Creek, approximately halfway along Brown Road and to the north of that road. The source is an unnamed tributary of Lauder Creek. The intake and dam are all located on the Armstrong's property. This water source is mostly a retake of the OAIC Dunstan race water and the Millers Creek water.

Water is also raced into the dam from the other dam (house block dam) on the farm. The water in the house block dam has been abstracted from Millers Creek or has come from the OAIC Dunstan Race. All water sources flow in via gravity. The intake site is located as the water leaves the dam. This is via a pipe and pump system. So, in reality the water being measured is partially a retake of the water from the other dam (house block dam) and partially new water. The intake pipe from the dam to the irrigation spray equipment is screened.

The dam was constructed in 1983 and is consented under Permit 2002.387 and the applicant seeks that this consent be replaced concurrently with the replacement water permit. The dam is small in scale and has a capacity of 40,000 m^3.

The stored water is used to spray irrigate up to 205 ha of pasture and lucerne.

The water taken under Permit 2002.399 is measured at the point of take. Water is measured on the pipe as it leaves the storage pond. Water use data is telemetered to the ORC from water meter number WM0248.

	
Photo showing piped intake and pumping shed structures *Source: ORC Inspection Sheet*	Photo inside shed showing pump equipment

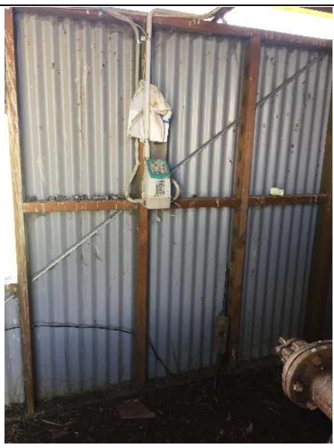



Photo showing measuring device inside pump shed	Photo of consented dam under 2002.387 storing water taken under Permit 2002.399. Intake pipe is under the small platform.

Photo of the Unnamed tributary, looking downstream of the point of take

Figure 77 Photographs of intake and associated infrastructure – Armstrongs

The following figures provide schematics of Armstrong's intake set-ups.

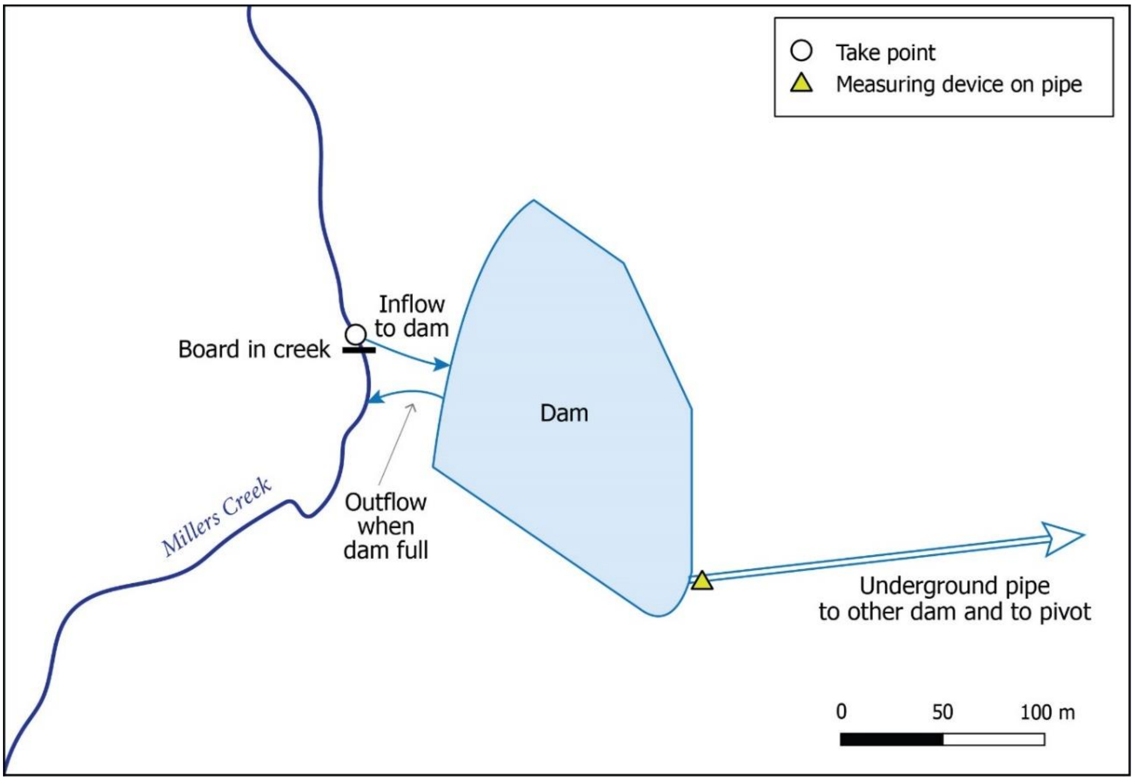


Figure 78 Schematic of intake associated with permit 3707, House Block dam.

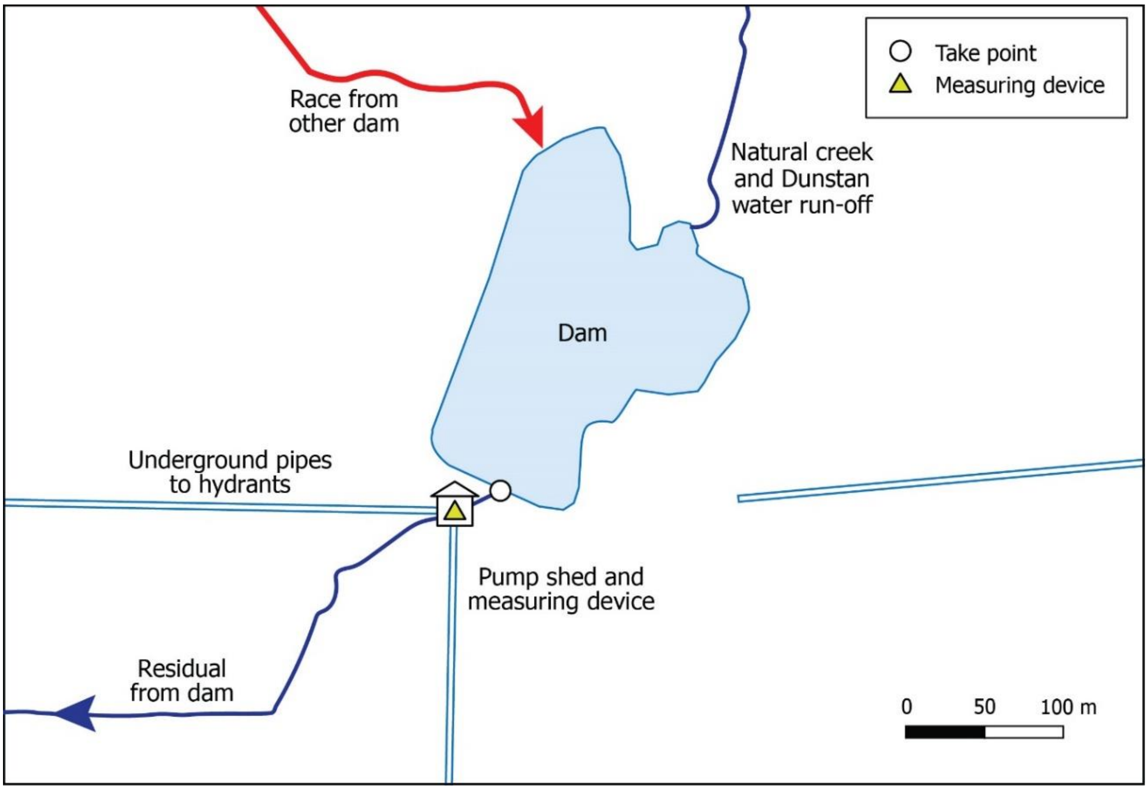


Figure 79 Schematic of the set-up for Permit 2002.399 and consented dam 2002.387

9.8.6 OAIC Water

The farm receives water from OAIC via the Dunstan Race and the Main Race.

The water delivered via the Dunstan Race is used to feed the pivot on the house side of the block. Some of the Dunstan Race water is delivered to the dam on the house side and can either irrigate on that side or be transported to the other dam and be used through the gun spray system.

The Main race water is delivered to the bottom of the farm and is applied through the contour irrigation system. Water is both raced and piped around the farm. The applications for the Dunstan and Main Race water are covered in the Dunstan Catchment Group Application and the OAIC Main Race Application respectively.

9.8.7 Water Use Summary

The applicant uses multiple sources of water including water delivered via the OAIC Dunstan Race and Main Race and water abstracted under private water rights. The different water sources are mixed except the OAIC Main race water which irrigates the 39 ha at the bottom of the farm.

Table 70 Overview of water sources and total areas irrigated

Block	OAIC		Private water	Area Irrigated
	Dunstan	Main		
OAIC Main Race block contour	No	Yes	No	39 ha
The rest of the farm	yes	No	Yes	274 ha
Total				313 ha

The table and figure below provide a water use summary for this property.

Table 71 Water Use Summary for Armstrong Family

Information	Property Details
Size of property	374 ha
Size of area irrigated	313 ha
Sources of Water	Tributary of Lauder Creek – Millers Creek – Permit 3707 Unnamed tributary of Lauder Creek – Permit 2002.399 *mostly a retake* Manuherikia River – OAIC delivered water via the Main Race Dunstan Creek - OAIC delivered water via the Dustan Race
Maximum recorded rate of take (from metering data)	Millers Creek 3707: >55.5 l/sec Unnamed trib 2002.399: >56 l/sec
Maximum recorded annual volume (from metering data)	Millers Creek 3707: 657,547.2 m^3 Unnamed trib 2002.399: 304,999.2 m^3
Aqualinc calculation of maximum efficient use m^3	2,705,926.1
Number of stock	2200 ewes and 3000 lambs 700 hoggets 200 beef cattle
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	2200 ewes and 3000 lambs: max 5200 @5 l/day= 26,000 l/day 700 hoggets @ 5 l/day = 3,500 l/day 200 beef cattle @ 45 l/day = 9,000 l/day Total 38,500 l/day = 0.44 l/sec
Frequency of water take (average and maximum)	Maximum = 24 hours per day, 7 days per week, 4 weeks per month

Information	Property Details
	Average – varies depending on season, but usually continuously when water is available.
Months during which water is expected to be taken in a dry year	Millers Creek: Whenever water is available during the season the take will be exercised. However traditionally this creek gets very low to completely dry in the middle of summer. Unnamed trib: the take at this source will be operating all season as the water source isn't just the natural creek. The natural creek's flow is variable depending on the irrigation water being applied upstream. It is a very small catchment that gains flow when irrigation is on in paddocks above this farm.
Part of day water when water will typically be taken:	Water will be abstracted anytime of the day it is available for 24hrs, 7 days a week. It depends on availability.
Does use of water provide recharge back into catchment?	The contour irrigation on the paddock at the bottom of the farm would result in a small amount recharging back to the catchment.
Is take from re-charge or is an augmented take?	Millers Creek 3707: A small amount of water enters Millers Creek on the farms above but not much as it does decrease in flow over summer. Unnamed trib 2002.399: Yes this water is a combination of water already measured at Millers Creek take and Dunstan Race water. The unnamed trib also gains water when the catchment for the small trib is irrigated on the above farms.
Storage for irrigation	Millers Creek: there is a small buffer pond to the side of approx. 10,000 m^3 Dam covered by Permit 2002.387 holds 40,000 m^3 and is being replaced
Monitoring in place	Yes.
WEX required and obtained	None required. Water takes measured at point of take.
s417 Certificate required and obtained	Not relevant. This is a water permit, not a deemed permit.

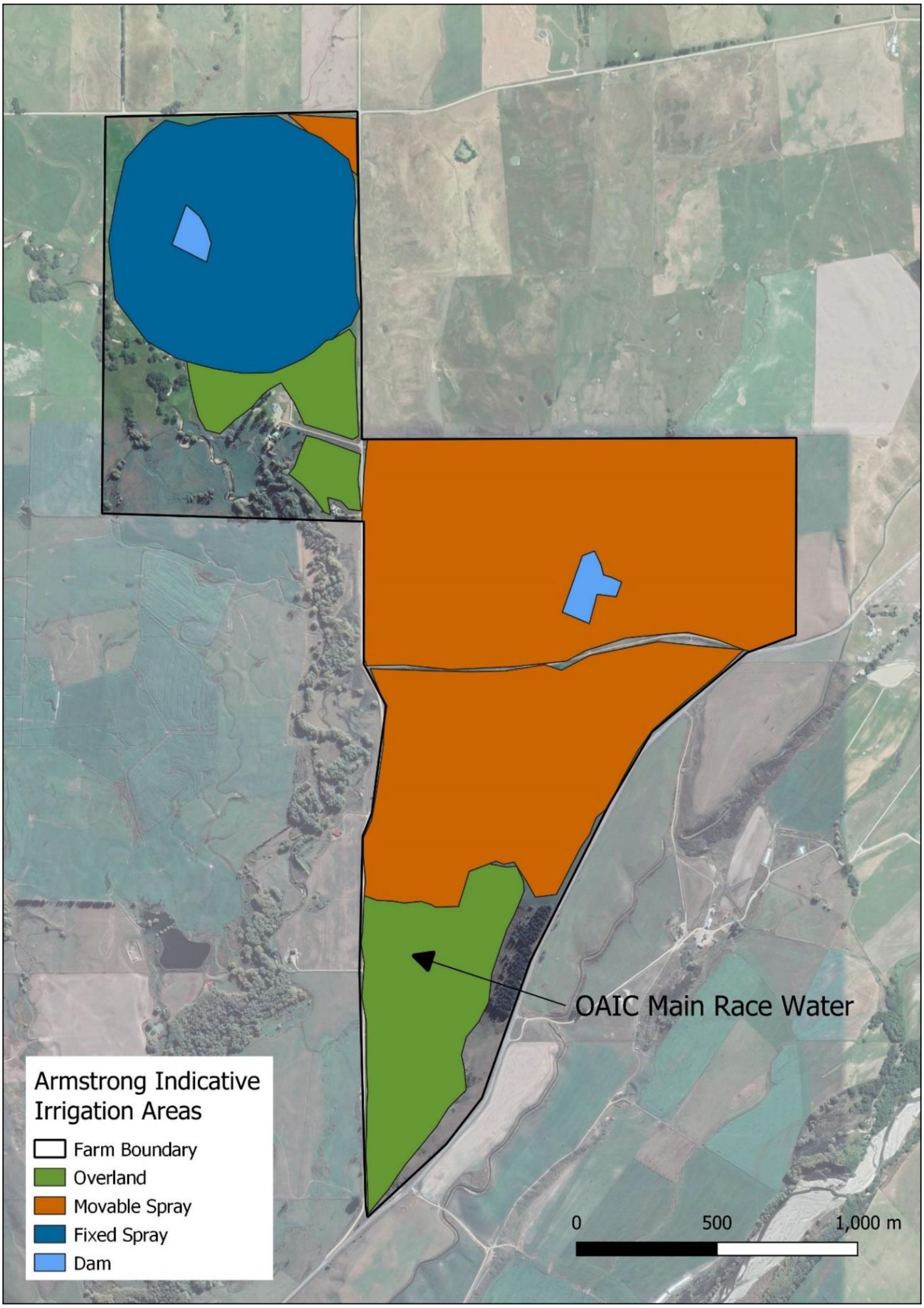


Figure 80 Overview of irrigation by type on Armstrong Farm

9.8.8 Water Use Records

Water use records are held at the ORC and the data is summarised here. No alternative water use records are provided.

Permit 3707

a) Rate of Abstraction

The figure below shows the rate of abstraction water use data for this permit measured at WM0514.

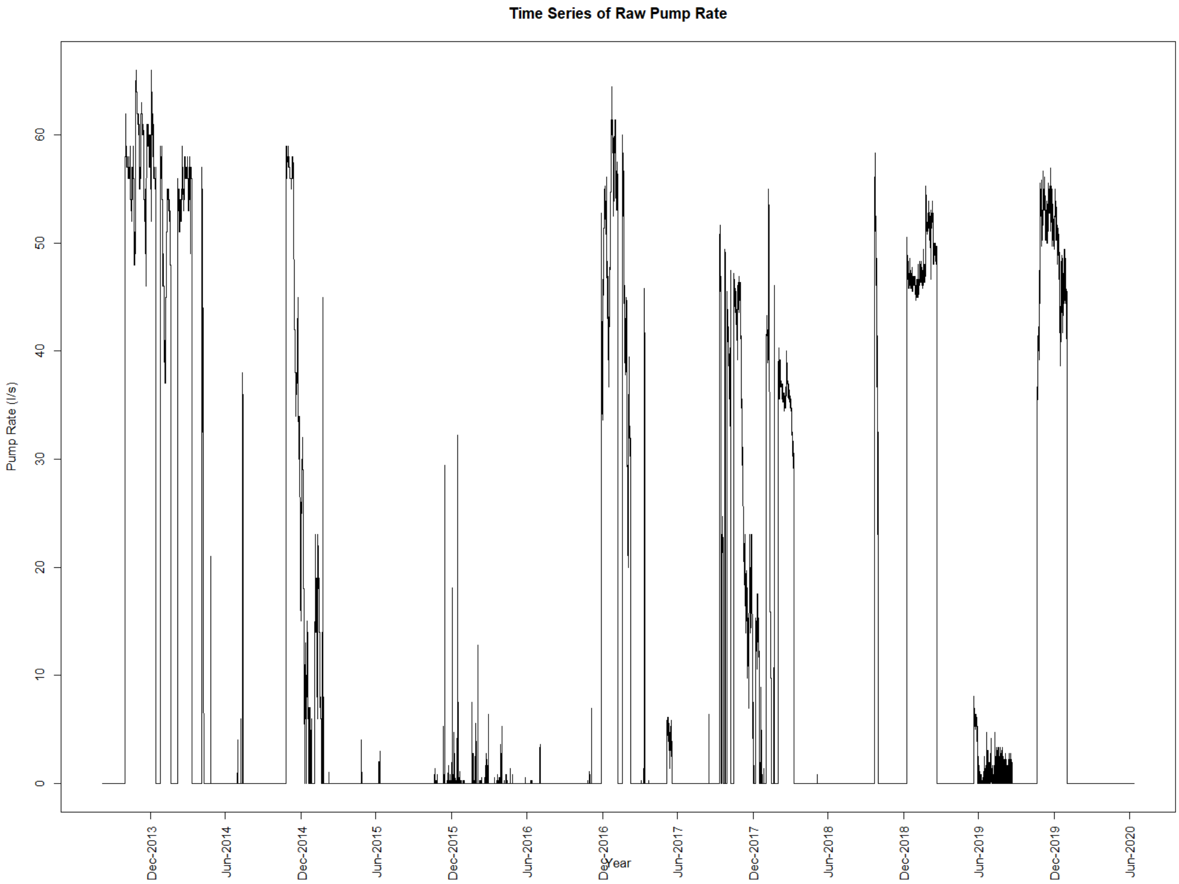


Figure 81 Graph showing ORC held data for rate of abstraction for Permit 3707

The authorised rate of abstraction for this permit is 200,000 l/hr, equivalent to 55.55 l/s. The records indicate exceedances of the authorised limit with a maximum recorded rate of abstraction of 66 l/s. However, in recent years the consented maximum rate of take as been regularly achieved.

b) Monthly Volume Abstracted

The figure below shows the authorised monthly abstraction volume for this permit measured at WM0514.

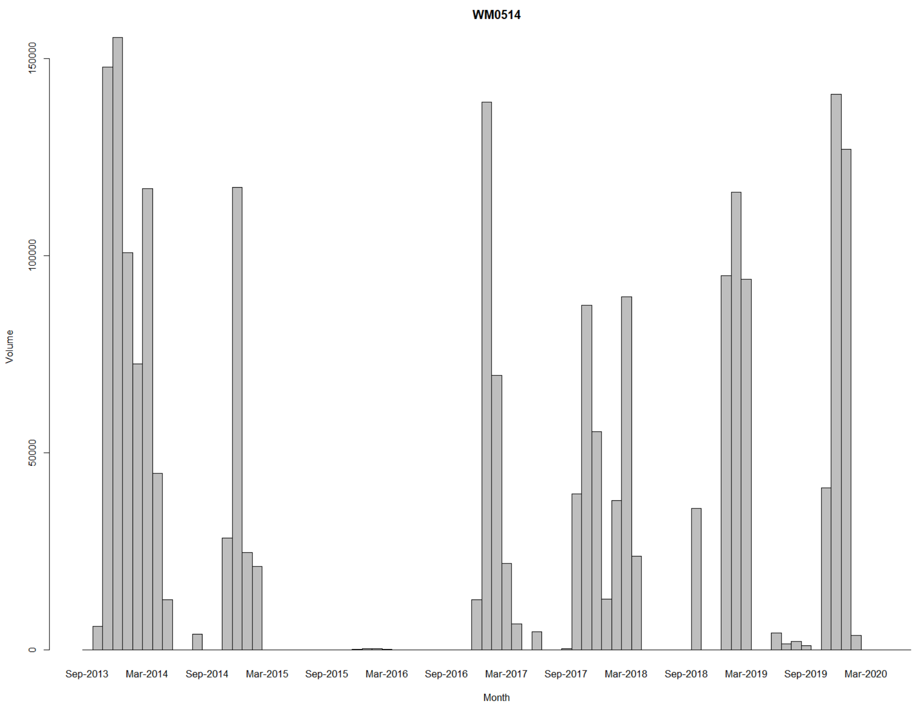


Figure 82 Graph showing ORC held monthly abstraction volume records for Permit 3707

There is no consented maximum monthly abstraction volume imposed on this permit. The maximum recorded monthly volume is 155,394 m^3 in December 2013.

c) Annual Volume Abstracted

The table below shows the annual volumes abstracted between September 2013 and 2020.

Table 72 Table showing annual abstraction volumes of Permit 3707

Annual Volume at WM0514	m^3/year
2013/2014	657,547.2
2014/2015	196,110
2015/2016	1469.8
2016/2017	254,969
2017/2018	347,329
2018/2019	345,584
2019/2020	317,780
2020/2021	0

There is no consented annual volume imposed on this consent. The maximum annual volume recorded is 657,547.2 m^3 in 2013-2014.

Permit 2002.399

This permit reflects the abstraction from the dam rather than the tributary. The tributary is very small and doesn't supply this rate or volume for abstraction. This take is mostly a retake.

a) Rate of Abstraction

The figure below shows the rate of abstraction water use data for this permit measured at WM0248.

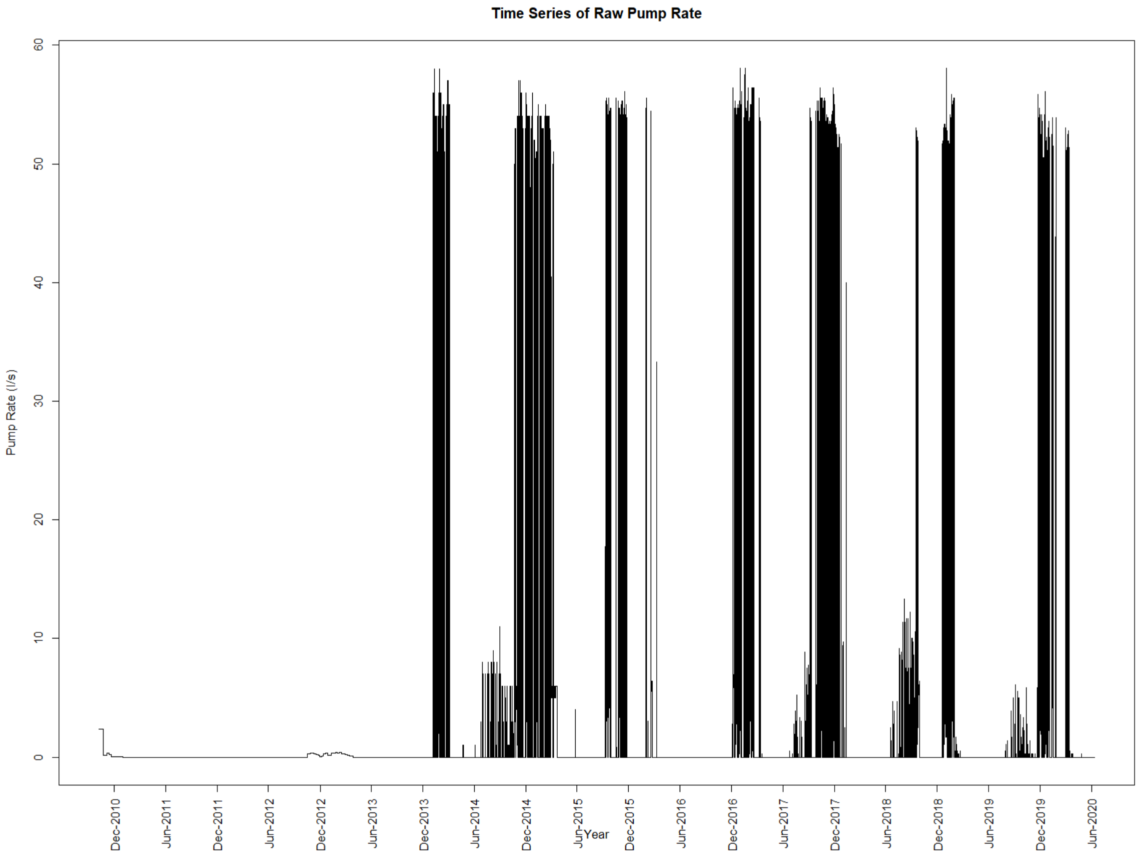


Figure 83 Graph showing ORC held data for rate of abstraction for Permit 2002.399

The authorised rate of abstraction for this permit is 200 m^3/hr, equivalent to 56 l/s. The maximum recorded rate of take is 58.1 l/s (and falls within the margin of error of 5% above the authorised rate). The maximum authorised rate of take is regularly achieved.

b) Monthly Volumes Abstracted

The figure below shows the authorised monthly abstraction volume for this permit measured at WM0248.

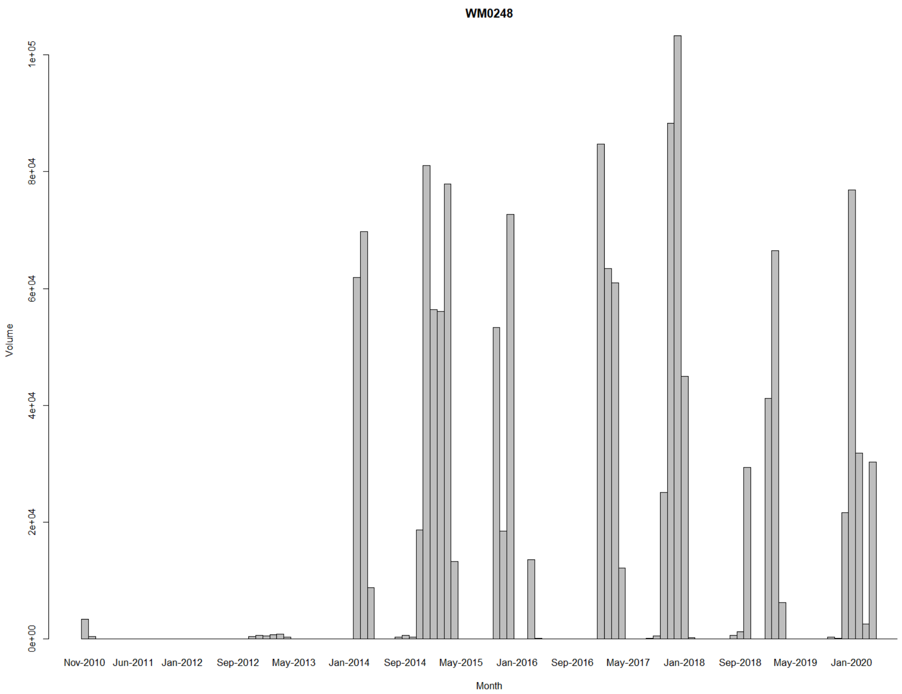


Figure 84 Graph showing ORC held monthly abstraction volume records for Permit 2002.399

The maximum monthly abstraction volume on this permit is 148,000 m^3. The maximum recorded volume abstracted is 103,230 m^3 in December 2017.

c) Annual Volume Abstracted

The table below shows the annual volumes abstracted between September 2010 and 2021.

Table 73 Annual abstraction volumes for Permit 2002.399

Annual Volume at WM0248	m^3/year
2010/2011	3,926
2011/2012	0
2012/2013	3,575
2013/2014	140,439.6
2014/2015	**304,999.2**
2015/2016	158,251
2016/2017	221,361
2017/2018	262,528
2018/2019	145,404
2019/2020	163,755
2020/2021	0

The maximum recorded annual volume is 304,999 m^3 in 2014-2015.

9.8.9 Summary of Water Use Records Armstrong Family

Table 74 Summary of Water Use Records - Armstrong Family

Permit	Consented rate of take l/s	Max rate of take recorded l/s	Consented monthly volume m^3	Max monthly volume recorded m^3	Consented annual volume m^3	Max annual volume m^3
3707	55.55	61.2[40]	148,785.12[41]	155,394	1,751,824.8[42]	657,547.2
2002.399	56	58.1	148,000	103,230	1,776,000[43]	304,999

Please note that 2002.399 is mostly a retake.

9.8.10 Water Balance

The Armstrong family utilise four sources of water on two separate blocks of land. The Main race water is used on its own separate block. The other three sources: Dunstan Race, Millers and unnamed Stream water is mixed and used on the rest of the farm.

Using the soil and rainfall maps and efficient water allocation volumes from the Aqualinc Report the 274 ha irrigated on the Armstrong property with private (Miller and Unnamed Stream) and Dunstan Race water requires a total volume of 2,354,645 m^3 to be watered efficiently. On average that is 8,594 m^3/ha/yr.

Using the same methodology, the 39 ha irrigated on a separate block with Main race water requires a total of 351,281.1 m^3 to be watered efficiently. On average that is 9,007 m^3/ha/yr.

The total volume being requested for the two private water consents in this application is 962,546 m^3 which is enough for 126.7 ha. This property seeks 1,321,786 m^3 as their portion of Dunstan Race water and 364,010 m^3 as their portion of Main Race water.

[40] Capped at 10% above consented rate
[41] Derived by extrapolating the authorised rate to a monthly volume (55.55x60x60x24x31)/1000
[42] Derived by extrapolating the authorised rate to an annual volume (55.55x60x60x24x365)/1000
[43] Derived by extrapolating the authorised monthly volume to an annual volume (148,000 x 12)/1000

Table 75 Water balance for J Armstrong

Water Source	Aqualinc efficient allocation for the farm (m³/yr)	Equivalent area (ha)[44]	Volume Requested (m³/yr)
Unnamed Stream private water (2002.399, mostly retake water)	962,546	274	304,999
Millers Creek water (3707)			657,547
Dunstan Race	1,514,541		1,321,786
Main Race	351,281.1	39	203,473
Total	**2,705,926**	**313**	**2,182,806 (not including the retake)**

The volume of water available to the Armstrong family is well below the total efficient volume as calculated by Aqualinc.

9.8.11 Allocation Requested / Outcome Sought

The applicant seeks the following allocation:

Table 76 Primary allocation sought by Armstrong Family

Points of take	3707	2002.399
Rate of take l/sec	55.55	56
Maximum Monthly Volume m^3	148,785	103,230
Maximum annual Volume	657,547.2	304,999
Residual flows	10 l/s	NA (on the dam permit)
Lauder Creek residual	Only 3707 to comply with 10 l/sec at the intake and sub-catchment residual - 100 l/s at Rail Trail Flow Site No residual stipulated on 2002.399 take.	
Abstraction	1 July to 30 June following year	
Minimum flow	Both take points: compliance with operative minimum flow	

Draft permits with proposed conditions are provided in Appendix C.

[44] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

Number of permits

The applicant requests three permits:

- Two to replace the two water rights, incorporating the two existing take point locations utilised under Permits 3707 and 2002.399. The purpose of use for each permit is irrigation and stock water.

- One permit to replace the dam permit 2002.387

Point of take and monitoring

All intakes and measuring sites are to remain in their current locations.

Permit 3707 has an exemption to measure away from the point of take.

Fish screens

A fish screen may be recommended for this take however an assessment to determine the need, practicalities and suitable design is requested before requiring implementation. A draft condition is included in the draft permits.

Residual flows

Based on the assessment undertaken by Hickey and Olsen (2020) (Appendix D), the following residual flows are recommended.

- 3707 - 10 l/s at intake and 100 l/s at Rail Trail Flow Site
- 2002.399 no residual considered necessary

9.9 Springburn Partnerships - Tucker Family

9.9.1 Water Permits

The Tucker Family hold the water permits in the table below.

Table 77 Water Permits held by Tucker Family

<table>
<tr><th>Permit</th><th>Location</th><th>Consented Abstraction l/hr</th><th>Consented Abstraction l/month</th></tr>
<tr><td>98488</td><td>Millers Creek (also known as Mellors Creek)</td><td rowspan="2">400,000 l/hr</td><td>144,000,000 l/month</td></tr>
<tr><td>98572</td><td>Millers Creek</td><td>144,000,000 l/month</td></tr>
</table>

9.9.2 OAIC Shareholder

The Tucker family also receive Dunstan Race water:

The Dunstan Race water is used on a separate block of land to the private water.

9.9.3 Farming Operation

The Tucker family run 'Springburn', a breeding operation for sheep, beef and deer. The 6480 ha property comprises rolling hills and high-country land in the foothills of the Dunstan Mountains. This property is run in combination with a block in Lawrence where many of the lambs are sent to fatten. The Manuherekia property subject to this application is primarily a dryland farm with support for winter feed from the irrigation.

The total property area is 6480 ha, of which 455 ha is irrigated using a combination of flood contour systems and spray via a hard hose gun. The irrigation water is used to grow pasture and lucerne to be cut for hay and for winterfeed crops. They use the irrigated areas to balance the dryland pasture and spell some of the more delicate high country if required.

This farming business supports the Tucker family, two other families and one staff member. They also use stock carriers, shearers and crutching contractors.

On this property there are two sources of irrigation water that generally remain unmixed. The OAIC shares from the Dunstan race are delivered to two separate blocks, as described in the following sections.

The Tuckers farm has two separate parcels of land. The Dunstan water is used on the Mee Rd parcel of land and the lower paddocks of the Home block. This total approx. 226 ha of irrigated from the Dunstan Race water.

The home block utilises the water from the private rights and up to 229 ha can be irrigated with this water.

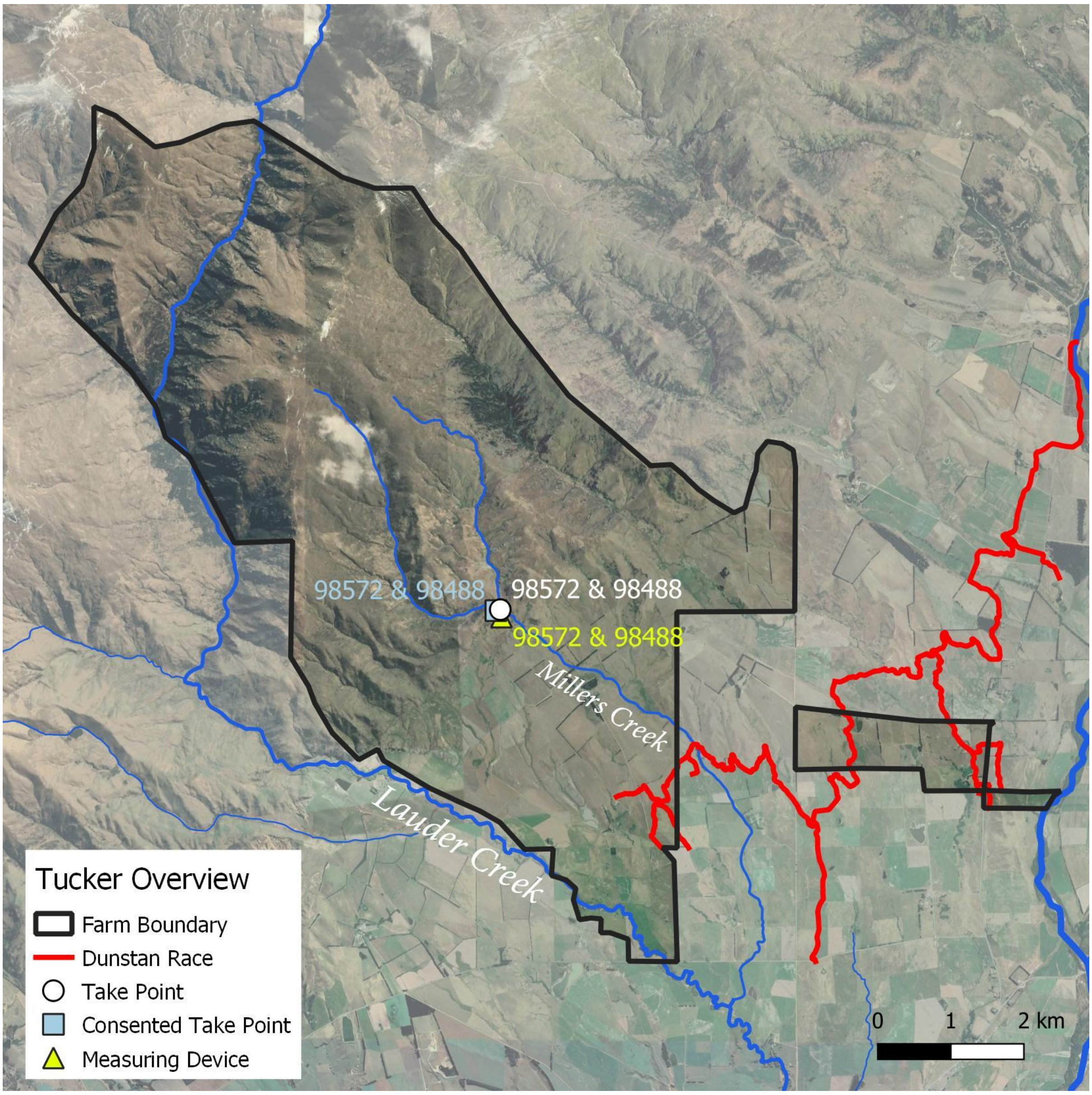


Figure 85 Overview of Springburn property

9.9.4 Irrigation and Investment

Many years ago, the applicant invested in upgrading some of their irrigation systems from overland flow techniques to spray method. Further investment is on hold until the permits are replacement and their surety of supply confirmed.

There is a storage dam on the Mee Road Block that the OAIC water can be dropped into for spray application as required. The dam is small and can hold 7 days' worth of water.

The Home Block where the private water is used has been completely refenced.

There is a separate stockwater supply to other parts of the farm however the private take also supports the stockwater situation in the irrigated paddocks. The paddocks this water supplies needs to provide water for up 10,000 sheep on occasion. The race needs to stay wet all year as many of the paddocks have troughs.

9.9.5 Water Take and Water Use

Permits 98572 and 98488

The shared water take location for these permits is located on Millers Creek is approximately 4.3 km north west of the intersection of Lauder Flat Road and Mee Road, Becks. The intake is on the Tucker's property.

The intake is formed with sandbags and rocks within the Creek. The water is raced to farm paddocks for contour irrigation on up to 229 ha the Home Block.

The Tuckers would like to upgrade the application method to spray, however this investment decision is dependent on the outcome of the water permit replacement process.

There are other users on the Miller Creek all located downstream of this take. The Lilybank and James Armstrong take details are in this application.

The Tuckers always leave a trickle of water flowing past their intake point on Millers Creek.

Water taken under Permits 98572 and 98488 is measured away from the point of take, as approved by Notice of Exemption WEX0138. Water use data is telemetered to the ORC from water meter WM0392.

	
Point of take from Millers Creek *Source: ORC Inspection Sheet*	Sandbags used during low flow to pond and make water available to the point of take *Source: ORC Inspection Sheet*
	
Water metering device *Source: ORC Inspection Sheet*	Solar panel connected to power supply to datalogger *Source: ORC Inspection Sheet*

Figure 86 Photographs of Intake and associated infrastructure under Permits 98572 and 98488

OIAC Water

The applicant uses their Dunstan Race on the two blocks, the Home Block and Mee Rd Block.

On the Mee Rd Block the water supplies a storage dam that then feeds the spray application for irrigation on an area of 123 ha. There is a further 60 ha available for contour application.

On the Home Block, the water is applied with contour application on an area of approximately 42 ha.

Schematic of Irrigation Set up

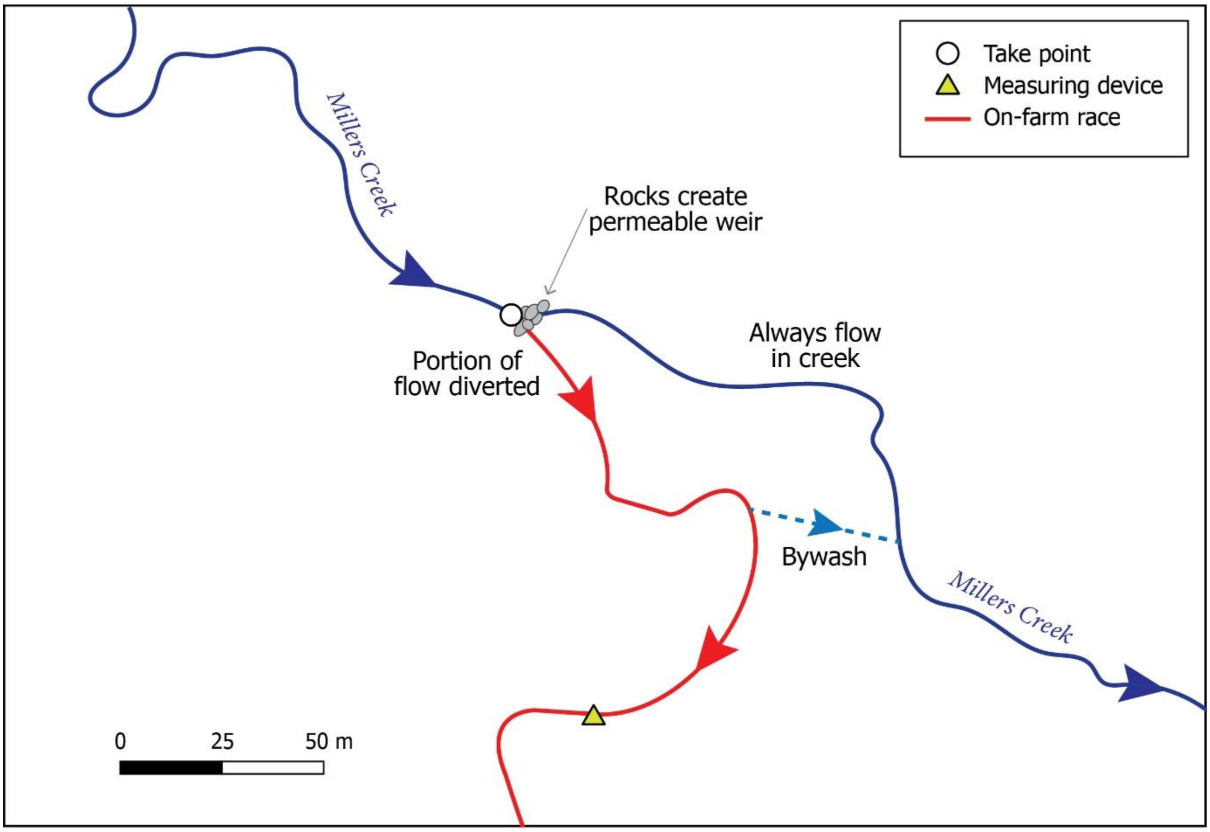


Figure 87 Schematic of Springburn Farm

9.9.6 Water Use Summary

The irrigated areas on Springburn Farm are summarised below:

Table 78 Irrigated areas on Springburn Farm

Block	Water source	Irrigation type	Area (ha)
Home Block	98572and 98488	Contour	229
	OAIC Dunstan Race	Contour	43
Mee Rd Block	OAIC Dunstan Race	Spray (Gun)	123
		Contour	60
Total			455

Water use on Springburn Farm is summarised below.

Table 79 Overview of water use on Springburn Farm

Information	Property Details
Size of property	6480 ha
Size of area irrigated	455 ha
Sources of Water	Permits 98572 and 98488 Mellors Creek OAIC Dunstan Creek via Dunstan race
Maximum recorded rate of take (from metering data)	Millers Creek: >111.1 l/sec
Maximum recorded annual volume (from metering data)	Millers Creek: 576,551.4m³
Aqualinc calculation of maximum efficient use m³	Dunstan source: 1,891,451 Private source: 1,910,086
Number of stock	The applicant relies on the Millers Creek water source for Stockwater. This water is supplied to troughs on the farm. 10,000 sheep
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	10,000*5= 50,000 l/day 0.6l/sec
Frequency of water take (average and maximum)	24hrs day when ever the water is available.
Months during which water is expected to be taken in a dry year	Miller Creek water is available through most of the irrigation season. As the flows decrease naturally in summer the amount for abstraction will decline. A dry season may just result in lower flows over summer.
Part of day water when water will typically be taken:	Water is abstracted when it is available at any time of the day for up to 24hours
Does use of water provide recharge back into catchment?	A small amount of water may recharge back to the catchment from the contour application of both the Dunstan race water and the private water.
Is take from re-charge or is an augmented take?	No
Hectares in a day	The hectares irrigated in a day depends on the requirement of the soil and the available water. Given there is not enough water to irrigate the areas completely all season over watering does not occur.
Storage	There is storage on the Mee Rd block that can hold 7 days water provided from Dunstan race.

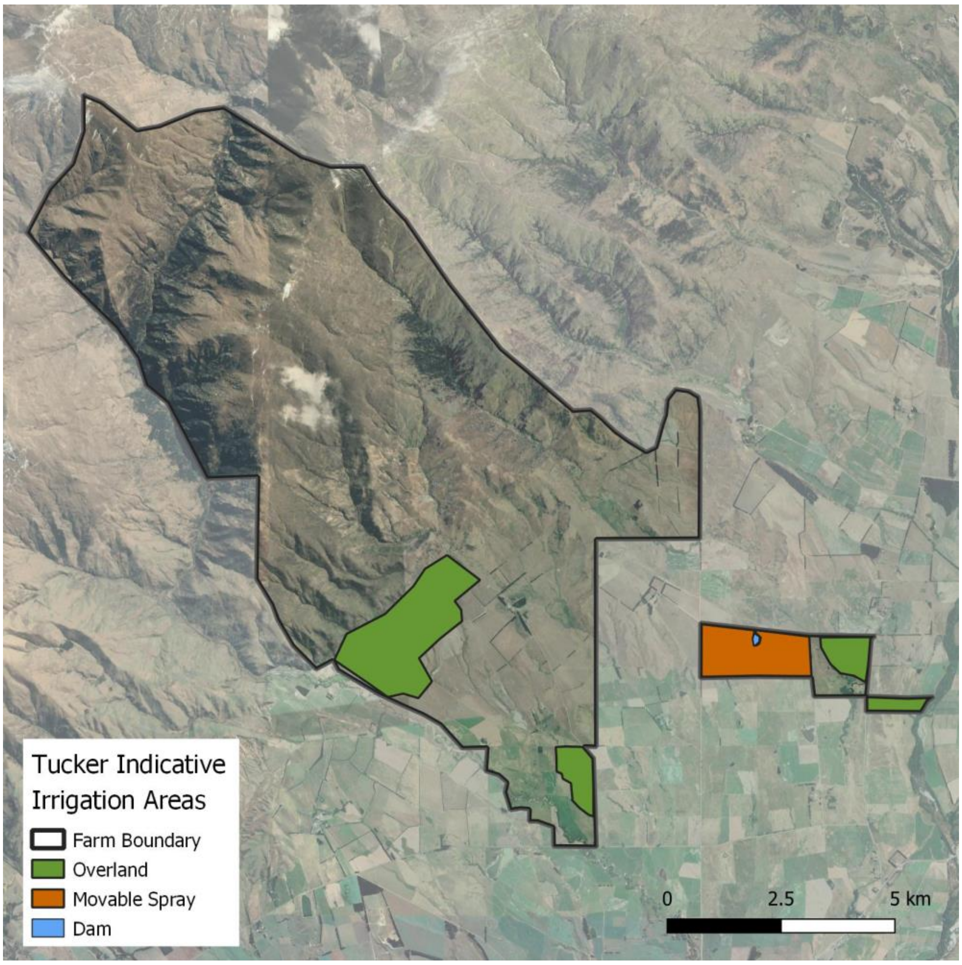


Figure 88 Irrigated areas by type on Springburn Farm (indicative only)

9.9.7 Water Use Records

Water use records are held at the ORC and the data is summarised here. No alternative water use records are provided.

Water Use Records 98572 and 98488

a) Rate of Abstraction

The figure below shows the rate the rate of abstraction for this permit measured at WM0392.

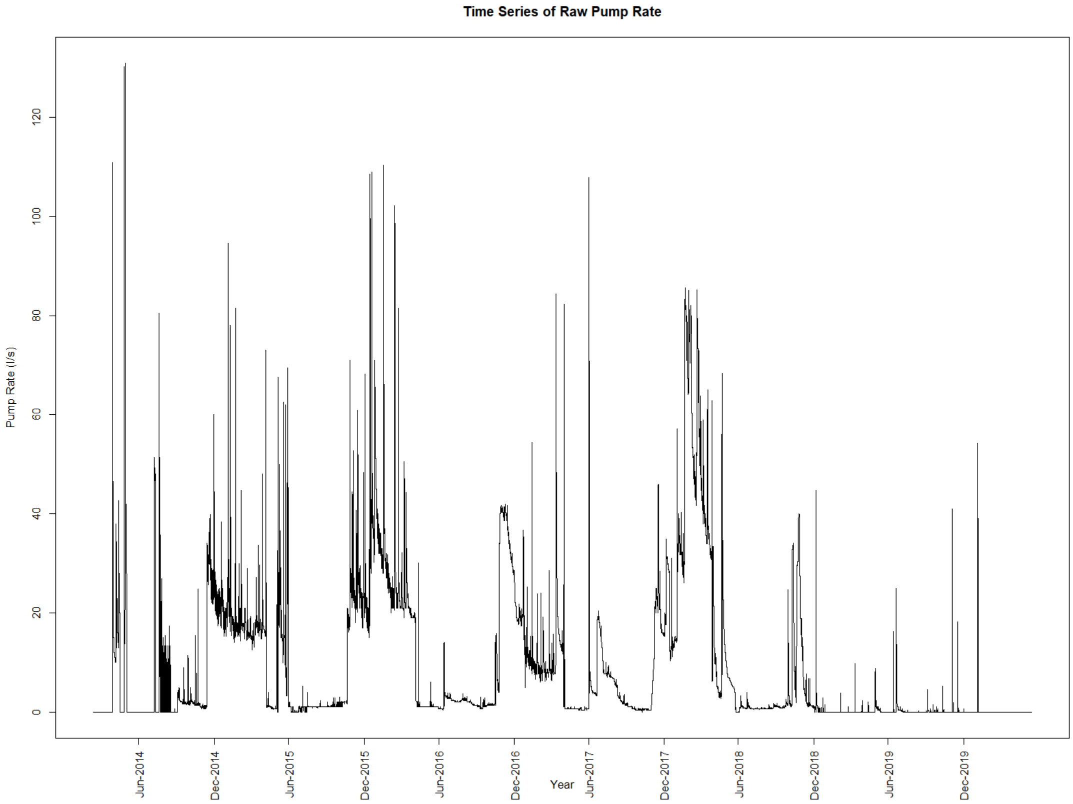


Figure 89 ORC held metering data for rate of abstraction for Springburn Farm under Permits 98572 and 98488

The combined consented maximum rate of abstraction under these permits is 111.11 l/s. While the data records indicate a maximum rate of take of 130.91 l/s, the rate of take generally complies with the authorised rate.

The consented rate of abstraction for this Permit is regularly achieved.

b) Monthly Volume Abstracted

The figure below shows the monthly volume of abstraction for this permit.

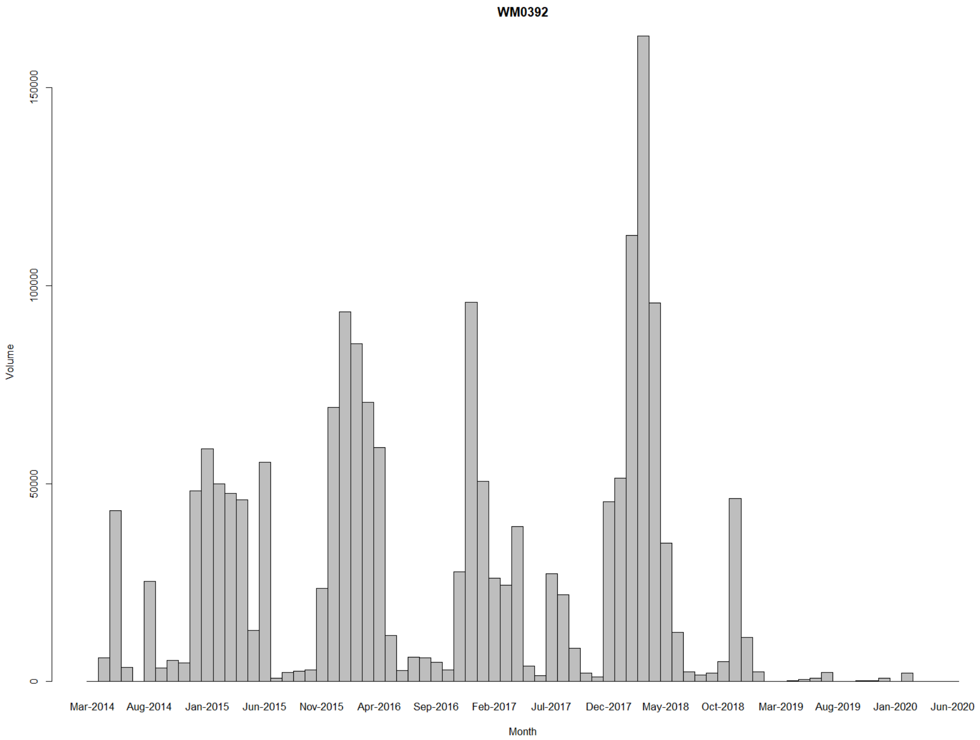


Figure 90 Graph showing monthly volume water use data for Permits 98572 and 98488

The combined consented maximum monthly abstraction volume for these permits are 288,000,000 l/month, equivalent to 288,000 m^3. The maximum recorded volume 163,004.3 m^3 March 2018.

c) Annual Volume

The table below shows the annual volumes abstracted under this Permit.

Table 80 Annual abstraction volumes water use data for Permits 98572 and 98488

Annual Volume WM0392	m^3/year
2013/2014	52,778.7
2014/2015	357,704.9
2015/2016	424,456.2
2016/2017	289,256.3
2017/2018	**576,551.4**
2018/2019	73,016.39
2019/2020	5,771.97

The maximum recorded annual abstraction volume under this Permit is 576,551.4 in 2017-2018.

9.9.8 Summary of Water Use Records

Table 81 Summary of Water Use Records for Tucker Family of Springburn

Permit	Consented rate of take (l/s)	Max rate of take recorded (l/s)	Consented monthly volume (m^3)	Max monthly volume recorded (m^3)	Calculated Consented annual volume (m^3)	Max annual volume recorded (m^3)
98572	111.11	122.22[45]	288,000	163,004.3	3,456,000[46]	576,551.4
98488						

9.9.9 Water Balance

Using the soil and rainfall maps and efficient water allocation volumes from the Aqualinc Report the 455 ha irrigated on the Springburn property requires a total volume of 3,801,537 m^3 to be watered efficiently. That is the equivalent 8355 m^3/ha/yr.

As the water sources are not mixed the efficiency calculations can be divided further.

The Aqualinc Report calculates Dunstan race water used on the Mee Rd Block and the Home Block for 225 ha is 1,891,451 m^3. That is the equivalent 8406 m^3/ha/yr.

The Aqualinc Report calculates the efficient volume for the Millers water on the 229 ha on the Home Block is 1,910,086 m^3. That is the equivalent 8341 m^3/ha/yr.

Table 82 Tucker water balance

Water Source	Aqualinc efficient allocation for the farm (m^3/yr)	Equivalent area (ha)[47]	Requested volume (m^3/yr)
Private	1,910,086	69	576,551.4
Dunstan Race	1,891,451	92	771,042
Total	**3,801,537**	**161**	**1,347,593**

The volume requested from the Dunstan Race is 771,042 m^3. This total volume is well within the efficient volume as calculated by Aqualinc for this area.

[45] Capped at 10% above the consented rate of take
[46] Derived by extrapolating the authorised monthly volume to an annual volume (288,000 x 12).
[47] Equivalent area (ha) has been calculated by dividing the volume request for each water source (m^3) by the average efficient water allocation (m^3/ha/year).

The volume requested from the Private water is 576,551.4 m^3. This total volume is well within the efficient volume as calculated by Aqualinc for this area.

The total Volume requested by the Springburn Partnerships is 1,347,593 m^3. The total volume is well within the total efficient volume as calculated by Aqualinc.

9.9.10 Allocation Requested / Outcome Sought

A summary of the allocation and limits sought by Springburn Farm Ltd is provided in the table below.

Table 83 Allocation and limits proposed for Springburn Farm under replacement permits

	Primary Permit
Consent	98572 and 98488
Rate of take L/sec	111.11
Maximum monthly volume (m^3)	163,004.3
Maximum annual volume (m^3)	576,551.4
Residual flow at intake	10 l/s
Residual flow for Lauder Creek	Applicant to comply with sub-catchment residual - 100 l/s at Rail Trail Flow Site
Minimum flow	Applicant to comply with operative minimum flow
Water access	12 months of the year, July 1 to June 30 the following year

A draft permit with proposed conditions is provided in Appendix C.

Number of permits

The applicant application seeks one permit in replacement of Permits 98572 and 98488.

Point of take and monitoring

No changes to the existing take location are sought. This permit already has an exemption to measure away from the point of take.

Fish screens

A fish screen may be recommended for this take however an assessment to determine the need, practicalities and suitable design is requested before requiring implementation. A draft condition is included in the draft permits.

Residual flows

Based on the assessment undertaken by Hickey and Olsen (2020) (Appendix D), residual flows of 10 l/s at the intake and 100 l/s at the Rail Trail Flow Site are recommended.

9.10 Lilybank Company Ltd – Brad and Kirsty McEwan

9.10.1 Water Permits

Lilybank Company ltd is operated by Kirsty and Brad McEwan they hold the following permit

Table 84 Water Permit held by Groundwater Family

Permit	Location	Consented Abstraction l/hr
2000.644.V2	Millers Creek (also known as Mellors Creek)	200,000 l/hr

The applicant also jointly holds water permit (99654.V1) to take water from Becks Creek. The replacement of that permit is under application and has been accepted for processing by the ORC (RM20.55). That application has remained on hold pending lodgement of the wider Manuherekia and sub-catchment applications. It is requested that the application for 99654.v1 (coded now as RM20.55) be processed alongside this application. The water use of the Becks Creek water has beem summarised in that application and not repeated here.

9.10.2 OAIC Shareholder

Lilybank also receive Dunstan Race water. This application supports the OAIC Dunstan Race application which is part of the Dunstan catchment group.

9.10.3 Farming Operation

Lilybank is operated by Brad and Kirsty McEwan and it is run in partnership with Kirsty's parents Barbara and Alastair Groundwater. Lilybank is 645 ha in total of which up to approximately 612 ha can be irrigated. The property is a breeding and finishing unit with beef cattle and sheep. The irrigation water is used to grow pasture, lucerne and winter crops for stock feed. Hay and silage are cut from the lucerne and pasture to feed the stock through the winter.

Lilybank company is in the middle of a development programme and have improved their production through more efficient water use and feed production to now be able to sell their stock in prime condition rather than as stores. However, the farm is yet to be completely developed as the applicants are waiting to see what level of water security they are left with after the permits have been replaced. Further spray technology will be installed as water surety is known and finances allow. Currently there is approximately 158 ha of spray application methods and 453 ha of overland flow methods either lazered border dykes or contour irrigation.

The business is in succession planning and significant investment has been made in upgrading the systems to better utilise the water and increase returns. At this point the continued access to water is crucial for the business survival.

On this property there are three sources of irrigation water and they can be mixed depending on the crop or pasture demand. There is water from the Becks Creek under permit application RM20.55, water from Millers Creek 2000.644 and water from the OAIC Dunstan Race. The use of Millers Creek and OAIC water is described in the sections below. The use of the Becks Creek source is the subject of RM20.55 which we ask to be processed with this application.

The water is piped to spray equipment in two locations on the Brookdale block and the original Lilybank block. Between these two spray locations water from all sources is applied using overland flow techniques. There are a series of races all over the farm allowing for the different paddocks to be irrigated dictated by the following: water access, soil moisture levels and crop or pasture needs.

Figure 91 Photographs of the family on the farm

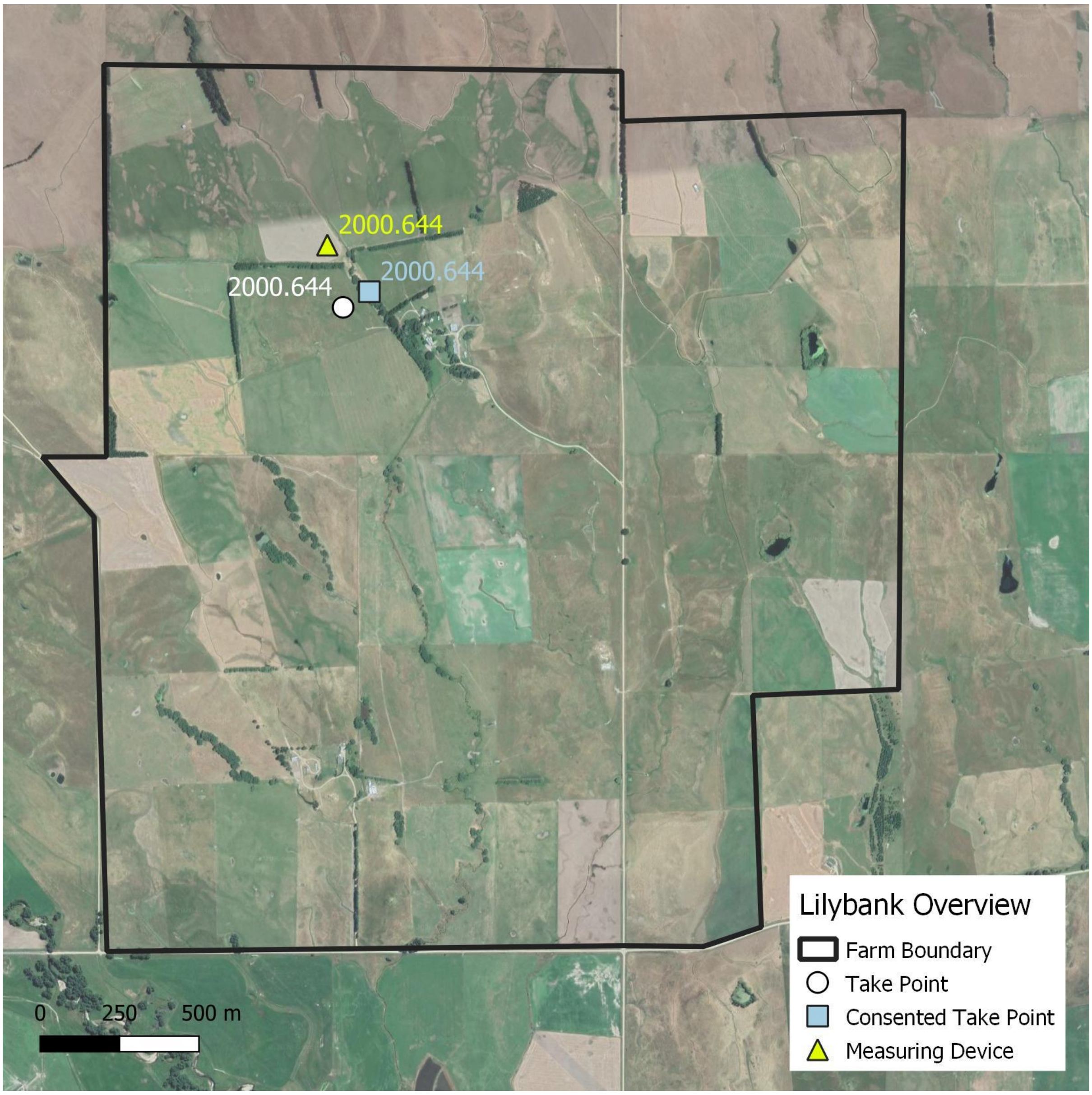


Figure 92 Overview of Lilybank

9.10.4 Irrigation and Investment

The applicants are a young farming family looking to upgrade their farm with modern irrigation techniques as funds allow. Some investment in irrigation systems has commenced but they are making decisions cautiously at this stage due to the uncertainty of the water resource. The changing regulations in such a short time period has been stressful for a farming family looking to establish a sustainable and profitable operation. Lilybank are keen to incorporate storage on farm to allow for further conversion to spray.

Investment costs for this farming family include the purchasing of the farm.

Depending on the outcome and term of the replacement permit, the applicant intends to proceed with upgrades to achieve further efficiency benefits, including upgrading existing infrastructure and possible storage, as follows:

- Investigating a mainline and hydrant system on the eastern block (known as 'Over Road Block') for gun use. Anticipated timeframe 3 – 5 years.
- Potential water storage alongside Millers Creek water right to store winter water for use on a pivot and guns to the west of the Homestead Block. Anticipated timeframe 3-5 years.

9.10.5 Water Take and Water Use

Permit 2000.644

The water taken under Permit 2000.644 is from Millers Creek, approximately two kilometres upstream from the Becks School Road and 500m upstream from the homestead on Brookdale.

The intake is an open race situated upstream of a 1 m high sloping, stacked rock weir in the Creek. At the point of take Millers Creek is approximately 1.5 m wide. The take is constructed of sandbags and boards in the Creek to guide the flow of water into the race. There is always water flowing past the intake site.

Water taken under Permit 2000.644 is measured at the point of take via an open channel weir. Water use data is recorded via a manual water level sensor and staff gauge and sent to the ORC meter number WM0033.

From here some of the water is pumped and sprayed onto the paddock with gun irrigation. Lilybank also apply the water with contour irrigation.

The water is also raced to a small holding pond in the south of the farm and applied through spray system set up with underground hydrants as illustrated in the schematic.

	
Millers Creek at intake, showing sandbags and board in the Creek guiding the flow	Location of measuring at open channel weir
	
Spray irrigation on Lilybank	Millers Creek, upstream of intake

	
Pump infrastructure on small holding pond	Gun irrigator used near Miller Creek intake

Figure 93 Photographs of the intake and associated infrastructure

9.10.6 OIAC Water

The applicant receives water from the Dunstan Race

Schematic of Irrigation Set up

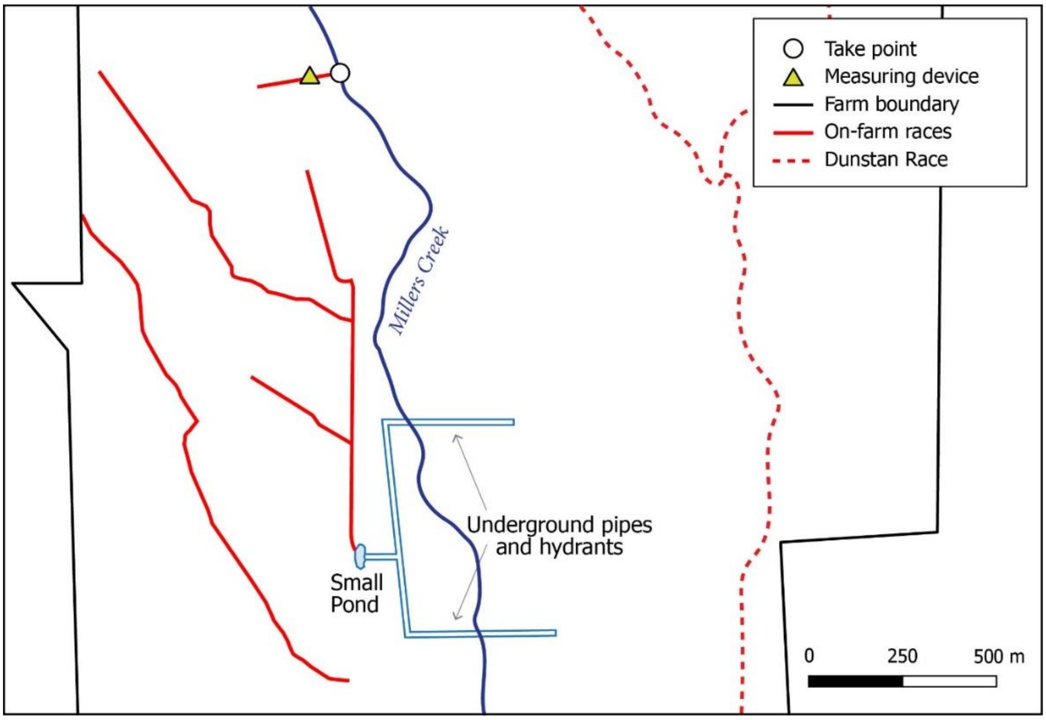


Figure 94 Schematic of Lilybank

9.10.7 Water Use Summary

The irrigated areas on Lilybank are summarised below:

Table 85 Irrigated areas on Lilybank

Farm	Irrigation type	Area (ha)
Lilybank	Overland flow Border dyke and contour	453
	Spray	158
Total		611

Water use on the Lilybank is summarised below.

Table 86 Overview of water use on Lilybank

Information	Property Details
Size of property	645 ha
Size of area irrigated	611 ha (varies between 611 and 612 depending on the rounding up)
Sources of Water	Becks Creek Millers Creek Dunstan Race
Maximum recorded rate of take (from metering data)	Millers Creek; > 55.5 l/sec
Maximum recorded annual volume (from metering data)	Millers Creek: 604,195.19 m^3
Aqualinc calculation of maximum efficient use m^3	5,199,859
Number of stock	Sheep: 5500 Cattle: 50
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	5500 * 5 = 27,500 50 * 45 = 2250
Frequency of water take (average and maximum)	24hrs day whenever the water is available and can be sent to the storage dams to be used as needed
Months during which water is expected to be taken in a dry year	The Miller Creek flow decreases in the middle of summer. However, there is often still some available for abstraction. In dry year the flow may decrease slightly earlier.
Part of day water when water will typically be taken:	Water is abstracted when it is available at any time of the day for up to 24hours.
Does use of water provide recharge back into catchment?	Yes the irrigation on some paddocks does go into on farm races to be used on paddocks further on the farm. The pond on the farm assists in capturing the water that is used on the paddocks higher up.

Information	Property Details
Is take from re-charge or is an augmented take?	The Miller Creek may be slightly impacted by the flood irrigation upstream.
Hectares in a day	The hectares irrigated in a day is related to the soil moisture needs and the water availability. Lilybank irrigation mangers make sure the paddocks that don't require irrigation are not irrigated but more often than not paddocks are too dry and in need of irrigation as the supply of water decreases over summer.
Storage	There is on small buffer pond on the farm that holds approx. 3,000m^3

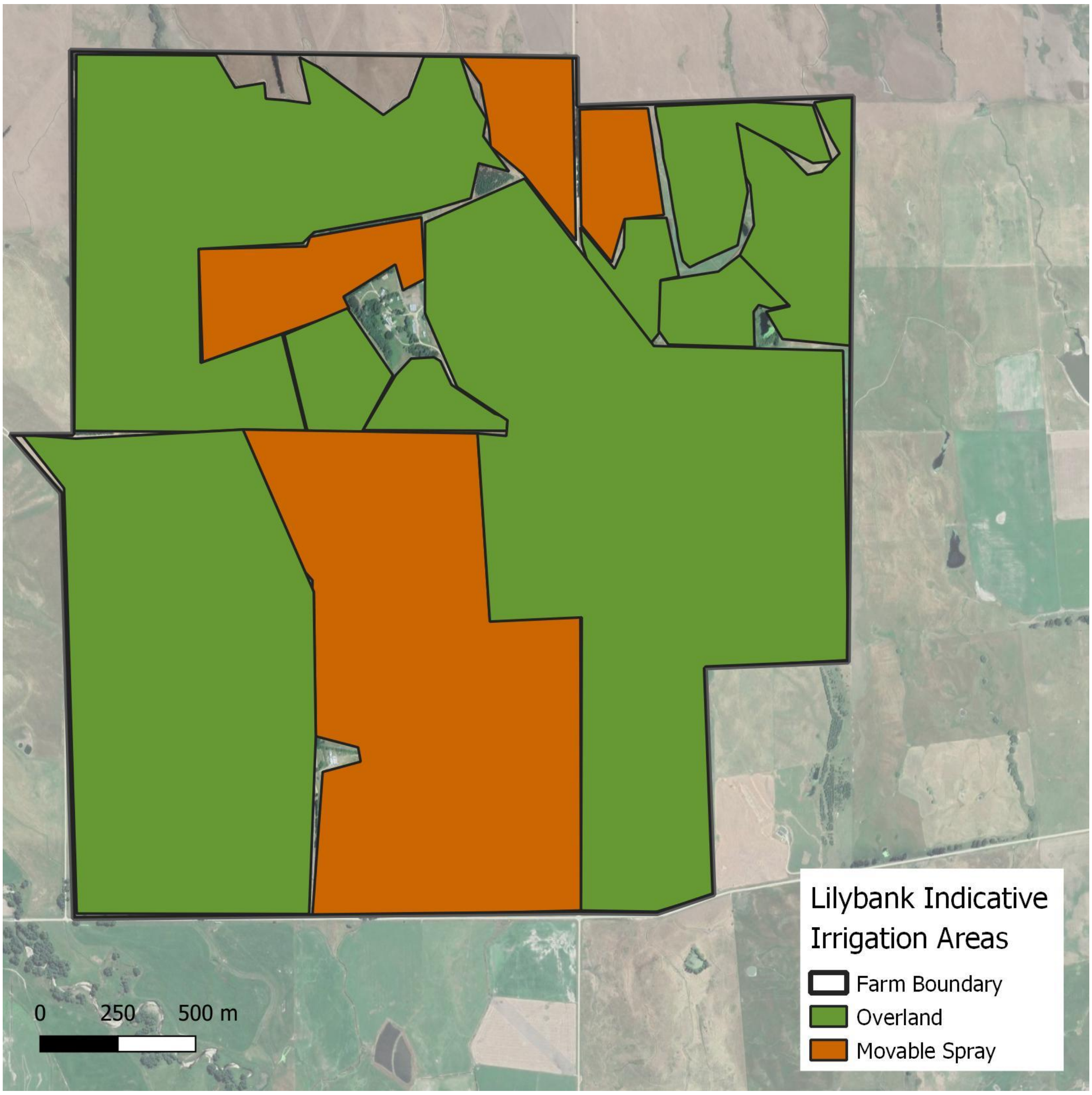


Figure 95 Irrigated areas by type on Lilybank (indicative only)

9.10.8 Water Use Records

Water use records are held at the ORC and the data is summarised here. No alternative water use records are provided.

Water Use Records Permit 2000.644

d) Rate of Abstraction

The figure below shows the rate the rate of abstraction for this permit measured at WM0033.

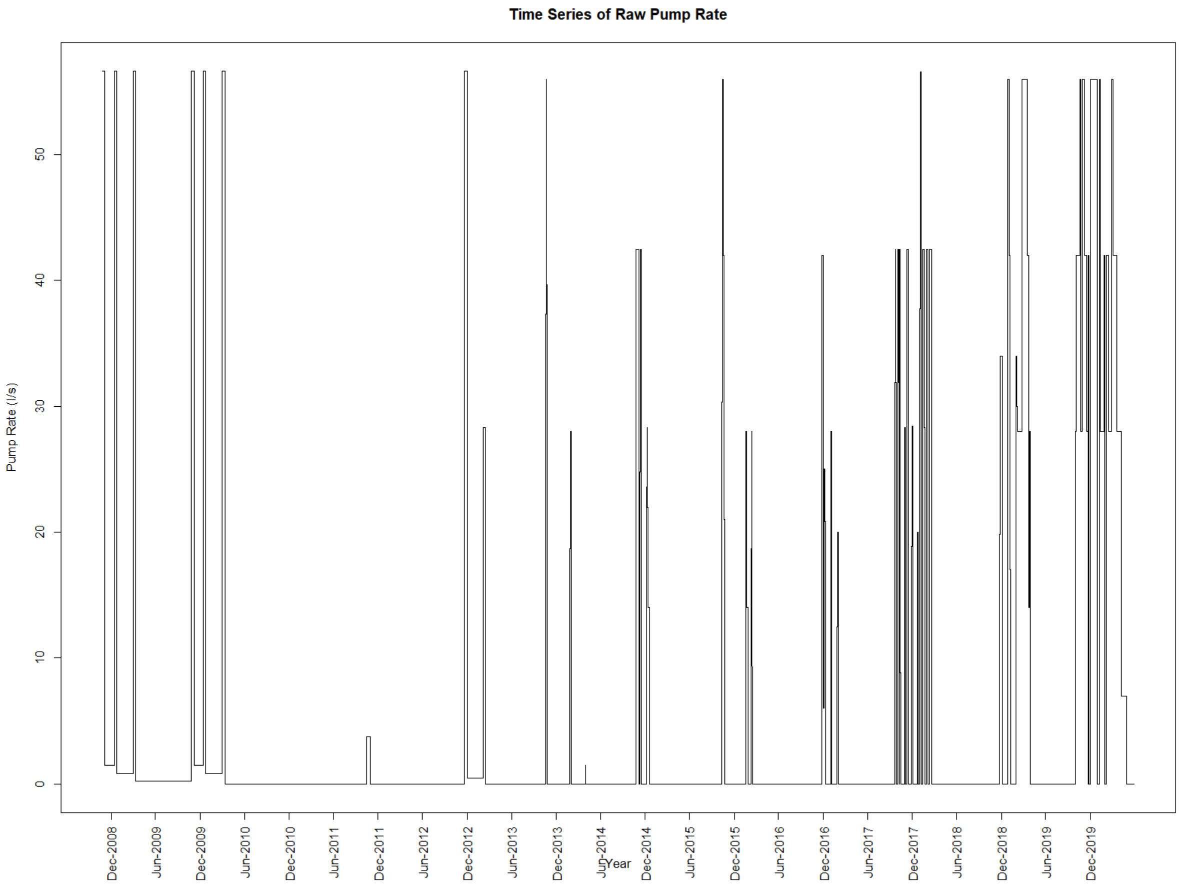


Figure 96 ORC held metering data for rate of abstraction for Lilybank under Permits WM0033

The combined consented maximum rate of abstraction under these permits is 200,000 l/hr, equivalent to 55.56 l/s. The maximum rate of take recorded is 56.63 l/s.

The consented rate of abstraction for this Permit is regularly achieved.

e) Monthly Volume Abstracted

The figure below shows the monthly volume of abstraction for this permit.

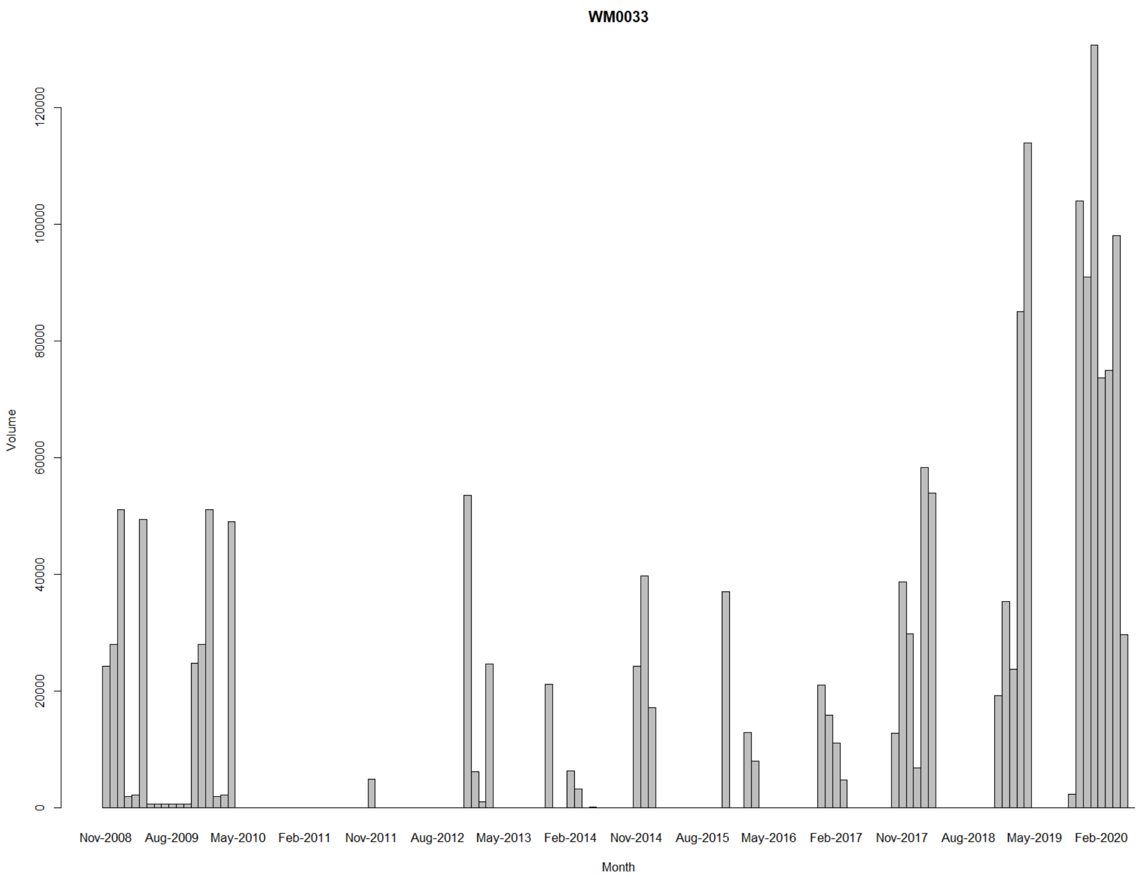


Figure 97 Graph showing ORC held data, monthly abstraction volumes under Permit 2000.644

There is no monthly abstraction volume limit specified on this permit. The maximum recorded volume is 130,636.8m^3 in January 2020.

f) Annual Volume

The table below shows the annual volumes abstracted under this Permit.

Table 87 Annual abstraction volumes water use data for Permit 2000.644

Annual Volume at WM0033	(m^3/year)
2008/2009	158,296.8
2009/2010	159,757.95
2010/2011	0
2011/2012	4,893.15
2012/2013	85,630.18
2013/2014	30,974.4
2014/2015	81,261.72

2015/2016	58,060.8
2016/2017	52,977.6
2017/2018	200,596.44
2018/2019	277,380.8
2019/2020	**604,195.19**

The maximum recorded annual abstraction volume under this Permit is 604,195.19m³ in 2019-2020.

9.10.9 Summary of Water Use Records

Table 88 Summary of Water Use Record for Permit 2000.644

Permit	Consented rate of take (l/s)	Max rate of take recorded (l/s)	Consented monthly volume (m^3)	Max monthly volume recorded (m^3)	Calculated Consented annual volume (m^3)	Max annual volume recorded (m^3)
2000.644	55.56	56.63	148,811.9[48]	130,636.8	1,752,140.16[49]	604,195.19

9.10.10 Water Balance

Lilybank hold 1/3 of the Becks Creek permit RM20.55. The volume of water requested and justified for Lilybank in the Becks creek application is one third of an annual volume of 1.406 Mm³, which equates to 468,999 m³.

Using the soil and rainfall maps and efficient water allocation volumes from the Aqualinc Report the 612 ha irrigated on the Lilybank property requires a total volume of 5,199,859 m^3 to be watered efficiently. On average each hectare will be allocated 8,497 ha.

[48] Derived by extrapolating the authorised rate of take to a monthly volume (55.56 x 60 x 60 x 24 x 31)/1000
[49] Derived by extrapolating the authorised rate of take to an annual volume (55.56 x 60 x 60 x 24 x 365)/1000

Table 89 Lilybank water balance

Water Source	Aqualinc efficient allocation for the farm (m³/yr)	Equivalent area (ha)	Volume requested (m³/yr)
Becks Creek	5,199,859	55	468,999
Miller Creek (this application)		71	604,195
Dunstan Race		155	1,321,786
Total	**5,199,859**	**612**	**2,394,980**

The total volume is well within the total efficient volume as calculated by Aqualinc.

9.10.11 Allocation Requested / Outcome Sought

A summary of the allocation and limits sought by Lilybank Ltd is provided in the table below.

Table 90 Allocation and limits proposed for Lilybank under replacement permit

	Primary Permit
Consent	2000.644
Rate of take l/sec	55.56
Maximum monthly volume (m^3)	130,636.8 m^3
Maximum annual volume (m^3)	604,195.19 m^3
Residual flow at intake	10 l/s
Residual flow for Lauder Creek	Applicant to comply with sub-catchment residual 100 l/s at Rail Trail Flow Site
Minimum flow	Applicant to comply with operative minimum flow
Fish screen	As described below

A draft permit with proposed conditions is provided in Appendix C.

Number of permits

The applicant application seeks one permit in replacement of Permit 2000.644.

Point of take and monitoring

No changes to the existing take location are sought.

Fish screens

A fish screen may be recommended for this take however an assessment to determine the need, practicalities and suitable design is requested before requiring implementation. A draft condition is included in the draft permits.

Residual flows

Based on the assessment undertaken by Hickey and Olsen (2020) (Appendix D), residual flows of 10 l/s at the intake and 100 l/s at the Rail Trail are recommended.

9.11 Central Park Ltd (J O'Brien)

9.11.1 Water Permits

Central Park Ltd holds the following permit to retake and use water:

Table 91 Water Permit held by Central Park Ltd

Permit	Location	Consented Abstraction l/hr
2002.768	Unnamed Tributary of Lauder Creek	28 l/s

9.11.2 OAIC Shareholder

Central Park Ltd receives main race water. This water use summary supports the OAIC Main Race application.

9.11.3 Farming Operation

J O'Brien owns and operates Central Park Ltd, a beef cattle finishing farm. The total property area is 389 ha, of which approximately 323.6 ha is irrigated using a combination of pivot, hard hose gun, and contour irrigation. The irrigation water is used to irrigate pasture to provide feed for cattle on the farm. Surplus feed grown in the summer is harvested for winter feed. There are approximately 1,300 beef cattle on the farm but this varies greatly depending on the season and feed availability.

There is one source of water used on this farm, their allocation from the OAIC Main Race. This permit application refers to a retake of that water to be used on a section of the land lower on the farm. The farm takes the water from the Main Race and on occasion drops it into a small creek locally known as Doctors Creek. The water is then retaken downstream and applied with spray irrigation. This permit has both discharge and retake the locations.

The current locations on the permit are not quite accurate in location but are within the areas of action and in the correct creek.

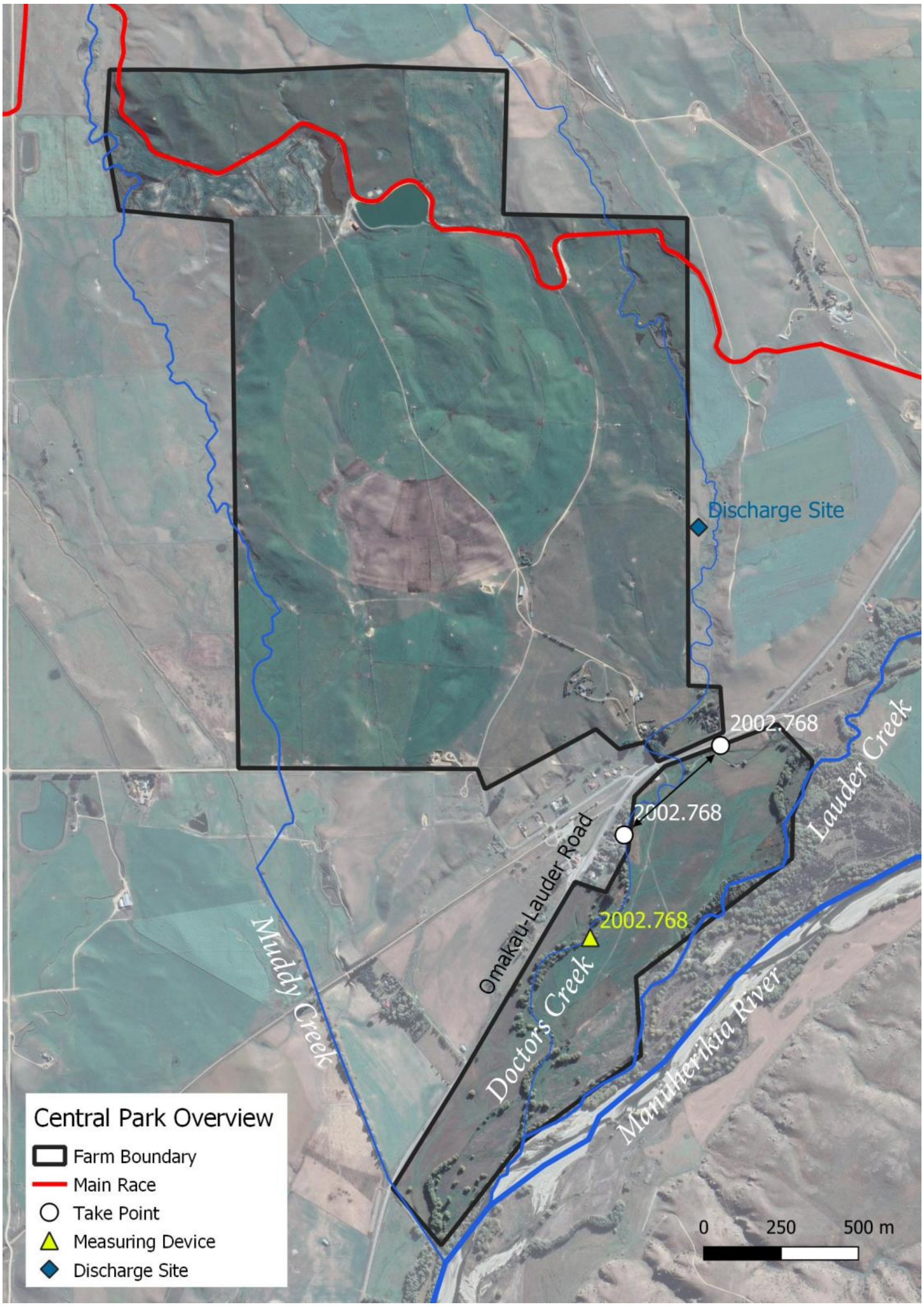


Figure 98 Central Park Property Overview

9.11.4 Irrigation and Investment

The applicant has invested heavily in recent years in the conversion from flood to spray irrigation methods. Investment costs to date are estimated to be $1.5-2M. The farm has added 300,000 m³ of storage, 2 centre pivots, piped water on the farm and new lanes and fences throughout.

The farm business supports two families and two full time employees. Numerous local contractors are used for various farm maintenance and development activities such as sowing crops and pastures, transport, specialist for irrigation measuring and fencing.

The applicant is contemplating further storage and conversion of the remaining flood irrigated area; however, this is dependent on the replacement permit process and surety of water supply.

9.11.5 Water re-take and use

The OAIC main race passes through the northern boundary of the property. The Main Race water is used to irrigate the property either directly or via the storage pond at the top of the farm. On occasion the applicant takes 28 l/s of their water through a particular box on the Main race and runs the water down a race on the farm and delivers it to a discharge site on the unnamed tributary of Lauder Creek at map reference NZTM 2000 E1338381 N5006793. This tributary is locally known as 'Doctors Creek'. The water travels along the water course and is retaken by the applicant for irrigation as authorised under Permit 2002.768. Water is piped around these lower paddocks on the property. There are hydrants for the spray irrigation throughout this lower section.

The existing permit currently allows for water to be taken from the unnamed tributary between two intake points located approximately 120 metres south south-east of the intersection of Matakanui Road and Becks-Omakau Road (State Highway 85), Lauder, Central Otago.

Water retaken under this permit is currently measured using an electromagnetic water meter that measures the piped flow about 150 m below the point of take range on the unnamed tributary (Doctors Creek), adjacent to Omakau-Lauder Road, and data is telemetered to the ORC under WM1161R. The applicant proposes to transfer the intake location to the site of the existing measuring device at NZTM 2000 E1338085 N5005457 to align the retake of water with the water metering and relinquish the existing take point locations on the existing permit. There is little data for this permit as the equipment has been faulty and the retake has not been used consistently in the last 2 years.

Existing conditions of consent require that the water retaken shall not exceed the net rate of inflow from the OAIC main race to the unnamed tributary watercourse, and that the consent may only be exercised when water is being supplied by the OAIC. At present there is no measurement of the water delivered by the main race to the tributary. The applicant proposes to offer a condition to ensure that the applicant or OAIC will record the inflow from the OAIC main race where it is delivered to the tributary watercourse.

	
Very small, ponded area in Doctors Creek and irrigation infrastructure *Source: ORC Inspection Sheet*	Piped electromagnetic water meter *Source: ORC Inspection Sheet*
	
Piped electromagnetic water meter *Source: ORC Inspection Sheet*	

Figure 99 Photographs of Doctors Creek intake site and measuring.

9.11.6 Water Use Summary

The irrigated areas on the Central Park Ltd are summarised below:

Table 92 Irrigated areas on Central Park Ltd

Farm	Irrigation type	Area (ha)
Central Park Ltd	Centre Pivot	157
	Hard hose gun	118.6
	Contour flood	47.6
	TOTAL	**323.6 ha**

Water use on Central Park Ltd is summarised below:

Table 93 Overview of water use on Central Park Ltd

Information	Property Details
Size of property	389.3 ha,
Size of area irrigated	323.6 ha
Sources of Water	Manuherikia River via OAIC Main race delivery
Maximum recorded rate of take (from metering data)	N/A seeking 28 l/sec
Maximum recorded annual volume (from metering data) m^3	N/A seeking current consented volume 416,724
Aqualinc calculation of maximum efficient use m^3	2,8469,94
Number of stock	1,300 Beef cattle
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	Based on ORC values at 45 litres per day per head, the applicant requires 58,500 litres per day, the equivalent of 0.68 l/s.
Frequency of water take (average and maximum)	24hrs day whenever the water is available and can be sent to the storage dams to be used as needed
Months during which water is expected to be taken in a dry year	During the growing season except there may be some restrictions due to low flow in the summer months
Part of day water when water will typically be taken:	Water is abstracted when it is available at any time of the day for up to 24 hours.
Does use of water provide recharge back into catchment?	Yes, the irrigation on some paddocks does go into on farm races to be used on paddocks further on the farm.
Is retake from re-charge or is an augmented take?	Retake is the result of the direct discharge of OAIC Main race water to the stream for retaking.

Information	Property Details
Hectares in a day	The hectares irrigated in a day is related to the soil moisture needs and the water availability. The farm will not irrigate soils that are already wet enough and will store excess water in their dam for application at a later date when the soils are moisture deficient.
Storage	There is on-farm storage reservoir, holding a capacity of approximately 300,000 m^3.
Monitoring in place	Yes.
WEX required and obtained	No WEX required.
s417 Certificate required and obtained	OAIC responsible for any s417 Certificates for main race.

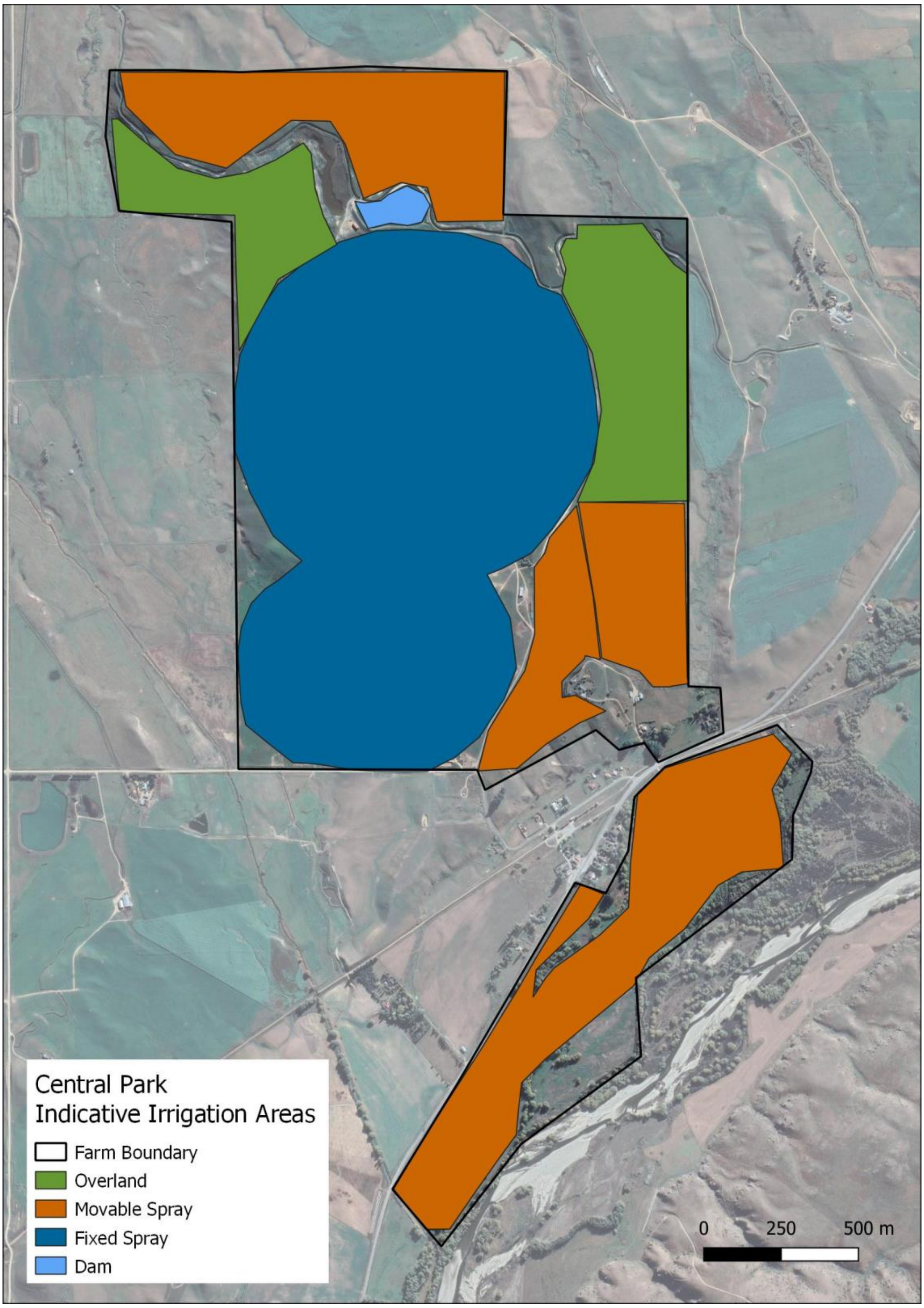


Figure 100 Irrigation on Central Park Ltd Property (Indicative only)

9.11.7 Water Use Records

This is a retake only, so is not in primary allocation block for the Manuherekia catchment.

The relevant focus is on demonstrating the retake and linkage with the associated discharge.

Water Use Records Permit 2002.768

The retake option has not been exercised much lately so the data is weak. This applicant is intending to utilise this option more consistently in the future.

	Consented abstraction limit	History of Use Data
Condition C (a)	28 l/s	The history of use data demonstrates that the consent holder has not abstracted water at a rate that exceeds 28 l/s.
Condition C (b)	2420m^3 per day	The history of use data demonstrates that the consent holder has not abstracted water at a rate that exceeds 2420m^3 per day.
Condition C (c)	16,940m^3 per week	The history of use data demonstrates that the consent holder has not abstracted water at a rate that exceeds 16,940m^3 per week
Condition C (d)	Abstraction shall not exceed the net rate of inflow to the tributary water source	At present the OAIC or the application do not measure or record the net rate of inflow to the tributary water source from the main race. The application includes the proposal for the OAIC or the applicant to record/measure the flow of water delivered to the tributary water, which can then be considered against the retake of water at the existing metering device.

9.11.8 Water Balance

Central Park Ltd receives OAIC main race water.

Using the soil and rainfall maps and efficient water allocation volumes from the Aqualinc Report the 323.6 ha irrigated on this property requires a total volume of 2,846,994 m^3 to be watered efficiently.

On average that is 8798 m^3/ha/yr. The Main Race OAIC allocates 938,026.8 m^3/year to Central Park.

Table 94 Water Balance for Central Park Ltd

Water Source	Aqualinc efficient allocation for the farm (m^3/yr)	Equivalent area (ha)	Volume requested (m^3/yr)
Main Race OAIC	2,846,994	323.6	938,026.8
Retake (of Main race OAIC)			416,724
Total	**2,846,994**	**323.6**	**938,026.80 (not including retake)**

The total volume is well within the total efficient volume as calculated by Aqualinc.

9.11.9 Allocation Requested / Outcome Sought

A summary of the allocation and limits sought by Central Park Ltd is provided in the table below.

Table 95 Retake limits proposed for Central Park under replacement permit

	Primary Permit
Consent	2002.768
Rate of OAIC water flow delivery into tributary creek l/s	28 l/s
Rate of retake l/s	28 l/s
Maximum monthly volume (m^3)	75,020
Maximum annual volume (m^3)	416,724
Residual flow at intake	NA
Residual flow for Lauder Creek	NA
Minimum flow	NA
Fish screen	Pumped intake is screened.

A draft permit with proposed conditions is provided in Appendix C.

Number of permits

The applicant application seeks one permit in replacement of Permit 2002.768

Point of take and monitoring

Existing flow meter to record re-take

Proposed applicant or OAIC measurement of water delivery

Fish screens

A fish screen already exists on the pumping from the creek.

Residual flows

NA

9.12 Sinclair Trust

The Sinclair Trust own a property that is located in three sub-catchments: Lauder, Becks and Dunstan. The land is leased by Chip and Paulette Duncan and managed with their land in the Dunstan Catchment.

Irrigation water is sourced for this farm from the Becks Creek, Woolshed Creek and the Dunstan Main Race. To avoid confusion this application does not repeat any of the information contained in the three other applications.

The Becks Creek water take (99654.V1) information has already been lodged with the ORC and is located in the application RM20.55. It is a jointly held take with Lilybank Company Ltd.

The Woolshed Creek take application has been lodged separately in early Jan 2021 and is a jointly held take with Hawkdun Pastoral Ltd.

The OAIC Dunstan Race water used on the Sinclair Trust property has been described in the Landpro application for the Dunstan Catchment and in particular the OAIC Dunstan Race take and use description associated with the Duncan Farming operation. This is because the Duncan's manage the Sinclair Trust Land.

The Lauder Subcatchment maps include the Sinclair Trust property with the areas irrigated also mapped so the location of the farm can be observed.

10. Overview of Proposed Water Monitoring Locations

The proposed monitoring is detailed in the table below.

Table 96. Details of existing water metering and proposed changes to location

Consent No.	Metering location (NZTM 2000)	Metering Details /Comments on RS2 Forms	Change Proposed?
2000.644.V2	1339653E 5015058N	Control structure is an open channel weir (thin crested) Manual water level senor - Staff gauge only	No
DP 2001.710	1333975E 5015275N	Control structure is a concrete channel, rectangular weir. Water sensor is a digital encoder. Datalogger and telemetry (data held by NIWA)	No change to location of metering, however, after two years will also measure WR432B.
2002.071	1336148E 5008980N	Control structure is a concrete channel, rectangular weir. Water sensor is a digital encoder. Datalogger and telemetry (data held by NIWA)	No
2002.399	1341490E 5011104N	Electromagnetic water meter Datalogger (data held by Boraman Consultants)	No
2002.768	Retake: 1338085E 5005457N	Retake: Electromagnetic water meter Datalogger and telemetry (data held by Harvest)	Retake: no change
	Discharge	To be developed	Discharge: Proposal to measure OAIC delivery of water into tributary
2004.788	1340128E 5010000N	Control structure is a concrete channel, Cipoletti weir Water level sensors is a Digital encoder	No

		Datalogger and telemetry (data held by NIWA)	
3707	1340177E 5012354N	Electromagnetic water meter Datalogger (data h eld by Boraman Consultants)	No
93447	1340230E 5008631N	Electromagnetic water meter Datalogger and telemetry (held by Watercheck)	No
94548	1333290E 5015535N	Control structure is a concrete channel, rectangular weir. Water sensor is a digital encoder. Datalogger and telemetry (data held by NIWA)	No
96779	1334858E 5015185N	Control structure is a concrete channel, rectangular weir. Water sensor is a digital encoder. Datalogger and telemetry (data held by NIWA)	At same location for one year. After 1 year will be measured at 94548
98122	1340530E 5011410N	Control structure is a concrete channel, Cipoletti weir Water level sensors is a Digital encoder Datalogger and telemetry (data held by NIWA)	No
98488 and 98572	1336445E 5017413N	Control structure is an open channel weir Water level sensor is a pressure transducer Datalogger and telemetry (data held by aqualinc)	No
99525	1338855E 5012660N	Control structure is a concrete channel, rectangular weir Water level sensors is a digital encoder Datalogger and telemetry (data held by NIWA)	No
Phada	1340050E 5008465N	Water meter is an insertion Mag Flow Datalogger and telemetry (data held by aqualinc)	New supplementary same location as primary

WR378B	1332925E 5014320N	Control structure is an open channel weir Water level senor is a pressure transducers Datalogger and telemetry (data held by aqualinc)	No
WR380B	1331318E 5016602N	Control structure is an open channel weir Water level sensor is a staff gauge sensor only	No
WR432B	1334832E 5015171N	Control structure is an open channel, rectangular weir Water level sensors is a digital encoder Datalogger	No

10.1 Exemptions to measure away from point of take

The following water takes have water metering exemptions to meter away from the point of take:

- WR380B, WR382B.V1, WR378B.V1 (Glassfords) WEX 0152
- 2001.710 (OAIC) WEX0119
- 3707 (Armstrong) WEX0001
- 98488 and 98572 (Tucker) WEX 0138

The applicants seek these metering exemptions be approved concurrently with the replacement permits.

11. Status of Activities

Under Section 14 of the Resource Management Act (RMA) the taking and use of surface water can be authorised by a rule in a regional plan or by a resource consent.

The relevant plans for this application regarding activity status is the ORC's Regional Plan: Water for Otago (RPW), and the Proposed Water Permits Plan Chance (Plan Change 7) notified by the ORC on 18 March 2020.

The provisions proposed in PC7 relate to freshwater and therefore took immediate legal effect. As such, the activity status of the application is determined under PC7 when assessing the application under section 104(1)(b).

11.1 Taking and Use of Water – Primary Allocation

Plan Change 7 established a controlled activity consenting framework for short duration consents which comply with the controlled activity conditions for applications to renew deemed permits expiring in 2021, and water permits for the taking and use of surface water expiring prior to 31 December 2025. PC7 also established a non-complying consenting framework for consents replacing existing water permits where a longer duration is proposed or where the application fails to meet one or more of the controlled activity conditions.

PC7 does not specifically address the re-taking of water, even though the operative RPW contains rules specifically addressing the re-taking of water. As s14 of the RMA does not categorise re-takes separately, and the definition of taking in the RPW is the process of extracting water for any purpose, re-taking is considered to be included within the ambit of PC7.

This application includes the replacement of 17 permits to take and use surface water, all of which are subject to PC7 as they relate to the taking and use of water and expire prior to the 31 December 2025. It also seeks one replacement water permit for retake of surface water.

This application seeks a term of up to 35 years for all of the permits. This means that the taking and use of water has **a non-complying activity status** under Rule 10A.3.2.1.

The application also seeks one new supplementary water permit within the Lauder Creek sub-catchment. Associated with the new supplementary water permit being sought is the surrendering by the applicant of the existing Water Permit to take and use primary water (RM18.030.02).

11.2 Taking and Use of Water – Supplementary Allocation

The application includes a proposal for one new supplementary permit for Phada Industries Ltd. The Manuherekia catchment does not have a supplementary minimum flow specified in Schedule 2B of the RPW. This means that the taking and use of water as supplementary allocation is a restricted discretionary activity under Rule 12.1.4.7. This rule sets a default supplementary minimum flow.

The proposal includes a supplementary minimum flow of 600 l/s at the Rail Trail flow site. It is anticipated the both the proposed 600 l/s supplementary flow and the appropriate supplementary block minimum flow at Campground flow site would need to be met to allow for taking.

11.3 Damming of Water

The application includes the replacement of two water permits to dam water for the purpose of storing water for irrigation:

- Permit 2002.387 (to dam an unnamed tributary of Lauder Creek)
- Permit 2004.787 (to dam an unnamed tributary of Lauder Creek)

Rule 12.3.3.1 of the RPW provides for the damming of water, which has previously been carried out under a resource consent or other lawful authority, as a **restricted discretionary** activity subject to a range of performance criteria. The continuation of these activities will not result in any additional effects than those already consented to by the existing permits. There has been no change in the scale or design of the dam activities authorised under the existing permits, and no known flooding, erosion, land instability, sedimentation or property damage resulting from the damming activities has occurred.

This application does not seek consent for the construction of any new dams. Any future plans by Lauder water users to develop additional on-farm storage dams will be assessed for compliance with RWP and the Building Act and will be sought separately to this application if required by the individual landowners.

Other small dams supplied with water from the subject water permits were constructed in compliance with ORC advice and guidance at the time they were developed. Recent changes to interpretation by the ORC of its own rules relating to the damming of water and the potential implications that this has for existing dams in the region are not considered to be within the scope of this application.

In terms of PC7, the interim planning framework does not apply to the proposed damming aspects of the proposal. The objective of PC7 is to manage new water permits and the replacement of deemed permits to take and use surface water where those water permits expire prior to 31 December 2025. PPC7 therefore does not apply.

11.4 Exemption to measure away from point of take

The Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 require that a water permit holder must use a water measuring device or system that is installed at the location from which water is taken. Exemption from this requirement is relevant to this application in association with the following permits:

- WR380B, WR382B.V1, WR378B.V1 (Glassfords) - WEX0152
- 2001.710 (OAIC) - WEX0119
- 3707 (Armstrong) - WEX0001
- 98488 and 98572 (Tucker) - WEX0138

It is requested these Notices of Exemptions be replaced concurrently with replacement permits.

11.5 Transfer of location of point of take

This application proposes to transfer the location of three points of take. The rationale for these transfers is set out below.

Table 97 Reasons for transfer of take locations

Permit	Permit holder	Consented Location NZTM 2000	Proposed Location NZTM 2000	Reason for Transfer
WR432B	Moran and Brown	E1334671 N5015094	E1333870 N5015279	Decommission private race associated with WR432B and transfer the take point to that of Permit 2001.710 immediately above the OAIC weir. A reduction in the total maximum rate of take will be an improvement for the creek ecology and flow.
96779	Heckler	E1334671 N5014994	E1333132 N5015721	Decommission private race associated with 96779 and transfer the take point location to that of Permit 94548 above the OAIC weir. Further improvements in the instream health and impacts on the lower reaches of this stretch.
2002.768	Central Park Ltd	E1338181 N5005792	E1338085 N5005457	Relinquish existing take point locations, and

		E1338481 N5006093 E1338381 N5006793		transfer point of take to location of metering equipment. The original locations were incorrect.

Section 136(2)(b) of the RMA allows the transfer of a water permit to another site in certain circumstances. As these permits relate to an activity for which consent is required under Part 3 of the RMA, section 87B(1)(b) is considered to apply to the transfer of an interest in the relevant permits, and these activities are considered as a discretionary activity. Regard must be had to certain effects under s136(4), as well as the matters in Policy 6.4.17. Policy 6.4.17 is considered in Section 13.10, and relevant effects under s136(4) are considered in Section 13.10.

The table below sets out two administrative changes to take point locations, representing corrections to inaccurate map references on the existing permits. Section 136(2)(b) of the RMA is not considered to apply to these changes.

Table 98 Administrative Changes Required to Take Point Locations

93447	Booth	E1339880 N5008696	E1340187 N5008610	Administrative change only due to inaccurate consented map reference.
RM19.448.01	Clouston	E1338976 N5012597	E1338898 N5012697	Administrative change only due to inaccurate consented map reference.

11.6 Permitted activities

Under Schedule 4(3) of the RMA, this application is required to provide a description of permitted activities that form part of the proposal to which the application relates.

Intake structures

The intake structures associated with each take are outlined below.

Under Rule 13.1.1.1 the use of a structure is permitted if it meets certain conditions, including that the structure was lawfully established.

Where structures were established to exercise a mining privilege relating to water, they were lawfully established as follows:

1. The water race licence associated with mining privilege authorised the intake (Sections 2 and 4 of the Water and Soil Conservation Amendment Act 1971, which adopted the provisions of preceding mining legislation).
2. Such activities continued to be authorised under the transitional provisions of the Resource Management Act, in particular Section 418(3A) until a Regional Plan otherwise provides.

This means that all of the intakes are considered to be lawfully established and so fall within permitted activity Rule 13.1.1.1. No change in use has occurred with these structures, these structures do not result in animal waste to enter waterways and these intakes are maintained in good repair.

In general terms, from the date the RPW became operative the continued use, repair, alteration, maintenance of these intakes structures is permitted (pursuant to Rules 13.1.1.1, 13.3.1.1 and 13.3.1.2) as long as:

- the structure is replaced or reconstructed in the same location as the original structure
- there is no permanent change to the scale, nature or functions of the structure

The continued use, repair and maintenance of these structures has complied with these conditions.

In addition, the disturbance of the bed of any river, and any resulting discharge or deposition of bed material associated with the maintenance or reinstatement of a water intake, in order to enable the exercise of a lawful take of water, is a permitted activity under Rule 13.5.1.1 (providing certain conditions are complied with).

All intakes associated with these water permits are considered to have been lawfully established.

Structures in waterways

An open race intake often consists of several components, all of which are essential to the successful operation of the take. In the case of the OAIC's Permit 2001.710, this includes a concrete weir in the Lauder Creek to back up flow and direct flow towards the race intake. Associated structures include the control gate to control the amount of water entering the race, and a by-wash to take excess water back to the Lauder Creek. All these components are considered essential to the intake and collectively form the 'intake structure'.

The Lauder Scheme includes various other structures to allow races to cross creeks without discharging into the waterway and re-taking water out of the waterway.

It is considered that these structures fall within the original authorisation for the mining privilege granted. On this basis, any such structure is considered to be lawfully established and fall within the ambit of Rule 13.1.1.1.

As with intake structures, in general terms, from the date the RPW became operative the repair, alteration and maintenance of these intakes structures is permitted pursuant to 13.3.1.1 and 13.3.1.2. The conditions of these rules are expected to be met by OAIC for all structures and works associated with these structures, as there have been no changes to the scale, nature of functions of these structures.

Discharge of Water

There is one discharge and retake activity associated with Central Park Ltd as described in the application.

No other takes associated with this application are discharged back into a waterway by any of the applicants for the purpose of conveyance.

The discharge of water to water from the dams that were constructed as permitted activity dams is considered to be a permitted activity under Rule 12.C.1.1. The discharge complies with all the conditions of this rule as it does not cause flooding, erosion, land instability or property damage, it does not contain contaminants that result in changes in colour or visual clarity or cause a noticeable increase in sedimentation and does not have odour, oil, grease film, scum or film.

Discharge of Contaminants

The ORC is reviewing its approach to water quality and has prepared Proposed Plan Change 8 (Discharge Management) to the RPW (PC8). PC8 has been called in by the Minister for the Environment and has been notified by the Environmental Protection Authority.

The operative RPW contains several permitted activity rules relating to water quality. Rule 12.C.1.1 permits the discharge of water or any contaminant to water, or onto or into land in circumstances which may result in a contaminant entering water, providing certain conditions are met. These conditions include avoidance of indicators of an adverse effect on water quality such as odours, a change in colour or clarity as well as flooding, erosion and whether there is a discharge from one catchment to another. This rule is not proposed to be changed by PC8.

Discharges from the applicants' properties as a result of the use of water subject to this application are expected to comply with this permitted activity rule, as compliance is anticipated with good farm management practices such as keeping stock out of waterways, ensuring irrigation of effluent does not result in ponding or surface run-off and ensuring sediment does not enter waterways. In addition, Lauder Water Users are focused on ensuring compliance with the water quality aspects of this rule. There have been no discharges from the applicants' properties known to have resulted in flooding, erosion or property damage. Water is not discharged to another catchment by any of the applicants, as water remains within the Manuherekia catchment.

Animal Waste System

PC8 has introduced new rules relating to animal waste systems including 2 permitted activity rules. Where the animal waste systems cannot comply with the conditions of permitted activity Rule 14.7.1.1, under Rule 14.7.1.2 such systems are permitted until a specified date by which time a complete consent application must have been received by the Council. This date is calculated from the date that PC8 becomes operative. This means that there are currently no applicable rules relating to the construction and use of an animal waste system.

Discharge of Nitrogen

Rule 12.C.1.3 permits the discharge of nitrogen unconditionally until April 2026, after which time nitrogen leaching limits apply, although this rule is likely to be superseded by a new Land and Water Plan by that time. Under Rule 12.C.1.3 the discharge of nitrogen is the responsibility of the applicants who have assured us they currently comply with this permitted activity rule.

11.1 Bundling of permits

The bundling approach has been developed from case law to enable appropriate consideration of the effects of an activity, or group of activities. Applications involving different activities with different activity status can be 'bundled' together, so that the most restrictive activity classification is applied to the overall proposal.

It may not be appropriate to bundle activity status across a proposed and operative plan, and so it may be necessary to consider whether to grant consents under the operative RPW and PC7 separately. However, this could result in the granting of permits under the operative RPW that cannot be exercised if other permits necessary for the overall activity are not granted under PC7. For the sake of simplicity, the activities have been bundled in this application as they are inherently interlinked, and this application is considered on the basis that it has a non-complying activity status. It is noted the approach to bundling may need to be revisited once lodged and under consideration.

12. Assessment of Effects on the Environment

12.1 Introduction

An assessment of the effects of the activity on the environment has been prepared in accordance with the scale and significance of the activity.

Specifically, the following matters are addressed in the Assessment of Environmental Effects:

- Effects on Hydrology
- Effects on Water Quality
- Effects on ecological values
- Effects on Amenity and Natural Character
- Effects on Recreational Values
- Effects on Cultural Values
- Effects on Downstream Users
- Climate Change Effects
- Effects of Transferring Location of Point of Take
- Economic Effects
- Social Effects
- Cumulative Effects
- Positive Effects

This Assessment of Effects on the Environment is informed where relevant by the "Assessment of Environmental Effects of water abstraction from Lauder Creek, Lauder Catchment" (Hickey and Olsen, 2020) which is attached as Appendix D.

12.2 Effects on Hydrology

Lauder Creek is a significant tributary of the Manuherikia River, and the taking of water has the potential to alter the natural flow characteristics of the Creek, resulting in potential adverse effects on ecological values, cultural values, amenity and natural character, recreational values and downstream water users.

At present, the minimum flow of 820 l/s applies to all existing takes in the Manuherikia catchment upstream of the Ophir flow site which includes takes in Lauder Creek and Muddy Creek catchments. However, to date, there have been few takes in the Lauder Creek and Muddy Creek catchment with residual flows, and there has been no agreement between water users to roster to maintain flows in the lower reaches of Lauder Creek.

The report prepared by Hickey and Olsen (2020) establishes the importance of residual flows, in addition to minimum flows, as a key mechanism for protecting ecological and natural character values in tributaries with different hydrological characteristics to the main stem. A residual flow is the amount of water that must be left at a point of take to provide for ecological values and natural character of that waterbody. Residual flows apply at the point of take and apply in concert with a minimum flow. This means that both the minimum flow and any applicable residual flow must be met for water to be taken.

The reports by Hickey and Olsen (2020) (Appendix D and the WRM (2020) (Appendix E) assess the natural hydrology of the subject streams at the points of take and the potential effects of the proposed takes on those flows and ecological values present. A flow regime is recommended to ensure any effects resulting from the taking of water can be appropriately managed.

12.2.1 Proposed Residual Flow Regime

Hickey and Olsen, 2020 (Appendix D) and WRM Ltd (2020) propose the following residual flow regime.

1. **Lauder Creek Sub-Catchment Residual Flows**

   It is proposed that consent holders abide by the following sub catchment residual flows:

   a. *Upper Reach of Lauder Creek: Mainstem water users above the OAIC weir will cooperate to maintain a residual flow of 100 l/s past the weir at all times.*

   b. *Lower Reach of Lauder Creek: Mainstem users below the OAIC weir will cooperate to maintain a residual flow of 100 l/s at the Rail Trail Flow Site at all times.*

2. **Individual Take Point Residual Flows**

   In conjunction with collectively delivering 100 l/s at the OAIC Weir and the Rail Trail Flow Site, it is further recommended that residual flows at points of take where takes are from perennial tributaries of Lauder Creek. No residual flows are recommended for naturally intermittent tributaries.

The residual flow regime is summarised in the table below.

Table 99 Summary of Residual Flow Regime

Existing Consent Number	Take location	Recommended Residual Flow(s)
WR380B.V1 and WR382B.V1	Welshman's Creek	10 l/s at intake and 100 l/s at OAIC Weir
94548	Lauder mainstem	100 l/s at OAIC Weir
2001.710	Lauder mainstem	100 l/s at OAIC Weir
WR432B[50]	Lauder mainstem	100 l/s at OAIC Weir
96779[51]	Lauder mainstem	100 l/s at OAIC Weir
WR378B.V1	Shepherds Creek	Visual surface flow below the take and 100 l/s at Rail Trail Flow Site
RM19.448.01	Lauder mainstem	100 l/s at Rail Trail Flow Site
98488 and98572	Millers Creek (Top Take)	10 l/s at intake and 100 l/s at Rail Trail Flow Site
2000.644.V2	Millers Creek (middle take)	10 l/s at intake and 100 l/s at Rail Trail Flow Site
3707	Millers Creek (bottom take)	10 l/s at intake and 100 l/s at Rail Trail Flow Site
98122	Lauder mainstem	100 l/s at Rail Trail Flow Site
2002.399	Unnamed tributary of Lauder creek (lower Creek)	Visual surface flow below the dam
2004.788	Unnamed tributary of Lauder Creek (lower Creek)	100 l/s at Rail Trail Flow Site
93447	Lauder mainstem	100 l/s at Rail Trail Flow Site

12.2.2 Supplementary Residual Flow

With regard to the proposed supplementary permit, Hickey and Olsen (2020) recommend a supplementary residual flow of 600 l/s at the Rail trail flow site to allow for the taking of water for storage purposes. This flow is exceeded 90% of the time during winter (May to Sept) and is also higher than the natural 7-day MALF. It is expected that both the 600 l/s residual flow and the appropriate supplementary block minimum flow at Campground flow site would need to be met to allow for taking.

Taking in association with the supplementary permit sought by Phada Industries Ltd is therefore not anticipated to have adverse effects on hydrology that are more than minor, as the high minimum flow will limit this abstraction to periods when flows in the Manuherikia River are high – which will mean that flows are also high in the tributaries of Lauder Creek.

[50] WR432B is proposed to shift upstream to the OAIC intake (2001.710) and reduce the combined rate of take from 536 l/s to 450 l/s.
[51] 96779 will be shifted upstream to take from the same location as 94548.

12.2.3 Minimum Flows

All takes will be subject to the respective downstream minimum flows on the Manuherikia River.

12.2.2 Overall Comment

From a hydrology perspective, residual flows (implemented in concert with the respective downstream minimum flows on the Manuherikia River) are the key mechanism for protecting ecological and natural character values of waterbodies. The recommended residual flows are based on an assessment of the natural hydrology of the subject streams at the points of take and the potential effects of the proposed takes on those flows and ecological values present.

The proposed residual flow regime is considered appropriate as it will ensure that water flow is maintained through the perennial waterways where flow would be likely without these takes. Permit holder compliance with the proposed regime will ensure a collective approach to water management within the Lauder Creek and Muddy Creek catchments and the wider Manuherekia catchment. On this basis, the proposed activities are anticipated to have a minor adverse effect on flows in Lauder Creek and its tributaries, and Clear Creek within the Muddy Creek catchment.

The key elements of the proposed flow regime are set out below and discussed further where relevant in specific sections of the AEE.

12.3 Effects on Water Quality

Hickey and Olsen (2020) assess the water quality in the Lauder Creek catchment, and this is presented in the report contained in Appendix D. Key findings include:

- Nitrate-nitrite nitrogen and ammoniacal nitrogen in Lauder Creek are below levels that are expected to be toxic to aquatic life
- DRP concentrations observed in Lauder Creek are elevated at the Rail Trail flow site, and an associated risk of nuisance growths of periphyton developing
- Insufficient *E. coli* data is available for both sites in Lauder Creek, meaning that it is not possible to assess the suitability of either sites for contact recreation (i.e. primary or secondary contact)
- Water clarity in Lauder Creek at the Cattle Yards site is good, meaning that concentrations of suspended solids are expected to be having a minimal impact on instream biota. However, water clarity was found to be poorer at the Rail Trail flow site with high levels of fine sediment present. This can potentially affect many aspects of the stream ecosystems.

- The Macroinvertebrate Community Index (MCI)[52] score for the Lauder Creek site were consistent with fair water and habitat quality, while the QMCI score (3.5) indicated poor water and habitat quality.

Overall, Hickey and Olsen (2020) conclude that water quality in Lauder Creek is impacted by flood irrigation methods occurring within the Lauder Creek catchment. Continued conversion of irrigation from flood to spray methods is expected to result in significant improvements to water quality in the Lauder Creek catchment, with substantial reductions in phosphorus, sediment and microbial contamination anticipated.

All water users within the Lauder catchment are committed to co-ordinating with other water users in the sub-catchment to achieve ongoing improvements and adoption of best management practice to ensure the cumulative effects of the taking and use of water, on water quality, are managed appropriately. All water users within the Lauder Creek sub-catchment are members of the Lauder Water Users Group and are committed to explore any further water quality initiatives once the permits have been reissued.

12.3.1 Overall Comment

The water quality observed in Lauder Creek reflects the historical dominance of overland irrigation methods and some poorer practices around critical source area management within the Lauder Creek catchment. The continued conversion of irrigation from flood to spray methods is expected to result in significant improvements to water quality in the Lauder Creek Creek catchment, with substantial reductions in phosphorus, sediment and microbial contamination anticipated. Continued fencing to exclude stock and improvement to riparian management and critical source area management are also anticipated to contribute to improvements in water quality within the catchment.

While the abstraction of water by the applicants does not result in direct adverse effects on water quality (except perhaps to reduce the potential dilution of contaminants), the land use which this water supports has had an adverse effect on water quality. Continued conversion to efficient irrigation and ongoing improvement to farm management practices are anticipated to effectively mitigate effects on water quality to appropriate levels.

All water users within the Lauder catchment are committed to co-ordinating with other water users in the Manuherekia catchment to achieve adaptive management of abstraction to ensure the effects of taking and use of water, on water quality, are managed appropriately. All applicants are members of the Manuherikia Catchment Group (MCG), an incorporated society with the purpose of developing and operating under a collectively agreed catchment management plan.

[52] *The MCI and its quantitative variant (QMCI) uses the composition of the macroinvertebrate community (as well as the abundance of different taxa in the case of the QMCI) as a measure of water and habitat quality.*

12.4 Effects on Ecological Values

12.4.1 Ecological Values in Lauder Creek Catchment

Hickey and Olsen (2020) assess the ecological values present in the Lauder Creek catchment, as presented in the report contained in Appendix D. Key findings include:

- Overall, six fish species have been recorded from Lauder Creek.
- Brown trout and upland bully are widespread in the Lauder catchment.
- Central Otago Roundhead Galaxias have been recorded from a tributary in the lower reaches of the catchment.
- Although available FFDB records only show CORG's present in a single small stream in the catchment, recent observations by the ORC indicate that there is a population in Lauder Creek itself above Glassford Road.
- Longfin eels have been recorded at the lower Lauder catchment
- There is a record of a single brook char from a tributary in the middle-upper reaches of the catchment
- There are two records of rainbow trout from Millers Creek

The map below shows the distribution of these species within the Lauder Catchment.

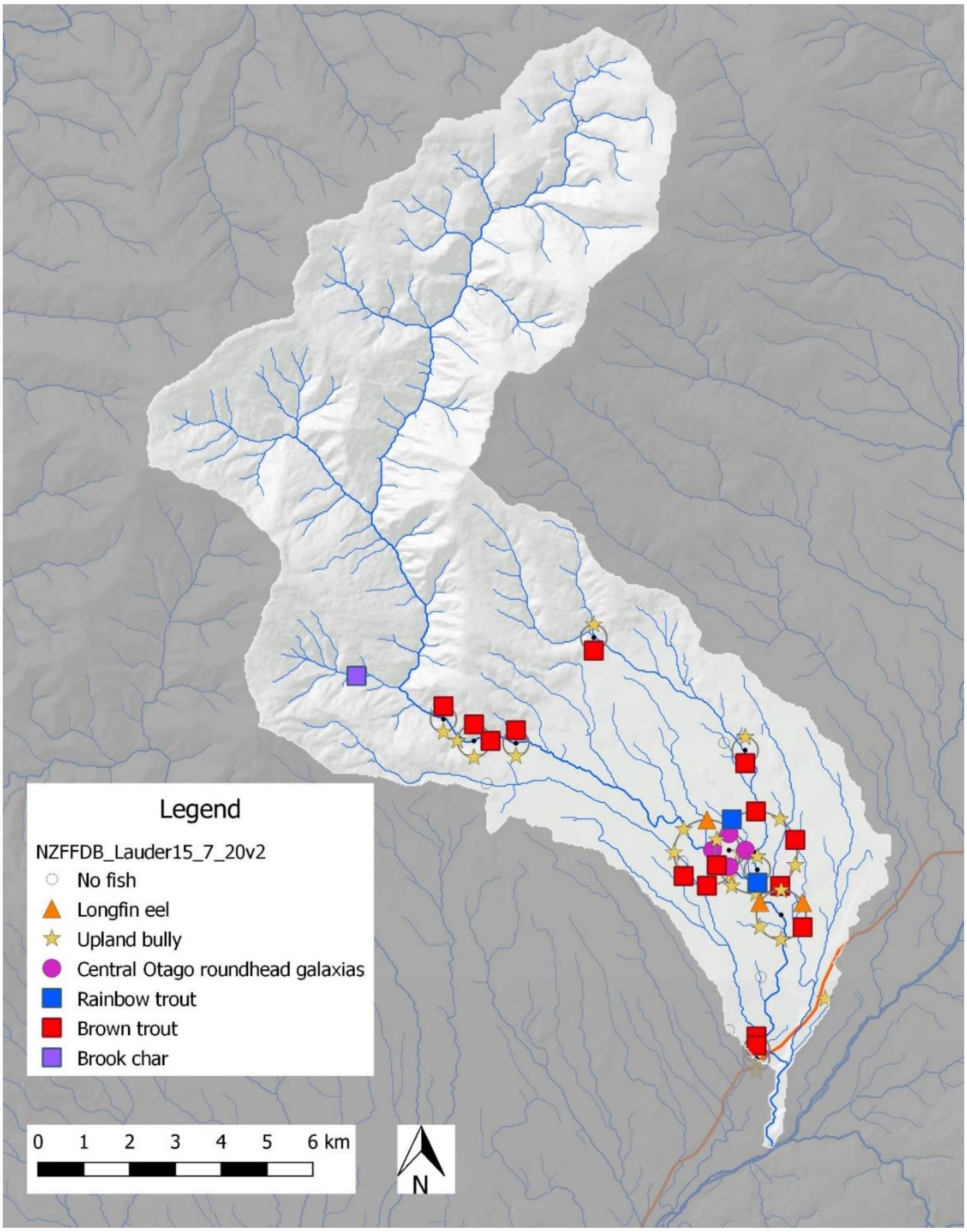


Figure 101 Fish distribution in the Lauder Creek catchment based on the NZ Freshwater Fish Database Source: Hickey and Olsen (2020) (Appendix D)

The taking of water from the Lauder Creek and its tributaries has the potential to adversely impact on habitat availability and quality for the fish species present, as well as food production. In addition, open race intakes can cause entrainment of fish species. The land uses linked to irrigation can also adversely affect instream ecology by impacting water quality. Historic abstraction has potentially also resulted in some positive effects on Central Otago Roundhead Galaxias by limiting flows and reducing habitat suitability for trout.

12.4.2 Effects on Central Otago Roundhead Galaxias

Central Otago roundhead galaxias (CORGs) are classified as nationally endangered (the second highest threat classification) are known to represent a significant contribution to the indigenous biodiversity of the Lauder Creek catchment.

Hickey and Olsen (2020) note that while Central Otago roundhead galaxias were likely widespread historically in the Lauder Creek catchment, predation from trout has likely reduced their distribution and range within the catchment. Available FFDB records suggest that CORGs are present in a single tributary of Lauder Creek in its middle reaches near Glassford Road. However, recent ORC observations suggest that there is a population in Lauder Creek itself above Glassford Road.

There are no consented water takes from this tributary. It is unclear from available records if they are completely excluded from the mainstem of Lauder Creek. It is possible that juvenile exports from the unnamed tributary contribute to a population in the mainstem of Lauder Creek.

The National Policy Statement Freshwater Management 2020 includes compulsory values for ecosystem health and threatened species, and these are relevant considerations in the Lauder Creek context.

Specifically, ecosystem health consists of five biophysical components: water quality, water quantity, habitat, aquatic life, and ecological processes. In a healthy freshwater ecosystem, all five biophysical components are suitable to sustain the indigenous aquatic life expected in the absence of human disturbance or alteration (before providing for other values). However, the NPSFM (2020) does not provide guidance on how the influence of introduced sports fish on indigenous aquatic life and ecological processes should be assessed. Simply, introduced sports fish are known to alter indigenous ecosystem processes and indigenous aquatic life[53].

The Threatened Species Compulsory Value directs to the extent to which an FMU or part of an FMU that supports a population of threatened species has the critical habitats and conditions necessary to support the presence, abundance, survival, and recovery of the threatened species. All the components of ecosystem health must be managed, as well as (if appropriate) specialised habitat or conditions needed for only part of the life cycle of the threatened species. Again, this compulsory value has no guidance on implementation when the key threat to the survival and recovery of the threatened species is an introduced sports fish, as is the case for Lauder Creek. Central Otago roundhead galaxias are limited to a single, small tributary in the lower catchment.

Hickey and Olsen (2020) assert that the optimum flow for the Central Otago roundhead galaxias (being the only threatened fish species present in the Lauder Creek catchment) is 100 l/s. However, it is important to note that other factors in heavily modified streams also influence the presence and distribution of indigenous species that may not be able to be addressed by flow related consent

[53] For example, the presence of trout alters the drift behaviour of indigenous invertebrates, the presence and abundance of indigenous invertebrates as well as the presence and abundance on indigenous fish.

conditions. For example, in the Lauder catchment, CORG's are limited to single tributary, and available records suggest they are not likely present at other locations or are in very low numbers due to the impact of trout predation. This represents a significant non-flow related factor that influences ecosystem health and threatened species in Lauder Creek and is beyond the ability of the applicants to address at the Lauder sub-catchment level.

12.4.3 Effects on Longfin Eel

Longfin eels have been recorded in the lower Lauder Creek catchment. The National Policy Statement Freshwater Management 2020 includes compulsory values for traditional mahinga kai species, and this is a relevant consideration in the Lauder Creek context given Longfin eels are a highly valued mahinga kai species.

Hickey and Olsen (2020) note that while the analysis of Jowett (2020)[54] predict that the optimum flow for juvenile and adult longfin eel habitat was 860 l/s and 540 l/s respectively, it is important to take into account that flow habitat is currently not the main factor affecting the distribution and abundance of longfin eels in the Manuherekia catchment. The main factor affecting the recruitment numbers of longfin eels in the Manuherekia catchment is considered to be the presence of the Roxburgh Dam which blocks the inward migration of juvenile eels that have entered the Clutha/Mata-Au from the ocean. Historically, some of the elvers entering the Clutha/Mata-Au would have migrated up past Roxburgh into the Manuherekia catchment and beyond.

The NPSFM Mahinga Kai value directs that kai would be safe to harvest and eat, and that transfer of knowledge is able to occur about the preparation, storage and cooking of kai. The value directs that in FMUs (or parts of FMUs that are used for providing mahinga kai) the desired species are plentiful enough for long-term harvest and the range of desired species is present across all life stages. In the case of the Lauder Creek catchment, the NPSFM compulsory value/objective for Longfin eel is unlikely to be realised/achieved due to recruitment issues caused by the presence of Roxburgh Dam, which blocks the inward migration of juvenile eels that have entered the Clutha/Mata-Au from the ocean. This represents a significant non-flow related factor that influences ecosystem health and mahinga kai species in Lauder Creek and is beyond the ability of the applicants to address at the Lauder sub-catchment level.

12.4.4 Effects on Upland Bully

Upland bully is known to be widespread in the Lauder Creek catchment, consistent with many inland waters in the South Island. While this species is not classified as being threatened, they are likely to positively contribute to the indigenous biodiversity of the Lauder Creek catchment.

[54] Habitat modelling by Jowett Consulting 2020

Hickey and Olsen (2020) note that the analysis of Jowett (2020)[55] predicts that the optimum flow for upland bully habitat is 80 l/s. It is noted that higher flows would favour trout and would likely result in an increased predation pressure on this species.

12.4.5 Effects on Brown Trout

Brown trout are known to be widespread in the Lauder Creek catchment. As noted by Hickey and Olsen (2020), although Lauder Creek is not recognised as providing significant habitat for trout in either Schedule 1A of the Regional Plan: Water or the Otago Fish and Game Management Plan (Otago Fish and Game Council 2015), it is considered likely that Lauder Creek provides a recruitment mechanism for the regionally significant Manuherikia River fishery.

Hickey and Olsen (2020) note that the analysis of Jowett (2020) predicts that the optimum flow for spawning habitat for Brown Trout is 359 l/s. However, due to the presence of the threatened CORG in the catchment and the compulsory value for threatened species in the NPSFM (2020), encouraging annual trout migrations from the Manuherikia River to Lauder Creek to spawn may not be desirable. This could potentially result in an annual influx of juvenile trout into Lauder Creek which would increase competition and predation effects on the threatened CORG. It is noted that if migrations were to be prevented this would need to be via a physical barrier rather than flow conditions as Lauder Creek is too large to manage flows to prevent trout passage in winter.

Hickey and Olsen (2020) recommend that a residual flow of 100l/s in Lauder Creek (downstream of the OAIC Weir and at the Rail Trail flow site) will improve the rearing habitat for juvenile brown trout with greater than 60% habitat retention based on Jowett and Richardson (2008) relative to the natural 7-day MALF. This will obviously provide potential benefit to the Manuherikia trout fishery but may also have deleterious effects on any remnant CORG population in the mainstem due to increased predation and competition (McIntosh *et al.* 2009).

12.4.6 Fish Passage

Hickey and Olsen (2020) assess the extent to which the OAIC weir on Lauder Creek impedes fish passage. Key findings include:

- The weir is expected to prevent upstream passage of trout due to its vertical height (1.8 m) and the presence of a concrete apron. However, brown trout has an abundant self-sustaining population upstream of the weir.

- The weir is expected to prevent upstream passage of Upland bullies. However, Upland bully has an abundant self-sustaining population upstream of the weir.

[55] Habitat modelling by Jowett Consulting 2020

- Longfin eels are expected to be able to make passage past this weir at low flows when small amounts are passing over portions of the weir. Longfin eel are rare in the Manuherikia River (when compared to a natural stated) due to the Roxburgh Dam.

- Lamprey are expected to be able to make passage past this weir at low flows when small amounts are passing over portions of the weir. Lamprey are rare in the Manuherikia River (compared to natural state) due to the Roxburgh Dam.

- Kōaro are expected to be able to make passage past this weir at low flows when small amounts are passing over portions of the weir. Kōaro, however, are rare in the Manuherikia River (compared to natural state) due to damming and trout predation.

No adverse effects are anticipated with regard to fish passage.

12.4.7 Fish Screening

Fish screens are typically installed to prevent fish from being entrained in water take infrastructure (e.g. race, pipe) and to return the fish unharmed to the waterway they came from. The design parameters for fish screens vary depending on the setting and the species/life-stage of fish present. Hickey and Olsen (2020) generally recommended that screens should be designed to comply with the relevant standards and guidelines (as outlined in Schedule 2 of the Canterbury Land and Water Regional Plan), and that 2mm mesh is proposed on takes where galaxias may be present and 3mm is proposed for other takes, where trout are the dominant species.

Hickey and Olsen (2020) further recommend that the need for fish screens on specific takes need to be investigated on a case-by-case basis, and that if they are determined to be required, the most practical option should be used to ensure the desired outcome for the species present at each take. For example, for OAIC's permit 2001.710, trout will be sent into a losing reach that will be dry a short distance below the weir for much of the summer, and in other cases criteria may need to be refined to make them appropriate for screening off-takes from dams.

On this basis, conditions are proposed for the replacement permits that requires consent holders to further investigate the need for fish screens within certain timeframes following the replacement consent being issued.

12.4.8 Overall Comment

The assessment undertaken by Hickey and Olsen (2020) highlights the ecological values present within the Lauder Creek catchment and the associated management complexities based on compulsory values under the NPSFM 2020. In the case of Lauder Creek, a significant focus is on the nationally threatened Central Otago roundhead galaxias (CORG) and the traditional mahinga kai species longfin eel.

The proposed residual flow regime is expected to sustain the indigenous aquatic life in Lauder Creek expected from a physical habitat perspective and will ensure that abstractors do not take all the flow in tributary streams. However, factors outside of the applicants' control also influence the presence of indigenous species and cannot be remedied through the imposition of flow conditions. For example, the lack of eel present is likely to be due to Roxburgh Dam preventing recruitment, and CORGs are likely not present at many locations or are in very low numbers due to the impact of trout.

Care has been taken to balance the management objectives for the species present, however, a tension exists between improving habitat to benefit the Manuherikia River trout fishery and protecting the habitat of any remnant CORG population in the mainstem due to increased competition and predation.

Taking in association with the supplementary permit sought by Phada Industries is not anticipated to have adverse effects on ecology, as the high minimum flow will limit this abstraction to periods when flows in the Manuherikia River are high – which will mean that flows are also high in the Lauder Creek and tributaries. On this basis, this take is not anticipated to affect the habitat quality or availability for fish species present.

In conclusion, habitat modelling and flow requirements for the fish species present in the Lauder Creek have been assessed when arriving at the recommended residual flow regime. The proposed flow regime will require permit holders to maintain flows within the mainstem and tributaries of Lauder Creek, and the proposed fish screening will prevent entrainment of fish in on-farm irrigation systems and infrastructure. Combined, these measures are anticipated to avoid or mitigate the potential effects of abstraction on ecology within the subject waterways. Further, the applicants are committed to additional work to improve water quality in the catchment, and continued reduction in overland irrigation is also anticipated to improve water quality in the catchment. In combination, these measures are anticipated to enhance the ecology of the catchment, and to appropriately manage the potential adverse effects of these activities on ecological values.

Taking these factors into account, the effects of the proposed activities on ecological values is assessed as being no more than minor subject to appropriate conditions of consent.

12.5 Effects on Amenity and Natural character

Natural character is influenced by the extent to which the natural elements, patterns and processes occur; and the nature and extent of modification to the ecosystems and landscape.

Amenity values are defined as those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes. Visual amenity provides an attractive visual setting or backdrop for people living, working, recreating, visiting or travelling through the area.

All existing water take infrastructure is in keeping with irrigation infrastructure anticipated within this rural, pastoral environment, and is not considered to have more than a minor adverse effect on natural character or amenity within this context. The contribution of irrigation infrastructure to the landscape is generally acknowledged in Section 2.3.1 of the Central Otago District Plan, including the sense of history provided by water races and the 'oasis character' provided by irrigated pasture within the predominantly dry landscape.

The amenity and natural character of Lauder Creek is limited in the middle reaches where flows are naturally intermittent with large losses to ground. Residual flows are the key mechanism for protecting the natural character values in tributary streams. The proposed flow regime in this application, combined with the broader catchment enhancement proposed by irrigators and permit holders within the Lauder catchment, are anticipated to maintain and enhance the existing amenity and natural character of the subject waterways. With these measures in place the abstractions are likely to have a minimal adverse effect on the amenity and natural character of these channels.

The taking of water in association with the supplementary permit sought by Phada Industries is not anticipated to have adverse effects on natural character or amenity as this will be restricted by a supplementary minimum flow limit.

Taking these factors into account, the effects of the proposed activities on amenity and natural character are assessed as being no more than minor subject to appropriate conditions of consent.

12.6 Effects on Recreational Values

The ORC commissioned report "Manuherikia River and Dunstan Creek Recreation Values Assessment" (Greenaway and Associates, June 2020, Draft Version 2) concludes that:

> *"The Manuherekia River has regionally significant angling, swimming, kayaking and jet boating values, and in reaches near settlements – such as Alexandra, Omakau and Becks – is popular for walking and picnicking. The River presents a scenic setting and is of a moderate scale, and so is accessible to a wide range of skill levels for all activities."*

The recreational values of Lauder Creek and tributaries are not specifically addressed in the ORC commissioned report. However, watercourses of the Manuherikia River catchment are recognised as important recreational fishing waterways, and this includes Lauder Creek valued for trout fishing.

As discussed in Section 12.4, the proposed residual flows of 100 l/s Lauder Creek (downstream of the OAIC Weir and at the Rail Trail flow site) is expected to improve the rearing habitat for juvenile brown trout. Further, the implementation of a catchment specific sharing regime will offer protection for sports fishery and instream ecosystem values.

On this basis, abstraction from Lauder Creek is likely to have a very minor adverse effect on recreation values. Water quality from land use associated with subject water takes may have an adverse effect on downstream recreation values, including swimming, boating and fishing in the Manuherikia River. Improvements to water quality within the Lauder catchment are anticipated as a result of ongoing improvements to on-farm management practices, and a reduction in overland flow irrigation.

12.7 Effects on Cultural Values

Aukaha submissions on recent deemed permit replacement applications in Otago have highlighted key issues and management principles of relevance to this application. These issues and management principles are described here and addressed in turn below.

- **Mahika kai** (literally 'food works') is an integral aspect of Kāi Tahu culture and it is critical to keep mahika kai intact including in terms of cultural practices, productivity, and diversity of species. Mahika kai is more than just the food itself, it also encompasses cultural practices including seasonal migrations, access to the resource, the act of gathering and using resources and ensuring the future health of these resources.

- **Mauri** can be tangibly represented in terms of elements of the physical health of the land, a river, or surrounding biodiversity. Physical aspects used to reflect the status of mauri include aesthetic qualities e.g. natural character and indigenous flora and fauna; life supporting capacity and ecosystem robustness; and fitness for cultural usage. Mauri also includes intangible qualities associated with spiritual aspects, and these can also be affected by activities affecting the freshwater resource. The mauri of a resource is desecrated if it no longer supports traditional uses and values.

- **Ki uta ki tai** concept is used to describe their holistic understanding of freshwater ecosystems and how the health and well-being of the people are intrinsically linked to the natural environment.

Traditional mahika kai resources in the Manuherekia catchment are understood to be eels, waterfowl and lampreys. The Roxburgh and Clyde Dams have prevented long fin eel migration into and out of the Clutha River/Mata-au. Waterfowl in the catchment are now dominated by introduced species, some of which have flourished on farm dams in the area. Lamprey have a conservation status of 'nationally vulnerable'. They are now thought to be uncommon in the Manuherekia and have only been found near the confluence with the Clutha River/Mata-au. As they are generally found closer to the coast the Manuherekia is thought to be close to the upstream extent of their distribution.

A wide range of activities and issues have impacted on the diversity and density of mahika kai species including the development of land for both urban and rural land uses with resultant impacts on habitat, the introduction of exotic terrestrial and aquatic species (including predators), as well as the construction of dams (including for hydro-electricity generation) and the taking and use of water. All of these factors have impacted on mahika kai practices.

As set out in Section 12.4, Hickey and Olsen (2020) address the NPSFM 2020 compulsory values for mahika kai in relation to the Lauder Creek catchment. The NPSFM Mahinga Kai value directs that kai would be safe to harvest and eat, and that transfer of knowledge is able to occur about the preparation, storage and cooking of kai. The value directs that in FMUs (or parts of FMUs that are used for providing mahinga kai) the desired species are plentiful enough for long-term harvest and the range of desired species is present across all life stages. In the case of the Lauder Creek catchment, the NPSFM compulsory value/objective for Longfin eel is unlikely to be realised/achieved due to recruitment issues caused by the presence of Roxburgh Dam, which blocks the inward migration of juvenile eels that have entered the Clutha/Mata-Au from the ocean. This represents a significant non-flow related factor that influences ecosystem health and mahinga kai species in the Lauder Creek and Muddy Creek Catchments and is beyond the ability of the applicants to address at the Lauder sub-catchment scale.

Hickey and Olsen (2020) assess the extent to which the existing OAIC weir on Lauder Creek acts as a barrier preventing fish passage, as detailed in Section 12.4. Based on this assessment, it is concluded that the weir does not prevent upstream passage of Longfin eels, Lamprey, or Kōaro, noting that these species are rare in the Manuherekia (when compared to natural state), likely due to factors relating to the Roxburgh dam and trout predation.

Recently, Aukaha, on behalf of local Runaka, has indicated in submissions and evidence for deemed permit replacements that abstraction should result in at least 50% of the natural flow remaining in the waterway. The rationale for this appears to be that taking more than half of the resource is inequitable with nature and will deplete the resource.

The abstraction of water may always be considered to have a level of adverse effect on the mauri of a waterway, as the very nature of abstraction is to remove a resource from its source. Ecological assessments can provide a useful perspective on the degree to which a resource is physically depleted or impacted as a result of water abstractions and includes consideration of the following three factors.

1. Retention of flow variability
2. Proportion of water abstracted or retained in a waterway
3. Retention of connectivity along the length of a waterway and between connected water bodies

While the assessment provided by Hickey and Olsen (2020) is focused on physical aspects of Mauri, the assessment can be used as a proxy to inform potential effects on spiritual aspects of Mauri.

The mauri of the Lauder Creek catchment is likely to be impacted by historic land use practice, artificial in-flows from irrigation schemes or run-off and recharge from upstream land uses. However, they do still hold value as they carry water, which has its own wairua, and the water in these channels supports an endangered indigenous fish species and a valued Mahika kai longfin eel.

In addition, from a holistic perspective of ki uta ki tai, the land use activities associated with water taken from Lauder Creek and its tributaries has degraded water quality. The applicants are committed to addressing these effects and protecting the Central Otago Roundhead galaxias. The ongoing commitment of the Lauder Water Users Group to improve farm management practices, combined with further conversion to efficient irrigation, is anticipated to effectively avoid or mitigate effects on water quality. This will in turn support and enhance the mauri of these waterways.

Overall, within the context of the Lauder Creek catchment (including their physical characteristics and flow sources) and the measures proposed to manage the effects of abstraction and associated land use are anticipated to effectively mitigate adverse effects on cultural values so that they are minor.

12.8 Effects on Downstream Users, Lawfully Existing Takes

Effects on downstream users are not considered adverse, given this application reflects the accepted status quo, which is in a sense an equilibrium between these users and downstream users, and this application does not propose to worsen effects on downstream users.

Effects on other water users in the wider catchment will be managed by the imposition of minimum flows in the Manuherikia River. This ensures that the Lauder Creek catchment will contribute to upholding minimum flows in the Manuherikia River and ensures a level of equity within the wider catchment.

The applicants are all members of the Lauder Creek sub-catchment Group and as such are working together to present a catchment solution. The inter-connectedness of their intakes has been discussed by this Group and the joint application supported by all.

Downstream water users will also be protected by the supplementary minimum flow in relation to the Phada Industries supplementary allocation take, as this prevents new abstraction (i.e., not already authorised as a primary allocation take) from occurring below this minimum flow.

There are not anticipated to be adverse effects on downstream water users as a result of these activities.

12.9 Climate Change Effects

A report prepared for the Central Otago District Council in 2017[56] identifies a decrease in snowpack by the end of the century as one of the key effects relevant to agriculture and instream flows in Central Otago. More winter precipitation is anticipated to fall as rain, resulting in less accumulated snow and therefore reduced contributions of snowmelt to river flows in spring. This is expected to lead to substantial increases in streamflow during winter and declines in summer, driven by increasing winter precipitation and a reduction in snow storage.

[56] Bodeker Scientific, August 2017, *The Past, Present and Future Climate of Central Otago: Implications for the District* prepared for Central Otago District Council

These predictions, while falling outside of the term sought for these consents, highlight the importance of the large dams within this catchment (such as Falls Dam) in enabling productive use of land. The OAIC scheme utilises water from Falls Dam, and the applicants are shareholders of, and receive water from OAIC. This dam and scheme will continue to play a vital role in supporting a wide range of businesses, many of which support food production, and the storage of winter water will become even more important in terms of avoiding the effects on abstraction when flows are lower in summer.

These activities are not anticipated to exacerbate the effects of climate change on the subject waterways. Nor are the proposed activities anticipated to be vulnerable to the effects of climate change within the term of the consents sought. In addition, the residual and minimum flow limits proposed by this application will protect the affected waterways from any reduction in instream flows due to climate change.

On this basis climate change related effects are anticipated to be less than minor.

12.10 Effects of Transferring Location of a Take

The proposal includes the transfer of three intake sites, as detailed in Section 11.5.

In accordance with Section 136(4) of the RMA, the consent authority shall, when considering an application to transfer the whole part of a consent holder's interest in a Water Permit, have regard to the effects of the proposed transfer and the effects of allowing the transfer, in addition to the matters set out in Section 104 of the RMA. Policy 6.4.17 of the RPW sets out the requirements for an application for a transfer and these matters are also addressed where appropriate.

All three proposed transfers shift the point of take either further upstream or downstream of the subject Creeks and so the water rights retain primary allocation status as the consented takes were originally in the primary allocation. The takes will also remain subject to the primary allocation minimum flow. The proposed transfer therefore meets Policy 6.4.17(a).

Following the transfer of takes the allocation quantities will be no more than currently authorised and will result in a reduction to the rates of take for the Scheme/Moran Brown combination. Therefore, the transfer of the points of take will not result in water being taken in excess of the quantity abstracted prior to the transfer occurring and so meets the requirement of Policy 6.4.17(b).

In terms of reasonableness of use, the applicants are intent on using the water that is available to them as efficiently as possible. The application demonstrates that the applicants' use of water under these Permits is within the efficient allocation limit determined by Aqualinc and is an appropriate amount to efficiently irrigate the soils in these locations. The proposed transfer therefore meets the requirement of Policy 6.4.17(c).

The proposed transfer will not introduce any additional effects on the natural and human use values of Lauder Creek or its tributary that are different to those which occurred prior to the transfer. The physical changes resulting from the proposed transfers are described below:

- The existing intake races associated with Permits WR432B and 96779 will be disestablished and no longer used within 2 years and one year respectfully post consent issue. The new intake locations for these permits will utilise the existing intake infrastructure authorised under Permits 2001.710 and 94548.
- The existing intake race associated with Permit 96779 will be disestablished and no longer used. The new intake location for this permit will utilise the existing intake infrastructure authorised under Permit 94548 above the OAIC weir.
- The existing take points associated with Permit 2002.768 have never been used and are an error. The intake for this permit will be located at the actual current location which is the same location as the metering equipment. This is a retake that will only be operational when flow has been specifically provided for abstraction.

The transfers do not place the taking at any different locality that would affect other lawful abstractions and, in any case, effects on other water users in the wider catchment will be managed by the imposition of minimum flows in the Manuherikia River. This ensures that the Lauder Creek and Muddy Creek catchments will contribute to upholding minimum flows in the Manuherikia River and ensures a level of equity within the wider catchment.

Overall, the proposed transfers result in a reduction in the number of intakes in the Lauder Creek catchment and will result in a reduction of corresponding effects on the aquatic environment, creek character or amenity, and natural river values generally. The proposed transfer meets all requirements under Policy 6.4.17(c).

12.11 Economic Effects

Irrigation is accepted as having positive economic effects on farming businesses, including by increasing productivity, protecting farms from the vagaries of climatic events, allowing finishing on farm, and farm system diversification. While the economic benefits of irrigation are dependent on a range of factors - including the cost of irrigation (related to factors such as distance from source, infrastructure requirements), climate, soil types, effective farm management – the reliability of the supply of water is one of the key overriding factors.

Farming practices within the Manuherekia catchment are reliant on irrigation water, given the climatic and physical characteristics of the area. Irrigation in the area has developed based on confidence in continued access to water.

This has led to a significant investment in irrigation infrastructure throughout the catchment, over many decades. This is an ongoing process influenced by factors such as technology and policy changes.

Otago Regional Council has had a strong policy emphasis on efficient irrigation practices for many years. This policy has resulted in the shift towards increasing use of spray irrigation, including the centre pivots and other spray methods on the applicants' properties.

The taking and use of this water enables these farming businesses. These businesses in turn utilise and support a wide range of local contractors including irrigation specialists, fencing contractors, shearers, local engineers and rural suppliers.

Continued access to this water is an important component of supporting these businesses to be viable. The taking and use of this water results in significant positive economic effects for these applicants and the local community.

12.12 Social Effects

The taking and use of this water enables these farming businesses. These businesses in turn utilise a wide range of local contractors. This supports the local community and results in positive social effects. Viable rural businesses provide local employment which in turn supports the maintenance of the local population. This in turn supports the retention of local sports clubs, playcentre groups, schools and range of other social groups and clubs and associated facilities.

Degradation of water quality or low flows caused by the taking and use of water can have adverse effects on the local community by limiting their ability to use and enjoy local rivers. Water quality is being addressed by the applicants and the Lauder Creek sub-catchment group and the measures outlined in the assessment of effects on water quality are anticipated to address water quality. As a result of these measures adverse social effects due to the use of water are anticipated to be very minimal.

Overall, the taking and use of this water results in positive effects on social well-being.

12.13 Cumulative effects

The abstraction by the applicants represents a small proportion of the total amount of water being abstracted from the Manuherekia catchment and includes the reuse of run-off or recharge water.

Cumulatively, the taking and use of water has had a significant effect on the Manuherekia catchment, particularly when dams and irrigation schemes are considered. These dams and schemes have enabled the use and development of the catchment for productive land uses and have supported the development of the Alexandra area. Flows and instream values have undoubtedly been affected by these uses and developments over time. These uses were lawfully established and were often undertaken by or facilitated by central government.

The cumulative effects of water use within the catchment is being addressed by the catchment management approach being taken by the MCG, which these applicants are members of. This includes residual flow and minimum flows and a reduction in allocation which aims to address the cumulative effects of abstraction on instream values, whilst also supporting economic and social well-being. A minimum flow will be proposed as part of the Manuherikia Catchment Group proposal, and the applicants will be subject to this. Compliance with national standards and regulations focused on water quality, ongoing efforts to improve on farm management practices, continued conversion to spray methods, and a range of enhancement measures will work to maintain and enhance water quality within the catchment.

With these measures in place, the cumulative effects of the taking and use of water will be mitigated to what is considered to be an appropriate level, taking into account both the potential adverse and positive effects of taking and using water.

12.14 Summary of effects and proposed mitigation measures

Overall, the proposed taking and use of water results in positive effects for the applicants, employees, and the local community. Consent holders have made a substantial and significant investment in irrigation infrastructure in recent years to ensure transition towards increasing use of efficient irrigation infrastructure and are working together at the sub-catchment and wider Manuherekia catchment scales.

A range of mitigations are proposed to manage the environmental effects associated with the proposed activities, summarised below:

A. Residual flows on tributary Creeks where appropriate which will address effects on a wide range of values including effects on hydrology, ecology (particularly galaxias present) and cultural values, and to a lesser degree will support downstream recreational, amenity and natural character values.

B. Compliance with the residual flow above the OAIC weir and at the Rail Trail flow site for the upper and lower reaches of Lauder Creek, for the benefit of the Lauder Creek catchment.

C. Compliance with the minimum flows in the Manuherikia River (including the supplementary minimum flow for the supplementary allocation sought by Phada Industries Ltd). Compliance with the catchment minimum flow will address cumulative effects of abstraction.

D. Fish screens considered and researched for suitability on all intakes with mesh size appropriate to exclude fish from becoming entrained in races.

E. Continuing conversion to more efficient forms of irrigation.

F. A commitment to continue addressing water quality issues via ongoing improvements to farm management practices and compliance with national standards and regulations.

Combined, these measures are anticipated to effectively and appropriately avoid or mitigate the adverse effects of these activities whilst enabling these landowners and their local community to provide for their economic and social well-being.

13. Legislative Analysis

13.1 Central Otago District Council District Plan

All of the properties lie within the Rural Resource Area of the Central Otago District Plan.

Under Rule 4.7.1(i), any activity not listed as a controlled, discretionary, restricted discretionary , non-complying or prohibited activity is permitted if it complies with relevant rules or standards. The standards in 4.7.6 do not relate to the activities undertaken by the applicants. Section 12 to 15 include district wide standards relating to matters such as access, noise, signs, transmission lines, as well as rules relating to infrastructure, utilities, heritage. None of these rules relate to the proposed activities subject to this application.

13.2 Otago Regional Council: Regional Plan: Water for Otago

The Regional Plan: Water for Otago (RPW) became operative on 1 January 2004 and contains objectives, policies and rules managing activities associated with water in Otago, including rules which require a resource consent for the damming, taking and use of water and discharges to water. Since it became operative it has been subject to several amendments, some relevant to the whole region, and others focused on specific catchments (including minimum flow plan changes). One amendment was to ensure compliance with the provisions of the original NPS-FM 2011.

The RPW is also subject to the Proposed Water Permits Plan Change (Plan Change 7, referred to here as PC7) which includes an additional objective, as well as policies and rules relevant to water permit applications that would override, or limit the relevance of some of the existing provisions in the RPW. PC7 seeks the creation of an interim regulatory framework for the replacement of deemed permits, and any other water permits expiring prior to 31 December 2025 to allow time for the development of a new Land and Water Regional Plan that is consistent with national policy. This interim framework is a significant departure from the framework in the operative RPW.

The ORC has also notified Proposed Plan Change 8 – Discharge Management (PC8). The weighting to be given to this plan change does not have direct bearing on the applications that form this proposal and so the weighting to be given to PC8 is not considered here, although similar assessments would be likely to apply to any consideration of the weight to afford that plan change.

13.2.1 Weighting to be applied to Operative RPW and PC7

The rules in PC7 relate to water and therefore have legal effect in terms of determining activity status. However, the ORC is applying a number of principles derived from case law when determining the appropriate level of weight to be applied to proposed provisions. These are considered below:

1. The extent that it has progressed through the plan-making process

PC7 was notified on 18 March 2020 and the submission period closed on 4 May 2020, however the plan change was 'called in' by the Minister for the Environment and PC7 was re-notified for submissions by the Environmental Protection Authority (EPA) on Monday 6 July 2020, with that submission period closing on 17 August 2020. At the time of writing a summary of submissions had been released and this noted that 72% of submissions opposed PC7, while 21% of submissions did not state whether they supported or opposed the application. Only 7% supported the plan change. This highlights that the proposed plan change is in its early stages and is the subject of considerable opposition and potential change.

2. The extent that the proposed measure has been subject to independent testing or decision making

PC7 has not yet been the subject of decisions on submissions. At the time of writing, the Environment Court has directed that the pre-hearing process commences 27 November 2020, with the hearing scheduled throughout March, April and May 2021. To date, there has been no independent testing or decision-making on PC7.

3. Circumstances of injustice

It is considered that there is considerable injustice associated with giving weight to PC7 for the following reasons:

a) The applicants began preparatory work supporting the replacement of water permits almost 10 years ago (through their involvement and support of the Manuherikia Strategy Group) to develop a comprehensive proposal to support replacement of their permits.

b) The nature and timing of notification of PC7 has introduced further complexity to the process, with applications now required to consider both the operative and proposed provisions of the RPW. Given the expiry dates on permits and the need to lodge at least 6 months prior to the expiry date (s124 of the RMA), the applicants had no choice but to continue to develop comprehensive applications, at significant cost. As no NPSFM compliant planning framework has put in place for this catchment by the ORC, the applications have also had to address far broader matters than would normally be required. This is in direct contrast to the 'simple' process promoted by the ORC and the 'relatively low cost, and fast issuing of new consents' requested by the Minister.

c) The ORC began work on a limit setting plan change for the Manuherekia in 2016 and proposed to notify this plan change in 2018. The applicants engaged and assisted the ORC with this work. In 2018 the ORC indicated that the plan change was no longer proposed to fully implement the NPSFM, as it would not address allocation. OWRUG requested that any plan change for the Manuherekia give full effect to the NPSFM, so that permits could be replaced within this framework. The date for notification has continued to slip and now the applicants must lodge an application without this planning framework in place, due to the expiry date of the permits being replaced.

d) The applicants have invested in professional advice so their applications would be acceptable to affected parties and decision makers based on existing operative planning requirements.
e) In direct response to the operative provisions of the RPW, and in preparation of the renewal process, the applicants have actively invested in infrastructure and efficient application methods, with significant total investment costs to date.

Given the above, the circumstances of injustice to the applicants are significant. The financial implications of a shorter consent term under PC7 is a key matter to be considered.

4. The extent to which a new measure, or the absence of one, might implement a coherent pattern of objectives and policies in a plan

The extent to which PC7 might implement a coherent pattern of objectives and policies has not yet been determined via the plan change process or any independent testing or decision-making. PC7 is not considered to be a coherent pattern of objectives and policies including because:
a) it fails to give effect to existing objectives in the RPW, or to link with them in a cohesive manner
b) it does not protect a range of values, including ecological values or economic or social-well-being, as is likely to result in worse outcomes than the existing plan
c) it fails to achieve sustainable management as required by Part 2 of the RMA

This assessment is clearly outlined in the submissions on PC7 by OWRUG and MCG.

5. Whether there has been a significant change in Council policy and the new provisions are in accordance with Part 2 of the RMA.

Given the current progression of PC7 through the plan change process, there is no determination yet as to whether the proposed provisions in PC7 are in accordance with Part 2 of the RMA. A preliminary assessment of PC7 is that it will result in inferior environmental outcomes and fail to achieve the purpose of the Act, including because there is no requirement to:
a) protect significant habitats of indigenous fauna
b) protect trout or salmon habitat
c) share water
d) take into account effects on affected parties
e) take into account how the existing deemed permit priority system influences the observed flow regime or ecological values present in the waterway

This is detailed in the OWRUG and MCG submission on PC7.

It is also noted that the proposed plan change itself does not purport to give effect to Part 2 of the RMA, or to give effect to any other relevant statutory planning instrument such as the NPSFM. The plan change is effectively a holding pattern to delay assessment of replacement permits until a new Land and Water Regional Plan is operative.

For the above reasons, little weight should be placed on the provisions of the proposed plan. It is the operative provisions that have been tested and debated through a public plan change process and therefore the operative RPW is considered to be the dominant planning instrument.

13.2.2 Relevant Objectives and Policies in PC7

The objectives and policies of PC7 are relevant the activities proposed by the applicants, namely the taking and use of water, including re-takes.

The following objectives and policies of PC7 are applicable to the water takes applied for here:

Objective 10A.1.1

> *Objective 10A.1.1 Transition toward the long-term sustainable management of surface water resources in the Otago region by establishing an interim planning framework to manage new water permits, and the replacement of deemed permits and water permits to take and use surface water (including groundwater considered as surface water) where those water permits expire prior to 31 December 2025, until the new Land and Water Regional Plan is made operative.*

The long- term aim of the objective is stated to be a transition toward long-term sustainable management of surface water resources. The objective sets up a process to do this via an interim planning framework, which includes the non-complying activity status relevant to this application. However, PC7 does not attempt to achieve long-term sustainable management itself – instead, it relies on a future Land and Water Regional Plan, to be notified by 31 December 2023[57] to achieve this.

In contrast, these applications will result in the long-term sustainable management of the surface water resources affected by the applicants' activities, as is discussed in the Section 16, in each of the applications, and in the analysis of Part 5 of RMA and the NPSFM. Sustainable management includes enabling people to provide for their economic and social well-being. The only way in which this can occur for these applicants is through a long term of consent. This is necessary to support or enable the investment required in on-farm infrastructure to support efficient use of water.

Accordingly, these applications are not considered to be contrary with Objective 10A.1.1 in that they will achieve long-term sustainable management.

In any case, little weight should be placed on this objective for the reasons stated above.

Policy 10A.2.1

> *Policy 10A.2.1 Irrespective of any other policies in this Plan, avoid granting resource consents that replace deemed permits, or water permits to take and use surface water (including*

[57] Recommendation of Minister for the Environment, Hon David Parker to the Otago Regional Council (undated letter with file date 18 November 2019).

groundwater considered as surface water under policy 6.4.1A (a), (b) and (c) of this Plan) where those water permits expire prior to 31 December 2025, except where:

(a) The deemed permit or water permit that is being replaced is a valid permit; and

(b) There is no increase in the area under irrigation, if the abstracted water is used for irrigation; and

(c) There is no increase in the instantaneous rate of abstraction; and

(d) Any existing residual flow, minimum flow or take cessation condition is applied to the new permit; and

(e) There is a reduction in the volume of water allocated for abstraction.

Policy 10A.2.1 provides a direction to 'avoid' granting consent except where the provisions in (a)-(e) are met.

The use of the word 'avoid' in a policy has been interpreted by the Courts as a policy that is intended to be directive and indicates that the policy is intended to be binding.[58] The use of the word 'avoid' signals that an activity is inappropriate and should be prevented and is normally coupled with more restrictive rules such as non-complying or prohibited activity rules. In the case of PC7, granting of replacement permits is to be avoided, except where several exceptions can be met. These exceptions are considered in turn here:

a) All water permits being replaced are 'valid', as they were authorised and issued by the ORC

b) This application does not propose an increase in irrigated area.

c) This application does not result in an increase in the instantaneous rate of abstraction.

d) This application proposes residual flows that are based on an assessment of the values in the subject waterways. Further, the applicants will accept and comply with the minimum flow proposed for the Manuherekia catchment by the Manuherekia catchment proposal. This exception is considered to be met.

e) This application, if granted, would result in a reduction in the volume of water allocated for abstraction. This application would result in an overall reduction in the volume of water allocated from these waterways.

As such, this application is not considered to be contrary to this policy, particularly as the proposed activities go further than required by this policy, particularly with respect to residual and minimum flow conditions.

In any case, little weight should be placed on this policy for the reasons stated above.

[58] *Environmental Defence Society Inc v The New Zealand King Salmon Co Ltd* [2014] NZSC 38

Policy 10A.2.2

> *Policy 10A.2.2 Irrespective of any other policies in this Plan concerning consent duration, only grant new resource consents for the take and use of wate for a duration of no more than six years.*

The supplementary permit sought by Phada Industries Ltd is a new permit to take and use water and the applicants seek a long term of consent for this permit. This is inconsistent with this policy.

In any case, little weight should be placed on this policy for the reasons stated above.

Policy 10A.2.3

> *Policy 10A.2.3 Irrespective of any other policies in this Plan concerning consent duration, only grant new resource consents that replace deemed permits, or resource consents that replace water permits to take and use surface water (including groundwater considered as surface water under policy 6.4.1A (a), (b) and (c) of this Plan) where those water permits expire prior to 31 December 2025, for a duration of no more than six years, except where Rule 10A.3.2.1 applies and:*
>
> *(a) The activity will have no more than minor adverse effects (including no more than minor cumulative effects) on the ecology and the hydrology of the surface water body (and any connected water body) from which the abstraction is to occur; and*
>
> *(b) The resource consent granted will expire before 31 December 2035.*

This policy applies to the water takes subject to this application. The effects of these activities on the ecology and hydrology on affected waterbodies were assessed in Section 13.2 and 13.4 and were assessed as being no more than minor. This application is not consistent with this policy as it seeks a term of consent that will expire after 2025.

Little weight should be placed on this policy for the reasons stated above.

13.2.3 Relevant Objectives and Policies in the Operative Plan

Key provisions in the RPW that are of relevance to this application are discussed below.

Schedule 1 Values

Objective 5.3.1 To maintain or enhance the natural and human use values, identified in Schedules 1A, 1B and 1C, that are supported by Otago's lakes and rivers.

Schedule 1A of the RPW identifies natural values for specific water bodies in Otago. This Schedule is now considered to be out of date, as it was based on information at the time the RPW was notified in 1998. However, it does provide a helpful starting point for understanding the characteristics and values that may be present. Notably, these values were scheduled within the RPW with the existing activities (as proposed in this application) in place.

No natural or human use values are identified for Lauder Creek, or its tributaries.

Commonly identified values for the Manuherekia mainstem and tributaries within the Manuherekia Valley include the presence of trout and eels, spawning and juvenile rearing areas for trout, riparian vegetation, being weed free, and in some tributaries, habitat for roundhead galaxiid.

The flow limits and fish screening proposed by this application are anticipated to avoid or mitigate the potential effects of abstraction on ecology by the applicants by maintaining flow within Lauder Creek and its tributaries and preventing entrainment of fish in on-farm irrigation systems and infrastructure. These measures are anticipated to maintain and enhance the natural values present in the Lauder Creek catchment.

Objective 5.3.2 To maintain or enhance the spiritual and cultural beliefs, values and uses of significance to Kāi Tahu, identified in Schedule 1D, as these relate to Otago's lakes and rivers.

Schedule 1D of the RPW identifies spiritual or cultural beliefs, values or uses associated with water bodies of significance to Kāi Tahu. These values were identified with the existing activities in place. Lauder Creek and its tributaries fall within 'Other Manuherikia Tributaries' within this Schedule and are identified as having the following values:

- Kaitiakitanga - the exercise of guardianship by Kāi Tahu in accordance with tikanga Māori 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 Kāi Tahu have with the water bodies of Otago.
- Wāhi tapu and/or Waiwhakaheke - sacred places; sites, areas and values associated with water bodies that hold spiritual values of importance to Kāi Tahu. (Note: Kāi Tahu should be

consulted regarding the location of these places, sites areas and values for a river identified as MA3).

- Wāhi taoka - treasured resource; values, sites and resources that are valued and reinforce the special relationship Kāi 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).

These values have been assessed as part of the Assessment of Effects on the Environment (Section 12). This concluded that overall, within the context of Lauder Creek catchment (including their physical characteristics and flow sources) the measures proposed to manage the effects of abstraction and associated land use are anticipated to effectively mitigate adverse effects on cultural values so that they are minor.

Natural Character

Objective 5.3.3 *To protect the natural character of Otago's lakes and rivers and their margins from inappropriate subdivision, use or development.*

Policy 5.4.8 *To have particular regard to the following features of lakes and rivers, and their margins, when considering adverse effects on their natural character:*

(a) The topography, including the setting and bed form of the lake or river;
(b) The natural flow characteristics of the river;
(c) The natural water level of the lake and its fluctuation;
(d) The natural water colour and clarity in the lake or river;
(e) The ecology of the lake or river and its margins; and
(f) The extent of use or development within the catchment, including the extent to which that use and development has influenced matters (a) to (e) above.

The proposed activities are for taking and re-taking of water and the damming of water. These activities occur within the rural environment and support rural activities. Many of the activities enabled by the supply of water are long established. This application does not propose a change to the existing natural character of the area.

The flows limits proposed as part of this application will maintain the character of the Lauder Creek and Muddy Creek and their tributaries channels, while the broader catchment enhancements proposed are anticipated to maintain and enhance the existing amenity and natural character of these channels.

Accordingly, this application is considered to be consistent with this objective and policy.

Amenity Values

> ***Objective 5.3.4*** *To maintain or enhance the amenity values associated with Otago's lakes and rivers and their margins.*
>
> ***Policy 5.4.9*** *To have particular regard to the following qualities or characteristics of lakes and rivers, and their margins, when considering adverse effects on amenity values:*
> *(a) Aesthetic values associated with the lake or river; and*
> *(b) Recreational opportunities provided by the lake or river, or its margins.*

As determined in Section 12, The proposed activities will not result in a change to existing amenity and recreational values. Based on the factors discussed in Section 16 and the measures proposed by the applicants, including broader catchment enhancements, the amenity values of these waterways and connected downstream waterways will be maintained and enhanced and this application is consistent with these provisions.

Providing for sustainable use and development

> *Objective 5.3.6 To provide for the sustainable use and development of Otago's water bodies, and the beds and margins of Otago's lakes and rivers.*

This proposal aims to enable existing users to continue utilising the water resource, subject to measures to ensure that this continued use is sustainable. The residual flows and fish screens proposed by this application, along with the decrease in allocation, reducing the number of sites which the applicants could legally abstract water; the ongoing development of efficient irrigation and broader measures to improve water quality will all support natural values for future generations while also enabling these applicants and the community that they are part of to provide for their social and economic well-being.

Approach to effects

> ***Policy 5.4.2*** *In the management of any activity involving surface water, groundwater or the bed or margin of any lake or river, to give priority to avoiding, in preference to remedying or mitigating:*
> *(1) Adverse effects on:*
>
> > *(a) Natural values identified in Schedule 1A;*
> > *(b) Water supply values identified in Schedule 1B;*
> > *(c) Registered historic places identified in Schedule 1C, or archaeological sites in, on, under or over the bed or margin of a lake or river;*
> > *(d) Spiritual and cultural beliefs, values and uses of significance to Kāi Tahu identified in Schedule 1D;*
> > *(e) The natural character of any lake or river, or its margins;*
> > *(f) Amenity values supported by any water body; and*
>
> *(2) Causing or exacerbating flooding, erosion, land instability, sedimentation or property damage.*

Entrainment of fish in races will be avoided through the fish screening conditions. This proposal will avoid flows that are too low to sustain ecological values through the imposition of residual flows (where appropriate) and minimum flows. These same measures, along with a reduction in allocation, conversion to spray irrigation and water quality enhancement measures will also act to mitigate adverse effects.

On this basis these applications are considered to be consistent with this policy, as adverse effects have been avoided where possible.

Shared management

> ***Policy 5.4.12*** *To promote the establishment of, and support, appropriate water user groups to assist in the management of water resources.*
> ***Policy 6.4.0B*** *To promote and support shared use and management of water that:*
> *(a) Allows water users the flexibility to work together, with their own supply arrangements; or*
> *(b) Utilises shared water infrastructure which is fit for its purpose.*

This proposal is entirely predicated on a shared approach to water management and the applicants are committed to the Manuherikia catchment proposal as well as a catchment approach for the Lauder sub-catchment.

Table 100 Overview of water sharing by applicants with wider catchment

Purpose of water use	Irrigation, storage, stock drinking water
Name of associated water allocation committee or water management group	Manuherikia Catchment Group (MCG) and Lauder Creek Sub-Catchment Group
Description of how the water allocation committee or water management group operates	MCG is an incorporated society of which these applicants are members. Lauder Creek Sub-Catchment is an informal, local catchment group which operates informally at this stage. Members of these groups: • share information and costs • will be rationing takes to meet the Lauder Creek residual flows of 100l/s above and below the OAIC weir, and the minimum flows in the Manuherekia
Description of how the water rationing regime applies to the proposed takes	Water rationing will occur through a collective approach to ensuring the Lauder Creek residual flows and Manuherekia minimum flows are not breached, possibly based on the instructions of a committee or person tasked with overseeing rationing.

This application gives effect to these policies.

Life-supporting capacity

Objective 6.3.1 *To retain flows in rivers sufficient to maintain their life-supporting capacity for aquatic ecosystems, and their natural character.*

Based on the analysis of hydrological and ecological effects in Appendix D and Section 12, the proposed residual and minimum flows will maintain life-supporting capacity where it would be present during the irrigation season. On-farm measures and broader catchment initiatives to improve water quality will also maintain life supporting capacity.

The application is considered to be consistent with this objective.

User needs

Objective 6.3.2 *To provide for the water needs of Otago's primary and secondary industries, and community domestic water supplies.*

Abstraction by the applicants provides water to support the needs of a primary industry – farming. This water is essential for these farming activities. This application is consistent with this objective.

Minimise conflict between users

Objective 6.3.3 *To minimise conflict among those taking water.*

The group approach proposed by this application, and catchment flow limits will minimise any potential conflict between water users.

The application is considered to be consistent with this objective.

Hydrological characteristics

Policy 6.4.0 *To recognise the hydrological characteristics of Otago's water resources, including behaviour and trends in:*
(a) The levels and flows of surface water bodies; and
(b) The levels and volumes of groundwater; and
(c) Any interrelationships between adjoining bodies of water, when managing the taking of water.

The hydrological characteristics of the catchment, and its interrelationship with the Manuherekia have been given consideration throughout the development of this application. These characteristics are considered in Appendix D and Section 12.

The application is therefore considered to be consistent with this policy.

Required amount

Policy 6.4.0A *- To ensure that the quantity of water granted to take is no more than that required for the purpose of use taking into account:*
(a) How local climate, soil, crop or pasture type and water availability affect the quantity of water required; and
(b) The efficiency of the proposed water transport, storage and application system.

The local climate, soils, crops and pastures have been taken into account by utilising the Aqualinc approach to calculating the volume of water required to efficiently irrigate the command area.

This application represents a reduction in allocation, with the aim that only the water required for the proposed use will be taken. This reduction is as follows:

Total consented annual volume	= 33,055,587.00 m^3[59] *(excluding the Becks Creek permit)*
Total annual volume applied for	= 14,467,463.62 m^3 *(excluding the Becks Creek permits)*
Total annual calculated water demand	= 46,088,770 m^3

The allocation sought by applicants is considered to be efficient.

The application is considered to be consistent with this Policy.

History of use

> ***Policy 6.4.2A** - Where an application is received to take water and Policy 6.4.2(b) applies to the catchment, to grant from within primary allocation no more water than has been taken under the existing consent in at least the preceding five years, except in the case of registered community drinking water supply where an allowance may be made for growth that is reasonably anticipated.*

The rates of abstraction and annual volumes sought for each of the replacement consents for primary allocation water within the catchment takes into account and is based on the applicants' monitoring records. This is further supported by maps of the irrigation command area.

This application is considered to be consistent with this policy.

Minimum Flow

> ***Policy 6.4.5** The minimum flows established by Policies 6.4.3, 6.4.4, 6.4.6, 6.4.9 and 6.4.10 will apply to resource consents for the taking of water, as follows:*
>
> *…*
>
> *(c) In the case of any existing resource consent to take water from the Lindis catchment area, Luggate catchment area, Manuherikia catchment area (upstream of Ophir) and the Taieri catchment areas Paerau to Waipiata, Waipiata to Tiroiti and Tiroiti to Sutton, as defined in Schedule 2A, upon collective review of consent conditions within those catchments under Sections 128 to 132 of the Resource Management Act.*

All of the takes subject to this application will be subject to the relevant minimum flow in the Manuherekia.

This application is consistent with this policy.

[59] Derived by extrapolating monthly rate over a year

Residual Flows

> ***Policy 6.4.7*** *- The need to maintain a residual flow at the point of take will be considered with respect to any take of water, in order to provide for the aquatic ecosystem and natural character of the source water body.*

The need for residual flows was considered in Hickey and Olsen (2020) in Appendix D and in Section 12. Residual flows have been proposed for the Lauder Creek, and tributaries where appropriate, to provide aquatic values and natural character. This application is considered to be consistent with this policy.

Supplementary Allocation

> *Policy 6.4.9 To provide for supplementary allocation for the taking of water, in blocks of allocation where that is appropriate:*
> *(a) Such that up to 50% of flow at the catchment main stem, minus the assessed actual take, is available for allocation subject to a minimum flow set to ensure that no less than 50% of the natural flow remains instream; or*
> *(b) On an alternative basis, provided:*
> > *(i) The take has no measurable effect on the flow at any Schedule 2 monitoring site, or any site established in terms of Policy 6.4.4, at flows at or below any minimum flow applying to primary allocation; and*
> > *(ii) Any adverse effect on any aquatic ecosystem value or natural character of the source water body is no more than minor; and*
> > *(iii) There is no adverse effect on any lawful existing take of water.*
>
> *(c) Supplementary allocations and associated minimum flows for some catchments are set in Schedule 2B.*

The proposal includes a supplementary residual flow of 600 l/s at the Rail trail flow site, and the appropriate supplementary block minimum flow at Campground flow site would also need to be met to allow for taking.

The proposed supplementary allocation is consistent with this policy.

Transfer of location of a take

> ***Policy 6.4.17*** *To approve an application to transfer a consent holder's interest in a resource consent to take and use water in terms of Section 136(2)(b)(ii) of the Resource Management Act, retaining the take's allocation status, providing:*
> *(a) The transfer is within the same catchment or aquifer as the original consent, or both sites are connected in terms of Policy 6.4.1A(a) or (b); and*
> *(b) The total take from the water body following transfer does not exceed that occurring prior to the transfer, as a result of the transfer; and*
> *(c) The quantity of water taken is no more than that required for the purpose of use of that water, having regard to the local conditions; and*
> *(d) There is no more than minor adverse effect on any other take, any right to store water, or on any natural or human use value, as a result of the transfer.*

This application includes a proposal to transfer the location of the two existing takes to a location further upstream in both cases. The effects of the proposed transfer were considered in Section 12 and it is concluded that any effects resulting from the proposed transfer of intake locations on the aquatic environment, creek character or amenity, and natural river values generally, will be less than minor, and will in fact reduce any effects when compared to the existing take point locations for the reasons that - the two key intakes being transferred are located in the losing reach of the Upper Lauder Creek and the proposal includes a new residual flow above this reach which will be left unabstracted. The proposed transfers also result in a reduction of the total rate of abstraction.

The proposed transfer meets all requirements under Policy 6.4.17(c).

Duration of Resource Consents

> ***Policy 6.4.19*** *When setting the duration of a resource consent to take and use water, to consider: (a) The duration of the purpose of use;*
> *(b) The presence of a catchment minimum flow or aquifer restriction level;*
> *(c) Climatic variability and consequent changes in local demand for water;*
> *(d) The extent to which the risk of potentially significant, adverse effects arising from the activity may be adequately managed through review conditions;*
> *(e) Conditions that allow for adaptive management of the take and use of water;*
> *(f) The value of the investment in infrastructure; and*
> *(g) Use of industry best practice.*

A long term of consent is considered appropriate for these resource consents on the following a basis:

- All of the permits for the taking and use of water as sought by this application have a purpose of use with a long duration.

- The inclusion of review conditions as conditions of consent are anticipated by the applicant.

- Any potential or actual adverse effects resulting from the proposal will be appropriately mitigated, where relevant, by the inclusion of residual and minimum flows and fish screen conditions where appropriate.

- The use or continued conversion to efficient spray application methods within the irrigated areas, along with an increased emphasis by the Lauder Creek catchment group on water quality protection and enhancement will improve water quality within the catchment through reduced overland runoff and better management of riparian area.

- The applicants have worked collectively with water users throughout the Manuherekia catchment to understand and respond to the hydrological connections within the Manuherekia catchment. The applicants would accept a condition of consent requiring each permit holder to operate in accordance with any Council approved rationing regime or Water Management Group that may developed in the future for the catchment.

- The application gains support from the relevant policies of the RWP including safeguarding the life-supporting capacity of Otago's water resources.

- The application also addresses national planning instruments including the NPSFM (2020).
- The term sought provides sufficient surety and confidence to enable the applicants to make investment decisions and to provide confidence for farm management in the longer term. Short term permits do not provide the confidence in water access security looked for by funding bodies and can create a situation where permit holders are unable to obtain the necessary finance to make continual improvements to their farming systems. These improvements include the actions identified in the applicants FEPs, many of which will enhance water quality.

13.2.4 Chapter 7 - Water Quality

The ORC is reviewing its approach to water quality, including the objectives and policies within Chapter 7 of the RPW, and has prepared Proposed Plan Change 8 - Discharge Management (PC8) to the RPW. PC8 has been called in by the Minister for the Environment and has been notified by the Environmental Protection Authority.

The objectives and policies below are not affected by PC8.

> *Objective 7.A.1 To maintain water quality in Otago lakes, rivers, wetlands, and groundwater, but enhance water quality where it is degraded.*
>
> *Objective 7.A.2 To enable the discharge of water or contaminants to water or land, in a way that maintains water quality and supports natural and human use values, including Kāi Tahu values.*
>
> *Objective 7.A.3 To have individuals and communities manage their discharges to reduce adverse effects, including cumulative effects, on water quality.*

This proposal centres on the replacement of permits associated with the taking and use of water. However, the use of water can however affect water quality, particularly when associated with more intensive land use involving stock or nitrogen leaching.

This proposal takes a holistic approach to land management and has outlined measures that are designed to enhance water quality. This includes continued fencing of waterways, riparian planting, and a reduction in overland flow irrigation. Many of these measures were underway prior to the introduction of the Resource Management Stock Exclusion Regulations (2020).

13.2.5 Plan Change 8 – Discharge Management

The ORC is reviewing its approach to water quality, including the objectives and policies within Chapter 7 of the RPW, and has prepared Proposed Plan Change 8 - Discharge Management (PC8) to the RPW.

PC8 has been called in by the Minister for the Environment and has been notified by the Environmental Protection Authority.

This plan change includes changes to existing provisions and the addition of new provisions relating to discharges affecting water quality, including consents to discharge nitrogen, the management of animal waste systems and good farming practices.

Provisions relating to good farm practices include stock exclusion, standards for intensive grazing and managing sediment run-off from farming activities and management of critical source areas. Changes to policies are intended to provide additional guidance when assessing consent applications for discharges.

The ORC has since submitted against its own plan change in order to correct mistakes, providing better internal alignment and improving clarity. In addition, where parts of PC8 are addressed by the NES for Freshwater or the Stock Exclusion Regulations, the submission asks that the PC8 rules are deleted and the NES and Stock Exclusion Regulations are relied upon instead.

This proposal does not include an application for discharges addressed by this plan change. Stock exclusion and intensive winter grazing are addressed in the Sections below addressing national standards and regulations.

13.2.6 Summary of PC7 and operative RPW policy analysis and weighting

Overall, this application is considered to be generally consistent with the objectives and policies in the operative RPW.

It is also considered generally consistent with Objective 10A.1.1 of PC7 as it will result in a framework and measures to achieve sustainable management of surface water in the Manuherekia catchment. It is also consistent with Policy 10A.2.1 of PC7.

This proposal is not consistent with Policy 10A.2.2 or 10A.2.3 of PC7, because it seeks a long term of consent for all activities.

A 6 or even 15 year permit for water takes creates significant challenges for the applicants in financing on-farm improvements (including those relating to water quality). This has the potential to make the whole of catchment approach non-viable. The applicants are also part of a broader catchment-based approach, which includes irrigation schemes and large dams. These activities will also need longer terms of consent to enable financing of maintenance and upgrades.

For the reasons outlined in Section 17.21, little weight should be placed on the provisions of PC7, particularly as it has not been independently tested and is the subject of considerable opposition.

13.2.7 Otago Regional Council Regional Policy Statement

At the time of writing there are 3 versions of the Otago Regional Policy Statement to consider.

The Regional Policy Statement for Otago became operative on 1 October 1998 (referred to hereafter as the RPS (1998)). The proposed Regional Policy Statement (pRPS) was notified on 23 May 2015 and a decision was released 1 October 2016. The pRPS was made partially operative on the 14 January 2019 (PO-RPS), with the exception of all provisions and explanatory material in *Chapter 3: Otago has high quality natural resources and ecosystems*. This is the key chapter of relevance to this application.

A further review of the RPS was currently underway at the end of 2019, with the ORC aiming to notify a proposed plan in November 2020. The RPS, including the partially operative version, is considered out of date with respect to the NPSFM (2020).

13.2.8 Regional Policy Statement (1998)

The RPS (1998) contains a number of objectives and policies that are relevant to this application. Those that are particularly relevant are contained in Chapter 6 (Water), as set out below. It is noted these provisions can be afforded some weight, as they are replaced by proposed policies in the pRPS rather than operative policies in the PO- RPS:

> *Objective 6.4.1 To allocate Otago's water resources in a sustainable manner which meets the present and reasonably foreseeable needs of Otago's people and communities.*
>
> *Objective 6.4.2 To maintain and enhance the quality of Otago's water resources in order to meet the present and reasonably foreseeable needs of Otago's communities.*
>
> *Objective 6.4.3 To safeguard the life-supporting capacity of Otago's water resources through protecting the quantity and quality of those water resources.*
>
> *Objective 6.4.4 To maintain and enhance the ecological, intrinsic, amenity and cultural values of Otago's water resources.*
>
> *Policy 6.5.2 To allocate water in areas of Otago where there is or potentially will be insufficient water supplies through:*
> *(a) Considering the need to protect instream amenity and habitat values; and*
> *(b) Considering the needs of primary and secondary industry; and*
> *(c) Considering Kāi Tahu cultural and spiritual values; and*
> *(d) Considering the extent to which adverse effects can be avoided, remedied or mitigated.*
>
> *Policy 6.5.3 To promote efficient consumptive water use through:*
> *(a) Promoting water use practices which minimise losses of water before, during and after application; and*
> *(b) Promoting water use practices which require less water; and*
> *(c) Promoting incentives for water users to use less water.*

These matters are addressed throughout this application – particularly in relation to specific objectives and policies of the RPW. Overall, the proposed activities are considered to result in sustainable management which meets the needs of the applicants.

A range of measures are being proposed to safeguard life-supporting capacity and to maintain and enhance ecological, intrinsic, amenity and cultural values. These measures are outlined in detail in the assessment of effects in this document (Section 12). A considerable portion of the applicants irrigated area is converted to efficient methods of irrigation, with further conversion likely depending on replacement permits. The allocation of water to these applicants with the proposed residual and minimum flow conditions where appropriate will protect instream values and Kāi Tahu values while also supporting primary industry.

Overall this application is considered to be generally consistent with these provisions.

13.2.9 Partially Operative Regional Policy Statement

The relevant provisions (with amendments as a result of appeals included below) of the PO-RPS include:

- *Use resources sustainably to promote economic, social and cultural well-being for its people and communities (Objective 1.1)*
- *Provide for economic wellbeing by enabling resilient and sustainable use and development (Policy 1.1.1)*
- *Provide for social and cultural wellbeing and health and safety by recognising and providing for a number of matters including Kāi Tahu values, values of other cultures, and diverse needs of communities. (Policy 1.1.2)*
- *Taking the principles of Te Tiriti o Waitangi into account (Objective 2.1)*
- *Kāi Tahu values, interests and customary resources are recognised and provided for (Objective 2.2)*
- *Managing the natural environment to support Kāi Tahu wellbeing (Policy 2.2.1)*
- *Recognise and provide for the protection of sites of cultural significance to Kāi Tahu (Policy 2.2.2)*
- *Enable Kāi Tahu relationships with wāhi tupuna (Policy 2.2.3)*
- *Ensure communities are able to mitigate and adapt to the effects of climate change, including by applying a precautionary approach and by encouraging activities that assist to reduce or mitigate the effects of climate change (Policy 4.2.2)*
- *Manage activities in rural areas to support the region's economy and communities including by enabling primary production and other rural activities* (Policy 5.3.1)
- *Apply an adaptive management approach (Policy 5.4.2)*
- *Apply a precautionary approach to adverse effects where effects are uncertain, not able to be determined, or a poorly understood but are potential significant or irreversible (Policy 5.4.3)*
- *Control the adverse effects of pest species including to safe-guard the viability of indigenous species and their habitats (Policy 5.4.5)*

This proposal seeks to recognise and provide for Kāi Tahu values, including by managing the natural environment to support Kāi Tahu well-being. It does so particularly through setting flow limits where appropriate to maintain surface flows, and protection of habitat for indigenous species. This application also takes a 'whole of catchment' management approach which is consistent conceptually with 'ki uta ki tai'. It does so by acknowledging the effects of using water, and through the applicants commitment to addressing these effects, as well as their commitment to being part of the Manuherekia Catchment Group and the proposal that will be put forward by that group for management of the catchment.

This proposal promotes resource use that is sustainable by setting flow limits in waterways where appropriate. It also supports economic and social well-being by providing sufficient reliability of supply, including use of existing efficient infrastructure.

The activities that form this proposal are well established, and the associated effects resulting from these activities are also existing. Accordingly, an adaptive management or precautionary approach is not considered necessary, as this proposal seeks to enhance a range of values and mitigate or avoid a number of effects associated with these well-established activities.

The ongoing use of the dams on these farms and within the Manuherekia catchment will assist with mitigation of the potential effects of climate change, although the effects of climate change are likely to be experienced after the expiry of replacement consents sought by this application.

Replacement permits for these takes supports an efficient use of water, as the allocation proposed is consistent with efficient use as determined by applying the Aqualinc calculations.

On this basis this application is considered to be generally consistent with these provisions.

13.2.10 Proposed Regional Policy Statement

Since the pRPS was made partially operative, the mediated version of Chapter 3 (changed by Environment Court order – 15 March 2019) has been incorporated into the latest version of the PO-RPS (but not yet made operative). This includes the following provisions of relevance to this application:

- *Recognise, maintain, and/or enhance (where degraded) the values (including intrinsic values) of ecosystems and natural resources (Objective 3.1)*
- *Safeguard life-supporting capacity of freshwater and manage freshwater to achieve a range of matters including the maintenance or enhancement of aquatic eco-system health, indigenous habitats, indigenous species and their migratory patterns; to maintain and enhance as practicable the natural functioning of waterways, and the habitat of trout and salmon unless detrimental to indigenous biological biodiversity (Policy 3.1.1)*
- *Manage the beds of rivers to achieve a range of matters including safeguard life-supporting capacity of freshwater, maintain or enhance ecosystem health and indigenous biodiversity, and maintain or enhance, as far as practicable their natural functioning, character and amenity values. (Policy 3.1.2)*
- *Manage allocation and use of water by recognising and providing for the social and economic benefits of sustainable water use, avoid over-allocation, phase out existing allocation, ensure efficient allocation including by requiring that water allocated does not exceed what is*

necessary for efficient use and encouraging the development or upgrade of infrastructure that increases efficiency (Policy 3.1.3).

- *Manage for water shortage by undertaking all of the following: encouraging land management that improves moisture capture, infiltration, and soil moisture holding capacity; encouraging collective coordination and rationing of the take and use of water when river flows or aquifer levels are lowering, to avoid breaching any minimum flow or aquifer level restriction to optimise use of water available for taking; providing for water harvesting and storage, subject to allocation limits and flow management, to reduce demand on water bodies during periods of low flows (Policy 3.1.4)*
- *Maintain or enhance ecosystem health and indigenous biological diversity, maintain or enhance as far as practicable habitats of trout and salmon unless detrimental to indigenous biological diversity (Policy 3.1.9)*
- *Identify and protect or enhance, where degraded Otago's significant natural resources (Objective 3.2)*
- *Protect and enhance areas of significant indigenous vegetation and significant habitats of indigenous fauna (Policy 3.2.2).*

This proposal will result in the maintenance and enhancement of habitats of indigenous fauna. Broader catchment initiatives will enhance water quality within and downstream of these channels and waterways.

This proposal seeks to support economic and social well-being by ensuring water users have a sufficient reliability of supply to support a range of uses. The allocation proposed is based on an assessment of efficient use and will result in a reduction in allocation.

Accordingly, this application is considered generally consistent with the objectives and policies contained within this version of the RPS.

13.3 National Policy Statement on Freshwater Management (2014)

The NPSFM (2020) sets out the objectives and policies for freshwater management under the Resource Management Act 1991. It came into effect on 3 September 2020 and replaces the National Policy Statement for Freshwater Management 2014 (amended 2017).

Te Mana o te Wai

The fundamental concept underpinning the NPSFM (2020) is Te Mana o te Wai, recognising the fundamental importance of water and the health of water in protecting the health and well-being of the wider environment. Within the context of the NPSFM this encompasses 6 principles relating to the roles of tangata whenua and New Zealand in the management of freshwater and the implementation of the NPSFM.

These principles are (at 1.3(4))

> *"(a) **Mana whakahaere**: the power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater*

*(b) **Kaitiakitanga:** the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations*
*(c) **Manaakitanga:** the process by which tangata whenua show respect, generosity, and care for freshwater and for others*
*(d) **Governance:** the responsibility of those with authority for making decisions about freshwater to do so in a way that prioritises the health and well-being of freshwater now and into the future*
*(e) **Stewardship:** the obligation of all New Zealanders to manage freshwater in a way that ensures it sustains present and future generations*
*(f) **Care and respect:** the responsibility of all New Zealanders to care for freshwater in providing for the health of the nation."*

The NPSFM (2020) also sets out (at 1.3(5) and at Objective 2.1) a hierarchy of obligations and an objective for Te Mana o Te Wai that prioritises:

"(a) first, the health and well-being of water bodies and freshwater ecosystems
(b) second, the health needs of people (such as drinking water)
(c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future."

The development of this proposal has been based on these principles and obligations. The starting point has been to gain an understanding of the health of waterbodies and freshwater ecosystems, and then to assess the needs of people (primarily in terms of water quality within the context of this application), before assessing social, economic and cultural well-being.

The applicants anticipate that tangata whenua will exercise mana whakahaere, kaitiakitanga and manaakitanga through this process.

On behalf of all permit holders (including the applicants) in the Manuherekia catchment, OWRUG and MCG invited local Runaka to visit the catchment and extended a specific invitation to local Runaka to discuss how best to progress and develop a proposal for the catchment. The focus of the assessment undertaken by Hickey and Olsen (2020) draws on discussions with science staff from Aukaha about values within the Manuherekia catchment.

A number of the principles set out for Te Mana o te Wai are directly relevant to Councils in giving effect to the NPSFM (for example through the plan making processes), as they focus on tangata whenua's authority and responsibility and actions, as well as governance by the council. However, the principles are more difficult for an applicant to give effect to through a resource consent process. The principles that can be achieved by an applicant are stewardship, care and respect. The whole of catchment approach taken by MCG (of which the applicants are members) is premised on these principles. The initiatives to improve water quality within the Lauder Creek catchment also speak to these principles.

Clause 1.6 of the NPSFM requires the use of the best information available. A hierarchy is set up in terms of 'best information' starting with complete and scientifically robust data (1.6(1)) and then information obtained from modelling, partial data, local knowledge (1.6(2)). This application is based on scientifically robust data where it is available (refer to Appendix D) and is also based on local knowledge, given the complexity of the hydrology and set up of the applicants takes and systems. With the complexities involved, local knowledge is a vital component to understanding water management within the catchment and the effects of water management.

Policies for freshwater management to achieve Te Mana o te Wai and the Objective 2.1 are listed in 2.2 of the NPSFM (2020).

Policy 1 – Te Mana o te Wai

> *Policy 1: Freshwater is managed in a way that gives effect to Te Mana o te Wai.*

This proposal aims to enhance the health of the subject waterways and to restore and preserve the balance between water, the wider environment and the community by identifying and considering the values within, or associated with affected waterways, starting with ecological values. The health of freshwater will be sustained (for present and future generations) through a range of measures including setting of flow limits, reduction in allocation, changes to the location of intake structures, fish screening and on-farm and catchment initiatives relating to water quality.

Policy 2 – Tangata whenua

> *Policy 2: Tangata whenua are actively involved in freshwater management (including decision making processes), and Māori freshwater values are identified and provided for.*

The applicants are part of both OWRUG and MCG. These groups have approached Aukaha and local Rūnaka in the process of developing the proposal for the Manuherekia catchment including invitations to catchment field days (including Lauder Creek) and discussions about values of significance to Kāi Tahu. This application identifies Māori freshwater values, and actively seeks to provide for them by taking a holistic approach to the catchment, retaining sufficient in-stream flows where appropriate, protecting the habitat of indigenous freshwater species and improving water quality.

Policy 3 – Integrated management

> *Policy 3: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.*

This application includes considerations of the effects of using this water in this catchment. The applicants' commitment to ongoing improvements in farm management practices and compliance with the NESF and stock exclusions regulations address the management of freshwater in an integrated way.

Policy 4 – Climate Change

> *Policy 4: Freshwater is managed as part of New Zealand's integrated response to climate*

change.

The potential effects of climate change on this catchment have been considered as part of this proposal and is discussed in more detail in Section 16. The dams within the catchment will assist with addressing the effects of climate change in the long term.

Policy 5 – National Objectives Framework

Policy 5: Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.

These applications are made prior to the development of a planning framework under the National Objectives Frameworks set out in the NPSFM (2020), or any earlier NPSFM.

Policy 7 – Loss of extent and values

Policy 7: The loss of river extent and values is avoided to the extent practicable.

Clause 3.21 of the NPSFM (2020) defines 'loss of value' as meaning that a river is less able to provide for any value identified under the NOF process or any of:

i. Ecosystem health
ii. Indigenous biodiversity
iii. Hydrological functioning
iv. Māori freshwater values
v. Amenity

The words "loss" and "less" imply a comparison, but it is not clearly stated what the comparison is with – a common sense reading is that it must be 'loss' as opposed to the existing state of the values identified, particularly as the compulsory values are expressed in terms of current state i.e. the extent to which a waterway supports a value, not the extent to which a waterway would have supported a value. As the NOF process must include identification of all compulsory values in Appendix 1A of the NPSFM, there is some overlap with the values identified in Clause 3.21(i) to (v).

This proposal seeks to maintain and enhance the values associated with the subject waterways and is not anticipated to result in the loss of values.

This proposal may result in some loss of value to irrigation, cultivation and food production through a reduction in reliability of supply through flow limits. While this is inconsistent with this policy, it is consistent with the NPSFM's (2020) overarching hierarchy of obligations in Te Mana o te Wai.

This proposal will not result in loss of the extent of a waterway.

Overall, this proposal is considered to be generally consistent with this policy.

Policy 9 – Indigenous species

Policy 9: The habitats of indigenous freshwater species are protected.

Habitat requirements for the species present have been assessed as part of the development of this application (refer to Section 13.4 and Appendix D). The proposed flow regime will require permit holders to maintain flows within the mainstem and tributaries of Lauder Creek, and the proposed fish screening will prevent entrainment of fish in on-farm irrigation systems and infrastructure. Combined, these measures are anticipated to avoid or mitigate the potential effects of abstraction on ecology within the subject waterways, and therefore protect of the habitat for the indigenous species present. They will be further protected through on farm and wider catchment initiatives protecting water quality.

Policy 10 – Trout and Salmon

Policy 10: The habitat of trout and salmon is protected, insofar as this is consistent with Policy 9.

Brown trout are known to be widespread in the Lauder Creek catchment and are thought to provide a recruitment mechanism for the regionally significant Manuherekia River fishery. However, as detailed in Section 13.4, Central Otago roundhead galaxias (CORG) are known to represent a significant contribution to the indigenous biodiversity of the Lauder Creek catchment.

Care has been taken to balance the management objectives for the species present, however, on balance, priority has been placed on the protection of habitat of any remnant CORG population in the mainstem of Lauder Creek.

Policy 11 - Allocation and efficiency

Policy 11: Freshwater is allocated and used efficiently, all existing over-allocation is phased out, and future over-allocation is avoided.

Over-allocation is defined in the NPSFM (2020) as a situation where resource use exceeds a limit or if limits have not been set, an FMU or part of an FMU is degraded or degrading. This proposal addresses historic degradation by proposing an allocation limit and flow limits (including residual and minimum flows where appropriate) which will avoid abstraction from drying out Lauder Creek tributaries where flow is more reliable, and retaining sufficient flow in these channels to provide for ecological values.

With regard to efficiency, water abstraction and use affected by this proposal has been assessed based on the ORC's existing approach to assessing efficiency, as contained in Aqualinc (2017).

Conversion to more efficient irrigation has occurred or is proposed on all of the applicants' properties. For some, conversion to more efficient irrigation is reliant on sufficient certainty in terms of access to water, particularly with respect to the length of permits.

This means that while further improvements to efficiency can occur within the catchment, these will only be able to occur with a longer term of consent and sufficient reliability of supply.

Overall, based on the factors outlined above, the approach taken to allocation and efficiency with this proposal is considered to be consistent with this policy.

Policy 12 – Water Quality

> *Policy 12: The national target (as set out in Appendix 3) for water quality improvement is achieved.*

The applicants are committed to improving water quality within the catchment, as described in Section 12. These measures are anticipated to improve water quality within the Lauder Creek sub-catchment.

Policy 15 – Social, economic and cultural wellbeing

> *Policy 15: Communities are enabled to provide for their social, economic, and cultural wellbeing in a way that is consistent with this National Policy Statement.*

This proposal has been developed to enable the affected community to provide for its social, economic and cultural wellbeing whilst first prioritising the health and well-being of the wider environment. It does so by first understanding and seeking to protect instream ecology and natural values.

Overall, this application is considered to be consistent with the relevant policies in the NPSFM (2020).

13.4 Resource Management (National Environmental Standards for Freshwater) Regulations 2020

The Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (referred to here as the NESF). The NESF regulates activities that pose risk to the health of freshwater and freshwater ecosystems.

The NESF come into force on 3 September 2020, although clauses relating to intensive winter grazing, stocking holding areas other than feedlots and application of synthetic nitrogen fertiliser to pastoral land come into force in mid-2021.

At the time of lodging these applications, regulations had been very recently released, with some aspects not yet in force.

The applicants are currently working to understand the implications of the NESF (2020) on their operations. Many already have farm environmental plans and will be updating these to incorporate a freshwater farm plan component, although at this stage there are no appointed certifiers and no clear certification process, as this is still being developed (refer to the RMA Amendment Bill below). If the FFP process is not in place by the winter of 2021, the applicants may need to apply for a resource consent.

Where consents are required, these will be applied for separately by each individual applicant, once a clearer understanding of the implications of the NESF (2020) is reached.

13.5 Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007

The NES for Sources of Human Drinking Water (2007) sets requirements for protecting sources of human drinking water from becoming contaminated. This is not considered relevant to any of the activities applied for as part of this proposal.

13.6 Resource Management (Stock Exclusion) Regulations 2020

These regulations set out stock exclusion rules which came into force on 3 September, but will be phased in over time as set out below. Stock means beef cattle, dairy cattle, dairy support cattle, deer or pigs. The rules do not apply to sheep. The rules are summarised below:

Regardless of slope:

- From 2023 all dairy cattle must be excluded from lakes and rivers more than 1 metre wide and all dairy support from 2025.
- From 2023 all cattle and deer must be excluded from lakes and rivers more than 1 metre wide, where land is used for fodder-cropping, break-feeding or grazing on irrigated pasture.
- Wetlands already identified in a regional or district plan must have cattle, deer and pigs excluded by 1 July 2023. Otherwise, cattle, deer and pigs must be excluded by 1 July 2025.

On land mapped as 'low slope' by MFE (less than 10 degrees slope):

- beef cattle and deer must be excluded from lakes and rivers more than 1 metre wide by 1 July 2025.

If animals have to cross the waterway, they can only do so via a dedicated bridge or culvert or only cross (with supervision) twice within one month. Overall, culverts are already in place on applicant properties, and the applicants will check to ensure that these are all that are required.

Stock required to be set back from the edge of the lake or river (outlined above) must be setback by 3 metres. Extensively farmed beef on land not mapped as low slope are not required to exclude animals from lakes and rivers. The regulations have significant implications for many pastoral farms within the Manuherekia catchment, as many properties extensively fall within the 'low slope' mapping areas identified by the Ministry for the Environment, including the applicants' properties.

If there is already a fence in place by 3 September 2020 that excludes animals from the waterway, the existing fence can remain in place (even if it is closer than 3 metres from the edge of the waterway).

The applicants have direct responsibility for compliance with these regulations. The applicants have fenced large proportions of waterways within their properties and will continue to do so, and all new setbacks will be in compliance with the requirements of these regulations.

13.7 Resource Management (Measurement and Reporting of Water Takes) Regulations 2010

These regulations are directly relevant to the applications within this proposal. The regulations impose minimum requirements on the holders of certain water permits to keep and provide records of fresh water taken under the permits. All permits are required to be compliant with these regulations, and conditions of consent are included to this end. All applicants have monitoring of takes in place although some of the monitoring has been undertaken manually after approval from the ORC to do so in the past. All records are supplied electronically.

13.8 Kāi Tahu Policy Documents

13.8.1 Kāi Tahu Ki Otago Natural Resource Management Plan (2005).

The four Papatipu Rūnaka of Otago developed the Kāi Tahu Ki Otago Natural Resource Management Plan (2005). This is the principle planning document for Aukaha, a consultancy service acting on behalf of these Rūnaka.

The kaupapa of the plan is "Ki Uta Ki Tai", "Mountains to the Sea". This emphasises holistic management of the interrelated elements within and between catchments, from the air and atmosphere to the land and the coastal environment (p11). The over-arching principles governing this document include that of manawhenua, kaitiakitaka (guardianship, care, and wise management) and the protection of Mauri, or the protection of the life-giving essence of an ecosystem.

This document identifies issues for the Otago Region as a whole, and these include damming, over-allocation of water and inefficient use of water, lack of water harvesting, long duration of water take consents (refer 5.3.2 Wai Māori General Issues).

Relevant objectives and policies focus on recognition of cultural and spiritual significance of water to Kāi Tahu, protection and restoration of the mauri of all water, only granting the amount of water necessary for the proposed use of water and the efficient use of water (refer 5.3.4 Wai Māori).

Relevant policies at 5.3.4 include the following:

Water Extractions:

Policy 22.To require that resource consent applicants seek only the amount of water actually required for the purpose specified in the application.

Policy 23. To require that all water takes are metered and reported on, and information be made available upon request to Kāi Tahu ki Otago.

Irrigation:

Policy 26. To encourage those that extract water for irrigation to use the most efficient method of application. Flood irrigation, border dyke and contour techniques are less likely to be supported than spray irrigation techniques.

Policy 27.To require that a consent term for water extractions for irrigation be of 5-10 years where Kā Papatipu Rūnaka considers the method of irrigation to be inefficient to allow for an upgrade to a more efficient method

This proposal is based on an assessment of the amount of water required for the purpose of use, including by assessing irrigation needs using Aqualinc (2017). A large proportion of irrigation by these applicants uses efficient methods. The water takes are monitored and the data is publicly available from the ORC.

13.8.2 Te Runanga o Te Ngāi Tahu's Freshwater Policy

Kāi Tahu's Freshwater Policy provides an indication of the issues and values relating to freshwater management that are of particular concern to Kāi Tahu and the interested Papatipu Runanga.

Values identified in the Freshwater Policy that can be affected by abstraction/diversion include:

- Mauri – life-giving essence of a resource. Maintenance and enhancement of Mauri is identified as the primary management principal for Kāi Tahu. One method of doing so is the establishment of minimum flow levels that afford protection to instream values
- Kaitiakitanga – responsibility for the preservation of the integrity of valued waterways
- Rahui – places where restrictions were placed on an area or resource for a given purpose the prohibits a specific human activity.

Water quantity is one of the key issues identified for freshwater. A number of objectives and policies are included within the Freshwater Policy to ensure values of importance are protected. These emphasise the importance of protecting, maintaining and restoring the Mauri of waterways, and Mahinga Kai, as well as the identification and protection of Wahi Tapu sites and the support and facilitation of Kaitiakitanga.

Effects on these values were considered in detail in Section 12 of this document above. A range of measures are proposed to avoid or mitigate effects on these values, including residual and minimum flows, reduced allocation, fish screens and work to improve water quality. These measures are intended to recognise and protect Kāi Tahu values, as outlined in Section 12 including enhancing the mauri of the waterway and protecting an endangered indigenous species.

13.9 Section 104D Particular Restrictions for Non-Complying Activities

Section 104D imposes particular restrictions for non-complying activities, as follows:

> *104D Particular restrictions for non-complying activities*
> *(1) Despite any decision made for the purpose of notification in relation to adverse effects, a consent authority may grant a resource consent for a non-complying activity only if it is satisfied that either—*
> *(a) the adverse effects of the activity on the environment (other than any effect to which section 104(3)(a)(ii) applies) will be minor; or*
> *(b) the application is for an activity that will not be contrary to the objectives and policies of—*
> *(i) the relevant plan, if there is a plan but no proposed plan in respect of the activity; or*
> *(ii) the relevant proposed plan, if there is a proposed plan but no relevant plan in respect of the activity; or*
> *(iii) both the relevant plan and the relevant proposed plan, if there is both a plan and a proposed plan in respect of the activity.*

Section 104D of the Act specifies that a resource consent for a non-complying activity must not be granted unless the proposal can meet one of two limbs. The limbs of Section 104D require either that the adverse effects on the environment will be no more than minor, or that the application is for an activity which will not be contrary to the objectives and policies of both the relevant plan and the relevant proposed plan. Only one of the two tests outlined by Section 104D need be met in order for Council to be able to assess the application under Section 104 of the Act.

As discussed in the overview of the assessment of effects, the activities associated with this proposal are anticipated to have no more than minor adverse effects. Therefore, the proposal passes the first 'gateway' test of Section 104D.

The second 'gateway' test of Section 104D requires consideration of both an operative plan (RPW) and a proposed plan (PC7).

The proposal is assessed as being generally consistent overall with relevant objectives and policies of the RPW.

The proposal is considered consistent with Objective 10A.1.1 of PC7 as it will provide long-term sustainable management of surface water. It is also consistent with Policy 10A.2.1 of PC7 and is only inconsistent with Policies 10A.2.2 and 10A.2.3 in that it seeks a long term of consent. On balance, the proposal is not considered contrary to PC7 because it achieves sustainable management and gives effect to Te Mana o Te Wai.

The application passes the second 'gateway' test because it is not *contrary* to the objectives and policies of either of the relevant plans.

In summary, the application passes both gateway tests in Section 104D of the Act. Therefore, consideration can be given to the granting of the consent and a full assessment of the application in accordance with Section 104 can be made.

13.10 Section 104 of RMA

Section 104 sets out those matters the consent authority must have regard to when considering a resource consent application.

104 Consideration of applications:

(1) When considering an application for a resource consent and any submissions received, the consent authority must, subject to Part 2, have regard to–

- *a) any actual and potential effects on the environment of allowing the activity; and*
- *ab) any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity; and*
- *b) any relevant provisions of—*
  - *i. a national environmental standard:*
  - *ii. other regulations:*
  - *iii. a national policy statement:*
  - *iv. a New Zealand coastal policy statement:*
  - *v. a regional policy statement or proposed regional policy statement:*
  - *vi. a plan or proposed plan; and*
- *c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.*

...

(2A) When considering an application affected by section 124 or 165ZH(1)(c), the consent authority must have regard to the value of the investment of the existing consent holder.

With regard to s104(1)(a), the actual and potential effects of allowing the activities proposed are considered in Section 16 of this application. Overall adverse effects are considered to be no more than minor.

With regard to s104(1)(ab), the application does not propose offsets and compensation.

With regard to s104(1)(b)(i) the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 are directly relevant to these applications and are considered in earlier in this section. The Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations (2007) has been considered as part of this proposal but is not considered directly relevant.

In terms of any other regulations under s104 (1)(b)(ii) the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 and the Resource Management (Stock Exclusion) Regulations 2020 are relevant to this application. These are addressed as part of this application.

With regard to s104(1)(b)(iii), the National Policy Statement on Freshwater Management (2020) is relevant to this application and has been considered.

Under s104(1)(b)(v) and (vi), the ORC Regional Policy Statement (RPS), the Partially Operative Regional Policy Statement and Proposed Regional Policy Statement (PRPS) are relevant to this application, as is the Regional Plan: Water for Otago (RPW) and the Proposed Water Permits Plan Change – Plan Change 7 (PC7) and Proposed Plan Change 8 (Water Quality) (PC8). These have all been considered in developing and assessing this application.

In terms of s104(2A), this application is affected by section 124, as it involves the replacement of existing consents within the ambit set out by section 124(1). This means that the value of the investment of the existing consent holders is a matter to which regard must be had in considering this application. The value of investments by each permit holder is outlined in each of their application sections within this document.

Under s104(1)(c) other relevant matters are considered to include Kāi Tahu policy documents relating to freshwater. These are addressed earlier in this Section.

13.11 Resource Management Act (RMA) Amendment Act 2020

The Resource Management Act (RMA) Amendment Act 2020 was passed on 30 June and has introduced to the RMA a provision for farm plans (Part 9A). This development was signalled as part of the Government's freshwater management announcements in May 2020.

These provisions do not yet apply. An Order of Council (made by the Governor-General) is needed to state which region, district, or part of New Zealand the new requirements apply to.

Further detail will be added through regulation, including timeframes for certification and audit, criteria for the appointment of certifiers and auditors, any fees payable, and content requirements.

13.12 Part 2 of RMA

For completeness, consideration is given to the ability of the proposal to meet the purpose of the Act, which is to promote sustainable management of natural and physical resources. The relevant sections are set out in Section 5, 6, 7 and 8 of the Act.

> ***Section 5** Purpose*
> *(1) The purpose of this Act is to promote the sustainable management of natural and physical resources.*
> *(2) In this Act, sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and*

communities to provide for their social, economic, and cultural well-being and for their health and safety while—
(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and
(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

With regard to Section 5, this application is considered to achieve sustainable management, as it enables social and economic well-being, whilst meeting the requirements of Section 5(2)(a)-(c). The retention of instream flows through flow limits ensures natural and physical resources will meet the needs of future generations. The proposal safeguards life supporting capacity by protecting habitat for galaxias and through the applicants' commitment to improving water quality through a range of measures. Adverse effects are also avoided or mitigated through the use of fish screens where appropriate. Cultural well-being will be provided for through the retention of instream flows.

***Section 6** Matters of national importance*
In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:
(a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:
(b) the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development:
(c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:
(d) the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers:
(e) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, and other taonga:
(f) the protection of historic heritage from inappropriate subdivision, use, and development:
(g) the protection of protected customary rights:
(h) the management of significant risks from natural hazards.

With regard to s6(a), the proposed activities are existing activities occurring in a catchment with a long history of water abstraction. The proposal is not anticipated to change the natural character of the subject waterways. The proposed activities are appropriate for their intended use in the proposed locations. Fencing and planting along the waterways may enhance their natural character, as will the retention of flows through flow limits.

With regard to s6(b) no outstanding natural landscapes are identified in the area affected by this application.

With regard to s6(c) no areas of significant indigenous vegetation or significant habitats of indigenous fauna have been identified as affected by this proposal. However, Lauder Creek does provide habitat for Central Otago roundhead galaxias, and residual flows are proposed to provide for this habitat where appropriate, given the endangered status of this species.

With regard to s6(d) public access is not adversely affected by this application.

With regard to s6(e), the relationship of Māori with the affected waterways is acknowledged and discussed in this application. The measures proposed by this application, including flow limits and fish screens will support values of importance to Māori within affected waterways.

With regard to s6(f), historic heritage is not affected by this application.

With regard to s6(g), there are no known protected customary rights relevant to this application.

With regard to s6(h), there are no significant risks from natural hazards relevant to this application.

Overall the application is considered to have recognised and provided for these matters.

> *Section 7. Other matters*
> *In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—*
> (a) *kaitiakitanga:*
> (aa) *the ethic of stewardship:*
> (b) *the efficient use and development of natural and physical resources:*
> (ba) *the efficiency of the end use of energy:*
> (c) *the maintenance and enhancement of amenity values:*
> (d) *intrinsic values of ecosystems:*
> (f) *maintenance and enhancement of the quality of the environment:*
> (g) *any finite characteristics of natural and physical resources:*
> (h) *the protection of the habitat of trout and salmon:*
> (i) *the effects of climate change:*
> (j) *the benefits to be derived from the use and development of renewable energy.*

This proposal is consistent with the requirements of Section 7 of the Act.

Kaitiakitanga and stewardship have been considered in Section 12 of this application and are provided for through the avoidance or mitigation of effects via a number of measures including residual and minimum flows, reduction in allocation and fish screens.

Regard has been given to the efficient use and development of natural and physical resources, with water use being assessed for efficiency. Further upgrades to efficient infrastructure will be able to occur if permits are replaced with a sufficient reliability of supply.

Amenity values have been considered in Section 12, with the conclusion that the proposed activity will have minimal adverse effects on amenity values.

The intrinsic values of ecosystems, and the maintenance and enhancement of the quality of the environment have also been given particular regard, as outlined in Section 12. The environment will be maintained as this application will result in the continuation of an existing activity, with known effects. Enhancement will also occur, including to intrinsic values, through the proposed mitigation measures.

While regard has been given to trout habitat, in order to protect indigenous species, priority has been given to the provision of habitat for galaxias, given their endangered species status.

The effects of climate change are unlikely to be felt until after the expiry of these permits, if long term permits are granted. The assessment in Section 12 assessed the effects of climate change as being less than minor – both to the proposed activities and as a result of the proposed activities.

> *Section 8: Treaty of Waitangi*
> *In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).*

The principles of the Treaty of Waitangi have been taken into account by this proposal by acknowledging and providing for Kāi Tahu values. These values are acknowledged and taken into account in Sections 12 and Section 13 of this proposal.

14. Consideration of Alternatives

A consideration of alternatives has not been undertaken on the basis that the adverse effects of the activities have been assessed as no more than minor.

15. Consultation

The applicants are part of the OWRUG and MCG, and as such are part of ongoing discussions with a range of stakeholders groups, including DOC, Fish and Game, Aukaha, and Central Otago Environmental Society on issues associated with the Manuherekia catchment and future management of the catchment.

Meetings were held with Department of Conservation in 2019 to locate sites to be surveyed that may present suitable galaxiid habitat for protection.

Further consultation will occur with any parties identified as affected parties after lodgement of this application. The Department of Conservation, Fish and Game Otago and Aukaha are considered to be affected parties to this application.

16. Term of Consent and Lapse Period

The applicants request a term of 35 years for all replacement consents that form part of this application. This request is based on the rationale set out in relation to Policy 6.4.19 in Section 17 of this application.

Given that the permits being replacement by this application are likely to have expired prior to new permits being issued, the replacement permits are unlikely to utilise a lapse period, and so there is no need for one to be specified, or a 2 year lapse period will be sufficient.

17. Notification

The applicants request the proposal is publicly notified.

18. Appendices

Appendix A: Certificates of Title

Appendix B: Record of ORC Meeting Minutes

Appendix C: Draft Permits and Conditions of Consent

Appendix D: Hydrology, Ecology, Water quality report

Appendix E: WRM 2020

Appendix F: Water Demand Methodology

Appendix G: Memo from Freshwater scientist Dean Olsen

Appendix H: Section 417 Certificates

Appendix I: Legal Description of land where water will be used for OAIC, Viewpoint and Brown permit

Appendix J: OAIC Scheme Management Plan

Appendix K: Total water demand for properties and water sources

Lauder Sub-catchment Meeting Minutes
Held 6 August 2020

In attendance:
ORC: Natasha Pritchard, Pete Ravenscroft, Vicky Swaney
Incite: Angela Fenemor, Adele Dawson
McKeague Consultancy: Suzie McKeague, Ros Day,
Richard Allibone
Kelly Heckler – water user

Apologies:

Item	Subject
1	***Overview of sub-catchment*** *Suzie/ Ros* • List of permits has been sent out. Farmers set up water user group over 2 years ago and have been working steadily to obtain an understanding of the creek and have applications that are robust. • *Question* - is everyone part of the water user group or are there one or two outside of group – some have already replaced their consents but have still participated in flow sharing to achieve residual flow at bottom of creek. • **Key values** – is not a fishing creek, and although it is an attractive area it is not somewhere people would come to have picnic – used more by locals. • There are trout and other species in water, but no valuable *galaxias*. • Highly valued for stock and irrigation water. Had an iwi hui but no specific information. • Lauder Creek is free flowing and in natural state • *Pete* - There have been *galaxias* spotted at one or two sites but he hasn't been back to see if still there. Would like to conduct survey in low flows. Kelly noted there is about a three week window due to lambing when access will be limited. Pete said that ideally they wait untill Christmas but this will be too late. • Richard was checking map – several records of galaxias, gaps in main stream
2	***Consent requirements*** • No dam permits required - all water/deemed permits • Ros/Susie looking for assurance will follow approach within Long Gully decision. Natasha noted that guidance notes will be available in upcoming weeks. • Ros/Susie seeking approach from ORC on assessing water take data – if different interpretation would be helpful to know. Do not know what the operative Plan Change 7 (PC7) will look like in respect to data assessment requirements. At the time of making a decision

	PC7 requirements could be different from those in the notified version. • Incite asked if takes will have fish screens – Not consistently. • Fish screens are often required where there are fish values to protect but are not always imposed i.e. they were not a condition for Long Gully.
3	***Science information/data*** • Matt Hickey is working with water users on hydrology and Ben on other parts of reports – not ready to discuss now. More confident with science data collected on Lauder than with Thomson at moment. • Incite – will new permits have standard condition - abide by allocation agreement. • Suzie advised people who are not in the water user group usually end up joining eventually as they see the benefits to everyone. • Have done trials to see if released water at top of catchment would reach bottom but it never got to the bottom of dry stretch. • All water users must have consistent approach.
5	***Other*** • Incite offered to look over draft application before lodgement – this will be a timing factor, going to be complicated and will take people time to piece it together. • Suzie explained how they may structure the application with an overview section and have more information in the company rights then private as they will have information on shareholders etc. • **Consultation -** Manuherekia catchment started consultation 3 years ago including site visits with Science team, Fish and Game etc. Response from iwi, they are difficult to get onsite. • Discussion on affected parties – will not be identified until application is lodged

Actions arising:

ACTION	RESPONSIBLE
1. Fish survey of Lauder Creek and Thomsons Creek to be undertaken in Sept/Oct or during low flows in Dec/Jan	Pete
2.	
3.	
4.	

1. Omakau Area Irrigation Company (OAIC), Viewpoint (Moran) and Brown

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: Omakau Area Irrigation Company *(73.2% share of volume)*
Address: C/-Checketts Mackay, 31 Tarbert Street, Alexandra

Applicant: Viewpoint Farm Ltd *(13.4% share of volume)*
Address: 411 Muddy Creek Road, RD 2, Lauder, Omakau

Applicant: IR and MA Brown *(13.4% share of volume)*
Address: 136 Brown Rd, RD 2, Omakau

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, water storage and stock water from the mainstem of Lauder Creek.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction:
Lauder Creek at the foot of the Dunstan Mountains

Point of Take map reference:
Take A: NZTM2000 E1333870 N5015279
Take B: NZTM 2000 E1334834 N5015169

Legal Description of land adjacent to points of take:
Lot 3 Deposited Plan 422600, Section 1 SO 24145, Sections 22-23 46 49, Block V Section 15 Block X Lauder SD

Legal Description of land where water will be used:
See attached table in Appendix J of the main application

Conditions
Specific

1. This permit shall not commence until Deemed Permits 2001.710 and WR432B have been surrendered or expired.

2. When Take Point B is operational, Take Point A abstraction must not exceed:
   a. Rate of take: 424.5 l/s
   b. Monthly maximum volume: 1,112,518 m^3/month
   c. Annual maximum volume: 5,518,281 m^3/year. Abstracted between July 1 and 30 June the following year.

3. Take Point A (once Take Point B is closed)
    a. Rate of take: 450 l/sec
    b. Monthly maximum volume: 1,205,280 m^3/month
    c. Annual maximum volume: 6,996,957 m^3/year. Abstracted between July 1 and 30 June the following year.

4. Take Point B to be closed down within two years of consent issue
    a. Rate of take: 112 l/sec
    b. Monthly maximum volume: 289,315.8 m^3/month
    c. Annual maximum volume: 1,469,226 m^3/year. Abstracted between July 1 and 30 June the following year.

5. Fish Screen on Take Point A
    a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from the Lauder Creek.
    b. A report presenting the results of this report must be submitted by the consent holder to the consent authority within 1 year of the commencement of this consent.
    c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

6. No abstraction shall occur when flow in Lauder Creek at the OAIC weir is less than 100 l/s at all times.

7. While Take B is operational no abstraction shall occur when flow below the take B intake is less than 100l/sec

8. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

9. Water Management Agreement
    a) Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
        i. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
        ii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
        i. Outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body.
    b) The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all time.

Note:
Notice of Exemption WEX0119 applies to this permit.

2. Glassford, AW and KL

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: AW and KL Glassford Ltd

Address: Dougalston,
Glassford Rd,
RD 2 Omakau

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, water storage and stock water supply from two unnamed tributaries of the Lauder Creek locally known as Welshman's creek and Shepherds creek.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction:

I. Unnamed tributary of Lauder Creek locally known as Welshmans Creek

II. An unnamed tributary of Lauder Creek commencing in Sheppard's Gully, and terminating in Sluices Gully locally known as Shepherds Creek.

Point of Take map reference:

I. NZTM 2000 E1331243 N5016662

II. NZTM 2000 E1332467 N5014317

Legal Description of land adjacent to points of take:
Lot 3 Deposited Plan 422600, Section 1 SO 24145, Sections 22-23 46 49, Block V Section 15 Block X Lauder SD

Legal Description of land where water will be used:
LOT 2 DP 337168, Section 8 38 44 54-56, Part Section 33 37, Block VI, Section 9 10 12-14, Part Section 35 Block X, Lauder SD.

Conditions
Specific

1. This permit shall not commence until Deemed Permits WR380B, WR382B.V1 and WR378B.V1 have been surrendered or expired.

2. The combined abstraction must not exceed:

a. Rate of take: 125 l/s
b. Maximum monthly volume: 199,666 m^3/month
c. Maximum annual volume: 1,163,188 m^3/year. Abstracted between September 1 and 31 May the following year.

3. Fish Screen
    a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from the Lauder Creek.
    b. A report presenting the results of this report must be submitted by the consent holder to the consent authority within 1 year of the commencement of this consent
    c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

4. No abstraction shall occur from Shepherds Creek when flow in Shepherd Creek (unnamed tributary of Lauder Creek) at the point of take when flow below the point of take is not visible.

5. No abstraction shall occur from Welshmans Creek when flow in Welshman Creek (unnamed tributary of Lauder Creek) at the point of take is less than 10 l/s.

6. No abstraction shall occur from either Welshman or Shepherds Creek when flow in Lauder Creek at the OIAIC weir is less than 100 l/s.

7. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

8. Water Management Agreement
    a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
        ii. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
        iii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
        iv. Outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body.
    b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

Note:
Notice of Exemption WEX0152 applies to this permit.

3. Heckler Family

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: James Phillip Murray Heckler

Address: Lauder Creek,
617 Glassford Road,
RD2, Omakau

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, water storage and stock water supply from mainstem of the Lauder Creek.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: Mainstem of Lauder Creek, Omakau

Point of Take map reference: Take Point A NZTM 2000 E1333132 N5015721
Take Point B NZTM 2000 E1334671 N5014994

Legal Description of land adjacent to point of take: Run 226G, Block X, Lauder SD

Legal Description of land where water will be used:
LOT 3 Deposited Plan 422600, Section 1 SO 24145, Section 22-23 46 49 Block V, Section 15 Block X, Lauder SD

Conditions
Specific

1. This permit shall not commence until Water Permit 94548 and Deemed Permit 96779 have been surrendered or have expired.

2. Abstraction at take point B will cease within one year of consent issue
   a. Rate of take: 27.7 l/sec
   b. Maximum Monthly Volume: 40,034 m^3
   c. Maximum Annual Volume: 211,073 m^3 Abstracted between July 1 and 30 June the following year.

3. The combined abstraction at take point A and B must not exceed:

   a. Rate of take: 83.4 l/s
   b. Maximum Monthly Volume: 157,034 m^3/month

c. Maximum Annual Volume: 1, 599,209 m^3/year. Abstracted between July 1 and 30 June the following year.

4. Fish Screen

    a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from the Lauder Creek.
    b. A report presenting the results of this report must be submitted by the consent holder to the consent authority within 1 year of the commencement of this consent
    c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

5. No abstraction shall occur when flow in Lauder Creek at the OIAIC weir is less than 100 l/s.

6. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

7. Water Management Agreement
    a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
        i. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
        ii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
        v. Outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body.
    b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

4. Viewpoint Farm Ltd, Moran Family

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: Viewpoint Farm Ltd

Address: 411 Muddy Creek Road
RD 2, Lauder
Omakau

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, water storage and stock water supply from Clear Creek.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction:
Lauder Creek at the foot of the Dunstan Mountains

Point of Take map reference: NZMS 260 G41:438-770

Legal Description of land adjacent to point of take:
LOT 3 DP 422600, Section 1 SO 24145, Section 22-23, 46, 49 Block V, Section 15 Block X, Lauder SD

Legal Description of land where water will be used:
Section 20, 25, 47 Block V Lauder SD

Conditions
Specific

1. This permit shall not commence until Water Permit 2002.071 has been surrendered or expired.

2. The combined abstraction must not exceed:
   a. Rate of take: 56 l/s
   b. Maximum Monthly Volume: 169,188.3 m^3/month
   b. Maximum Annual Volume: 584,963.1 m^3/year. Abstracted between July 1 and 30 June the following year.

3. Fish Screen
   a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from Clear Creek.

b. A report presenting the results of this report must be submitted by the consent holder to the consent authority within 1 year of the commencement of this consent
c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

4. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

5. Water Management Agreement
   a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
      i. Outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body.
   b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

5. Avonrath, Geoff Clouston

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: Geoffrey Thomas Clouston

Address: Avonrath,
Shephard Road
Lauder
RD 2, Omakau

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, water storage and stock water supply from the mainstem of the Lauder Creek.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: Mainstem of Lauder Creek

Point of Take map reference: NZTM 2000 E1338898 N5012697

Legal Description of land adjacent to point of take:
Lot 2 Deposited Plan 329435, Section 5, 13, 16, 21, Part Section 4 Block V Lauder SD

Legal Description of land where water will be used:
Lot 2 Deposited Plan 329435, Section 5, 13, 16, 21, Part Section 4 Block V Lauder SD

Conditions
Specific

1. This permit shall not commence until Water Permit RM19.448.01 has been surrendered or expired.

2. The combined abstraction must not exceed:
   a. Rate of take: 56 l/s
   b. Maximum Monthly Volume: 145, 152 m^3/month
   c. Maximum Annual Volume: 769,369 m^3/year. Abstracted between July 1 and 31 August the following year.

3. Fish Screen

a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from the Lauder Creek.
b. A report presenting the results of this report must be submitted by the consent holder to the consent authority within 1 year of the commencement of this consent
c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

4. No abstraction shall occur when flow in Lauder Creek at the Rail Trail Flow Site is less than 100 l/s.

5. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

6. Water Management Agreement
   a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
      i. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
      ii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
      iii. outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body
   b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: Geoffrey Thomas Clouston

Address: Avonrath,
Shephard Road
Lauder
RD 2, Omakau

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, water storage and stock water supply from the mainstem of the Lauder Creek.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: Main stem of Lauder Creek

Point of Take map reference: NZTM 2000 E1340549 N5011435

Legal Description of land adjacent to point of take:
Sec 5, Block V, Lauder SD

Legal Description of land where water will be used:
Lot 2 Deposited Plan 329435, Section 5, 13, 16, 21, Part Section 4 Block V Lauder SD

Conditions
Specific

2. This permit shall not commence until Deemed Permit 98122 has been surrendered or expired.

3. The combined abstraction must not exceed:
   a. Rate of take: 55.56
   b. Maximum Monthly Volume: 111,951 m^3/month
   c. Maximum Annual Volume: 440,119.73 m^3/year. Abstracted between July 1 and 31 August the following year.

3. Fish Screen
   a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from the Lauder Creek.

b. A report presenting the results of this report must be submitted to the consent authority by the consent holder within 1 year of the commencement of this consent
c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

4. No abstraction shall occur when flow in Lauder Creek at the Rail Trail Flow Site is less than 100 l/s.

5. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

6. Water Management Agreement
   a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
      i. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
      ii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
      iii. outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body
   b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: Geoffrey Thomas Clouston

Address: Avonrath
Shephard Road
Lauder
RD 2, Omakau

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, water storage and stock water supply from the mainstem of the Lauder Creek.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: An unnamed tributary of Lauder Creek, approximately 4 kilometres south west of Becks in the Manuherikia Valley, Central Otago.

Point of Take map reference: NZTM 2000 E1340128 N5010000

Legal Description of land adjacent to point of take:
Pt Sec 4 Blk V Lauder SD

Legal Description of land where water will be used:
Lot 2 Deposited Plan 329435, Section 5, 13, 16, 21, Part Section 4 Block V Lauder SD

Conditions
Specific

1. This permit shall not commence until Water Permit 2004.788 has been surrendered or expired.

2. The combined abstraction must not exceed:
    a. Rate of take: 22 l/s
    b. Maximum Monthly Volume: 40,000 m^3/month
    c. Maximum Annual Volume: 360,000 m^3/year. Abstracted between July 1 and 31 August the following year.

3. Fish Screen installed on the pipe intake to the centre pivot.

4. No abstraction shall occur when flow in Lauder Creek at the Rail Trail Flow Site is less than 100 l/s.

5. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

6. Water Management Agreement

    a. Water taken under this permit, including any subsequent variations of this permits, must be taken in accordance with a Water Agreement that:
        i. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
        ii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
        iii. outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body
    b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Geoffrey Thomas Clouston

Address: Avonrath
Shephard Road
Lauder
RD 2, Omakau

To dam water within an un-named tributary of Lauder creek for the purpose of storing water for irrigation.

For a term expiring: *[35 years from date of issue]*

Location of activity: An unnamed tributary of Lauder Creek, approximately 4 kilometres south west of Becks in the Manuherikia Valley, Central Otago.

Map reference: NZMS 260 G41:499-718

Legal Description: Pt Sec 4 Block V Lauder SD

Conditions

Specific

1. This permit shall not commence until Water Permit 2004.787 has been surrendered or expired.
2. No lawful take shall be adversely affected by the result of damming water.
3. The damming of water shall not cause flooding, erosion, land instability, sedimentation or property damage of another person's property.
4. The consent holder shall maintain the dam and associated outlet in a safe and stable condition.

Review

5. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions of this consent within 3 months of each anniversary of the commencement of this consent for the purpose of:

a. determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; or

6. CA & CE Booth

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: Clive Allen Booth and Elizabeth Claire Booth

Address: PO Box 5491
Dunedin

Purpose: To take and use surface water as primary allocation for the purpose of irrigation and stock water supply from the mainstem of the Lauder Creek.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: Mainstem of Lauder Creek

Point of Take map reference: NZTM 2000 E1340187 N5008610

Legal Description of land adjacent to point of take:
Lot 2 Deposited Plan 474116 Section 58 Block V Lauder SD

Legal Description of land where water will be used:
Lot 1, Deposited Plan 545384, Section 58, Block V, Lauder SD

Conditions
Specific

1. This permit shall not commence until Deemed Permit 93447.V2 has been surrendered or expired.

2. The combined abstraction must not exceed:
   a. Rate of take: 29.16 l/s
   b. Maximum Monthly Volume: 28,500 m^3/month
   c. Maximum Annual Volume: 90,006 m^3/year. Abstracted between July 1 and 30 June the following year.

3. Fish Screen
   a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from the Lauder Creek.

b. A report presenting the results of this report must be submitted to the consent authority by the consent holder within 1 year of the commencement of this consent
c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

4. No abstraction shall occur when flow in Lauder Creek at the Rail Trail Flow Site is less than 100 l/s.

5. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

6. Water Management Agreement
   a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
      i. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
      ii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
      iii. outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body
   b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

7. Phada Industries Ltd

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: Phada Industries Limited

Address: 55 Theodosia Street
Timaru

Purpose: To take and use surface water as supplementary allocation for the purpose of irrigation, water storage and stock water supply from the mainstem of the Lauder Creek.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: Mainstem of Lauder Creek

Point of Take map reference: NZTM 2000 E1339913 N5008301

Legal Description of land adjacent to point of take:
Lot 1 DP 504497

Legal Description of land where water will be used:
Lot 1 Deposited Plan 504497, Lot 1 Deposited Plan 474827, Lot 1 Deposited Plan 474116, Part Lot 1 Deposited Plan 24694 Part Lot 5 Deposited Plan 17393

Conditions
Specific

2. This permit shall not commence until Water Permit RM18.030.02 has been surrendered or expired.

3. The abstraction of this permit must not exceed:
   a. Rate of take: 56 l/s
   b. Maximum Monthly Volume: 145,152 m^3/month
   c. Maximum Annual Volume: 300,000 m^3/year. Abstracted between July 1 and 30 June the following year.

4. Fish Screen
   a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from the Lauder Creek.

b. A report presenting the results of this report must be submitted to the consent authority by the consent holder within 1 year of the commencement of this consent
c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

5. No abstraction shall occur when flow in Lauder Creek at the Rail Trail Flow Site is less than 600 l/s.

6. No abstraction shall occur when flow in the Manuherikia River is less than the supplementary minimum flow at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

7. Water Management Agreement
   a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
      i. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
      ii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
      iii. outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body
   b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

8. Armstrong Family

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: James Armstrong Partnership

Address: 295 Lauder Flat Road
Becks
RD 2, Omakau

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, water storage and stock water supply from Millers Creek a tributary of Lauder Creek known locally as Mellors Creek

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: Millers Creek a tributary of Lauder Creek known locally as Mellors Creek, approximately 800 metres south west of the intersection of Becks School Road and Lauder Flat Road

Point of Take map reference: NZTM 2000 E1339998 N5012442

Legal Description of land adjacent to point of take:
Section 21 & 22 Block V Blackstone SD and Section 6 Block V Lauder SD

Legal Description of land where water will be used:
Sections 22-22, Block V, Blackstone SD
Section 6, Block V, Lauder SD

Conditions
Specific

8. This permit shall not commence until Deemed Permit 3707 has been surrendered or expired.

9. The abstraction of this permit must not exceed:
    a. Rate of take: 55.55 l/s
    b. Maximum Monthly Volume: 148,785 m^3/month
    c. Maximum Annual Volume: 657,547.2 m^3/year. Abstracted between July 1 and 30 June the following year.

10. Fish Screen
    a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from the Mellors Creek.
    b. A report presenting the results of this report must be submitted to the consent authority by the consent holder within 1 year of the commencement of this consent
    c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

11. No abstraction shall occur when flow in Lauder Creek at the Rail Trail Flow Site is less than 100 l/s.

12. No abstraction shall occur when flow in Millers Creek at the point of take is less than 10 l/s.

13. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

14. Water Management Agreement
    a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
        i. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
        ii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
        iii. outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body
    b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

Note:
Notice of Exemption WEX0001 applies to this permit.

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: James Armstrong Partnership

Address: 295 Lauder Flat Road
Becks
RD 2, Omakau

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, water storage and stock water supply from an un-named tributary of Lauder Creek.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: Unnamed tributary of Lauder Creek (Lower Creek)

Point of Take map reference: NZTM 2000 E1341578 N5011098

Legal Description of land adjacent to point of take:
Section 21-22 Block V Blackstone SD and Section 6 Block V Lauder SD

Legal Description of land where water will be used:
Sections 22-22, Block V, Blackstone SD
Section 6, Block V, Lauder SD

Conditions
Specific

1. This permit shall not commence until Water Permit 2002.399 has been surrendered or expired.

2. The abstraction of this permit must not exceed:
   a. Rate of take: 56 l/s
   b. Maximum Monthly Volume: 103,230 m^3/month
   c. Maximum Annual Volume: 304,999 m^3/year. Abstracted between 30 Sept and 31 May the following year.

3. Fish Screen
   a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from the Lauder Creek.

   b. A report presenting the results of this report must be submitted to the consent authority by the consent holder within 1 year of the commencement of this consent
   c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

4. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

5. Water Management Agreement
   a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
      i. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
      ii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
      iii. outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body
   b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: James Armstrong Partnership

Address: 295 Lauder Flat Road,
Becks
RD 2, Omakau

To dam water within an un-named tributary of Lauder creek for the purpose of storing water for irrigation.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: Unnamed tributary of Lauder Creek, approximately halfway along Brown Road and to the north of that road, Omakau

Map reference: ` NZTM 2000 E1341578 N5011098

Legal Description: Section 9, Block V, Blackstone SD.

Conditions

Specific

1. This permit shall not commence until Water Permit 2002.387 has been surrendered or expired.
2. The consent holders shall maintain a residual flow downstream of the dam at all times there is an inflow into the dam.
3. The Consent Holder must undertake a visual inspection of the integrity of the dam and its appurtenant structures every twelve months, beginning *[insert date]*. The visual inspection must identify any signs of scour, slumping and/or seepage on the crest, downstream face and toe of the dam's embankment. The results of this inspection, including representative photographs, must be forwarded to the Consent Authority within 2 months of inspection.

General

4. The damming of water must not cause flooding, erosion, land instability, sedimentation, or property damage of any other person's property.
5. The Consent Holder must ensure that the dam and all its appurtenant component and accessory structures must be operated and maintained to ensure that, at all times, they are structurally sound, pose no undue risk to human life, property, or the natural environment, and are able to perform satisfactorily to their approved design standard.

Review

6. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions of this consent within 3 months of each anniversary of the commencement of this consent for the purpose of:
    a. determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; or

9. Springburn Partnership – Tucker Family

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: Richard James Tucker

Address: Springburn,
Becks,
RD 2, Omakau

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, water storage and stock water supply from an un-named tributary of Lauder Creek known locally as Millers Creek

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: Millers Creek, locally known as Mellors Creek, approx. 5.4km Norwest of the intersection of Hamilton Rd and Glassford Rd, Becks, Central Otago

Point of Take map reference: NZTM 2000 E1336429 N5017513

Legal Description of land adjacent to point of take:
Sec 2 Block III and Block XII Lauder SD

Legal Description of land where water will be used:
Section 3 Block XII Lauder SD
Lot 2 Deposited Plan 22370 Sections 2, Block XIII Lauder SD
Lots 1 & 2, Deposited Plan 422600

Conditions
Specific

1. This permit shall not commence until Deemed Permit 98488 and 98572 have been surrendered or expired.

2. The combined abstraction of this permit must not exceed:
    a. Rate of take: 111.11 l/s
    b. Maximum Monthly Volume: 163,004.3 m^3/month

c. Maximum Annual Volume: 576,551.4 m^3/year. Abstracted between July 1 and 30 June the following year.

3. Fish Screen
    a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from the Mellors Creek.
    b. A report presenting the results of this report must be submitted to the consent authority by the consent holder within 1 year of the commencement of this consent
    c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

4. No abstraction shall occur when flow in Millers Creek (un-named tributary of Lauder Creek) at the point of take is less than 10 l/s.

5. No abstraction shall occur when flow in Lauder Creek at the Rail Trail Flow site is less than 100 l/s.

6. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

7. Water Management Agreement
    a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
        i. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
        ii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
        iii. outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body
    b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

Note:
Notice of Exemption WEX0138 applies to this permit.

10. Lilybank Company Ltd – Brad and Kirsty McEwan

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: Lilybank Company Limited

Address: 81 Becks School Road
RD2 Omakau

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, water storage and stock water supply from an un-named tributary of Lauder Creek known as Millers Creek.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: Millers Creek, approximately 2 kilometres upstream from the Becks School Road

Point of Take map reference: NZTM 2000 E1339791 N5014917

Legal Description of land adjacent to point of take:
Sections 44, 48. 54, Block V Lauder SD, Sections 58, 60, 65, 67 Block II Blackstone SD

Legal Description of land where water will be used:
Sections 44, 48. 54, Block V Lauder SD
Sections 58, 60, 65, 67 Block II Blackstone SD
Section 1 Block XII Lauder SD.

Conditions
Specific

2. This permit shall not commence until Deemed Permit 2000.644.V2 has been surrendered or expired.
3. The abstraction of this permit must not exceed:
    a. Rate of take: 55.56 l/s
    b. Maximum monthly volume: 130,636.8 m^3/month
    c. Maximum annual volume: 604,195.19 m^3/year. Abstracted between September 1 and 31 May the following year.

4. Fish Screen
    a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from the Millers Creek.
    b. A report presenting the results of this report must be submitted to the consent authority by the consent holder within 1 year of the commencement of this consent.
    c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

5. No abstraction shall occur when flow in Lauder Creek at the Rail Trail Flow Site is less than 100 l/s.

6. No abstraction shall occur when flow in Millers Creek (middle take) at the point of take is less than 10 l/s.

7. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

8. Water Management Agreement
    a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
        i. has been signed by the current consent holders of this permit and other permit holders in the Lauder Creek Water Users Group.
        ii. outlines how flows in the Lauder Creek and its tributaries shall be shared between consent holders, including at low flows.
        iii. outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body
    b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

11.Central Park Ltd – J O'Brien

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104D of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: Central Park Ltd

Address: 168 Duncan Road,
RD1, Bulls

Purpose: To retake from an un-named tributary of lauder creek for the purpose of irrigation, water storage and stock water supply.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: An un−named tributary of Lauder Creek

Point of Take map reference: NZTM 2000 E1338085 N5005457

Legal Description of land adjacent to point of take:
Lot 1 Deposited Plan 433629, Lots 1,2,4 Deposited Plan 17392, Sections 7 & 33, Part Sections 14, 23, 43, Block IV Lauder SD

Legal Description of land where water will be used:
Lot 1 Deposited Plan 433629, Lots 1,2,4 Deposited Plan 17392, Sections 7 & 33, Part Sections 14, 23, 43, Block IV Lauder SD

Conditions
Specific

1. This permit shall not commence until Water Permit 2002.768 has been surrendered or expired.
2. The retake abstraction of this permit must not exceed:
    a. Rate of Take: 28 litres/second
    b. Maximum monthly volume: 75,050 m^3/month.
    c. Maximum annual volume: 416,724 m^3/year. Abstracted between 1 September and 31 May the following year.
3. Fish Screen

a. The consent holder must commission an assessment by a suitably qualified person of the practicability of a fish screen on the take from an un−named tributary of Lauder Creek.
b. A report presenting the results of this report must be submitted to the consent authority by the consent holder within 1 year of the commencement of this consent
c. If the report concludes that a fish screen is practicable, the consent holder must install a fish screen within 1 year of submitting the report to the consent authority.

4. Abstraction at the point of take is only permissible when water is discharged to Doctors Creek for abstraction. Records from the consent holder or the OAIC Race Manager must show release of Main Race water to Doctors Creek when abstraction is occurring.

5. No abstraction shall occur when flow in the Manuherikia River is less than the minimum flow of 820 litres per second at the monitoring site Manuherikia River at Ophir. *[or other relevant operative minimum flow.*

6. Water Management Agreement
   a. Water taken under this permit, including any subsequent variations of this permit, must be taken in accordance with a Water Agreement that:
      i. outlines the flow sharing in the Manuherikia Catchment and is managed by the Manuherikia Catchment Group or any replacement body
      ii. has been signed by the current consent holders of this permit and other permit holders in the Manuherikia Catchment Group and the Lauder Sub Catchment Group
   b. The consent holder must ensure that the Consent Authority has a copy of the most up to date Water Agreement at all times.

Assessment of Environmental Effects of water abstraction from the Lauder catchment

By:

Matt Hickey, (Water Resource Management Ltd.)

Dean Olsen, Freshwater Scientist (Freestone Freshwater Ltd.)

Prepared for Lauder Creek Catchment Group

December 2020

by Matt Hickey & Dean Olsen

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Executive Summary

Lauder Creek is a significant tributary of the Manuherikia River entering on the true right bank at Lauder. The observed natural 7-day MALF upstream of all takes is 325 l/s with the lowest observed natural daily average flow being 228 l/s. Observed flows below all water takes shows that Lauder Creek can be dry due to abstraction in dry seasons.

Concentrations of NNN and ammoniacal nitrogen in Lauder Creek are low while DRP concentrations observed in Lauder Creek at Rail Trail are elevated. As a result, there is an elevated risk of nuisance growths of periphyton developing.

There is insufficient *E. coli* data is available for both sites in Lauder Creek, meaning that it is not possible to assess the suitability of either sites for contact recreation (i.e. primary or secondary contact).

Water clarity in Lauder Creek at the Cattle Yards sites was good (3.5 m), meaning that concentrations of suspended solids are expected to be having a minimal impact on instream biota. Meanwhile, water clarity is reduced at the Rail Trail site (median turbidity = 5.2 NTU, median estimated clarity = 0.94 m), which can affect many aspects of the stream ecosystems.

The water quality observed in the lower Lauder Creek appears to be affected by flood irrigation methods within the wider catchment. The conversion of irrigation from flood to spray methods is expected to result in significant improvements to water quality in the Lauder Creek catchment, with reductions in phosphorus, sediment and microbial contamination anticipated.

Monitoring indicates that the middle reaches of Lauder Creek are naturally intermittent with large losses to ground causing it to dry. Observations indicate that water lost to ground resurfaces further down the catchment.

There are 18 existing primary water take permits and one retake permit in the catchment consented to take up to 1435[1] l/s. Historically there has been few takes in the catchment with residual flows set to provide for ecological values and there has been no agreement between water users to roster to maintain flows in the lower reaches of Lauder Creek.

Based on the NIWA freshwater fish database Lauder Creek has one species of threatened fish, the Central Otago roundhead galaxias and two other species of native fish that have been recorded more than once (upland bully and longfin eel) and brown, rainbow and brook trout have been recorded in the catchment.

This report proposes residual flows (summarised in Table 1), a water sharing regime and a change in water take infrastructure to provide a flow regime to provide for the ecological values present in Lauder Creek.

[1] The retake is 28 l/s

Table 1. Summary of primary take consents and proposed residual flows for ecological values.

Existing Consent Number	Take location	Recommended Residual Flow(s)
WR380B.V1 and WR382B.V1	Welshman's Creek	10 l/s at intake and 100 l/s at OAIC Weir
94548	Lauder mainstem	100 l/s at OAIC Weir
2001.710	Lauder mainstem	100 l/s at OAIC Weir
WR432B[2]	Lauder mainstem	100 l/s at OAIC Weir
96779[3]	Lauder mainstem	100 l/s at OAIC Weir
WR378B.V1	Shepherds Creek	Visual surface flow below the take and 100 l/s at Rail Trail Flow Site
RM19.448.01	Lauder mainstem	100 l/s at Rail Trail Flow Site
98488 &98572	Millers Creek (Top Take)	10 l/s at intake and 100 l/s at Rail Trail Flow Site
2000.644.V2	Millers Creek (middle take)	10 l/s at intake and 100 l/s at Rail Trail Flow Site
3707	Millers Creek (bottom take)	10 l/s at intake and 100 l/s at Rail Trail Flow Site
98122	Lauder mainstem	100 l/s at Rail Trail Flow Site
2002.399	Unnamed tributary of Lauder creek (lower Creek)	Visual surface flow below the dam
2004.788	Unnamed tributary of Lauder Creek (lower Creek)	100 l/s at Rail Trail Flow Site
93447	Lauder mainstem	100 l/s at Rail Trail Flow Site

[2] WR432B is proposed to shift upstream to the OAIC intake (2001.710) and reduce the combined rate of take from 536 l/s to 450 l/s.

[3] 96779 will be shifted upstream to take from the same location as 94548.

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1. Introduction

There are 19[4] primary water take consents in the Lauder Creek catchment, the majority of which are being lodged for replacement prior to their expiry in October 2021.

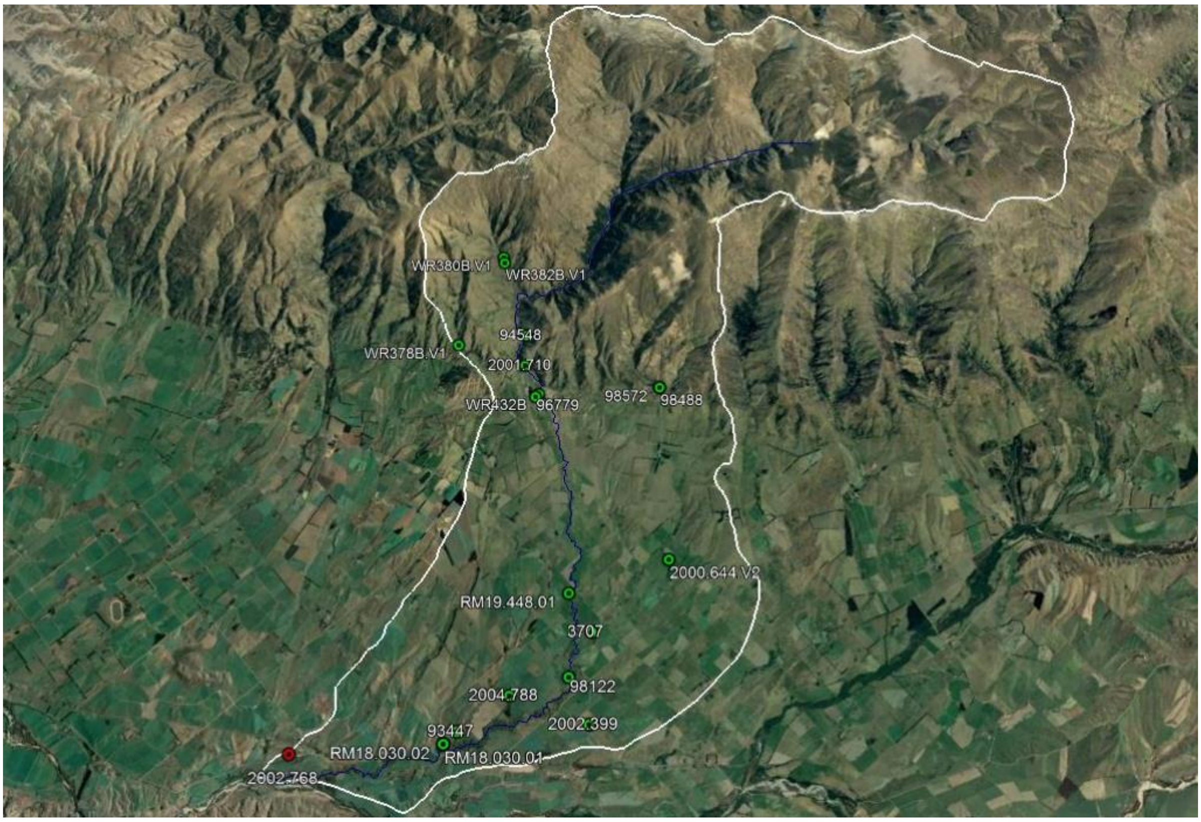

Figure 1. Current primary water take permits in the Lauder Creek catchment. The single re-take permits is shown in red.

Currently, a minimum flow of 820 l/s applies to all takes in the Manuherikia catchment upstream of the Ophir flow site. This includes takes in Lauder Creek. However, in addition, residual flows are the key mechanism for protecting ecological and natural character values in tributaries with different hydrological characteristics to the mainstem. A residual flow is the amount of water that must be left at a point of take to provide for ecological values and natural character of that waterbody. Residual flows apply at the point of take and apply in concert with a minimum flow, i.e. both the minimum and residual flow must be met for water to be taken.

When determining a residual flow, it is important to determine the ecological values to be protected, the natural hydrology of the stream at the point of take and the potential effects of the proposed take on those flows, and subsequently the ecological values. A key focus of this report is the requirement for residual flows at the point at which the water is taken from Lauder Creek.

1.1. Scope of these assessments

The scope of this report is to provide an assessment of hydrology and aquatic ecology of Lauder Creek including consideration of potential mitigation options (e.g. residual flows, fish screens, flow sharing).

[4] One is considered a retake as it picks up water that has previously been discharged by OAIC.

1.2. Available information

This assessment relies on the following information:

1. Certified flow records collected by Otago Regional Council (ORC) from the Lauder Creek at Rail Trail and Cattle Yards Flow Sites.
2. Water metering data supplied by ORC.
3. Information from NIWA's Freshwater Fish Database.
4. Longitudinal gaugings and photos by ORC.
5. Photos and observations by LWUG.
6. State of the Environment monitoring data from ORC.
7. Habitat modelling by Jowett Consulting.
8. Water quality reporting from NIWA and ORC.
9. The NPSFM (2020).

2. Catchment Description

2.1. Climate

The climate of the Lauder catchment is typified by long, hot, dry summers and very cold, dry winters. The highest temperature recorded at NIWA's Lauder research station is 35.0°C and experiences an average of 3 days a year where maximum temperatures exceed 30°C, and an average of 33 days per year where maximum temperatures exceed 25°C (Macara 2015). The lowest temperature recorded at Lauder was -19.7°C, and it experiences an average of 104 days with the minimum below 0°C (Macara 2015).

The mean annual rainfall at the Lauder Research Station is 439 mm, with highest rainfall in December (61 mm) and January (58 mm) and lowest rainfall in July (23 mm), August (20 mm) and September (23 mm) (Macara 2015). Rainfall increases from the valley floor (400-450 mm) to the top of the Dunstan Ranges (750-800 mm) (Figure 2).

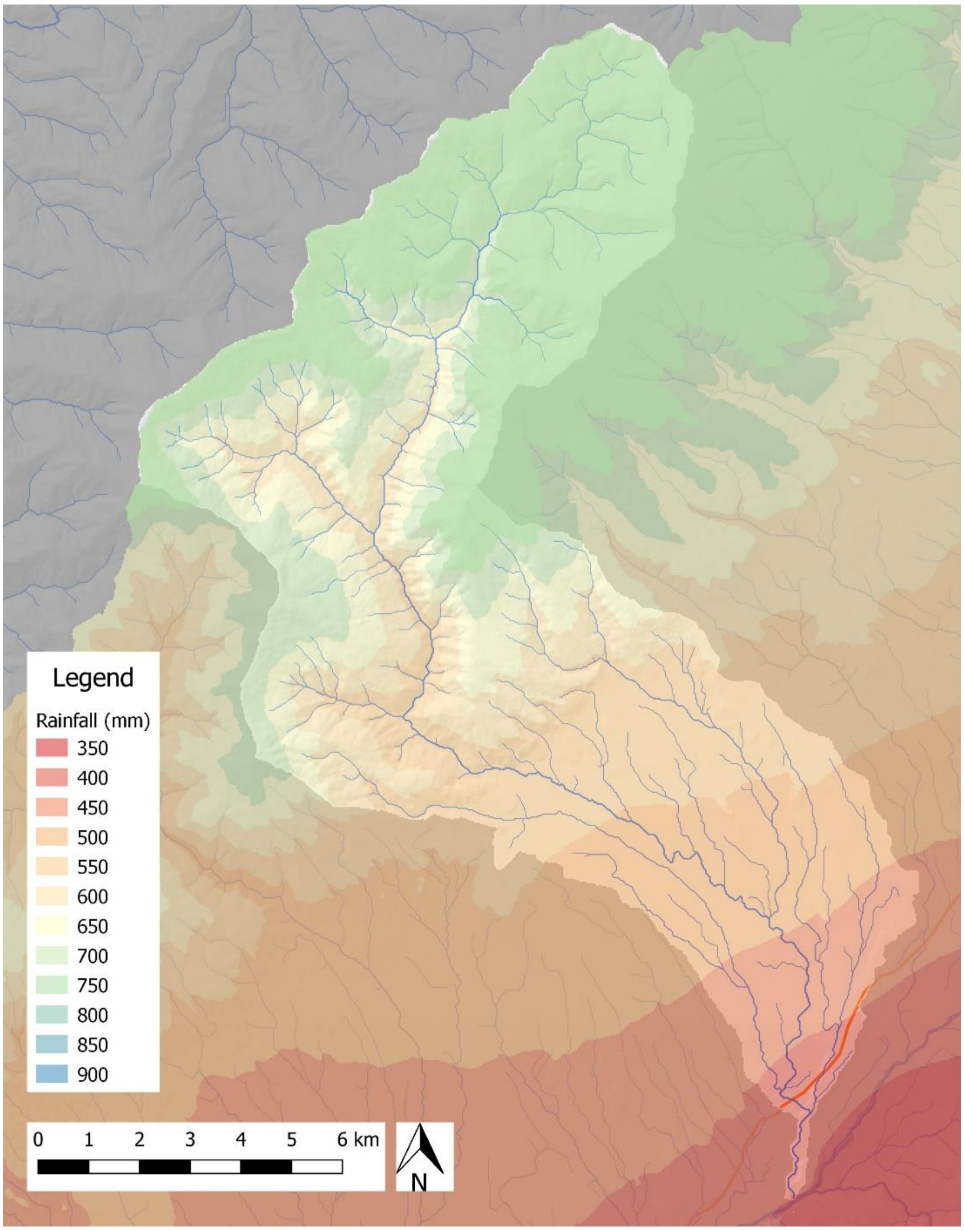

Figure 2. Rainfall in the Lauder Creek catchment based on Grow Otago (courtesy of Otago Regional Council).

2.2. Geology and geomorphology

The upper reaches of Lauder Creek flow from the Dunstan Range through a steep, catchment, before flowing out onto the Manuherikia Valley near Omakau, where the gradient is markedly lower (Figure 3).

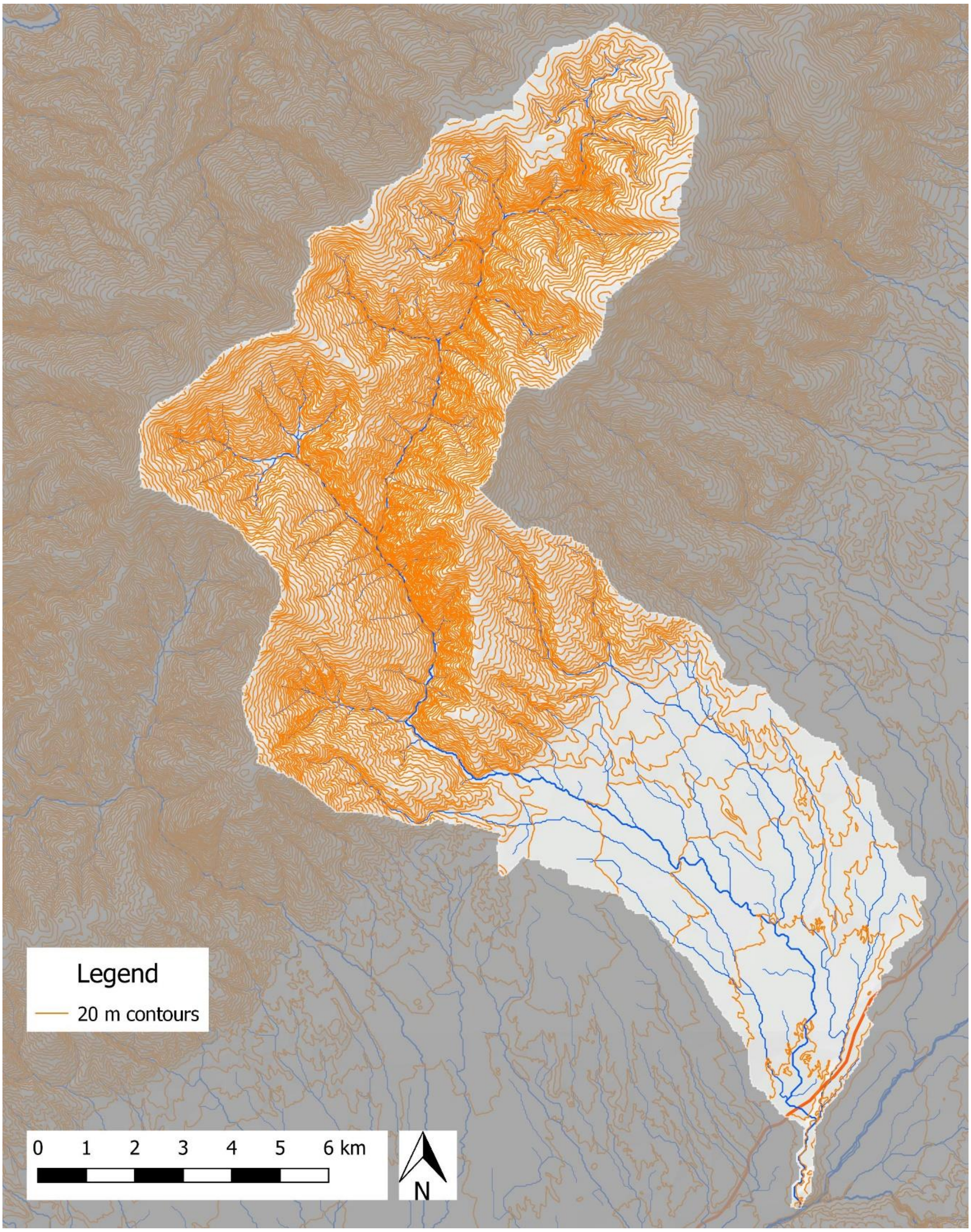

Figure 3. Topography of the Lauder Creek catchment based on 1:150,000 scale contours. Contour spacing is 20 m.

This transition from the steep valley of the upper catchment to the low gradient of the valley floor coincides with the Dunstan Fault, which runs along the eastern edge of the Dunstan Ranges (Figure 4). To the west of the Dunstan Fault, the basement rocks are schist, while to the east the valley floor is dominated by quaternary outwash gravels of various ages along with deposits of lacusturine clay, silt and oil shale with minor lignite seams, quartz sand and conglomerate (Figure 4).

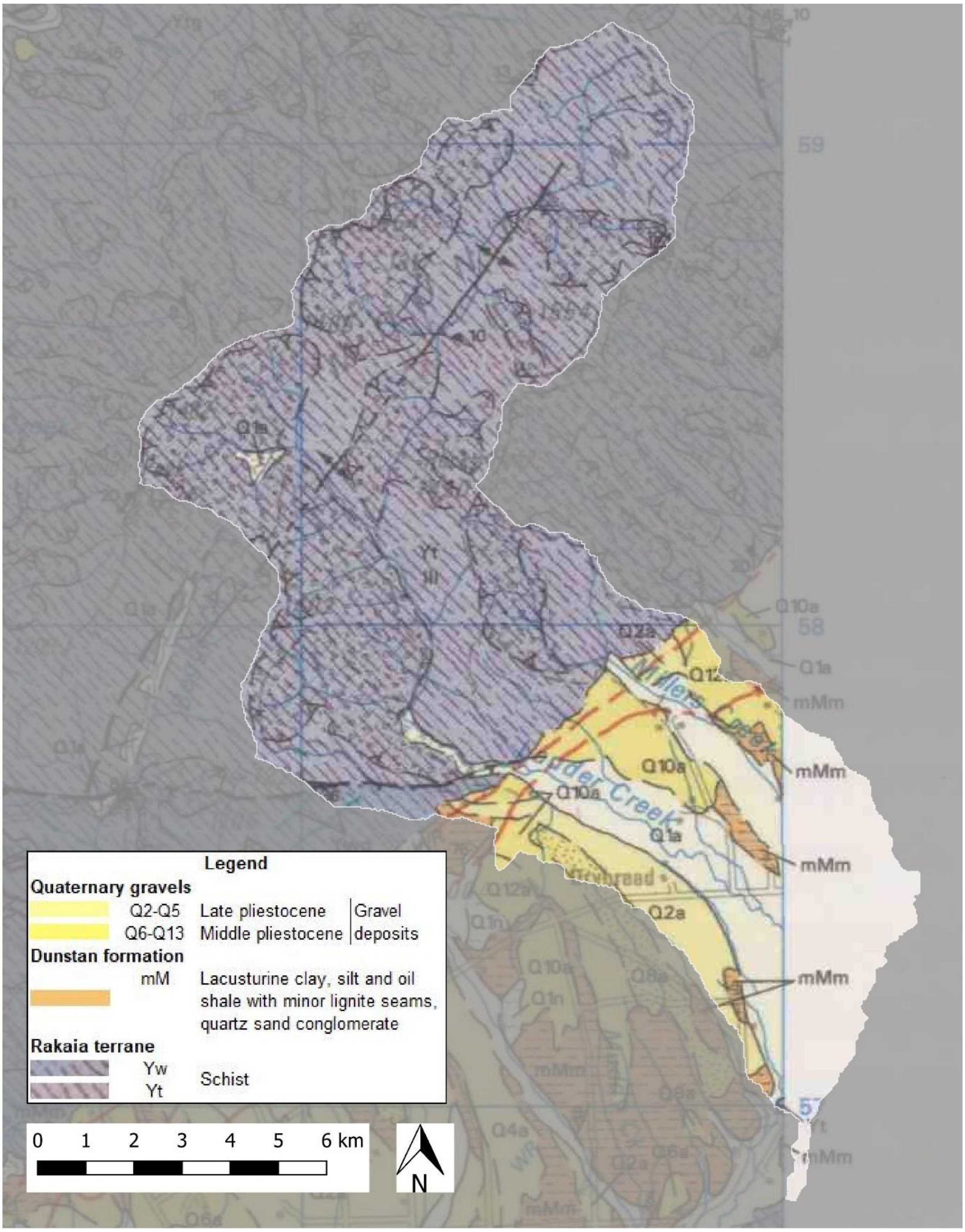

Figure 4. Geology of the Lauder Creek catchment based on QMap Wakatipu (Turnbull 2000).

2.3. Catchment landuse

The majority of the Lauder Creek catchment consists of agricultural grasslands with tall tussock (7,287 ha; 49%) and low producing grassland (2,093 ha; 14%) dominating the hill country and high-producing pasture grasslands (4,433 ha; 30%) dominate the valley floor (Figure 5). Much of the upper catchment of Lauder Creek is within the Lauder Basin Conservation area (3,753 ha), with a smaller portion of the catchment within the Neinei kura Conservation Area (34 ha) in the southwestern part of the upper catchment.

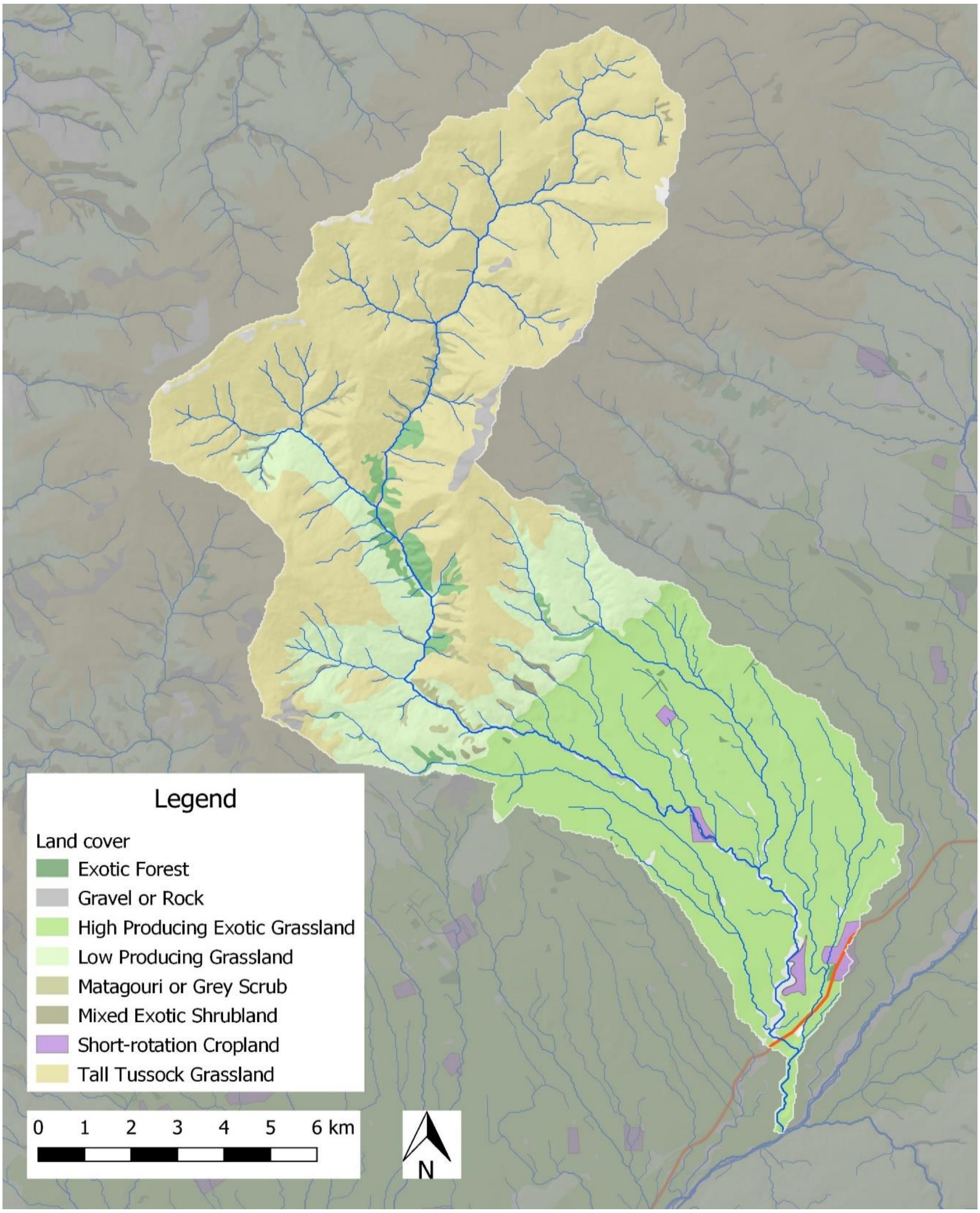

Figure 5. Land cover of the Lauder Creek catchment based on the Land Cover Database (LCDB, version 4.1).

3. Hydrology

ORC has maintained two flow sites over the last decade in the Lauder Creek catchment, one above all takes in the upper reaches of Lauder Creek and the other at the Rail Trail immediately above the

Manuherikia confluence (Figure 6). In addition to these sites ORC has carried out longitudinal gaugings and maintained temperature loggers to help determine time of drying in the mid reaches of Lauder Creek.

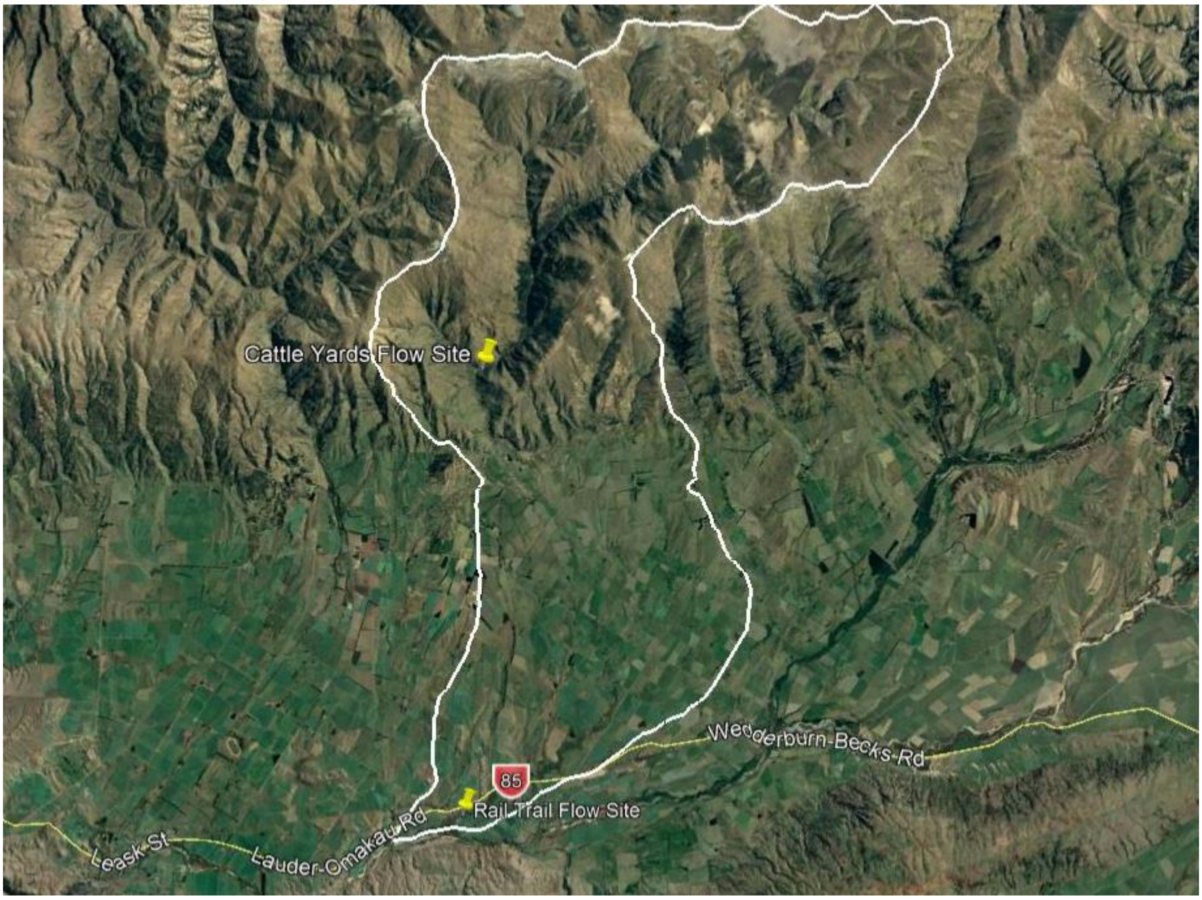

Figure 6. ORC flow sites in the Lauder Creek catchment.

The hydrology of Lauder Creek is complex with both losing and gaining reaches, significant contributions to groundwater recharge from the use of water which has entered the catchment via the Omakau Irrigation Company race from Dunstan Creek.

Figure 7 provides observed flows for both the Lauder Creek at the Cattle Yards (above all abstraction) and Lauder Creek at the Rail Trail (below all abstraction) for the 2019/20 irrigation season (Oct – April).

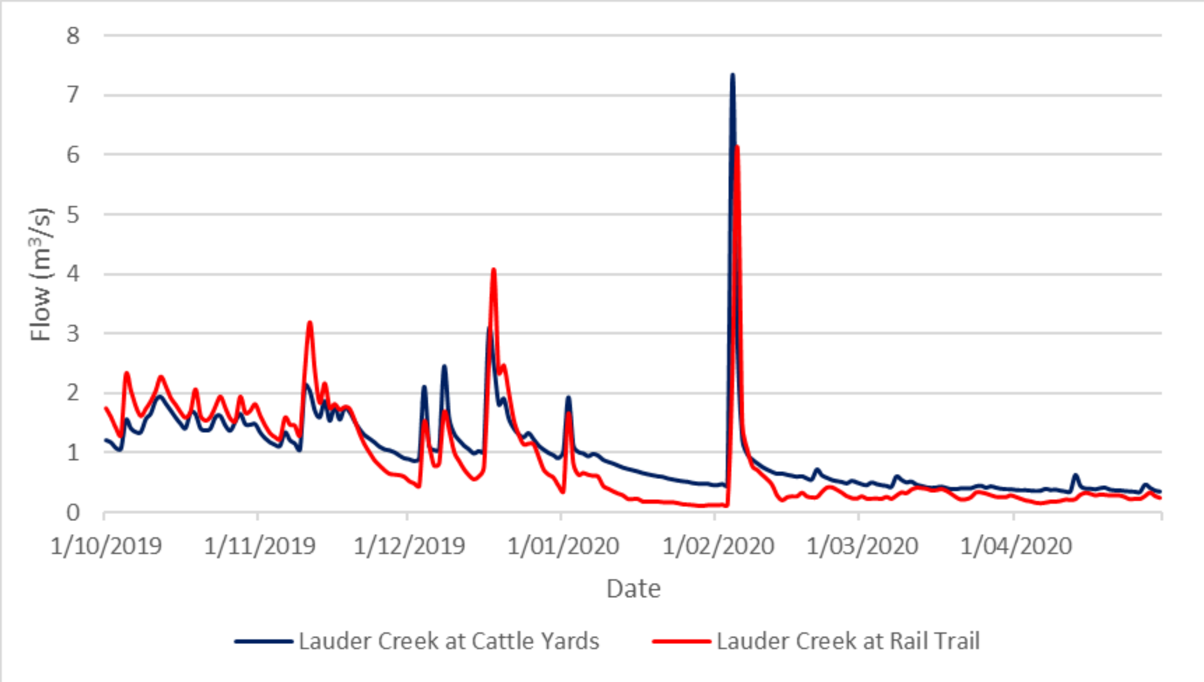

Figure 7. Observed flows at Lauder Creek at the Cattle Yards and at the Rail Trail for the 2019/20 irrigation season.

3.1. Low flow statistics

Flow monitoring has been carried out at two sites in Lauder Creek, Lauder Creek at the Cattle Yards and Lauder Creek at the Rail Trail. Lauder Creek at the Cattle yards is unaffected by abstraction and has four irrigation season of flow record for 2009 – 2010 and 2017 -2020. Lauder Creek at the Rail Trail is downstream of all abstractions in the catchment and it also has four irrigation seasons of flow record for 2009 – 2010 and 2017 -2020.

Thomsons Creek which neighbours Lauder Creek has a flow site that is unaffected by abstraction for the period 2009 – 2011 and 2019 -2020. A synthetic record for the 2010/11 irrigation season has been developed for Lauder Creek at the Cattle yards based on the flow relationship between these two sites to supplement the low flow record for Lauder Creek[5].

Table 2 provides observed flow statistics for the two continuous flow sites in Lauder Creek for the periods of record with observed and synthetic flows.

[5] ***Refer to Appendix 1***

Table 2. Flow Statistics based on daily average flows for Lauder Creek at the Cattle Yards and Lauder Creek at the Rail Trail.

Site	Catchment Area Above Recorder (km^2)	Lowest Daily Flow (m^3/s)	1-Day MALF (m^3/s)	7-Day MALF (m^3/s)	Median (m^3/s)	Mean (m^3/s)	Max (m^3/s)
Lauder Creek at the Cattle Yards[6]	74	0.228	0.306	0.325	0.861	1.158	23.431
Lauder Creek at the Rail Trail[7]	157	0.001	0.077	0.090	0.956	1.193	14.430

Table 2 shows that observed low flows at Rail Trail are significantly less than the natural flows recorded above all abstractions, while the median and mean flows are less affected.

Table 3. Daily average minimum and 7-day ALF's observed at the Rail Trail on Lauder Creek for the hydrological years with record.

Hydro Year (July – June)	Daily Minimum (m^3/s)	7-day ALF (m^3/s)
2009/10	0.040	0.053
2016/17	0.062	0.092
2017/18	0.001	0.001
2018/19	0.158	0.171
2019/20	0.122	0.132

Table 3 shows considerable variation in annual low flows observed at Lauder Creek at the Rail Trail, suggesting lows flows are not an annual issue but when dry seasons occur there is significant risk of ecological impact.

3.2. Losing and Gaining Reaches Between the OAIC Weir and SH85.

Water users have over many years observed a drying reach between the OAIC Weir and Glassford Road Bridge despite significant flow passing the OAIC weir. ORC and the LWUG have carried out gaugings and observations at several locations within the drying reach identified. These observations and gaugings indicate that the drying reach appears to break at a point about 3Km below the OAIC weir and then expand both upstream towards the OAIC Weir and downstream towards the Glassford Road Bridge. Duration of low to no flow past the OAIC Weir contributes to the expansion of the drying reach.

It appears that there is a large alluvial aquifer downstream of the OAIC Weir that when local groundwater levels fall causes significant losses in the losing reach although the majority (>80%) of flow lost within the drying reach appears to resurface by the Glassford Road Bridge. Gaugings from

[6] Based on 7 seasons of record.
[7] Based on 5 seasons of record.

ORC and NIWA along with observations by LWUG indicate that Lauder Creek can be dry above Glassford Road Bridge when flows exceed 350 l/s at the Rail Trail Flow Site[8].

ORC have carried out a number of gaugings from below the OAIC Weir and Glassford Road Bridge to determine the losses across this reach. LWUG observations indicate that the ORC gauging sites although indicative of losses are in reaches that would either be naturally neutral or gaining meaning that loss calculations based on the gaugings after factoring in water takes will under represent losses that occurred between the gauging sites (Figure 8).

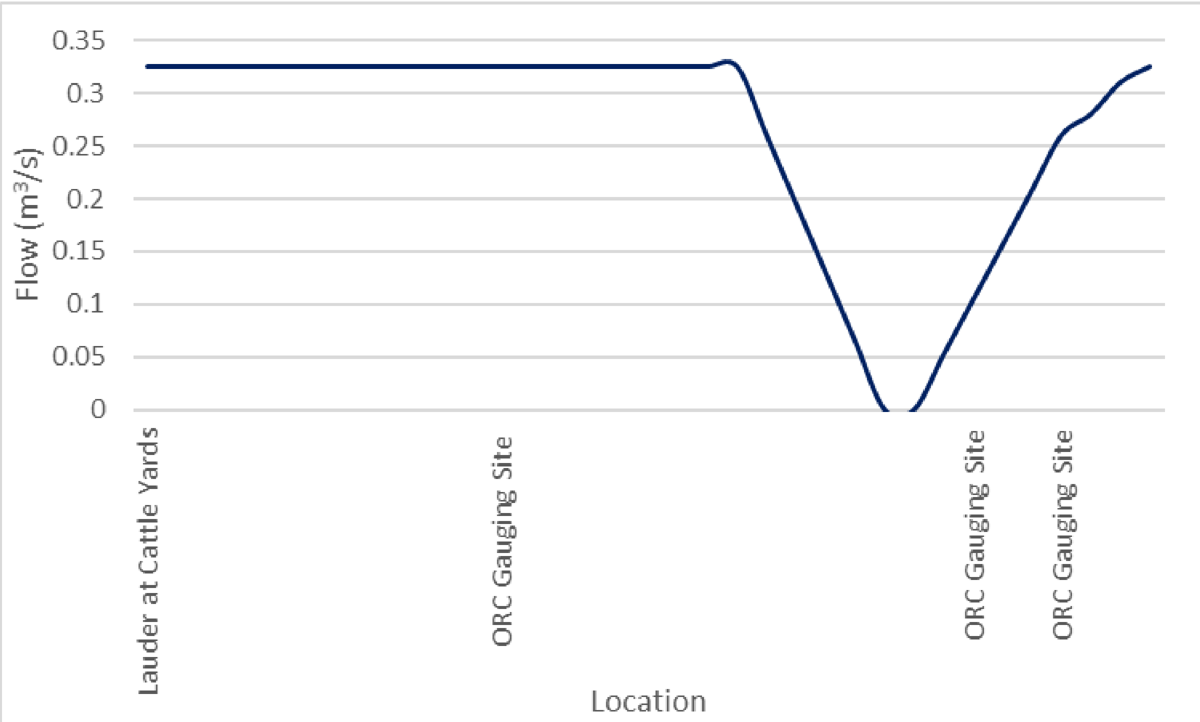

Figure 8. ORC gauging locations between the OAIC Weir and the Glassford Road Bridge.

Compounding understanding the flows in Lauder Creek is that there is water introduced from Becks Creek and Dunstan Creek to irrigate land in the catchment upstream of the Rail Trail Flow Site. This introduced water can contribute to flow, both by irrigation run-off and increased groundwater gains from irrigation seepage. Dunstan Creek is by far the greatest source of introduced water with around 280 l/s[9] introduced to irrigate land in the Lauder catchment, with much of this water used for contour flood irrigation (Figure 9).

Also, a large amount of water taken from Lauder Creek upstream of the Glassford Road Bridge is used to irrigate land downstream of Glassford Road adjacent to the true right bank of Lauder Creek. It is likely that this water also contributes to flows observed at the Rail Trail Flow Site, both by irrigation run-off and increased groundwater gains from irrigation seepage (Figure 9).

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[8] This was the case on the 26st of January 2019 and the 25th of February 2020 when flows at the Rail Trail were 475 l/s and 393 l/s respectively.
[9] Roger William of OAIC per comms.

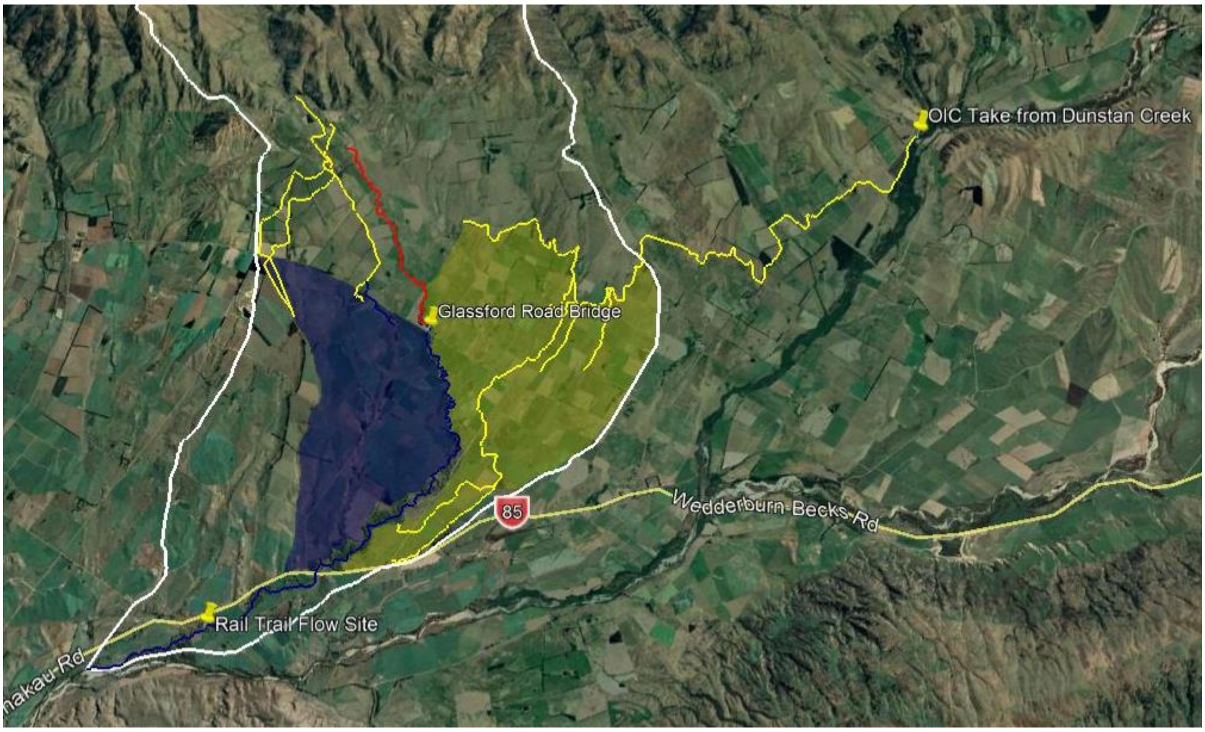

Figure 9. Map showing where water from Dunstan Creek is used to irrigate in the Lauder catchment (shaded yellow) and where water taken from Lauder Creek is used to irrigate land in the Lauder Creek catchment (Shaded blue). Yellow lines are water races and the white line is the Lauder Creek catchment boundary. The drying reach of Lauder Creek is shown (red line).

The lower reaches of Lauder Creek (Glassford Road to Rail Trail Flow Site) are heavily influenced by irrigation runoff and seepage along with bywash (OAIC bywash Dunstan Creek to Millers Creek). This is highlighted by the fact that the losing reach can be dry flows when observed flows at the Rail Trail Flow Site can be relatively high (>350 l/s). It is expected when the alluvial aquifer level drops and the associated contributions from irrigation water reduce or cease Lauder Creek flow would be expected to collapse. This is likely what occurred in January 2018[10].

Flows observed in Lauder Creek in January 2018 suggest that it is more than likely in normal to wetter seasons observed flows at the Rail Trail are artificially elevated compared to if water from other catchments was not introduced.

In January 2020 LWUG attempted to maintain at 100 l/s at Rail Trail Flow Site by beginning rostering at a flow of 150 l/s to trial a sharing regime. By the time flows were 150 l/s at Rail Trail the losing reach was dry. The water users then released 150 l/s past the OAIC and Moran Races to try increase flows at the Rail Trail Flow Site. After four days no significant increase in flows occurred highlighting that if the aquifer storage upstream is depleted and the upper catchment water users are tied to a flow at Rail Trail they may not be able to release enough flow to cause a rise in flow at the Rail Trail Flow Site. This suggests that a residual flow on the upper takes to maintain aquifer storage rather than trying to manage directly to the Rail Trail Flow Site could be more practical.

[10] In January 2018 natural flows were very low and the Water users were operating at 50%.

3.3. Longitudinal Flows

An attempt is made below to give an understanding of the natural flow regime at MALF of Lauder Creek from the Cattle Yards Flow Site to its confluence with the Manuherikia River compared to what currently occurs in a dry season (Figure 10). The below graph is by no means absolute, but it is our best attempt to provide an understanding of flows along Lauder Creek in summer when it is expected peak losses would occur. At the time of finalising this report ORC has competed one set of concurrent gaugings within the key losing reach in November 2020 and this is also shown in Figure 10.

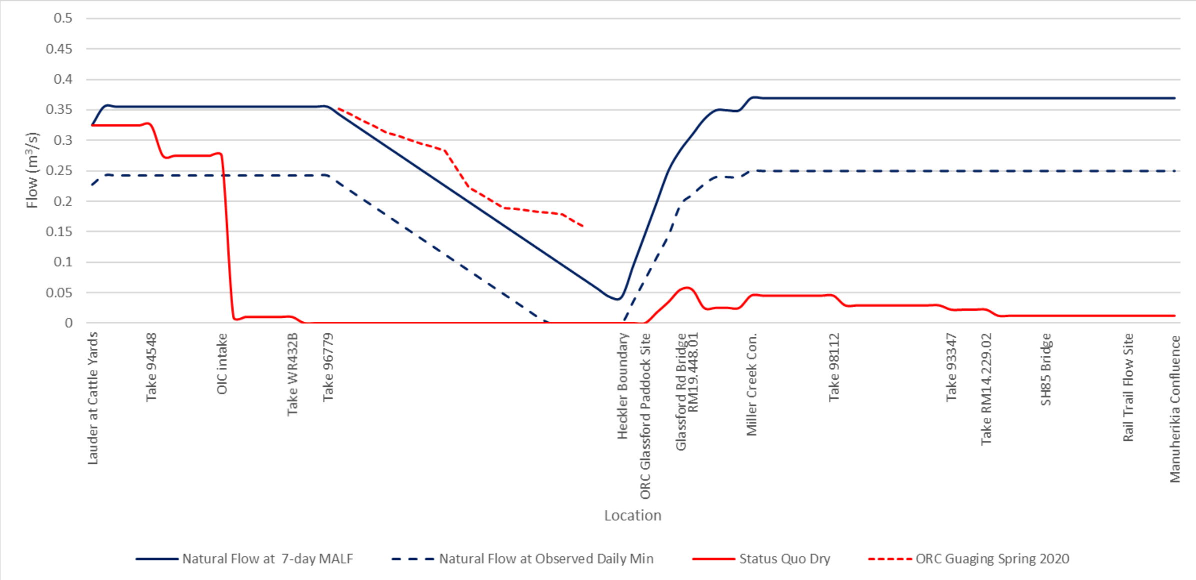

Figure 10. Longitudinal flows of Lauder Creek with an inflow at observed[11] MALF of 0.325 m³/s and observed[11] daily minimum of 0.228 m³/s showing the natural flow regime with no taking and the current regime with taking (status quo at MALF). It is 20Km from the Cattle Yards Flow Site to the Manuherikia confluence.

The longitudinal flows shown in Figure 10 indicate that all takes are from perennial reaches and that the combination of takes upstream of the Glassford Road Bridge increase the duration and extent of drying in the intermittent reach. The November 2020 gaugings by ORC are consistent with the peak loss rate used in this report, given spring would be expected to coincide with high ambient groundwater levels our expectation is that losses would be more in late January through to March.

Table 4 below documents the assumptions/observation to derive the natural flows presented in Figure 10.

[11] Observed flows at the Lauder Creek Cattle Yards Flow Site are not affected by abstraction.

Table 4. Flow losses and gains attributed to each section of Lauder Creek in Figure 10.

Reach	Reach neutral, losing or gaining	Natural flow loss or gain (l/s)	Data relied on
Cattle Yards Flow Site to OAIC Weir	Neutral		Cattle Yards flow data compared to OAIC take data and ORC gaugings don't support any significant gain or loss.
OAIC Weir to Bottom of Losing Reach	Losing	Have applied a peak loss of 325 l/s.	Assumed a peak loss per m over the dry reach the same as observed on the 25th of February based on the NIWA gauging and drone footage[12]. ORC gaugings in November 2020 indicate a loss of at least 200 l/s when ambient groundwater levels are expected to be high.
Start of Gaining Reach to Glassford Bridge.	Gaining	Additional gains over and above inflows into the drying reach can be 45 - 110 l/s at the Glassford Rd Bridge early in the season. However, once the alluvial aquifer is depleted the losses can be >80 l/s between inflows into the drying reach and Glassford Rd Bridge.	Measured gains vary. At higher flows gains are less obvious in this reach, while in dry periods flows are always greater at Glassford Road than below the OAIC weir. However, this additional gain will likely reduce over time if flows are constant below the weir. We have used an additional gain of 80 l/s with maintaining at least 100 l/s below the OAIC Weir.
Glassford Bridge to SH85	Gaining – Miller Creek enters	Minor gains from Millers Creek	Gains can be minimal in dry seasons (e.g. January 2018) or relatively large if irrigation has been unrestricted and large amounts of water is introduced from Dunstan Creek. We have accounted for an additional small gain below Glassford Rd of ~40 l/s.
SH85 to Rail Trail	Neutral		ORC gaugings
Rail Trail to Manuherikia River	Neutral		ORC gaugings

[12] Refer to Appendix 2

3.4. Flow Exceedance

Figure 11 below provides flow exceedance curves for flows of less than 5m^3/s at both the Lauder Creek Cattle Yards Flow Site and the Rail Trail Flow Site.

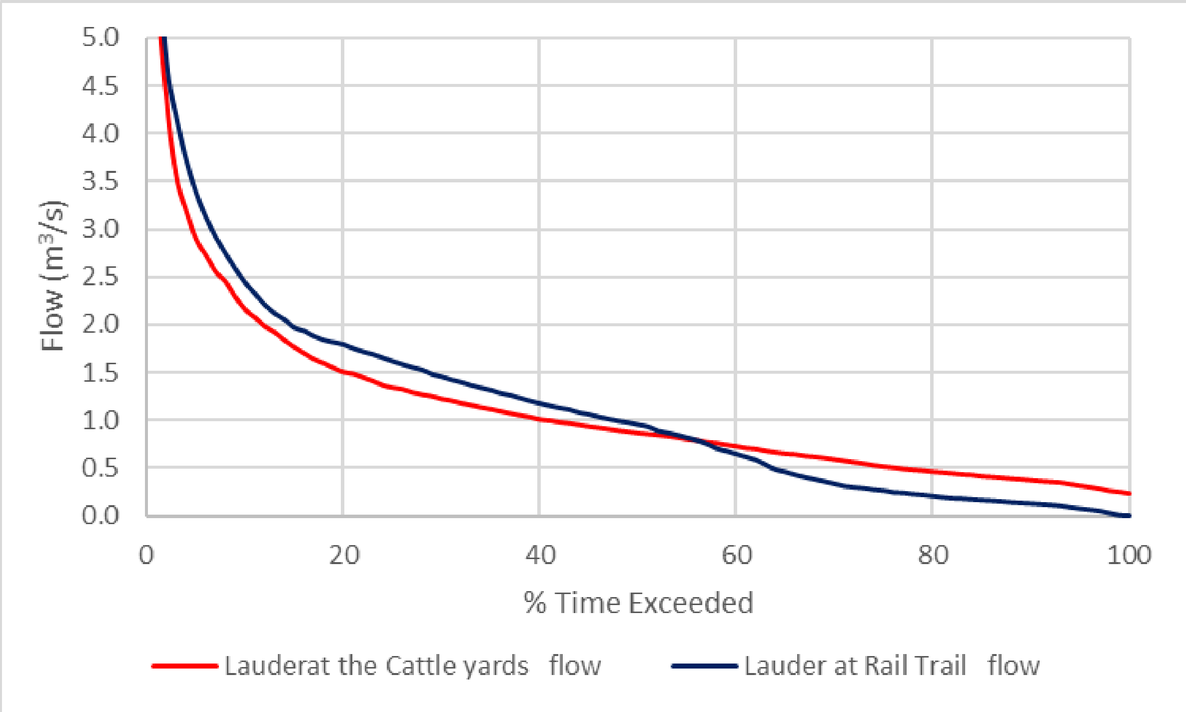

Figure 11. Flow exceedance curves for Lauder Creek Cattle Yards Flow Site and the Rail Trail Flow Site

3.5. Existing water use

Currently 1407 l/s is allocated from the Lauder Creek catchment as primary allocation with a further 28 l/s allocated as a retake where OAIC main race water is discharged to a small tributary to be picked up further down. The maximum observed combined daily take is 0.833 m^3/s based on metering records between October 2016 and April 2020.

Currently there are no residual flow conditions on most of the takes in the catchment nor is there any flow that the water users operate to collectively try to maintain in the lower reaches of Lauder Creek to provide for ecological values.

4. Existing environment

4.1. Water quality

A review of water quality in the Manuherikia catchment conducted by NIWA for the Otago Regional Council (Hudson & Shelley 2019) included two sites in the Lauder Creek catchment: Lauder Creek at Cattle Yard and Lauder Creek at Rail trail.

Each water quality variable was compared to the water quality limits/targets (Schedule 15) contained in the Regional Plan: Water (RPW) (Schedule 15; Receiving Water Group 2; Table 5) as well as the National Objective Framework (NOF) contained in the National Policy Statement for Freshwater Management (NPSFM). The following section summarises the results of the analyses presented in Hudson & Shelley 2019).

Table 5 Receiving water numerical limits and timeframe for achieving 'good' water quality in the Manuherikia catchment

		Nitrate-nitrite nitrogen	Dissolved reactive phosphorus	Ammoniacal nitrogen	*Escherichia coli*	Turbidity
Manuherikia	Limit/target	0.075 mg/l	0.01 mg/l	0.1 mg/l	260 cfu/100 ml	5 NTU
	Target date	31 March 2012	31 March 2025	31 March 2012	31 March 2012	31 March 2012

4.2. Comparison to regulatory limits

4.2.1. Nitrogen

Nitrate-nitrite nitrogen

In the Hudson & Shelley (2019) review, assessed the proportion of values in multiple 5-year periods that complied with the Schedule 15 limits contained in the Regional Plan: Water. For nitrate-nitrite nitrogen, 7-10% of values exceeded Schedule 15 limit of 0.075 mg/L (Table 3-4 of Hudson & Shelley 2019). Given that the Schedule 15 limit applies as an 80th percentile, a site would exceed the limit if more than 20% of values recorded when flows were below median flow were higher than the numerical limit[13].

The 95th percentile and median NNN concentrations recorded at both sites in Lauder Creek in 2016 and 2017 were in Attribute state A of the NOF (toxicity), as were the 95th percentile and median NNN concentrations recorded at the Lauder at Rail Trail site in 2009 and 2010 (Hudson & Shelley 2019). NNN concentrations in the A-band of the nitrate (toxicity) attribute table in the NOF are unlikely to toxic to sensitive aquatic life.

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[13] Note – In Tables 3-4 – 3-8 of Hudson & Shelley (2019) *"Where concentrations in more than 80% of water samples collected in a five-year period (when flows are less than median at an associated flow monitoring site) exceed 0.075 mg/L, the cell is shaded magenta"*. This appears to be a misunderstanding of Schedule 15, as the Schedule 15 limit is exceeded when more than <u>20%</u> of samples collected in a five-year period (when flows are less than median at an associated flow monitoring site) exceed 0.075 mg/L.

The draft NPSFM included a proposed attribute for dissolved inorganic nitrogen (DIN) based on median and 95th percentile values. However, the revised NPSFM that is due to come into effect later in 2020 does not include a national bottom line for DIN.

Ammoniacal nitrogen

Ammoniacal nitrogen concentrations at the site in Lauder Creek was within the Schedule 15 limit (0.01 mg/L) in all 5-year periods considered (Table 3-5 of Hudson & Shelley 2019).

Maximum and median ammoniacal nitrogen concentrations at both sites in Lauder Creek were in Attribute state A of the NOF over the period 2013-2019 (Figure 3-3 of Hudson & Shelley 2019). Ammoniacal nitrogen concentrations in the A-band of the NOF are equivalent to a 99% species protection level. However, it should be noted that the numeric attribute state for ammonia (toxicity) is based on pH 8 and temperature of 20°C. It is not clear whether the ammoniacal nitrogen concentrations used in the NIWA analysis were adjusted for pH.

4.2.2. Phosphorus

Hudson & Shelley (2019) report that 74-100% of the recorded concentrations of dissolved reactive phosphorus (DRP) exceeded the Schedule 15 limit of 0.01 mg/L (Table 3-6 of Hudson & Shelley 2019). This is in keeping with the target date for compliance with Schedule 15 of the RPW being 31 March 2025.

The NPSFM due to come into effect in September 2020 includes a DRP attribute based on median and 95th percentile values, although this table does not include a national bottom line for DRP. Limited data is available for both sites in Lauder Creek. The median DRP concentrations in Lauder Creek at Rail Trail over the most recent period for which data is available (2016-2017) (0.0095 mg/L) was in Attribute state B of the NOF (>0.006 and ≤0.010 mg/L[14]), while the 95th percentile (0.041 mg/L[14]) was in Attribute state C of the NOF (>0.030 and ≤0.054 mg/L). If other conditions also favour eutrophication, DRP concentrations in the B- and C-bands may be associated with varying degrees of enhanced algal and plant growth, loss of sensitive macroinvertebrate taxa, and higher respiration and decay rates.

4.2.3. Escherichia coli

Hudson & Shelley 2019 did not compare concentrations of the faecal indicator bacterium *Escherichia coli* in Lauder Creek with the Schedule 15 limit, most likely due to a lack of *E. coli* data for this site.

Comparison of *E. coli* concentrations for a waterbody with the NOF attribute table for *E. coli* requires a minimum of 60 samples collected over a maximum of 5 years collected on a regular basis irrespective of weather and flow conditions. The available data for Lauder Creek falls well short of these requirements, so it is not possible to compare data for either site on Lauder Creek with the NOF attribute table for *E. coli*.

[14] Calculated from data from 26 October 2016 – 27 September 2017. Data courtesy of ORC.

4.2.4. Turbidity

Hudson & Shelley (2019) report that 25% of the recorded turbidity readings exceeded the Schedule 15 limit of 5 NTU[15] for the three 5-year periods considered (Table 3-6 of Hudson & Shelley 2019).

Lauder Creek is classified as having a cool-dry climate (CD), hill source (H), and hard sedimentary geology (HS). This means that sites in Lauder Creek is in Suspended Sediment Class 9 for comparison with the Suspended Sediment attribute table in the NOF. Turbidity measurements in FNU and NTU are approximately equivalent. Assuming a 1:1 ratio between NTU and FNU units would suggest that turbidity readings at the Lauder at Rail Trail site are likely to exceed the national bottom line (>1.6 FNU) based on the median value (5.0 NTU) calculated for this site (from Appendix D of Hudson & Shelley, 2019).

The NPSFM includes a proposed attribute for water clarity (horizontal black disc visibility, m) based on Suspended Sediment class (based on the River Environment Classification of climate, topography and geology). The attribute state is based on the median value based on at least five years, either from a record from a continuous turbidity logger, or based on at least 5 years of monthly data.

Lauder Creek is classified as having a cool-dry climate (CD), mountain source (M), and hard sedimentary geology (HS). This means that sites in Lauder Creek are in Suspended Sediment Class 3 for comparison with the Suspended Sediment attribute table in the NOF (Table 23 of Appendix 2C of the NPSFM). ORC have no clarity data for Lauder Creek, meaning that whilst it has sufficient turbidity data to classify this site, in the absence of a turbidity-clarity relationship for this site, it is not possible to formally assess the compliance of this site with the suspended sediment attribute.

Using a turbidity-clarity relationship developed using data from two sites on the Manuherikia River[16], turbidity data for Lauder Creek were converted to water clarity to allow the estimation of median water clarity for these sites. The estimated median value for the 5-year period for Lauder Creek at Cattle Yards was 3.5 m and for Lauder Creek at Rail Trail was 0.94 m. These values would place the Lauder Creek at Cattle Yards site in the A-band and the Lauder Creek at Rail Trail site in the D-band of the NOF. The value for the Lauder Creek at Rail Trail site is below the national bottom line for this attribute (<2.22 m). The description of D-band for water clarity in the NOF states "*High impact of suspended sediment on instream biota. Ecological communities are significantly altered and sensitive fish and macroinvertebrate species are lost or at high risk of being lost.".*

4.2.5. Water quality trends

Hudson & Shelley (2019) present an analysis of trends in water quality in Lauder Creek for the period September 2009 – February 2019. This analysis did not identify any significant trends for any of the water quality parameters considered.

[15] Nephelomentric turbidity unit

[16] Water clarity = 2.8149*Turbidity$^{-0.669}$. This relationship is based on concurrent black disc and turbidity readings from Manuherikia at Blackstone Hill (n=35) and Manuherikia at Galloway (n=41) over the period 23 July 1997-14 March 2005.

4.2.6. Water quality summary

Concentrations of NNN and ammoniacal nitrogen in Lauder Creek are below levels that are expected to be toxic to aquatic life.

DRP concentrations observed in Lauder Creek at Rail Trail are elevated. As a result, there is an elevated risk of nuisance growths of periphyton developing.

Insufficient *E. coli* data is available for both sites in Lauder Creek, meaning that it is not possible to assess the suitability of either sites for contact recreation (i.e. primary or secondary contact).

Water clarity in Lauder Creek at the Cattle Yards sites was good (3.5 m), meaning that concentrations of suspended solids are expected to be having a minimal impact on instream biota. Meanwhile, poor water clarity/high levels of fine sediment are present at the Rail Trail site (median turbidity = 5.2 NTU, median estimated clarity = 0.94 m), which can affect many aspects of the stream ecosystems (e.g. shading the stream bed, changing instream habitat by smothering the streambed, directly damaging the gills of macroinvertebrates and/or fish.

The water quality observed in the lower Lauder Creek appears to be impacted by flood irrigation methods management practices of critical source areas which elevates the risk of contaminant movement off farm. The conversion of irrigation from flood to spray methods and the adoption of good management practice across all properties is expected to address contaminant movement which is expected to result in improvements to water quality in the Lauder Creek catchment, with reductions in phosphorus, sediment and microbial contamination anticipated.

4.3. Periphyton

No periphyton data is available for Lauder Creek.

4.4. Macroinvertebrates

Kitto (2011) presents the results of macroinvertebrate sampling at seventeen sites in the Manuherikia catchment, including one site in Lauder Creek (Lauder Creek at Rail Trail).

Based on 3 Surber samples taken at each site in December 2010, a relatively low proportion of the macroinvertebrate taxa at the Lauder Creek site were EPT[17] taxa, with EPT taxa representing approximately 20% of taxa.

The Macroinvertebrate Community Index (MCI) and its quantitative variant (QMCI) uses the composition of the macroinvertebrate community (as well as the abundance of different taxa in the case of the QMCI) as a measure of water and habitat quality. High scores indicate clean water quality and high habitat quality (MCI > 120, QMCI > 6), while low scores indicate poor water and/or habitat quality (MCI < 80, QMCI < 4) (Stark & Maxted 2007).

The MCI (90) score for the Lauder Creek site were consistent with fair water and habitat quality, while the QMCI score (3.5) indicated poor water and habitat quality (Kitto 2011). This value is below the national bottom line for QMCI (4.50), while the MCI score is at the national bottom line for MCI.

[17] E = Ephemeroptera (mayflies), P = Plecoptera (stoneflies) and T = Trichoptera (caddis flies). These three orders are typically associated with clean, oxygenated water (with the exception of some caddis flies).

However, these results should be interpreted with caution, as the NOF table is intended to be applied as 5-year median values.

4.5. Fish

Six fish species have been recorded from Lauder Creek (Table 6). Brown trout and upland bully are widespread in the Lauder catchment, while Central Otago roundhead galaxias have been recorded from a tributary in the lower reaches of the catchment (Figure 12). Longfin eels have been recorded at the lower Lauder catchment (Figure 12).

There is a record of a single brook char from a tributary in the middle-upper reaches of the catchment and two records of rainbow trout from Millers Creek (Figure 12).

Table 6 ***Fish species recorded from Lauder Creek. Threat status based on Dunn*** **et al.** ***(2018).***

Common name	Species	Source	Threat status
Longfin eel	*Anguilla dieffenbachii*	Hudson & Shelley 2019	Declining
Upland bully	*Gobiomorphus brevipinnis*	NZFFDB, Hudson & Shelley 2019	Not threatened
Central Otago Roundhead galaxias	*Galaxias anomolus*	NZFFDB	Nationally endangered
Brown trout	*Salmo trutta*	NZFFDB, Hudson & Shelley 2019	Introduced & naturalised
Brook char	*Salvelinus fontinalis*	NZFFDB	Introduced & naturalised
Rainbow trout	*Oncorhynchus mykiss*	Hudson & Shelley 2019	Introduced & naturalised

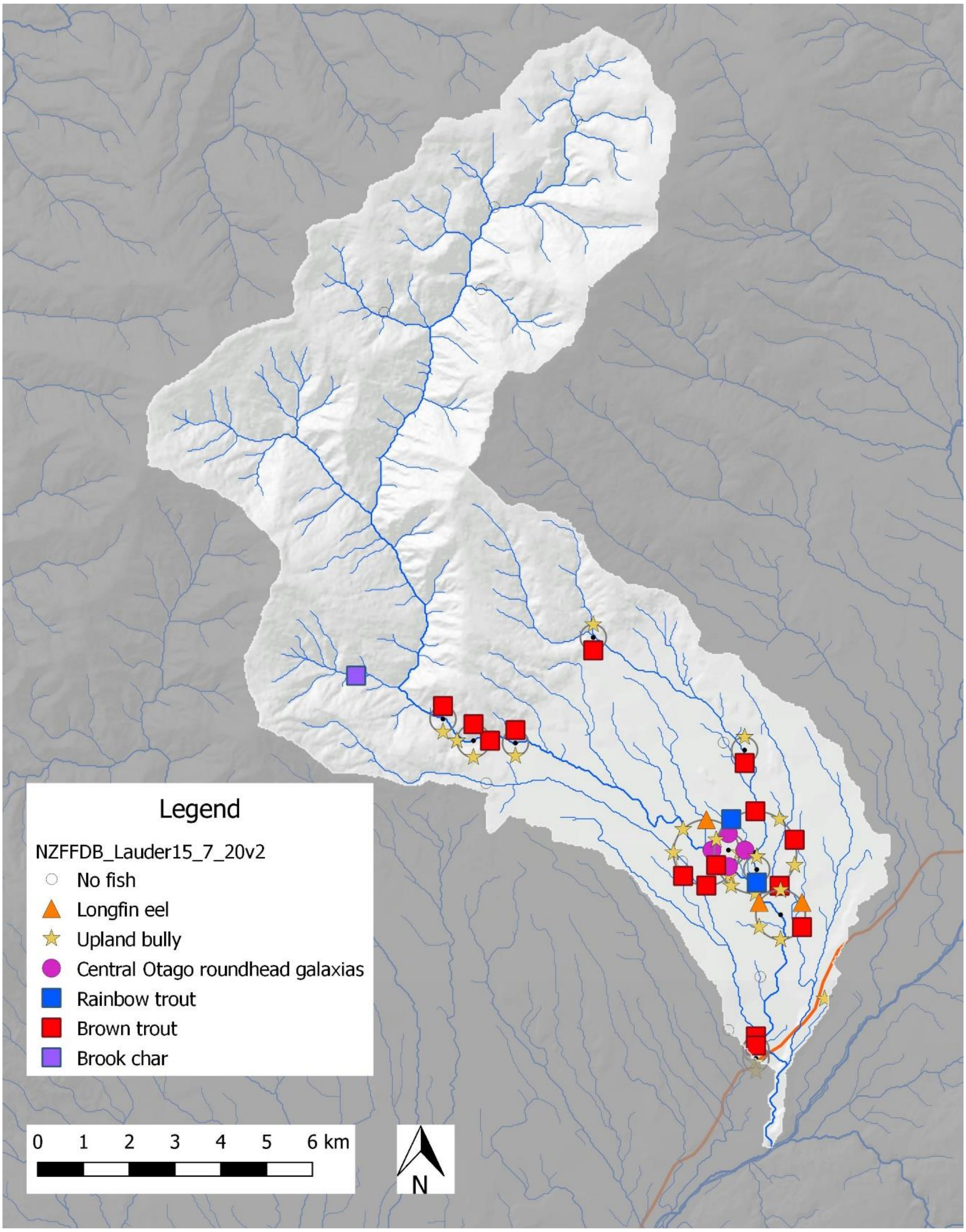

Figure 12 ***Fish distribution in the Lauder Creek catchment based on the NZ Freshwater Fish Database (NZFFDB, downloaded 15 July 2020)***

5. Mitigation measures

5.1. Residual flows

5.1.1. Fish habitat modelling

Jowett (2020) has undertaken instream habitat modelling at a site in the lower reaches of Lauder Creek near ORC's Rail Trail Flow Site, which can be used to inform decisions regarding environmental flows. However, the level at which environmental flows are set depends on management objectives, such as the species for which flows are set and the level of habitat retention sought.

It is important to keep in mind that habitat modelling does not take a number of other factors into consideration, including the disturbance and mortality caused by flooding, physical barriers to the presence of a species and biological interactions (such as predation), which can have a significant influence on the distribution of aquatic species.

Brown trout and upland bully are widespread in the Lauder Creek catchment, while longfin eels have been recorded from the lower catchment and Central Otago roundhead galaxias, brook char and rainbow trout are known from single tributaries (see Section 4.5). Of the species consistently recorded in Lauder Creek, brown trout have the highest flow requirement, whilst upland bully are expected to have the lowest optimum flow requirements. (Figure 13).

Central Otago roundhead galaxias

Central Otago roundhead galaxias are classified as nationally endangered, the second highest threat classification (Dunn *et al.* 2018) and represent a significant contribution to the indigenous biodiversity of the Lauder Creek catchment. Central Otago roundhead galaxias have been recorded from a single tributary of Lauder Creek in its middle reaches near Glassford Road. There are no takes from this tributary.

Central Otago roundhead galaxias were likely widespread historically in the Lauder Creek catchment but due to predation from trout their range has likely been reduced. Although available FFDB records only show CORG's present in a single small stream in the catchment, recent observations by Mr Pete Ravenscroft indicate that there is a population in Lauder Creek itself above Glassford Road.[18]

Longfin eel

The analysis of Jowett (2020) predicts that an optimum flow to provide for adult longfin eel habitat was 540 l/s, while a flow of 860 l/s was predicted to provide optimum habitat for juvenile (<300 mm) longfin eels (Table 7). However, habitat is not currently the main factor affecting the distribution and abundance of longfin eels in the Manuherikia catchment. Recruitment of longfin eels in the Manuherikia catchment is low due to the presence of Roxburgh Dam, which blocks the inward migration of juvenile eels that have entered the Clutha/Mata-Au from the ocean. Historically, some of the elvers entering the Clutha/Mata-Au would have migrated up past Roxburgh into the Manuherikia catchment and beyond.

[18] E-mail 21/12/2020 documenting some hydrological and observation work by ORC staff.

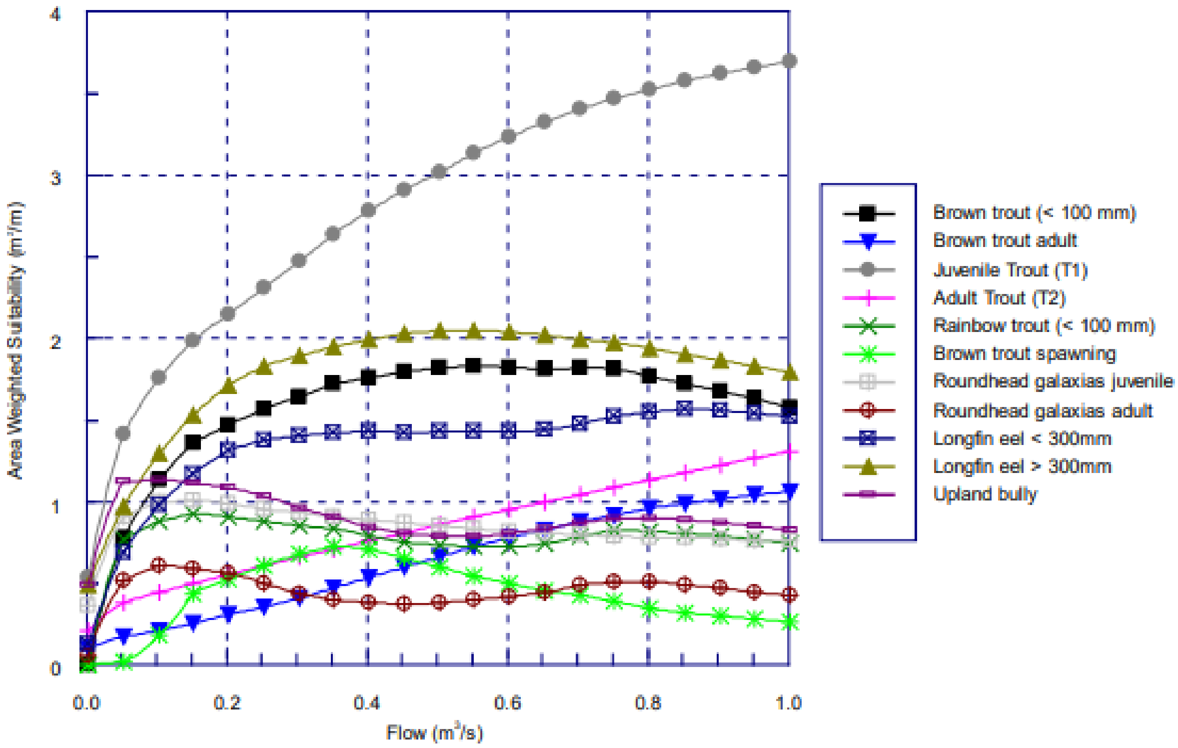

Figure 13 Relationship between area weighted suitability (AWS, a measure of potential habitat) and flow in Lauder Creek. Figure 6 of Jowett (2020).

Table 7 Flows that provide various levels of habitat retention levels relative to the naturalised 7-d MALF in Lauder Creek. Table 3 of Jowett (2020).

Species/life stage	Maximum habitat	90%	80%	70%	60%
Brown trout (<100mm)	660	243	159	113	85
Brown trout adult[1]	>1000	318	275	229	183
Juvenile trout (T1)[2]	>1000	276	195	122	74
Adult trout (T2)[2]	>1000	288	221	154	90
Rainbow trout (<100mm)	130	41	31	24	18
Brown trout spawning[3]	359	275	232	185	150
Roundhead galaxias (juvenile)	140	29	18	10	6
Roundhead galaxias (adult)	100	22	18	14	10
Longfin eel (<300mm)	860	185	141	103	75
Longfin eel (>300mm)	540	219	159	114	79
Upland bully[3]	80	5.8	4.1	2.5	0.8

[1] Hayes & Jowett (1994)

[2] Appendix 2 in Wilding, T. K. (2012). Regional methods for evaluating the effects of flow alteration on stream ecosystems. PhD thesis, Colorado State University.

[3] Shirvell & Dungey (1983)

Upland bully

Upland bully are widespread and abundant in many inland waters in the South Island and are classified as not threatened (Dunn *et al.* 2018). However, they contribute to the indigenous biodiversity of Lauder Creek. High flows (that favour trout) are expected to increase the predation pressure on upland bully. The analysis of Jowett (2020) predicts that the optimum flow for upland bully habitat was 80 l/s (Table 7).

Brown trout

Brown trout are widespread in the Lauder Creek catchment and it is likely that Lauder Creek provides a recruitment mechanism to the regionally significant[19] Manuherikia River fishery, although Lauder Creek is not recognised as providing significant habitat for trout in Schedule 1A of the Regional Plan: Water, or in the Otago Fish & Game Management Plan (Otago Fish & Game Council 2015).

Based on the analysis of Jowett (2020) a flow of 359 l/s would provide optimum spawning habitat (Table 7). The significance of Lauder Creek as a spawning and rearing tributary of the Manuherikia is unclear, but a habitat retention level of 70-80% would appear to be appropriate for these values. Based on the juvenile trout (T1) habitat suitability curves of Wilding (2012), a flow of 195 l/s would retain 80% of juvenile trout habitat available at MALF, while a flow of 122 l/s would retain 70% of juvenile trout habitat available at MALF (Table 7). Using the Brown trout (<100 mm) curves of Jowett & Richardson (2008) a flow of 159 l/s would retain 80% of juvenile trout habitat available at MALF, while a flow of 113 l/s would retain 70% of juvenile trout habitat available at MALF (Table 7).

5.1.2. Macroinvertebrate habitat modelling

Habitat for macroinvertebrates in Lauder Creek was assessed by modelling the effects of flow on a measure of general macroinvertebrate habitat (Food Producing) and habitat for three common macroinvertebrate taxa: the net-spinning caddis fly *Aoteapsyche*, the common mayfly *Deleatidium*, and the sandy-cased caddis fly *Pycnocentrodes.*

Based on the analysis presented in Figure 14 and Table 8, the optimum flows for all macroinvertebrate taxa considered were well in excess of the estimated MALF: Food Producing (>500 l/s), *Aoteapsyche* (>500 l/s), *Pycnocentrodes* (350 l/s) and *Deleatidium* (300 l/s) (Figure 14, Table 8).

Deleatidium is among the most abundant macroinvertebrate taxa in Lauder Creek. Flows of more than 103 l/s and 67 l/s are predicted to retain 80% and 70% of the *Deleatidium* habitat at MALF, respectively (Table 8). Whilst expected to be less common than *Deleatidium* in Chatto Creek, both *Aoteapsyche* and *Pycnocentrodes* are expected to be common. Flows of 149 l/s and 116 l/s are predicted to retain 80% and 70% of habitat for *Pycnocentrodes*, respectively, while flows of 193 l/s and 155 l/s are predicted to retain 80% and 70% of habitat for *Aoteapsyche*, respectively (Table 8).

Food producing habitat are predicted to rapidly increase with flow to the maximum modelled flow of 900 l/s (Figure 14), flows of 260 l/s and 231 l/s are predicted to retain 80% and 70% of food producing habitat, respectively (Table 8).

[19] 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.

The food producing habitat HSC is based on the work of Waters (1976), which was conducted in the United States on moderate sized trout rivers. On inspection of the habitat suitability curves (HSC), it is apparent that these curves suggest that food production is greatest in areas of moderate water depth (0.2-0.8 m), velocity (0.64-0.85 m/s) with cobble substrate. There is some reason to doubt the applicability of the Food Producing HSC to a small river like Lauder Creek. It is generally preferable to apply HSC that have been developed locally, on rivers of a comparable nature. For this reason, the *Aoteapsyche*, *Deleatidium* and *Pycnocentrodes* HSC developed in the Rainy River (a similar-sized, small river (MALF ~187 l/s) near Nelson), are more applicable to Lauder Creek than the Food Producing HSC.

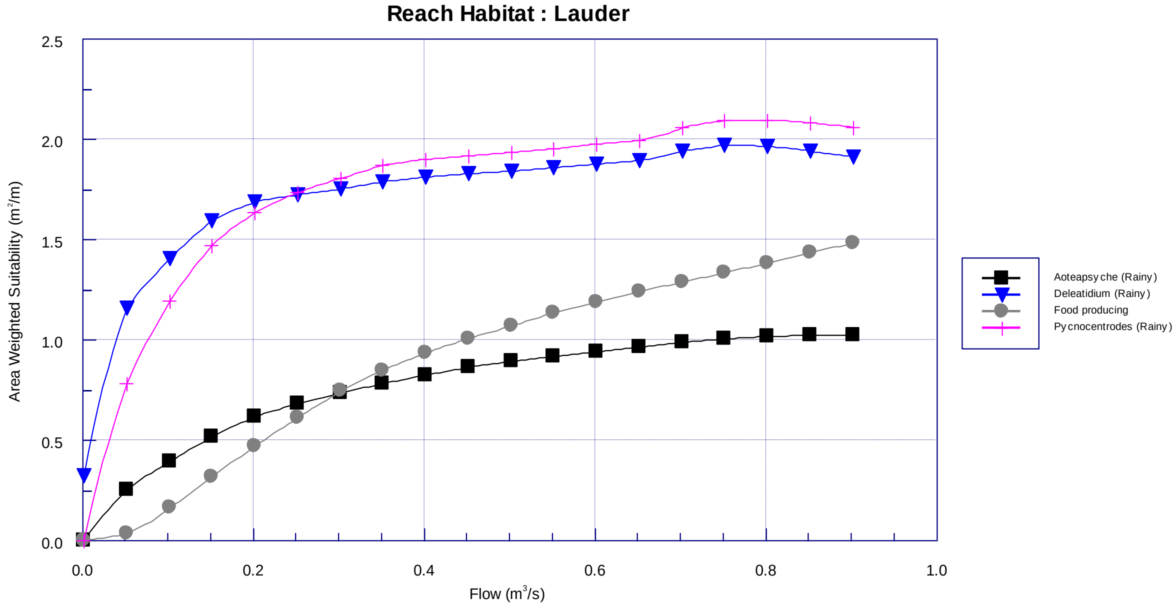

Figure 14 ***Relationship between area weighted suitability (AWS, a measure of potential habitat) for selected macroinvertebrate taxa and flow in Lauder Creek. Analysis courtesy of Ian Jowett (Jowett Consulting Ltd.).***

Table 8. ***Flows that provide various levels of macroinvertebrate habitat retention levels relative to the naturalised 7-d MALF in Lauder Creek. Analysis courtesy of Ian Jowett (Jowett Consulting Ltd.).***

Species/life stage	Optimum flow	% Habitat retention			
		90%	80%	70%	60%
Aoteapsyche (Rainy)	0.850	0.249	0.193	0.155	0.125
Deleatidium (Rainy)	0.750	0.150	0.103	0.067	0.044
Pycnocentrodes (Rainy)	0.775	0.209	0.149	0.116	0.089
Food producing	>0.900	0.290	0.260	0.231	0.204

5.1.3. NPSFM (2020) Compulsory Values

The NPSFM includes compulsory values for the following attributes ecosystem health, threatened species and mahinga kai.

Specifically, ecosystem health consists of five biophysical components: water quality, water quantity, habitat, aquatic life, and ecological processes. In a healthy freshwater ecosystem, all five biophysical components are suitable to sustain the indigenous aquatic life expected in the absence of human disturbance or alteration (before providing for other values). However, the NPSFM (2020) does not provide guidance on how the influence of introduced sports fish on indigenous aquatic life and ecological processes should be assessed. Simply, introduced sports fish alter indigenous ecosystem processes and indigenous aquatic life[20].

The Threatened Species Compulsory Value directs to the extent to which an FMU or part of an FMU that supports a population of threatened species has the critical habitats and conditions necessary to support the presence, abundance, survival, and recovery of the threatened species. All the components of ecosystem health must be managed, as well as (if appropriate) specialised habitat or conditions needed for only part of the life cycle of the threatened species. Again, this compulsory value has no guidance on implementation when the key threat to the survival and recovery of the threatened species is an introduced sports fish, as is the case for Lauder Creek. Central Otago roundhead galaxias are limited to a single, small tributary in the lower catchment.

Mahinga Kai Value directs that kai would be safe to harvest and eat, and that transfer of knowledge is able to occur about the preparation, storage and cooking of kai. In FMUs or parts of FMUs that are used for providing mahinga kai, the value also directs that the desired species are plentiful enough for long-term harvest and the range of desired species is present across all life stages. In the case of Lauder Creek, longfin eel, a highly valued mahinga kai species, is unlikely to meet the requirements of this compulsory value due to recruitment issues caused by the presence of Roxburgh Dam, which blocks the inward migration of juvenile eels that have entered the Clutha/Mata-Au from the ocean.

5.1.4. Management objectives

Because of the complexities highlighted above with the compulsory values of the NPSFM (2020) for Lauder Creek the focus of this report is on water quantity aspects of the ecosystem health attribute and the flow needs of threatened fish and traditional mahinga kai species. In the case of Lauder Creek, a significant focus is on the nationally threatened Central Otago roundhead galaxias (CORG)[21] and the traditional mahinga kai species longfin eel[22]. This is because there are significant non-flow related factors that are influencing ecosystem health, threatened species and mahinga kai species in Lauder Creek.

The flow regime identified to provide for the above compulsory values is also assessed for its expected outcome for the trout life stages present in Lauder Creek.

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[20] For example, the presence of trout alters the drift behaviour of indigenous invertebrates, the presence and abundance of indigenous invertebrates as well as the presence and abundance on indigenous fish.

[21] In our view given the scarcity of CORG's and hence their threat classification the lack of detections in the Lauder mainstem based on the existing monitoring results is not reason to write off their potential presence, particularly downstream of the current tributary population.

[22] Currently habitat is not limiting longfin eel in the Manuherikia catchment, eel are excluded from the catchment due to Roxburgh Dam with the exception of a few recruits from trap and transfer.

5.1.5. Proposed residual flow regime for Lauder Creek

Based on the management objectives discussed above and the instream habitat modelling of Jowett (2020), the optimum flow for the only threatened fish species present in the Lauder Creek catchment, Central Otago roundhead galaxias is 100 l/s. A flow of 100 l/s is higher than the optimum flow for upland bully[23]. 100 l/s also provides >60% habitat retention for large eels (>300mm) and 70% retention for small eels (<300mm) relative to natural MALF.

It is expected that a residual flow of 100 l/s in both the upper and lower reaches of Lauder Creek will sustain the indigenous aquatic life expected from a physical habitat perspective. However, other factors in heavily modified streams drive the presence of indigenous species that may not be able to be addressed by flow related consent conditions. For example, the lack of eels present is likely to be due to Roxburgh Dam preventing recruitment past it. CORGs are likely not present at many locations or are in very low numbers due to the impact of trout.

Implementing residual flows in Lauder Creek (downstream of the OAIC Weir and at the Rail Trail) of 100 l/s will also improve[24] rearing habitat for juvenile brown trout with greater than 60% habitat retention based on Jowett & Richardson (2008) relative to the natural 7-day MALF. This will obviously provide potential benefit to the Manuherikia trout fishery but may also have deleterious effects on any remnant CORG population in the mainstem due to increased predation and competition (McIntosh *et al.* 2009).

A residual flow of 100 l/s is recommended below the OAIC intake. It is expected this water will be lost to ground with the expectation it will resurface in the lower gaining reach to ensure sufficient flows reaches the lower reaches of Lauder Creek to provide for the values present. We expect this contribution below the OAIC Weir will be necessary with expected changes in water use within the wider Lauder Creek catchment (e.g. conversion from flood irrigation to spray irrigation methods) reducing returns in the lower Lauder Creek.

Lauder Creek is likely to provide some spawning for adult brown trout from the Manuherikia mainstem, therefore a winter (May – Sept) residual flow of 360 l/s (optimum habitat) at all Lauder Creek intakes would be reasonable to prevent takes to storage reducing flows below this point. However, because of the presence of the threatened CORG in the catchment and the compulsory value for threatened species in the NPSFM (2020) encouraging annual trout migrations from the Manuherikia to Lauder Creek to spawn may not be desirable[25]. If migrations were to be prevented this would need to be via a physical barrier rather than flow conditions as Lauder Creek is too large to manage flows to prevent trout passage in winter.

5.2. Individual Take Point Residual flows

In conjunction with collectively delivering 100 l/s at the OAIC Weir and the Rail Trail Flow Site we also recommend residual flows at points of take where takes are from perennial tributaries of Lauder Creek. No residual flows are recommended for naturally intermittent tributaries. Table 9 below provides residual flows for each take point that is from a tributary of Lauder Creek.

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[23] 80 l/s provides optimum habitat for upland bully.

[24] Currently with no residual flow in place flows can be 0 l/s at the Rail Trail Flow Site and immediately below the OAIC Weir – providing no rearing habitat.

[25] Allowing adult trout to access and spawn in Lauder Creek will cause an annual influx of juvenile trout which will increase competition and predation effects on CORG's.

Table 9. Tributary take consents, name of the stream and residual flow recommendations at the point of take.

Existing Consent Number	Take location	Residual flow recommended at point of take (l/s)	Downstream residual flow site
WR380B.V1 and WR382B.V1	Unnamed tributary of Lauder Creek	10	OAIC Weir
WR378B.V1	Shepherds Creek	5	Rail Trail Flow Site
98488	Millers Creek (Top Take)	10	Rail Trail Flow Site
2000.644.V2	Millers Creek (middle take)	10	Rail Trail Flow Site
3707	Millers Creek (bottom take)	10	Rail Trail Flow Site
2002.399	Unnamed tributary of Lauder creek (lower Creek)	Visual surface flow below the dam	Rail Trail Flow Site
2004.788	Unnamed tributary of Lauder Creek (lower Creek)	0	Rail Trail Flow Site

5.2.1. Winter Residual Flow at Confluence

The proposed residual flow conditions will result in reduced surety of supply or access to water by permit holders during the irrigation season. This is anticipated to result in aa greater focus on accessing water for on-farm storage. As a result of this potential shift in accessing water it is important to have winter flow controls on takes. This will address the potential effects of increased taking of water during winter of water.

A winter Residual flow of 350 l/s is recommended for Lauder Creek, which is optimum flow identified for trout spawning.

5.3. Supplementary Residual Flow

A supplementary residual flow of 600 l/s is recommended at the Rail trail flow site to allow taking to storage. This flow is exceeded 90% of the time during winter (May to Sept) and is also higher than the natural 7-day MALF. It is expected that both the 600 l/s residual flow and the appropriate supplementary block minimum flow at Campground flow site would need to be met to allow for taking.

5.4. Change to Water Takes

In addition to the residual flows it is proposed that the two private races immediately below the OAIC weir are decommissioned with take 96779 being amalgamated with Take 94548 (private take above the OAIC Weir) and take WR423B being amalgamated with the OAIC take. This will result in a reduction in combined maximum rate of take from 535.5 l/s to 450 l/s for consents WR432B and 2001.710.

Figure 15 below provides the longitudinal flows expected in Lauder Creek under average low flow conditions comparing natural flow with the status quo and this proposal where the following is proposed:

- 100 l/s residual below the OAIC Weir
- 100 l/s at the Rail Trail Flow Site.

- Site specific residual flows on tributary streams of Lauder Creek
- Decommission the two private water races immediately below the OAIC Weir and amalgamate them with the OAIC take.

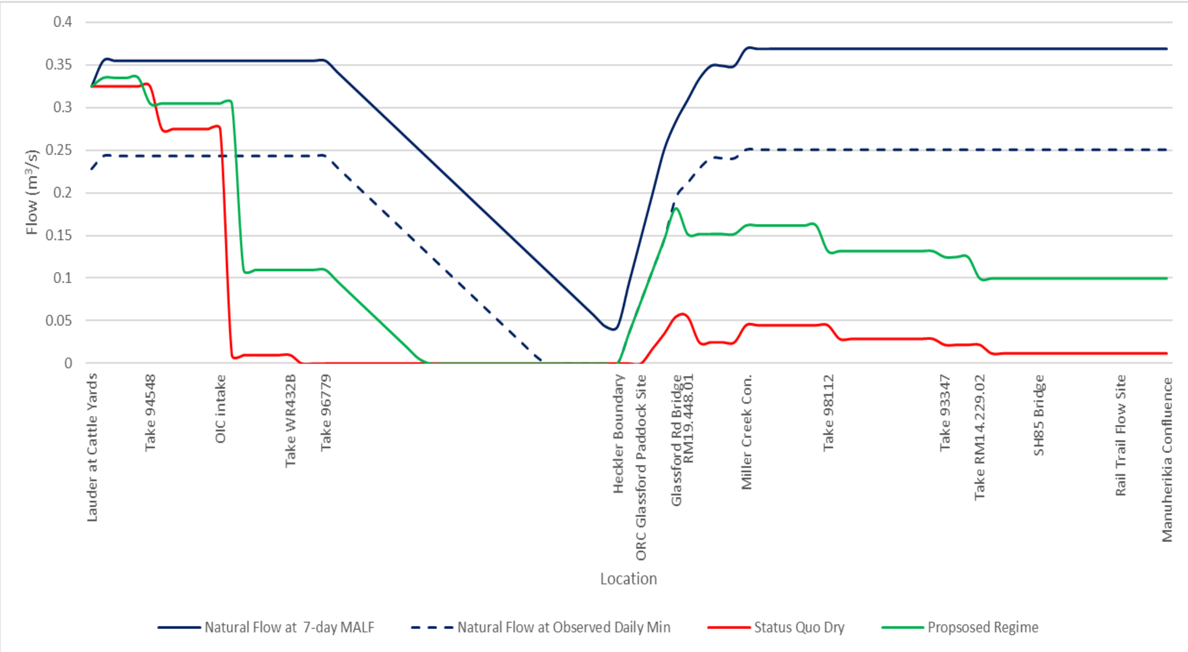

Figure 15. Longitudinal Flows at the natural 7-day MALF compared to the existng flow regime during dry periods and the flow regime expected under this propsal with an inflow of 325 l/s at the Cattle Yards Flow Site.

5.5. Fish screening

Fish screens are typically installed to prevent fish from being into water take infrastructure (e.g. race, pipe) and to return the fish unharmed to the waterway they came from. The design parameters for fish screens vary depending on the setting and the species/life-stage of fish present. In general, screens will be designed to comply with fish screening standards and guidelines (as outlined in Schedule 2 of the Canterbury Land and Water Regional Plan):

(a) The site is located as close to the river source as possible to minimise exposure of fish to the fish screen structure, and minimises the length of stream affected while providing the best possible conditions for (b) - (f) below;
(b) Water velocity through the screen ("approach velocity") is slow enough (generally <0.12 m/s) to allow fish to escape entrainment (being sucked through or washed over the screen) or impingement (being squashed or rubbed against the screen);
(c) Water velocity across (or past) the screen ("sweep velocity") is greater than the approach velocity (b) and is sufficient to sweep the fish past the intake;
(d) An effective bypass system is provided that is easily accessible to entrained fish, and fish are taken away from the intake and back into the source channel, or into water which provides the fish with unimpeded passage back into the source channel;
(e) Screening material (mesh, profile bars or other) on the screen needs to have a smooth surface and openings that prevent any damage to fish from coming into contact with the screening material; and

(f) The intake structure and fish screen are operated to a consistent, appropriate standard with appropriate operation and maintenance procedures, and this operation and maintenance should be regularly checked or monitored. A record should be kept of all the maintenance and monitoring carried out.

Our recommendation would be that on a case-by-case basis fish screens are investigated as to whether they are firstly needed, and what the best practical option is to deliver the desired outcome for the species present. The above criteria should be amended as required to make them appropriate for screening of off-takes from dams.

Consideration should be given to no screens being required on the OAIC Race as trout will be sent into a losing reach that will be dry a short distance below the weir for much of the summer.

5.6. OAIC Weir on Lauder Creek

On the 15th of September 2020 a number of OAIC Weirs were surveyed, particularly in respect to fish passage (Olsen, 2020). OAIC's Lauder weir is concrete with a rounded crest shape and at the survey flow of ~1.45 m^3/s the width of surface water across the Lauder Weir was 13.8m and the weir height was 1.8m (Figure 16 and Figure 17).

Figure 16. Photograph of the Lauder Creek race intake on Lauder Creek looking upstream.

Figure 17. Photograph of the Lauder Creek race intake on Lauder Creek from the True Left bank.

The weir is expected to prevent upstream passage of trout due to its vertical height (1.8 m) and the presence of a concrete apron. Upland bullies are also not expected to be able to make upstream passage past this weir. Due to their strong climbing abilities, longfin eels, lamprey and Kōaro are expected to be able to make passage past this weir at low flows when small amounts are passing over portions of the weir (Olsen 2020).

Both brown trout and upland bully are abundant upstream of OAIC's Lauder Weir, indicating a self-sustaining population above it. Longfin eel and Lamprey are rare in the Manuherikia (compared to natural state) due to the Roxburgh Dam. Finally, there are few Kōaro in the Manuherikia catchment, probably as a result of damming and trout predation.

Overall, the effects of the weir on fish passage are expected to be no more than minor.

5.7. Water sharing regime

In order to deliver the collective residual flows proposed both at the OAIC Weir and Rail Trail Flow Site the following would need to occur:

1. Consent holders on tributaries of the Lauder Creek mainstem will maintain their respective residual flows past their point of take.
2. Users above the OAIC Weir will cooperate to maintain a residual flow of 100 l/s past the weir at all times.
3. Users below the OAIC weir will cooperate to maintain at least 100 l/s at all times at the Rail Trail Flow Site.

All takes will also be subject to the respective downstream minimum flows on the Manuherikia River.

6. Summary

Lauder Creek is naturally intermittent in its mid reaches, though flows lost upstream reappear in the lower reaches.

The water quality observed in Lauder Creek appears to be impacted by flood irrigation methods within the Lauder Creek catchment. The conversion of irrigation from flood to spray methods is expected to result in significant improvements to water quality in the Lauder Creek catchment, with substantial reductions in phosphorus, sediment and microbial contamination anticipated.

Limited (one month of sampling) macroinvertebrate data gives an MCI and QMCI score of ~90 and 3.5 respectively for the lower Lauder Creek, indicating fair to poor ecosystem health. It is expected that the with the improvements in water use that these scores will improve over time.

Fish monitoring shows that currently there are three species of native fish in the Lauder Creek catchment, one is considered threatened (CORG) while another is a traditional mahinga kai species (longfin eel) while the third, upland bully are common and relatively adapt to low flows. Introduced species, Brown trout, rainbow trout and brook trout are also found in the Lauder Creek Catchment.

A residual flow of 100 l/s below the OAIC weir is proposed[26], this is expected to provide >60% habitat retention for juvenile brown trout[27] and near optimum habitat retention for upland bully and CORG's in the reach immediately below the OAIC intake. It is expected that with any residual flow below the OAIC weir Lauder Creek will dry downstream before reappearing upstream of the Glassford Road Bridge.

A residual flow of 100 l/s is proposed for the lower reaches of Lauder Creek at the Rail Trail Flow Site which is below all takes from the catchment. 100 l/s at the Rail Trail provides optimum habitat for CORG's. This flow also provides near optimum habitat retention for upland bully. 100 l/s also provides >60% habitat retention for large eels (>300mm) and 70% retention for small eels (<300mm) relative to habitat at the natural 7-day MALF. However, until recruitment of elvers past the Roxburgh Dam is resolved it will continue to be the key limiting factor for longfin eel in Lauder Creek.

Implementing a residual flow in the lower Lauder Creek of 100 l/s will also improve[28] rearing habitat for juvenile brown trout with greater than 60% habitat retention based on Jowett & Richardson (2008).

The 100 l/s residual flow will also provide 80% habitat retention for the abundant mayfly *Deleatidium*, >60% habitat retention for *Pycnocentrodes*, <60% habitat retention for *Aoteapsyche*.

Takes from tributaries of Lauder Creek will also have residual flows applied and be expected to adhere to either the 100 l/s residual at the OAIC Weir or the Rail Trail Flow Site depending on where the creek they take from joins Lauder Creek.

A winter primary residual flow of 360 l/s (optimum flow for trout spawning) at the Rail Trail Flow Site is also proposed for takes from Lauder Creek, while a supplementary residual flow of 600 l/s that would operate in conjunction with the appropriate supplementary minimum flow at Campground is recommended[29].

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[26] Currently there is no residual flow and the creek is dry most summers below the weir.
[27] Based on the Jowett and Richardson curves.
[28] Currently with no residual flow in place flows can be 0 l/s at SH85 – providing no rearing habitat.
[29] This supplementary minimum flow applied depends on which supplementary block the take is from.

The implementation of residual flows on all takes, the reduction in water use and the decommissioning of two private water races along with a catchment specific sharing regime will ensure the ecological values of Lauder Creek are maintained and improved.

Subject to proposed mitigations, the effects of the proposed activity on ecological values of Lauder Creek are not anticipated to be more than minor.

7. References

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Appendix 1. Synthetic Flow Developed for Lauder Creek at the Cattle yards based on Thomsons Creek above the Weir.

Thomsons Creek and Lauder Creek neighbour each other in the Manuherikia catchment and they drain very similar topography and aspect and have the same land uses and vegetative cover. Each catchment has a flow site installed above all abstraction points (Figure 18)

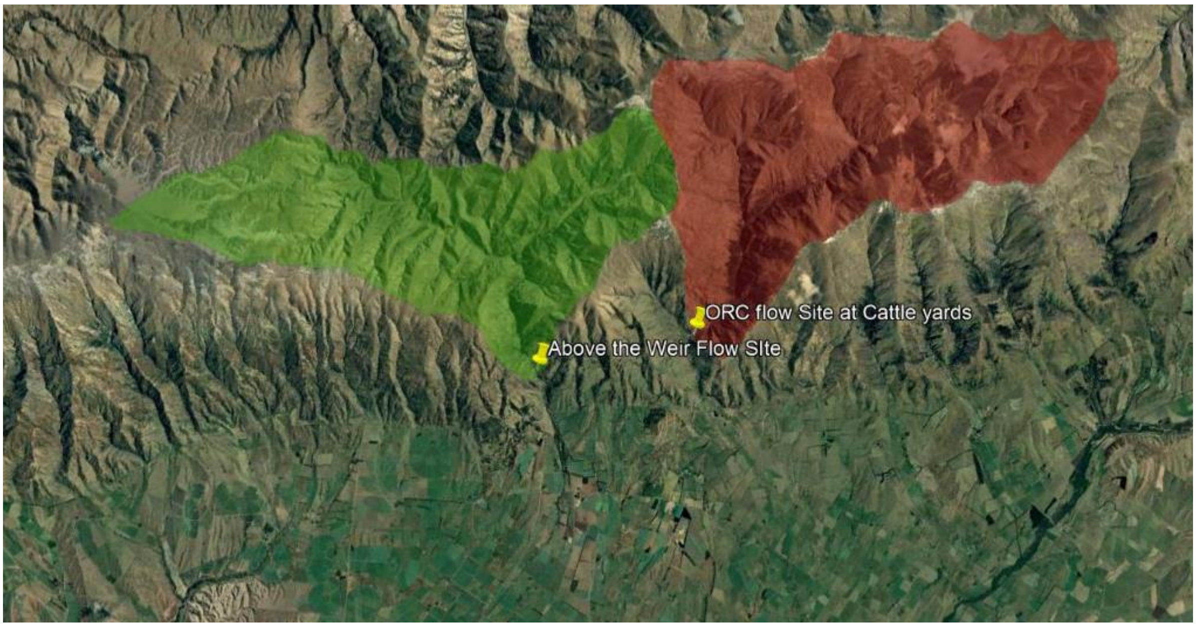


Figure 18. Location of the Thomson Creek above the Weir and Lauder Creek at the Cattle Yards flow sites.

Flow at Thomsons Creek above the Weir has been recorded over four irrigation season 2008/09, 2009/10, 2010/11 and 2019/20. Flows at Lauder Creek at the Cattle Yards have been recorded over six irrigation season 2008/09, 2009/10 and 2016-2020.

The pattern of flows recorded between Thomsons Creek above the Weir and Lauder Creek at the Cattle Yards are very similar, particularly for moderate to lows flows[30]. Figure 19 provides an example of the similarity in recorded flows from Thomsons and Lauder Creek.

[30] Flows less than 1.5 m^3/s at Lauder Creek.

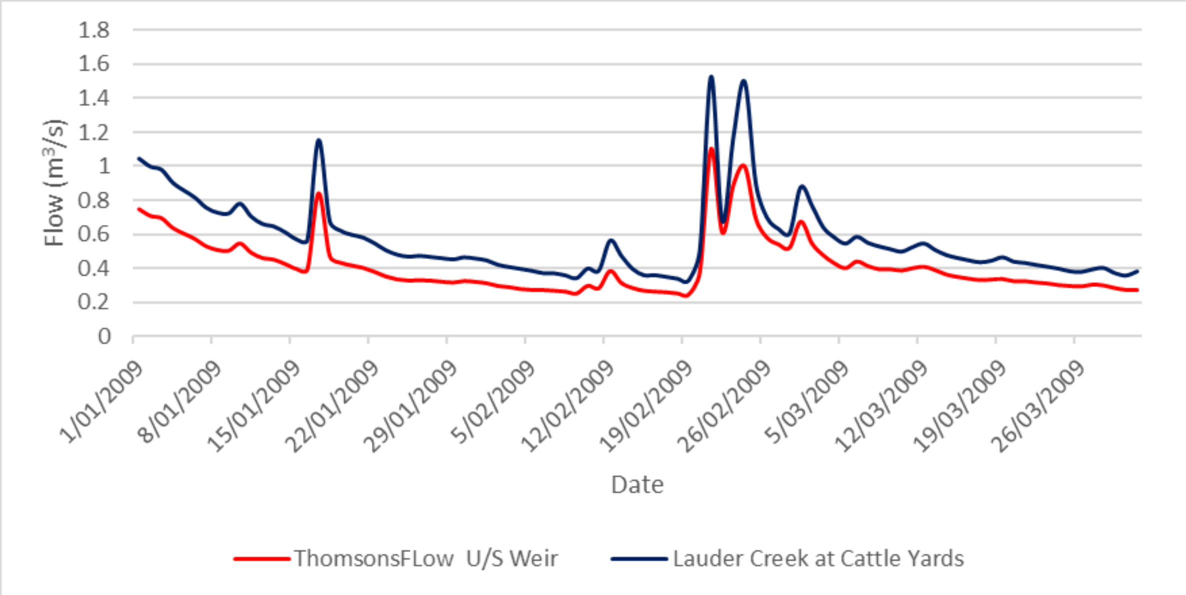


Figure 19 Observed flows at Thomsons Creek above the Weir and Lauder Creek at the Cattle yards for the period 1st of January to 30th March 2009.

There is three years of data where the two flow sites have operated simultaneously. Outside of high flow events (>1.5m^3/s) there is a strong correlation between the sites with the correlation tightening at the lower end of observed flows (Figure 20).

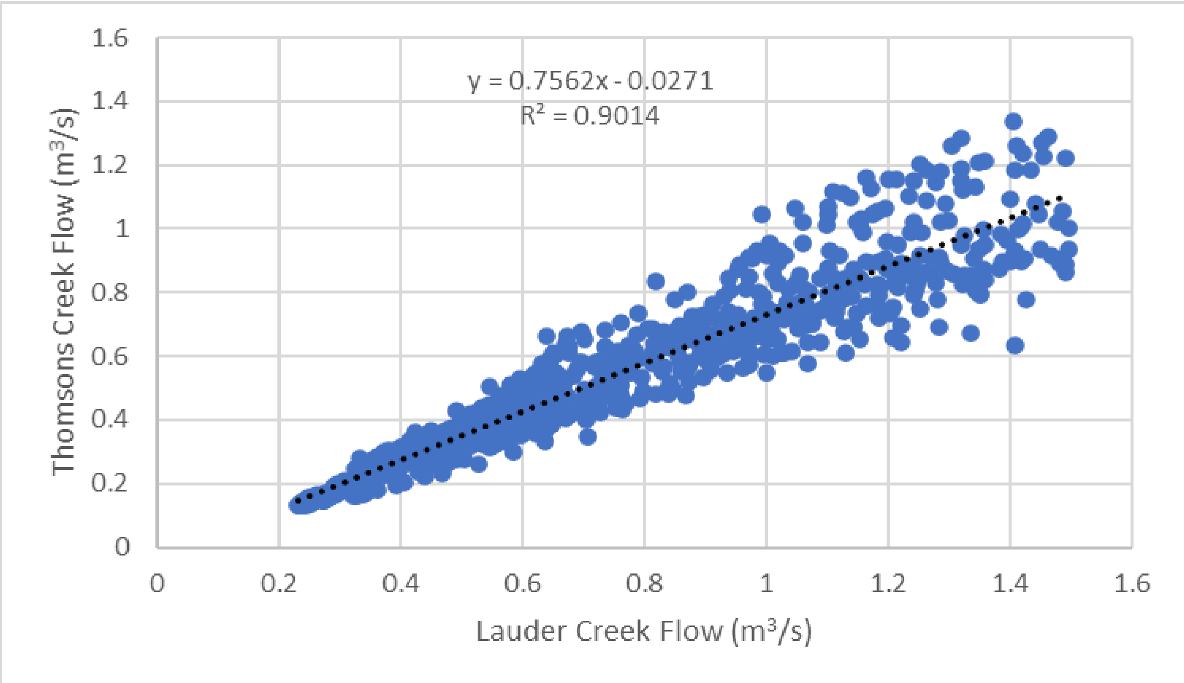


Figure 20. Correlations of observed flows between Lauder Creek at the Cattle Yards and Thomsons Creek above the Weir for flows less than 1.5m^3/s at Lauder Creek.

A synthetic flows for the 2010 – 2011 period in Lauder Creek at the Cattle Yards has been developed by applying the formula in Figure 20 to observed flows for Thomsons Creek above the Weir.

Appendix 2. Observation of Drying in Lauder Creek 25th of February 2020

On the 25th February 2020 we calculate the daily average flow below Take 96779 was 151 l/s[31]. On this day 1500m of creek bed was dry.

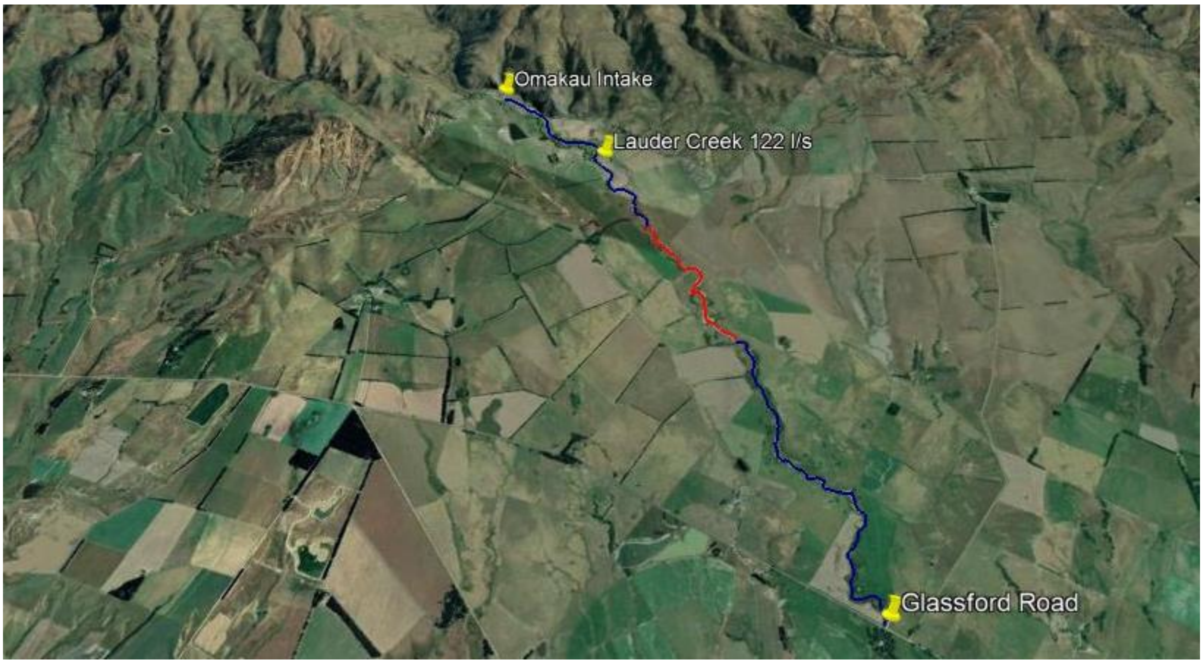


Figure 21. NIWA Gauging location (yellow pin 122 l/s) and the observed dry reach (shown in red) on the 25th of February 2020.

Between the 4th of February and 25th of February 2020 the flow below Take 96779 receded from 7,027 l/s to 151 l/s (Figure 22).

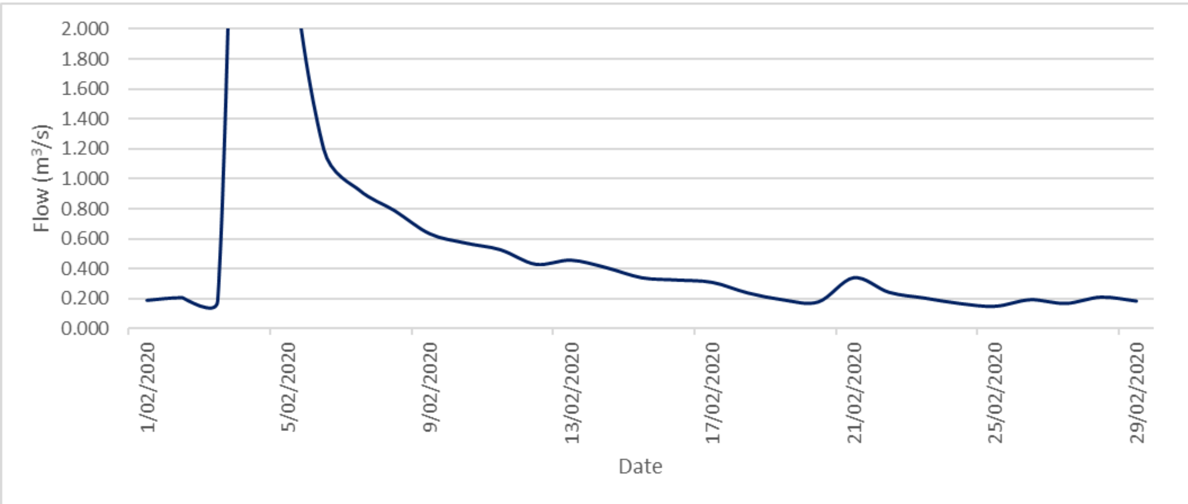


Figure 22. Daily average flows below Take 96779 for February 2020.

[31] We also had NIWA carry out a spot gauging of Lauder Creek immediately below Take 96779 on this day with a flow at the time of 122 l/s.

memo

To: Ros Day

From: Matt Hickey

Date: 20/11/2020

Re: Clear Creek – Take 2002.071

Clear Creek is a small tributary of Muddy Creek which in turn runs into the Manuherikia River on the true right near Lauder. The catchment area above the existing take is 3 km^2 (Figure 1).

Figure 1. Take point 2002.071 on Clear Creek and the catchment area upstream also shown is the water race from the take point to a storage dam.

The site was visited in October 2020 with the following photos of Clear Creek taken at the point of take (Figure 2 and Figure 3).

Figure 2. Clear Creek looking upstream from the existing intake.

Figure 3 Clear Creek immediately below the existing intake.

Figure 4 below provides a photo of Clear Creek and its catchment above the existing take. On the day of our visit there was a significant amount of contour flood irrigation occurring upstream which leads me to believe that the water seen in Clear Stream on the day is mostly source from irrigation run-off.

Given the small catchment upstream of the existing take (3 km^2) I would expect that Clear Creek without additional flow from irrigation runoff is naturally intermittent.

Figure 4. Clear Creek upstream of intake

Clear Creek has only been surveyed once in 2018 at the existing point of take as part of an ORC initiative to gather fisheries information in the vicinity of a number of water takes across Otago, that survey found no species present (Figure 5).

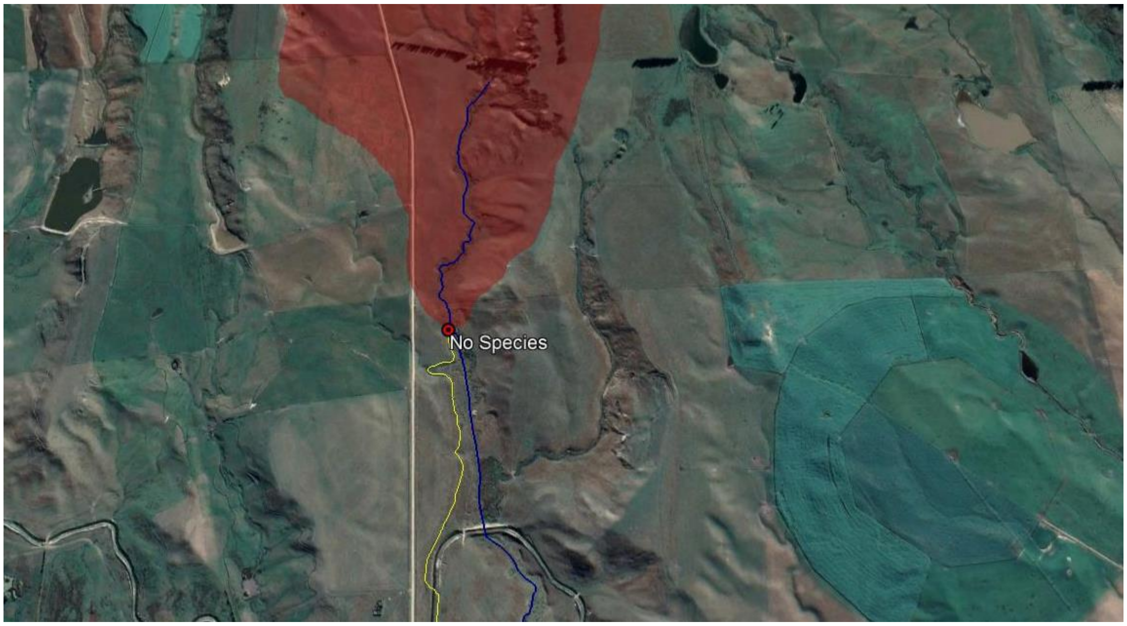


Figure 5. Fish survey location in Clear Creek from NIWA's NZFFDB.

Recommendation

Given Clear Creek is likely to be naturally intermittent and the recent fish surveys show no species present no residual flow is recommended for this take.

QGIS Methodology

The Maps provided in this Application were developed using QGIS software. The following data were imported:

- Climate Zone
- MAR
- PAW_MOD
- Other spatial data available on LINZ database.

Data processing:

- Climate Zone, MAR and PAW_MOD data was combined so that each unique combination is defined by a separate polygon.

- The data was then exported to Excel and the water demand calculated from the appropriate Aqualinc Table (climate zone, MAR, crop).

- Where PAW_MOD values fell between those listed in the Aqualinc Tables, a pro-rata calculation of water demand was made. For example, if PAW_MOD was 70, this is 1/3 of the way between the values in the table for PAW of 60 and 90. The pro-rata water demand was therefore calculated as 1/3 of the way between the demand values for 60 and 90.

- Where PAW_MOD values were lower than the lowest value in the Aqualinc tables, or higher than the highest, the lowest/highest value in the table was used, e.g. in a table giving values between 40 and 150, a PAW_MOD of 25 would be assigned the demand value in the table for 40, and a PAW_MOD of 200 would be assigned the value for 150. The range of values in the tables varies for each crop: 40-150 for pasture, 40-200 for grapes, 60-200 for cherries/apricots, and 120-150 for vegetables.

Memorandum

To:	Matt Hickey (Water Resource Management) Omakau Irrigation Company
From:	Dean Olsen, Freshwater Scientist
Cc:	
Date:	16 September 2020
Re:	**Manuherikia weir survey**

Outline

Irrigation weirs owned by the Omakau Irrigation Company within the Manuherikia catchment were surveyed on 15 September 2020 to provide the information required by Appendix 4 of the National Policy Statement for Freshwater Management (2020). The following information is presented for each weir:

- Name of structure
- Survey date
- Survey time
- Flow (no flow, low, normal, high, unknown)
- Width of water surface
- Weir width
- Structure type
- Crest shape
- Weir height
- Weir materials (e.g. concrete, rock, steel)
- Wetted margins present
- Weir slope
- Add-ons present
- Backwater distance
- Owner
- Fish Passage

In addition to the above, high-resolution aerial photographs were taken of each weir in addition to photographs of each structure looking upstream and from the bank. An aerial photograph was not taken of the Lauder Creek weir due to technical difficulties with the drone and high winds at this site. Aerial photographs were taken with a DJI Mavic Mini drone.

freestone
freshwater science

Memorandum

Name	**Omakau Irrigation Scheme main race intake**
Survey date	15/09/2020
Survey time	9:15
Flow at time of survey	13.3 m^3/s at Manuherikia at Ophir, estimated ~4 m^3/s at weir
Location	NZTM E1347200 N5014581

Structure type	Weir - irrigation intake
Width of water surface	29 m
Weir width	60 m
Weir materials	Concrete
Crest shape	Rounded
Weir height	2.6 m total, 1.2 m to first step, then 1.4 m to second step (top)
Wetted margins?	No
Weir slope	60°
Add-ons present	Nil
Owner	Omakau Irrigation Company
Fish Passage	This structure is likely to be partial barrier to trout, with large adult trout potentially above to make passage at high flows. Anecdotally, large trout have been seen attempting passage. Non-migratory galaxiids and upland bullies are not expected to be able to make upstream passage past this weir. Due to their strong climbing abilities, longfin eels, lamprey and kōaro are expected to be able to make passage past this weir.

Figure 1 ***Aerial photograph of the Omakau Irrigation Scheme main race intake on the Manuherikia River.***

Figure 2 ***Photograph of the Omakau Irrigation Scheme main race intake on the Manuherikia River looking upstream.***

Figure 3 ***Photograph of the Omakau Irrigation Scheme main race intake on the Manuherikia River from the True Left bank.***

Name	**Dunstan Ck main take**
Survey date	15/09/2020
Survey time	9:30
Flow at time of survey	3.7 m^3/s at Dunstan Creek at Beattie Road
Location	NZTM E1344160 N5021675

Structure type	Weir - irrigation intake
Width of water surface	23.8 m
Weir width	23.8 m
Weir materials	Rammed iron sheet piling & boulders
Crest shape	Square
Weir height	1 - 1.3 m
Wetted margins?	No
Weir slope	90° (vertical)
Add-ons present	Nil
Owner	Omakau Irrigation Company
Fish Passage	Passage for adult trout expected to be possible on true right edge. Non-migratory galaxiids and upland bullies are not expected to be able to make upstream passage past this weir. Due to their strong climbing abilities, longfin eels, lamprey and kōaro are expected to be able to make passage past this weir.

Figure 4 Aerial photograph of the Dunstan Creek main race intake on Dunstan Creek.

Figure 5 Photograph of the Dunstan Creek main intake on Dunstan Creek looking upstream.

Figure 6 Photograph of the Dunstan Creek main take on Dunstan Creek from the True Right bank.

Memorandum

Name	**Lauder Race intake**
Survey date	15/09/2020
Survey time	11:00
Flow at time of survey	1.45 m^3/s
Location	NZTM E1333788 N5015265

Structure type	Weir - irrigation intake
Width of water surface	13.8 m
Weir width	13.8 m
Weir materials	Concrete
Crest shape	Rounded
Weir height	1.8 m
Wetted margins?	No
Weir slope	90°
Add-ons present	Nil
Owner	Omakau Irrigation Company
Fish Passage	Upstream trout passage is not expected past this weir due to its vertical height (1.8 m) and the presence of a concrete apron. Upland bullies are not expected to be able to make upstream passage past this weir. Due to their strong climbing abilities, longfin eels, lamprey and kōaro are expected to be able to make passage past this weir at low flows when small amounts are passing over portions of the weir.

Figure 7 Photograph of the Lauder Creek race intake on Lauder Creek looking upstream.

Figure 8 Photograph of the Lauder Creek race intake on Lauder Creek from the True Left bank.

Name	**Clearwater race**
Survey date	15/09/2020
Survey time	13:20
Flow at time of survey	13.3 m^3/s at Manuherikia at Ophir, 1.0 m^3/s
Location	NZTM E1332112 N5005309

Structure type	Weir - irrigation intake
Width of water surface	6.6 m
Weir width	6.6 m
Weir materials	Rammed iron sheet piling & boulders
Crest shape	Right angle
Weir height	1.1 m
Wetted margins?	No
Weir slope	90° (vertical)
Add-ons present	Nil
Owner	Omakau Irrigation Company
Fish Passage	Adult trout are expected to be able to make passage past this structure, particularly at moderate to high flows. Non-migratory galaxiids and upland bullies are not expected to be able to make upstream passage past this weir. Due to their strong climbing abilities, longfin eels, lamprey and kōaro are expected to be able to make passage past this weir.

Figure 9 ***Aerial photograph of the Clearwater race intake on Lauder Creek.***

Figure 10 Photograph of the Clearwater race intake on Lauder Creek looking upstream.

Figure 11 Photograph of the Clearwater race intake on Lauder Creek from the True Right bank.

Name	**Matakanui Race - Thomsons Creek**
Survey date	15/09/2020
Survey time	15:00
Flow at time of survey	1 m^3/s at Thomsons Creek at SH85
Location	NZTM E1329290 N5012783

Structure type	Weir - irrigation intake
Width of water surface	12.7 m
Weir width	20.3 m
Weir materials	Concrete
Crest shape	Angle
Weir height	1.9 m
Wetted margins?	No
Weir slope	80°
Add-ons present	Nil
Owner	Omakau Irrigation Company
Fish Passage	Trout and upland bullies are not expected to be able to make passage past this structure due to the height (1.9 m) and angle of the weir. Due to their strong climbing abilities, longfin eels, lamprey and kōaro are expected to be able to make passage past this weir.

Figure 12 Aerial photograph of the Matakanui race intake on Thomsons Creek.

Figure 13 Photograph of the Matakanui race intake on Thomsons Creek looking upstream.

Figure 14 Photograph of the Matakanui race intake on Thomsons Creek from the True Right bank.

Name	**Coal Creek intake - County Race**
Survey date	15/09/2020
Survey time	15:00
Flow at time of survey	~100 l/s
Location	NZTM E1325102 N5006684

Structure type	Weir - irrigation intake
Width of water surface	1.5 m
Weir width	1.5 m
Weir materials	Concrete flume with boards
Crest shape	Boards
Weir height	0.4 m + boards
Wetted margins?	No
Weir slope	90° (vertical)
Add-ons present	Nil
Owner	Omakau Irrigation Company
Fish Passage	Trout and upland bullies are not expected to be able to make upstream passage pass this weir at low to normal flows with boards in place due to the shallow water depth flowing over the concrete flume and the vertical nature of the boards. Due to their strong climbing abilities, longfin eels, lamprey and kōaro are expected to be able to make passage past this weir.

Figure 15 Aerial photograph of the County race intake on Coal Creek.

Figure 16 Photograph of the County race intake on Coal Creek looking upstream.

Figure 17 Photograph of the County race intake on Coal Creek from the True Right bank.

Memorandum

Name	**Middle Race (Buster Race) - County Race**
Survey date	15/09/2020
Survey time	15:15
Flow at time of survey	~350 l/s
Location	NZTM E1323972 N5006028

Structure type	Weir - irrigation intake
Width of water surface	1 m
Weir width	1 m
Weir materials	Natural rock
Crest shape	Natural rock
Weir height	0.4 m
Wetted margins?	No
Weir slope	25°
Add-ons present	Nil
Owner	Omakau Irrigation Company
Fish Passage	Fish passage is expected to be possible for all fish species present.

Figure 18 ***Aerial photograph of the County race intake on Middle (Buster) Creek.***

Figure 19 Photograph of the County race intake on Middle (Buster) Creek looking upstream.

Figure 20 Photograph of the County race intake on Middle (Buster) Creek from the True Right bank.

ORC FILE MC030

Otago Regional Council

CERTIFICATE UNDER S. 417 OF THE RESOURCE MANAGEMENT ACT 1991

oOo

Pursuant to Section 417(2) of the Resource Management Act 1991, the Otago Regional Council hereby certifies that:

Name: **Ian Robert Brown**
Address: [redacted]

Name: **Thomas Matthew Moran and Joanne Elizabeth Moran**
Address: [redacted]

Name: **B J & C M McKenzie Limited**
Address: [redacted]

being registered as holders of Licence for a Water Race No 432, Blacks Registry of the Warden's Court, are entitled to cut, construct, and maintain a race, to use as a race a natural channel (but only where that channel has been so used under the licences); to occupy (but only for the purposes of the construction, maintenance, and improvement of the race) the land forming the course of the race plus a strip 6.1 metres (20 feet) wide along the entire length of the race, and measured either wholly on one side of its course or partly on one side and partly on the other, so that the total on both sides does not exceed 6.1 metres; to deposit within those strips any material removed from the race in the course of maintaining and improving it; and to convey water in the race, across the lands described in the Schedule, as indicated on the attached diagram.

OTAGO REGIONAL COUNCIL Common Seal

G N Martin
Chief Executive

Dated this 18th day of December 2009.

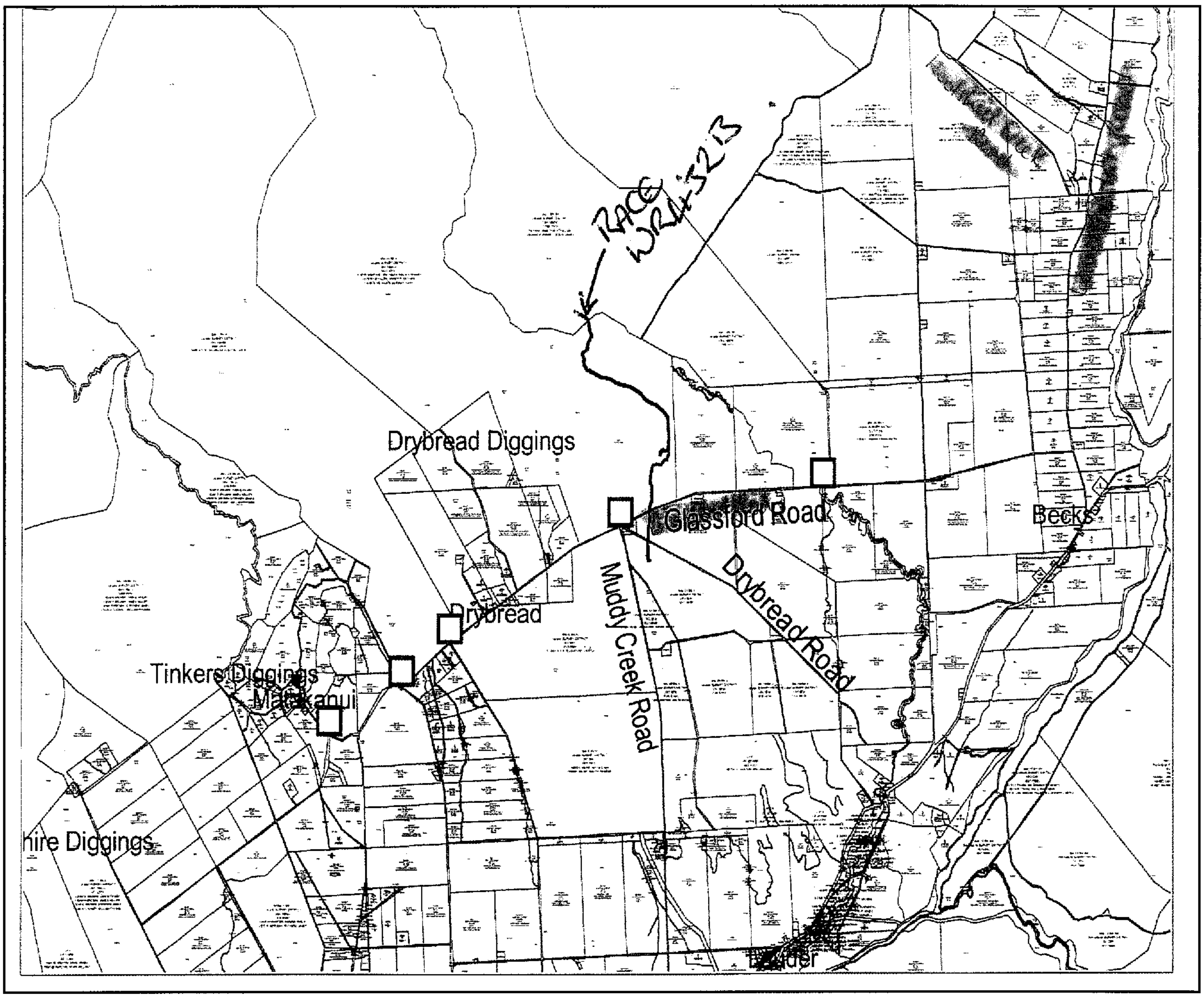
THE COMMON SEAL of the
OTAGO REGIONAL COUNCIL
Was hereunto affixed in the
Presence of:

R W Scott
Director Corporate Services

Otago Regional Council

SCHEDULE

Land Affected	Title Reference	Owner
Sec 15 Blk X Lauder SD	OT 13C/676	Annette Esther Heckler and Murray John Heckler, Polson Higgs Nominees (2008) Limited and Rogers Trustees Limited
Sec 25 Blk V Lauder SD	OT 10B/341	Viewpoint Farm Limited
Sec 22-23 and 46 Blk V Lauder SD	OT6B/1217	Murray John Heckler, Annette Esther Heckler, Rogers Trustees Limited, and Polson Higgs Nominees (2008) Limited
Sec 1 Blk XIV Lauder SD	OT14D/448	Helen Ruth Tucker, Roger Norman Macassey, George Frederick Tucker, Helen Ruth Tucker, GCA Legal Trustee 2005 Limited, Murray John Heckler, Annette Esther Heckler, Polson Higgs Nominees (2008) Limited, and Rogers Trustees Limited
Glassford Road	Road Reserve	
Drybread Road	Road Reserve	


RACE WR4-3213
Drybread Diggings
Glassford Road
Becks
Drybread
Muddy Creek Road
Drybread Road
Tinkers Diggings
Matakanui
hire Diggings

Appendix I: Legal Description of land where water will be used for OAIC, Viewpoint and Brown permit

Property	Legal Description of land where water will be used
Hill, Dave	Section 1A Matakanui SETT Block III Lauder SD (OT/13A/1282) Section 17 Block VI Lauder SD (OT/3D/1150)
Glassford, Tony	LOT 2 DP 337168, Sections 8, 38 44 54-56, PT Section 33, 37 BLK VI, Section 9, 10, 12-14, PT Sec 35, BLK X Lauder SD (OT/9B/574)
Groundwater, Barbara and Alastair	Section 6, 7 & 42 Block VI Lauder SD (OT/14C/195)
Avonrath (Clouston, Geoff)	LOT 2 Deposited Plan 329435, Section 5, 13, 16, 21, Part Section 4 Block V Lauder SD (OT/314/164)
Gillespie	Sections 46, 47, 56, 60, Block III lauder SD LOT 2 Deposited Plan 428616 LOT 2 Deposited Plan 357148 (OT/9C/95)
Hamilton, Marcus	LOT 1 DP 22370 (OT/14B/74)
Heckler, Murray (now James and Kelly)	LOT 3 DP 422600, Section 1 SO 24145, Section 22-23, 46, 49 BLK V, Section 15 BLK X, Lauder SD (OT/6B/1217)
Milmor (Milne Family)	Section 5 Block VI Lauder SD LOTS 1, 2, 4, 5, 36 Deposited Plan 359982 (OT/14B/522) (0/0/244002)
Muir, Max	LOT 1 DP 23431 Lot 1 DP 16391 (OT/15C/85)
Wildon Dairy Ltd (C Webster)	Sections 14, 15, 16, 32 Block VI Lauder SD (OT/14B/1114) Lot 2 Deposited Plan P 403585 Sections 4A 8A Matakanui SETT Sections 15, 20, 43 Part Sections 25 Block III Lauder SD (OT/7D/1319)
Viewpoint Farm Ltd and IR and MA Brown	Section 26, 27, PT Section 19, BLK V Lauder SD Section 20, 25, 47 Block V Lauder SD

Omakau Area Irrigation Company

Scheme Management Plan

Reviewed 2018

Prepared for the Otago Regional Council

Note.

The review of the Omakau Area Irrigation Company Scheme Management Plan has been conducted on the basis of what we know today. Future ORC plan changes and current plan changes under review will no doubt have effect on the operation of the scheme.

The outcome of the Manuherikia River Ltd feasibility study will also impact on our future direction.

CONTENTS

Plan Purpose

Scheme Management

Scheme description

Flow Measurement

Water Use Efficiency

Monitoring

Plan Review

Plan Purpose

The purpose of this management plan is to show how the Omakau Area Irrigation Company will comply with its consent conditions and details the ownership, description and operation of the scheme, how it is managed, the type of water uses, identification of the potential impacts on the environment and ways to mitigate any negative impacts on the environment.

Scheme Management

The Omakau Area Irrigation Company Directors and appointed race manager are in charge of the day to day operation of the scheme. The Company's objective is to supply their shareholders with a full water entitlement and operate the scheme as efficiently as possible by minimising water loss from the system and overall scheme operating costs.

The key responsibilities of the irrigation company are:

- Ensure that water is available to its shareholders when and where required
- Ensure that the consent conditions are met, including monitoring & reporting requirements
- Ensure that shareholders (water users) understand any requirements to meet environmental bottom lines
- Ensure that water users meet all contractual obligations with the irrigation company.

The race manager's responsibilities include:

- Controlling the water take from the Manuherikia river;
- Controlling the water takes into the sub main races from the hill races
- Arrange maintenance of races and race gates, siphons etc;
- The distribution and management of irrigation water; and
- Monitored that the Irrigation Management Plan best practices are followed by all water users.
- Report all water take records to ORC on an annual basis
- Keep company directors well informed

Scheme description

Omakau Main

The Omakau Main Race scheme services an area of 3607ha of irrigated land and provides water for 42 properties.
The intake for the Main race is situated approximately 4 kilometres upstream from Becks on the Manuherikia River. The Omakau main race carries water from the intake as far south as Tiger Hill.

Dunstan

The Dunstan Scheme services an area of 844ha of irrigable land and provides water for 13 properties.
The Dunstan scheme takes water from Dunstan Creek near Cambrians, distributing water in a south-west direction as far south as Lauder Creek.

Lauder

The Lauder Scheme services an area of 452ha of irrigable land and provides water for10 properties.
The Lauder scheme takes water from the intake at the mouth of Lauder gorge on the Lauder Creek and supplies water to the area south and south-west towards Thomson's Creek.

Matakanui

The Matakanui Scheme services an area of 555ha of irrigable land and provides water for 10 properties.
The Matakanui scheme takes water from the intake at the mouth of Thomson's gorge on Thomson's Creek and distributes it south-west to the Matakanui area.

County/Devonshire

The County /Devonshire scheme services an area of 230ha of irrigable land and provides water for 5 properties.
The County / Devonshire scheme takes water from County and Devonshire creeks through their race systems to upper Chatto creek area.

Clearwater

The Clearwater Scheme services an area of 151ha of irrigable land and provides water for 7 properties.
The Clearwater scheme takes water from Thomson's creek approximately 800 metres North West of Omakau Racecourse and servicing an area west of Omakau.

Flow measurement

Manuherikia River Intake

Omakau Main Race

Deemed permit 2001.702, 1981 l/s
Water permit 2001.703, 283 l/s - surrendered

Water is taken from the Manuherikia River at an intake weir just upstream of St Bathans Downs Road Bridge. The water flows down a pipeline to a control structure at the start of the Main Race, about 500 metres downstream of the intake.
The control structure maintains a flow of not more than 70 heads (Deemed Permit 2001.702, 1981 litres per second) into the Main Race.
Incorporated in the control structure is a desilter which enables the return of gravel to the river.
The race is electronically measured below the control structure by Niwa.
This Take has automated intake gates that enables us to set the desired flow remotely, by smart phone or computer.
Water Permit 2001.703 is now not required and has been surrendered.

Dunstan Race Intake

Dunstan Race
Deemed permit 2001.708, 424.5 l/s

Water is taken from Dunstan Creek at an intake weir adjacent to Loop Road near Cambrians Road corner. The water flows down an intake channel to a flood control and measure structure at the start of the Dunstan race approximately 353 metres downstream of the intake.
This race has an automated intake gate that enables us to set the desired flow remotely, by smart phone or computer.
The race is electronically measured below the flood control structure by Niwa.

Lauder Creek Intake

Lauder Race
Deemed permit 2001.710, 424.5 l/s

Water is taken from Lauder creek at the mouth of the Lauder Gorge and put into the race for distribution.
This race has an automated intake gate that enables us to set the desired flow remotely, by smart phone or computer.
This race has electronic measurement downstream of the intake at the measure weir.

Thomson's Creek Intake

Matakanui Race
Deemed permit 2001.706, 424.5 l/s

Water is taken from Thomson's Creek and put into the Matakanui race for distribution.
This race has an automated intake gate that enables us to set the desired flow remotely, by smart phone or computer.
This has been upgraded to electronic measure by Niwa and is awaiting calibration.

Thomson's Creek Intake

Clearwater Race
Deemed permit 2001.719, 113.2 l/s
Water permit 2001.720, 169.8 l/s

Water permit 2001.720 is used in conjunction with deemed permit 2001.719 at a single point of take.
Water is taken from Thomson's creek and put into the Clearwater race for distribution.
This race has electronic measurement downstream of the intake at the flood control gate and measure.
This race has an automated intake gate that enables us to set the desired flow remotely, by smart phone or computer.

Middle Creek intake

County Race
Deemed permit 2001.712, 84.9 l/s
Water permit 2001.713, 56.6 l/s

Water permit 2001.713, is used in conjunction with deemed permit 2001. 712, at a combined single point of take.

Water is taken from Middle creek and put into the county race system. The flow into the race is regulated by the intake gate and measured just downstream of the intake.
This race has electronic measurement just downstream of the Take.
This race has an automated intake gate that enables us to set the desired flow remotely, by smart phone or computer.

Coal Creek intake

County race
Deemed permit 2001.714, 28.3 l/s

Water is taken from Coal Creek and put into the county race system.
The flow into the race is regulated by the intake gate and measured just downstream of the intake.
This race has electronic measurement just downstream of the intake.

Scott's Creek intake

Scott's Creek race
Deemed permit 2001.715, 56.6 l/s

Water is taken from Scott's Creek under deemed permit 2001.715. The race from Scott's Creek flows for approximately 2 km to Devonshire Creek where the water is discharged into Devonshire Creek, about 50 metres upstream of where it is retaken.

The water is retaken at the combined intake of deemed permit 2001.716, and water permit 2001.718, and retake permit 2001.717.
A manual measure box is used to measure this take.
The total volume of the three takes is measured at one point at the Devonshire race, 2001.715, 2001.716, 2001.718.

Devonshire Creek Intake

Devonshire Race

Deemed permit 2001.716, 28.3 l/s
Water permit 2001.718, 84.9 l/s
Retake permit 2001. 717, 56.6 l/s

Water permit 2001.718, is used in conjunction with deemed permit 2001.716, and retake permit 2001.717, at a single point of take.
Devonshire Creek is supplemented by the discharge of the Scott's Creek water and retaken under retake permit 2001.717.
The total volume of the three takes is measured at one point at the Devonshire race, 2001,715, 2001.716, 2001.718.
This race has electronic measurement.
This race has an automated intake gate that enables us to set the desired flow remotely, by smart phone or computer.

Ownership Structure

The Omakau Area Irrigation Company owns the assets of the Schemes including the Falls Dam.

Irrigators own 20 unpaid shares per hectare of signed up quota with the Company
Management Structure

The affairs of the Omakau Area Irrigation Company are managed by the board of directors.

The Board consists of eight directors

5 Directors from the Main Race Scheme
1 Director from Lauder Scheme
1 Director from Dunstan Scheme
1 Director from Matakanui / Devonshire /County Schemes

Two directors retire by rotation and can stand for re-election at the annual AGM.

Falls Dam

Falls Dam assets are managed by the Falls Dam Company.

The Omakau Area Irrigation Company also has 2 director representatives on the Falls Dam Company Board.

The Falls Dam shareholders structure being

Omakau Area Irrigation company 53%
Manuherikia Irrigation Co-Op Company Limited 35%
Galloway Irrigation Society 6%
Blackstone Irrigation Company 6%

Water use efficiency

On Farm

All shareholders sign a current water agreement (appended) this sets out the terms and conditions for the efficient use of the water allocation for each property.

Major changes are taking place in the scheme command area with conversion to spray irrigation through the use of centre pivots .Some users are installing static sprinkler systems also. This trend is set to continue as more water users realise the potential of spray irrigation to their farming operations.

The water supply to farmers is rostered, based on the hectares each farm has signed up with the Irrigation Company. Most farms are supplied with a continuous flow, into on-farm dams and then is spray irrigated on farm.

This has in turn has heightened the awareness for the need to increase the storage in the catchment and the interest in the Manuherikia River Ltd feasibility study is gaining momentum.

Management of the spray systems will require a new set of skills for the water users and this is an area that will require ongoing development and understanding. There are multiple industry groups who are able to provide workshops and field days and are now readily available to water users.

The Manuherikia River Ltd feasibility study will address the issues around application rates on farm using the information available on soils, climate data, and altitude and land use options.

Off Farm

The Company is working as hard as it can to replace aging infrastructure to minimise losses. PE pipe is being introduced to replace steel and concrete siphons and has proven to be a major benefit through cost savings in materials, ease of installation and being able to take a bigger flow for the same size pipe and at the same time reduce losses.

Installation of water meters is completed and make the scheme easier to monitor and control as these have become automated and controlled on line.

Monitoring

The Scheme Manager is responsible for recording all water takes. The company has installed water meters and has converted from manual recording to electronic data storage and reporting. This applies to the main company takes but distribution to company shareholders will remain manual for the foreseeable future.

Water records will be available on demand to ORC and annually for shareholders or more regularly by arrangement.

Visual monitoring of the of the river and hill streams by our scheme manager is ongoing and any adverse environmental effects our scheme operations are having, are reported back to the directors

Shareholders in breach of their water agreement conditions are referred back to the directors for follow up consultation and remedial action.

Visual inspection of the scheme infrastructure is continual and a maintenance programme is well established.

Plan Review

This plan shall be reviewed every 5 years.

Appendix K – Total water demand for properties and water sources in the Lauder application

Annual water demand calculation (using the Aqualinc, (2017) approach)					Volume requested from private source	Calculated volume demand related to each water source (m^3/year)			
Applicant name	**Water source**	**Water demand** (m^3/ha/year)	**Area irrigated (ha)**	**Total demand requirement** (m^3/year)	**Private water (requested or issued) m^3/year**	**Lauder Race**	**Dunstan Race**	**Main Race**	**Matakanui Race**
James Armstrong	Lauder Race	8480	205.1	1739248					
		8760	16.7	146292					
		8980	47.4	425610					
		9180	4.7	43495					
		Total	273.9	**2,354,645**	657,547 + 304,999 = 962,546		1,514,541		
	Main Race	8980	39.1	**351,281**				351,281	
Booth	Private Water	8980	26.4	**237,317**	90,006				
Brown	Private Water	8980	114.2	1025449					
		8480	0.1	916					
		9180	68.4	627598					
		8760	15.4	135082					
		Total	198.1	**1,789,045**	1,469,226/2= 734,613				
Central Park	Main Race	9190	2.6	24186					
		8980	314.1	2820618					
		0	6.5	0					
		9180	0.2	2191					
		Total	323.5	**2,846,994**	0			2846994	
Clouston	Private water	9190	4.0	36312					
		8980	71.1	638925					

Annual water demand calculation (using the Aqualinc, (2017) approach)					Volume requested from private source	Calculated volume demand related to each water source (m³/year)			
Applicant name	**Water source**	**Water demand** (m³/ha/year)	**Area irrigated (ha)**	**Total demand requirement** (m³/year)	**Private water (requested or issued) m³/year**	**Lauder Race**	**Dunstan Race**	**Main Race**	**Matakanui Race**
	and Lauder Race	8480	362.4	3073256					
		8750	13.5	118117					
		8760	0.9	7685					
		Total	451.9	**3,874,295**	440,120+360,000 +769,369 = 1,569,489	2,268,806			
Gillespie	Private, Lauder Race and Main Race	9190	213.0	1957901					
		8980	52.9	474853					
		Total	265.9	**2,432,753**	286,250 (consented)	206,065		1,940,438	
Glassford	Private, Lauder Race and Matak Race	8480	35.6	301969					
		8750	20.3	177278					
		7770	149.1	1158508					
		8760	40.4	353884					
		Total	245.4	**1,991,639**	1,163,188	256,820			571,631
Groundwater	Private and Lauder Race	8480	55.9	474088					
		8750	39.2	342717					
		7770	35.8	278527					
		8760	172.1	1508011					
		Total	303.1	**2,603,343**		2603343			
Hamilton	Lauder Race	8480	35.9	304373					
		8760	0.1	1079					
		Total	40.0	**305,452**		305452			
Heckler		8480	103.6	878921					

Annual water demand calculation (using the Aqualinc, (2017) approach)					Volume requested from private source	Calculated volume demand related to each water source (m³/year)			
Applicant name	**Water source**	**Water demand** (m³/ha/year)	**Area irrigated (ha)**	**Total demand requirement** (m³/year)	**Private water (requested or issued) m³/year**	**Lauder Race**	**Dunstan Race**	**Main Race**	**Matakanui Race**
	Private and Lauder Race	8760	307.0	2689381					
		Total	410.7	**3,568,302**	1,599,209	1,969,093			
Hill	Private, Lauder Race and Main Race	9180	31.0	284211					
		9190	32.2	296057					
		8980	33.2	298472					
		8480	15.4	130856					
		8750	16.5	144707					
		8760	7.9	69534					
		Total	136.3	**1,223,837**	268,290	392774		562,770	
Lilybank	Private and Dunstan Race	8480	510.9	4332492					
		7770	12.4	96537					
		8760	88.0	770830					
		Total	611.3	**5,199,859**	604195 + 468928= 1,073,123		4,126,736		
Milne	Private, Lauder Race, Matak Race and Main Race	9190	77.6	712985					
		8980	116.6	1047394					
		8480	69.7	590893					
		8750	134.2	1174256					
		8760	3.0	26512					
		Total	401.1	**3,552,039**		2,259,097		1,129,548.4 0	163,394

Annual water demand calculation (using the Aqualinc, (2017) approach)					Volume requested from private source	Calculated volume demand related to each water source (m³/year)			
Applicant name	**Water source**	**Water demand** (m³/ha/year)	**Area irrigated (ha)**	**Total demand requirement** (m³/year)	**Private water (requested or issued) m³/year**	**Lauder Race**	**Dunstan Race**	**Main Race**	**Matakanui Race**
Moran	Private and Main Race	9180	2.1	19124					
		9190	113.9	1046475					
		8980	144.9	1301309					
		8480	54.7	463514					
		8760	162.6	1424422					
		Total	478.1	**4,254,844**	1,469,226/2= 734,613 + 584,963.1 = 1,319,576			2,935,268	
Muir	Lauder Race	8750	1.1	10053					
		7770	2.2	16771					
		8760	3.6	31911		0			
		Total	7.0	**58,736**		58735.89			
Phada	Private and Main Race	8980	172.9	1552765					
		9180	80.1	735027					
		Total	253.0	**2,287,791**	1016064 issued + supp 31,104 issued + 300,000 = 1,347,168			940,623	
Sinclair Trust	Private and Dunstan Race	**In the Dunstan application**							

Annual water demand calculation (using the Aqualinc, (2017) approach)					Volume requested from private source	Calculated volume demand related to each water source (m^3/year)			
Applicant name	**Water source**	**Water demand (m^3/ha/year)**	**Area irrigated (ha)**	**Total demand requirement (m^3/year)**	**Private water (requested or issued) m^3/year**	**Lauder Race**	**Dunstan Race**	**Main Race**	**Matakanui Race**
Tucker	Lauder Race	7780	46.6	362634					
		7140	12.2	86952					
		8480	120.7	1023775					
		8120	7.0	56540					
		8760	43.4	380184					
		Total	229.9	**1,910,086**	576,551				
	Dunstan Race	0	0.1	0					
		8480	35.8	303690					
		7770	75.8	589120					
		8760	114.0	998640					
		Total	225.7	**1,891,451**			1891450.66		
Webster-Wildon	Private, Lauder Race and Main Race	9180	34.5	316575					
		9190	151.2	1389624					
		8980	52.9	475339					
		8480	21.1	178689					
		8750	96.0	839976					
		8760	17.7	154857					
		Total	373.4	**3,355,060**	637,200 (issued)	602,190		2,752,870	
Total			**5,469**	**46088770**		**10,922,376**	**8,882,662**	**13,459,793**	**735,025**