1 Resource Consent Application

Otago Regional Council

This application is made under Section 88 of the Resource Management Act 1991.

(For Office Use Only)
Deposit Paid: $

Charges / Deposits

A deposit **must** accompany the application (see page **8** for amounts). The applicant will be invoiced for all costs incurred in processing this application that exceed the deposit.

Council can accept electronic lodgement of applications if sent to consents.applications@orc.govt.nz. Include "consent application" in the subject line.

Please complete the application in pen. For questions marked with an * you will find notes on page 4

1.* Applicant(s) Details

Applicant(s) name(s) in full: _____

_____

_____

_____

OR Company Name (in full) Smallburn Limited

OR Names of Trustees (in full) if Applicant is a Trust _____

_____

or Name of Incorporation _____

Postal Address ICL Limited
Level 1, 69 Tarbert Street
Alexandra Post Code 9320

Street Address _____
(not a P O box number) _____
_____ Post Code _____

Phone Number Business _____ Private _____
Mobile 027 653 3061 Fax _____

Email Address smallburnfarm@xtra.co.nz

Please provide a valid and clear email address. Otago Regional Council is moving to a paperless consenting process – therefore any correspondence including decision documents and consent (if granted) will be sent via email, unless you request a paper copy.

If you do not prefer contact by electronic means, please tick ☐

1(a). Key Contact for Applicant Details

If the applicant consists of multiple parties (e.g. multiple consent holders, Trust etc) please outline who the key contact for the consent will be, if granted.

Key contact name(s) in full: _____

_____

_____

_____

Postal Address _____

_____

_____ Post Code _____

Street Address _____
(not a P O box number) _____
_____ Post Code _____

Phone Number Business _____ Private _____
Mobile _____ Fax _____

Email Address _____

Please provide a valid and clear email address. Otago Regional Council is moving to a paperless consenting process – therefore any correspondence including decision documents and consent (if granted) will be sent via email, unless you request a paper copy.

If you do not prefer contact by electronic means, please tick ☐

2.* Consultant/Contact Details (if not applicant)

Name of Consultant/ Contact Person: Will Nicolson - Landpro Ltd

Postal Address PO Box 302
Cromwell
_____ Post Code 9342

Phone Number Business _____ Private _____
Mobile _____ Fax _____

Email Address will@landpro.co.nz

Please provide a valid and clear email address. Otago Regional Council is moving to a paperless consenting process – therefore any correspondence including decision documents and consent (if granted) will be sent via email, unless you request a paper copy.

If you do not prefer contact by electronic means, please tick ☐

3. On Site Supervisor/Manager Contact Details (if applicable)

Name of On Site Supervisor/Manager Person:

Postal Address _____
_____
_____ Post Code _____

Phone Number Business _____ Private _____
Mobile _____ Fax _____

Email Address _____

Please provide a valid and clear email address. Otago Regional Council is moving to a paperless consenting process – therefore any correspondence including decision documents and consent (if granted) will be sent via email, unless you request a paper copy.

If you do not prefer contact by electronic means, please tick ☐

4.* a) Are there any current or expired resource consents relating to this proposal?

☐ Yes ☐ No

If yes, give Consent Number(s) and Description: 96320, 96321, 94394, RM15.007.01 (see AEE for details)
_____
_____

b) Do you agree to your current consent automatically being surrendered should a replacement consent be issued.

☐ Yes ☐ No

c) Has there been a previous application for this activity that was returned as incomplete?

☐ Yes ☐ No

If yes, give Consent Number(s) and Description: _____

_____

_____

d) Have you a pre-application lodged with Council for this activity?

☐ Yes ☐ No

If yes, give pre-application Number(s) and Description: _____

_____

_____

e) Have you spoken to a Council staff member about this application prior to lodging this application?

☐ Yes ☐ No If yes, please state name of staff member _____

5. The applicant is (tick one): ☐ owner ☐ leasee ☐ prospective purchaser **of the land on which the activity occurs.**

6*. Who is the owner of the land on which the activity occurs/is to occur? (only complete if applicant is not the landowner)

Name of landowner: _____

Postal Address _____

_____

_____ Post Code _____

Phone Number Business _____ Private _____

Mobile _____ Fax _____

Email Address _____

7*. Who is the occupier of the land on which the activity occurs/is to occur? (only complete if the applicant is not the land occupier)

Name of land occupier _____

Postal Address _____

_____

_____ Post Code _____

Phone Number Business _____ Private _____

Mobile _____ Fax _____

Email Address _____

8*. Who leases the land on which the activity occurs/is to occur? (only complete if land is leased and it is not leased to the applicant)

Name of land leasee _____

Postal Address _____

_____

_____ Post Code _____

Phone Number Business _____ Private _____

Mobile _____ Fax _____

Email Address _____

9. Tick the consents required in relation to this proposal:

Water

☐ Take Surface Water ☐ Divert

☐ Take Groundwater ☐ Dam

Discharge onto or into:

☐ Land ☐ Water ☐ Air

Land Use:

☐ Bore construction ☐ Bore alteration

☐ Activities in or on beds of lakes or rivers or floodbanks

☐ Disturbance of contaminated land

Coastal: ☐ Activities in the coastal marine area (i.e., below mean high water spring tide)?

Where you have indicated the type of consent that is required, you must complete the appropriate Application Form before your application can be processed. Application Forms can be found on the Council's website: www.orc.govt.nz.

10. What is the maximum term of consent you are seeking? 35 years

11.Territorial Local Authority in which activity is situated?

☐ Dunedin City Council ☐ Queenstown Lakes District Council

☐ Clutha District Council ☐ Waitaki District Council

☐ Central Otago District Council

12*. Do you require any other resource consent from any local authority for this activity?

☐ Yes ☐ No

If Yes, please list: _____

Have these consents been applied for/issued? ☐ Yes ☐ No If Yes

If Yes, please give the date applied for or issued: _____

Notes on Application Form Details

1. **Applicant(s) Details**

A resource consent can only be held by a legal organisation or fully named individual(s). A legal organisation includes a limited company, incorporated group or registered trust. If the application is for a trust the full names of all trustees are required. If the application is not for a limited company, incorporated group or trust, then you must use fully named individual(s).

2. **Consultant/Contact Details**

If you are using a consultant/agent for this application put their details here. If you are not, leave question 2 blank.

4 Previous Consent

Do you currently have a resource consent to do the activity that you are applying to renew with this application? If so, please enter the permit number if known and a brief description including the date of issue and the expiry date.

6-8 **Landowner, occupier and leasee**

If you are not the landowner, land occupier or leasee of the land where the activity will be undertaken, you may be required to obtain their unconditional written approval to your application. On pg 6 there is a form that can be used.

12. **Additional Consents**

If you are carrying out earthworks or building work you may need other consents from either the ORC or your Territorial Local Authority.

Declaration

Before signing the declaration below, in order to provide a complete application have you remembered to:

Fully completed this Form 1 and the necessary Application Forms ☐

Attached the required deposit.(or pay on line) (see page 8 for deposit that is payable) ☐
Cheques payable to Otago Regional Council

Please note: your deposit may not cover the entire cost of processing your application. At the end of the application process you will be invoiced for any costs that exceed the deposit. Interim invoices may be sent out for applications, where appropriate.
If the required deposit does not accompany your application, staff will contact you on the phone number provided on this form to request payment, and after 3 working days your application will returned if no payment is made for the required deposit.

I/we hereby certify that to the best of my/our knowledge and belief, the information given in this application is true and correct.

I/we undertake to pay all actual and reasonable application processing costs incurred by the Otago Regional Council.

Name/s WILL NICOLSON (on behalf of Smallburn Limited)
(BLOCK CAPITALS)

Signature/s _____
(or person authorised to sign on behalf of applicant)

Designation Consultant Date 14/01/2020
(e.g., owner, manager, consultant)

Otago Regional Council Postal Address: 70 Stafford St, Private Bag 1954, Dunedin 9054

Consultation

– (consultation is not compulsory, but it can make a process easier and reduce costs).

Under Section 95E of the Resource Management Act 1991 (the Act) the Council will identify affected parties to an application and if the application is to be processed on a non-notified basis the unconditional written approval of affected parties will be required. Consultation with potentially affected parties and interested parties can be commenced prior to lodging the application.

Consultation may be required with the appropriate Tangata Whenua for the area. The address of the local Iwi office is: Aukaha, 258 Stuart Street, P O Box 446, Dunedin, Fax (03)477-0072, Phone (03) 477-0071, email: info@aukaha.co.nz. If you require further advice please contact the Otago Regional Council.

Good consultation practices include:

- Giving people sufficient information to understand your proposal and the likely effects it may have on them
- Allowing sufficient time for them to assess and respond to the information
- Considering and taking into account their responses

Written approval forms are appended to this form on Page 9.

Information Requirements

In order for any consent application to be processed efficiently in the minimum time and at minimum cost, it is critical that as much relevant information as possible is included with the application**. Where an application is significantly incomplete, the Consent Authority may decide not to accept the application for processing.**

Resource Management Act 1991
FOURTH SCHEDULE—ASSESSMENT OF EFFECTS ON THE ENVIRONMENT

(Below are the provisions of the 4th schedule of the Act, which describes what must be in an application for resource consent, as amended in 2015.)

1 Information must be specified in sufficient detail

Any information required by this schedule, including an assessment under clause 2(1)(f) or (g), must be specified in sufficient detail to satisfy the purpose for which it is required.

2 Information required in all applications

(1) An application for a resource consent for an activity (the **activity**) must include the following:

(a) a description of the activity:

(b) a description of the site at which the activity is to occur:

(c) the full name and address of each owner or occupier of the site:

(d) a description of any other activities that are part of the proposal to which the application relates:

(e) a description of any other resource consents required for the proposal to which the application relates:

(f) an assessment of the activity against the matters set out in Part 2:

(g) an assessment of the activity against any relevant provisions of a document referred to in section 104(1)(b). *("document" includes regional & district plans, regulations*, *national policy statements, iwi plans*)

(2) The assessment under subclause (1)(g) must include an assessment of the activity against—

(a) any relevant objectives, policies, or rules in a document; and

(b) any relevant requirements, conditions, or permissions in any rules in a document; and

(c) any other relevant requirements in a document (for example, in a national environmental standard or other regulations).

(3) An application must also include an assessment of the activity's effects on the environment that—

(a) includes the information required by clause 6; and

(b) addresses the matters specified in clause 7; and

(c) includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

3 Additional information required in some applications

An application must also include any of the following that apply:

(a) if any permitted activity is part of the proposal to which the application relates, a description of the permitted activity that demonstrates that it complies with the requirements, conditions, and permissions for the permitted activity (so that a resource consent is not required for that activity under section 87A(1)):

(b) if the application is affected by section 124 or 165ZH(1)(c) (which relate to existing resource consents), an assessment of the value of the investment of the existing consent holder (for the purposes of section 104(2A)):"(c) if the activity is to occur in an area within the scope of a planning document prepared by a customary marine title group under section 85 of the Marine and Coastal Area (Takutai Moana) Act 2011, an assessment of the activity against any resource management matters set out in that planning document (for the purposes of section 104(2B)

4 (relates to subdivisions- *not included here as subdivisions not ORC jurisdiction.)*

5 Additional information required in application for reclamation

An application for a resource consent for reclamation must also include information to show the area to be reclaimed, including the following:

(a) the location of the area:

(b) if practicable, the position of all new boundaries:

(c) any part of the area to be set aside as an esplanade reserve or esplanade strip.

Assessment of environmental effects

6 Information required in assessment of environmental effects

(1) An assessment of the activity's effects on the environment must include the following information:

(a) if it is likely that the activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity:

(b) an assessment of the actual or potential effect on the environment of the activity:

(c) if the activity includes the use of hazardous substances and installations, an assessment of any risks to the environment that are likely to arise from such use:

(d) if the activity includes the discharge of any contaminant, a description of—

(i) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and

(ii) any possible alternative methods of discharge, including discharge into any other receiving environment:

(e) a description of the mitigation measures (including safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effect:

(f) identification of the persons affected by the activity, any consultation undertaken, and any response to the views of any person consulted:

(g) if the scale and significance of the activity's effects are such that monitoring is required, a description of how and by whom the effects will be monitored if the activity is approved:

(h) if the activity will, or is likely to, have adverse effects that are more than minor on the exercise of a protected customary right, a description of possible alternative locations or methods for the exercise of the activity (unless written approval for the activity is given by the protected customary rights group).

(2) A requirement to include information in the assessment of environmental effects is subject to the provisions of any policy statement or plan.

(3) To avoid doubt, subclause (1)(f) obliges an applicant to report as to the persons identified as being affected by the proposal, but does not—

(a) oblige the applicant to consult any person; or

(b) create any ground for expecting that the applicant will consult any person.

7 Matters that must be addressed by assessment of environmental effects

(1) An assessment of the activity's effects on the environment must address the following matters:

(a) any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or cultural effects:

(b) any physical effect on the locality, including any landscape and visual effects:

(c) any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity:

(d) any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations:

(e) any discharge of contaminants into the environment, including any unreasonable emission of noise, and options for the treatment and disposal of contaminants:

(f) any risk to the neighbourhood, the wider community, or the environment through natural hazards or the use of hazardous substances or hazardous installations.

(2) The requirement to address a matter in the assessment of environmental effects is subject to the provisions of any policy statement or plan.

Set out below are details of the amounts payable for those activities to be funded by fees and charges, as authorised by s36(1) of the Resource Management Act 1991.

Resource Consent Application Fees (from 1 July 2018)

Note that the fees shown below are a **deposit** to be paid on lodgement of a consent application and applications for exemptions in respect of water metering devices. This deposit will not usually cover the full cost of processing the application, and further costs are incurred at the rate shown in the scale of charges. GST is included in all fees and charges.

If you wish to make a payment via internet banking, or on line, the details are below. Please note the applicants name and "consent application" should be used as reference when paying the deposit -

For on line payments go to www.orc.govt.nz and go to Home/ Rates/ Way to Pay and follow prompts

Publicly Notified Applications: [3]	**$**
First application	5,000.00
Concurrent applications	225.00

Non Notified Applications and Limited Notified Applications: [3]	**$**
First application (except those below)	1,000.00
Concurrent applications [1]	50.00
Variation to conditions – s127	1,000.00
Administrative variation – s127	500.00
Exemptions from water measuring Regulations	200.00
Bores	500.00
Gravel	500.00

Hearings	Per Note 2 below
Payment for Commissioner request – s100A	Per Note 4 below

Objections	
Payment for Commissioner request – s357AB	Per Note 4 below

Transfers and Certificates Deposits:	**$**
Transfer of permits and consents	100.00
Priority Table	100.00
Section 417 Certificate	200.00
Certificate of Compliance	200.00
Section 125 – Extension of lapse date	100.00
All Other Costs	As per Scale of Charges

Scale of Charges:	**From 1 July 2018 $**
Staff time per hour:	
* Executive staff	235.00
* Senior Technical/Scientist	170.00
* Technical/Scientist	125.00
* Field Staff	100.00
* Administration	85.00
Disbursements	Actual
Additional site notice	Actual
Advertisements	Actual
Vehicle use per kilometre	0.70
Travel and accommodation	Actual
Testing charges	Actual
Consultants	Actual
Commissioners	Actual
Photocopying and printing	Actual
Councillor hearing fees per hour	
*Chairperson	100
*Member	80
*Expenses	Actual

Notes

1. For additional permits in respect of the same site, activity, applicant, time of application, and closely related effect as the first application.

2. The deposit payable shall be 90% of the cost of a hearing as calculated by Council in accordance with information contained in the application file and using the scale of charges. The amount payable will be due at least 10 working days before the commencement of the hearing. If the amount is not paid by the due date, then the Otago Regional Council reserves the right under S36 (7) of the Resource Management Act to stop processing the application. This may include cancellation of the hearing.

Should a hearing be cancelled or postponed due to the non payment of the charge, the applicant will be invoiced for any costs that arise from that cancellation or postponement.

Following completion of the hearing process, any shortfall in the recovery of hearing costs will be invoiced, or any over recovery will be refunded to the applicant.

Under Section 100A of the RMA, one or more submitters may make a request to have a resource consent application heard by one or more hearing commissioners who are not members of Council. In this case the applicant will pay the amount that Council estimates it would cost for the application to be heard had the request not been made, and the submitter(s) who made the request will pay, in equal shares, the cost of the application being heard that exceeds that amount payable by the applicant.

Further, the applicant may request to have a resource consent application heard by one or more hearing commissioners who are not members of Council. In this case, the applicant will pay the full costs.

3. Where actual and reasonable costs are less than the deposit paid, a refund will be given.

4. Where an applicant requests under s100A (for a consent hearing) or under s357AB (for the hearing of an objection) an independent commissioner(s); the applicant will be required to pay any increase in cost of having the commissioner(s).

   Where a submitter(s) requests under s100A an independent commissioner(s) any increase in costs that is in addition to what the applicant would have paid shall be paid by the submitter. If there is more than one submitter who has made such request the costs shall be evenly shared.

Administrative Charges
The following one-off administration charges shall apply to all resource consent applications received:

Publicly Notified and Limited Notified Applications	**$**
First application	100.00
Concurrent applications	50.00

Non-Notified Applications	**$**
First application	50.00
Concurrent applications	25.00

Other	**$**
Certificate of Compliance	25.00
Section 417 Certificate	25.00
Exemptions from water metering regulations	25.00

Review of Consent Conditions
Following the granting of a consent, a subsequent review of consent conditions may be carried out at either request of the consent holder, or, as authorised under Section 128, as a requirement of Council. Costs incurred in undertaking such reviews will be payable by the consent holder at the rates shown in the Scale of Charges above.

Reviews initiated by Council will not be charged to consent holders.

Compliance Monitoring Charges (from 1 July 2017)

1. Performance Monitoring
The following charges will apply to the review of performance monitoring reports for all consent holders, except those listed in section 1.6 below. The charges shown are annual fixed fees per performance monitoring report or plan, and are inclusive of GST.

		From 1 July 2017
1.1 Discharge to Air Consent		***$***
Measurement of contaminants from a Stack report		86.00
Ambient air quality measurement of contaminants report		100.00
Management plans and maintenance records		33.50
Annual Assessment report		66.50
1.2 Discharge to Water, Land and Coast		***$***
• Effluent Systems	Environmental Quality report	46.50
	Installation producer statements	60.00
	Return of flow/discharge records	60.00
• Active Landfills	Environmental Quality report	58.00
	Management Plans	130.00
• Industrial Discharges	Effluent quality report	42.00
	Environmental report	92.50
	Return of flow/discharge records	60.00
Annual Assessment report		50.00
Management Plans – minor environmental effects		130.00
Management Plans – major environmental effects		260.00
Maintenance records		30.00

1.3 Water Takes

Verification reports	60.00
Annual assessment report	50.00
Manual return of data per take	80.00
Datalogger return of data per take sent to the ORC	50.00
Telemetry data per consent	35.00
Administration fee – water regulations	100.00
Low flow monitoring charge*	
- Kakanui at McCones	327.00
- Unnamed Stream at Gemmels	1,431.00

*Charge for monitoring sites established by the ORC specifically to monitor consented activities in relation to river flows.

1.4 Structures

Inspection reports for small dams	130.00
Inspection reports for large dams	260.00
Structure integrity reports	80.00

1.5 Photographs

Provision of photos	60.00

1.6 Set Fees for Specific Consent Holders

Performance monitoring fees will be charges as 75% of actual costs for the following consent holders

Dunedin City Council
Central Otago District Council
Clutha District Council
Queenstown Lakes District Council
Waitaki District Council
Ravensdown
Contact Energy
Trustpower
Pioneer Generation

Additional charges may be incurred for new consents granted during the year.

2. Audit

Audit work will be charged at half of the actual cost incurred, with the actual costs being calculated using the Scale of Charges.

3. Non-Compliance, Incidents and Complaints

Enforcement work on consent conditions, and remedying negative effects from permitted activities – Scale of Charges.

Gravel Inspection and Management

Gravel extraction fee – $0.66 per cubic metre (incl. GST). Where more than 10,000 cubic metres of gravel is extracted within a prior notified continuous two month period, the actual inspection and management costs will be charged, as approved by the Director Corporate Services.

Written Approvals of Persons Likely to be Adversely Affected

I/We (Please print full name/s)_____ _____

of (Address) _____

I /we have read the full application for the proposal by (Applicant)

_____

for a Resource Consent (Number) _____ to _____

_____
and give my/our written approval to the proposed activity/activities.

In signing this written approval I/we understand that:

- The consent authority must decide that I/we am/are no longer an affected person, and disregard adverse effects on me/us
- That /we I may withdraw my/our written approval in writing before the hearing, or if no hearing before a decision is made on the application.

Signature/s_____ Date _____
(or person authorised to sign on behalf of affected party/parties)

Phone _____ Fax _____ Email _____

Please note: If this application is subsequently notified the above approval does not constitute a submission as required under Section 96 of the Resource Management Act 1991.

Written Approvals of Persons Likely to be Adversely Affected

I/We (Please print full name/s)_____ _____

of (Address) _____

I /we have read the full application for the proposal by (Applicant)

_____

for a Resource Consent (Number) _____ to _____

_____
and give my/our written approval to the proposed activity/activities.

In signing this written approval I/we understand that:

- The consent authority must decide that I/we am/are no longer an affected person, and disregard adverse effects on me/us
- That /we I may withdraw my/our written approval in writing before the hearing, or if no hearing before a decision is made on the application.

Signature/s_____ Date _____
(or person authorised to sign on behalf of affected party/parties)

Phone _____ Fax _____ Email _____

Please note: If this application is subsequently notified the above approval does not constitute a submission as required under Section 96 of the Resource Management Act 1991.

Resource Consent Application Form 4

To take and use surface water

This application is made under Section 88 of the Resource Management Act 1991.

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1. Note to applicants

The purpose of this form is to provide applicants with guidance on information that is required for your application under the Resource Management Act 1991. This form acts as a guide only and Otago Regional Council reserves the right to request additional information.

Please ensure that you fully complete this form **as well as** a fully completed resource consent application form (form 1) in support of your application, **and** preparation of an **Assessment of Environmental Effects** in terms of the Fourth Schedule of the Resource Management Act 1991. Failure to do so may result in Council rejecting your application, requesting further information, or publicly notifying your application, leading to delays in the processing of your application and potential increases in processing costs.

Acceptance of your application for processing does not constitute a guarantee that water allocation is available.

2. General

2.1 This application is for (please tick any applicable box):

A new surface water take

An application to replace a current Water Permit

Water permit number: *Expiry date:*

An application to replace a Deemed Permit / Mining Privilege

Deemed permit number: 96320.V1, 96321.V1, 94394, RM15.007.01

Expiry date: 1 October 2021 (plus 2 consents to re-take water, as outlined in the attached AEE).

2.2 **A lapse period** of _____5 years_____ is sought. Provide reasons in application attached.

Note: This is the timeframe within which the consent must be given effect to. The default timeframe is 5 years after the date of commencement of the consent unless stated otherwise.

2.3 **A consent term** of ___35 years_____is sought. Provide reasons in application attached.

Note: This is the timeframe from the date of commencement of the consent which the consent will expire.

2.4 **Provide a map or coloured aerial photograph which outlines the following details (as applicable):**

The location of the existing and proposed point(s) of take and all associated infrastructure

The location of the water measuring device(s) or system(s)

The total property area boundary

The area(s) to be irrigated (if relevant) by water applied for under this application

The area of the community supply (if relevant)

Distances to any discharge activities

Other surface water bodies and wetlands, and distances from the point of take(s) to them

The coastline and the distance to it (if relevant)

The location of any dairy shed(s)

The location of any known recreational activities, other water takes, areas of significance to iwi and areas where food is obtained from the water body.

3. Volume and rates of take applied for

3.1 **Quantity and rate of take**

Note: 1,000 litres = 1 cubic metre

a. Maximum rate of take: **See AEE Section 6.12** litres per second

b. Maximum monthly volume: cubic metres per month

c. Maximum annual volume: cubic metres per year

*Note: Some deemed permits refer to hourly/weekly rates. Water permits are issued in litres per second, m^3 per month and m^3 per year. Should you wish to seek hourly or weekly rates **in addition** to those listed on the form, please provide this information including justification for any variances.*

3.2 Frequency of take

Note both the maximum and estimated average take.

	Average	Maximum
How many hours per day?	**See AEE**	
How many days per week?		
How many weeks per month?		

3.2.1 In your application describe the timing of your take, including which months of the year you expect to take water in both an average year and a dry year, and what part of day the water take will generally occur.

3.2.2 In your application describe whether the take is from re-charge or is an augmented take, along with whether your activity provides re-charge back into the catchment.

3.3 Storage

3.3.1 Do you intend to store your water before subsequent use?

Yes

No

3.3.2 If yes, what/how much storage will be provided?

1x 120,000 m^3 pond, 1x 20,000 m^3 pond

3.3.3 In your application outline the type of storage facilities that are proposed.

Note: You may need a building consent and/or additional resource consents for the construction of storage facilities. If the reservoir is in a water body or captures catchment runoff, you may require resource consents for damming and associated activities.

4. Point(s) of take description

4.1 What are the GPS coordinates of the point(s) you propose to take water from?

Note: if there are more than two points of take, please provide these details on a separate sheet.

Point 1: NZTM 2000 E: **See AEE** N:

Point 2: NZTM 2000 E: N:

4.2 Please provide photographs of the proposed point(s) of take ☑

4.3 What is the name of the water body/ies from which the proposed take(s) is/are to occur? Breakneck Creek, Amisfield Burn, Park Burn (plus re-take from Park Burn tributary & Five Mile Creek)

Note: if the water body is unnamed please note this and note the water body it flows into.

4.4 If the take is from a river, stream, spring, drain or modified water body, in your application please provide a full description of the water course, including:

The average channel width and depth at various locations including at the point of take and upstream and 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.

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 at the point of take and upstream and downstream of the point of take.

Please also answer the following:

4.4.1 What type of water body will the take/s occur from?

River

Stream

Modified water body

Spring

Drain

4.4.2 Is the water course perennial (flows all year round) or ephemeral?

Perennial

Ephemeral

4.5 If the take is from a lake, pond or wetland please answer the following:

Lake

Pond

Wetland

4.5.1 If the take is from a wetland, is the wetland classed as a Regionally Significant Wetland identified in Schedule 9 of the Regional Plan: Water for Otago?

Yes (list the name and provide an assessment of effects on the wetland)

No

4.5.2 Has the wetland been formed by artificial means?

Artificial

Natural

4.5.3 What is the surface area of the lake/pond/wetland?

4.5.4 How deep is the lake/pond/wetland?

4.5.5 Does the lake/pond/wetland have an outlet? i.e. does water flow out of it?

Yes

No

4.5.6 What is the main source of water that fills the lake/pond/wetland?

Groundwater

Springs

Runoff from surrounding land

Direct rainfall

Stream/river (list name)

Other (provide details)

5. Historical water use

5.1 Water abstracted over at least the last 5 years

Note: if you are applying to replace an existing water permit for primary allocation, or an existing deemed permit or mining privilege you must provide evidence of the amount of water abstracted under that permit for at least the last five years.

The following usage evidence is provided in support of this application:

Water metering records, attached to this application with historical water use summarised and assessed

Water metering records sent to Council electronically or recorded on file by Council with historical water use summarised and assessed

Detail on alternative water use information, attached to this application

5.2 In your application please analyse and assess the historical volumes and pattern of water use based on the water use evidence.

5.3 Provide a summary of your analysis below:

a. Maximum rate of take: **See AEE Section 2.3** litres per second
b. Maximum monthly volume: cubic metres per month
c. Maximum annual volume: cubic metres per year

5.4 For which years have these rates and volumes been recorded? 2013-2020

6. Water use and management

6.1 For what purpose(s) will the water be used?

Stock water and/or dairy shed use

Irrigation (provide detail of irrigation use in your application attached)

Community supply

Commercial/industrial

Other

6.2 Will the water take be managed as part of an existing water allocation committee or water management group?

Yes (name of committee of group):

No

6.3 If yes, have you described how the allocation committee/management group operates in your application?

Yes

No

6.4 In your application describe any water rationing regime that operates in the catchment.

6.5 Will the take applied for be operated in accordance with the rationing regime you have described in question 6.4?

Yes

No

6.6 Will you or others "re-take" water from your take (i.e. via a water race)? If yes, please provide details of such re-takes in your application.

Yes

No

7. Measuring and reporting

7.1 In your application describe the type of water metering system that is installed or proposed to be installed.

Note: If currently installed provide proof of installation or note below if proof has already been provided to Council. Proof for both meters (Park Burn & Amisfield Burn races) already provided to Council several years ago.

7.2 Provide information in your application demonstrating that the installation of the measuring device or system shall be undertaken in accordance with Council guidelines.

Note: If the installation is not able to meet these guidelines, you need to fill out and attach to this application form a Non-Standard Installation Form for Water Measuring Devices, available on our website or through the environmental services unit of the Council.

Tick if completed

Tick if completing a Non-Standard Installation Form for Water Measuring Devices

7.3 Is your water measuring device or system installed or proposed to be installed at the point(s) of take?

Note: The council considers the point of take to be within a 100 metre radius of the physical take point. If your answer is No, you need to apply for a Water Measuring Exemption (WEX) by filling out Application Form 24 – Application for Exemption to use a device or system near the location from which water is taken. A fully completed Form 24 should be lodged at the same time as this application to enable dual processing.

Yes

No – complete an Application Form 24 – Application for Exemption Already authorised via WEX0123 & WEX0124 (see AEE)

8. Location and Efficiency of Water Use

8.1 Provide details of point/area of use (include legal description(s) and grid references.

Yes (attached to application)

No (please outline reasons why this has not been provided)

8.2 Provide a description of any existing works/infrastructure in place, including value, in your application.

Yes (attached to application) However a detailed breakdown of value/investment has not been provided. It can be provided on request, if deemed necessary. Needless to say, investment in water-related infrastructure would total in the millions, when considering the length of the races, new/upgraded storage ponds, various pivots, and extensive reticulated stockwater and k-line systems.

No (please outline reasons why this has not been provided)

8.3 Provide a description of proposed works/infrastructure to give effect to consent sought, including value of investment, in your application.

Yes (attached to application)

No (please outline reasons why this has not been provided)

8.4 Provide an assessment of the proposed use against the Aqualinc report for reasonable water requirements[1].

Completed

Not Completed (provide details of alternative assessment and justification for that)

8.5 If you propose to use water to irrigate land, please outline:

a. How many hectares of land will be irrigated? **See AEE**

b. What is the soil type(s) of the land being irrigated?

c. What will you be irrigating (i.e. crop, pasture etc in ha)?

d. What is the target application rate (mm/day and mm/year)?

8.6 What type of irrigation system is proposed to be used or is currently being used?

K-line

Centre pivot

Travelling irrigator

Border-dyke/flood irrigation

Other – provide details

[1] *"Guidelines for reasonable irrigation water requirements in the Otago Region", Aqualinc, 2017. Note that while this document provides a basis for assessing efficiency of use, other matters may be applicable.*

8.7 Do you have any water distribution infrastructure in place (for example pipes, storage tanks, open races etc.)?

Yes

No

If yes, in your application please describe the type of infrastructure in place and how you intend to ensure that it is maintained in good working order (e.g. do you intend to have a maintenance or leak detection programme, will the scheme be managed by an external company).

Note: For deemed permits please ensure you have the right to convey water under s417 of the Resource Management Act if that conveyance crosses another party's property, prior to the expiry of the deemed permit.

8.8 Do you intend to install any water distribution infrastructure (for example pipes, storage tanks, open races etc.)?

Yes

No

If yes, in your application please describe the type of infrastructure to be installed and how you intend to ensure that it is maintained in good working order (e.g. do you intend to have a maintenance or leak detection programme, will the scheme be managed by an external company).

Note: For deemed permits please ensure you have the right to convey water under s417 of the Resource Management Act if that conveyance crosses another party's property, prior to the expiry of the deemed permit.

8.9 If you propose to use water for stock and/or dairy shed use – please answer the following:

Note: The Council considers the following values as efficient use of water for stock:

Sheep	*5 litres per day per head*
Beef cattle	*45 litres per day per head*
Dairy cows	*70 litres per day per head*
Deer	*15 litres per day per head*
Dairy shed use	*50 litres per day per head*

8.9.1 What type of animal and numbers of stock will be supplied with water for drinking?

Sheep **See AEE (Section 6.6 & Appendix D)**

Number: Water required: litres/head/day

Beef cattle

Number: Water required: litres/head/day

Dairy cows

Number: Water required: litres/head/day

Other
Number: Water required: litres/head/day

8.9.2 How much water do you require for your dairy shed?

litres/head/day

8.9.3 If you are seeking more water for stock and/or dairy shed use than that recommended by the Council please state why this is in your application.

Note: please provide the source of any data provided. Also include details of stock water transportation if relevant.

8.10 If you propose to use water for industrial use – in your application state what type of industry will be using the water and how will the water be used.

8.11 If you propose to use water for community/domestic supply – please answer the following:

a. For households, the number of households to be supplied:

b. For camping grounds, the maximum number of visitors and staff per year:

c. For schools, the maximum number of students and staff per year:

d. For motel units, the number and expected occupancy:

e. Other uses (please describe):

8.12 For all uses, demonstrate in your application how have you calculated the amount of water you need?

Note: Please note that the Council will only grant volumes that have been assessed as efficient, and will assess the volumes sought for efficiency, taking into consideration the local climate, soils, and crop type.

Tick if completed. **Completed**.

8.13 In your application please describe any other sources of water available for the property. How much water is available and what it is used for.

8.14 In your application please describe any measures you are proposing to minimise wastage of water and maximise its efficient use.

9. Assessment of Environmental Effects

Note: Pursuant to Schedule 4 of the Resource Management Act, 1991, there are a number of matters that must be addressed by an assessment of environmental effects. These matters are listed in Form 1, with additional or specific matters relating to water permits are listed below.

9.4 Provide an independent ecological assessment/instream assessment of the water body. It is recommended that all takes not from the main stem of a catchment have this assessment carried out.

Yes (attached to application)

No (please outline reasons why an independent ecological assessment has not been undertaken in your application)

9.5 Outline any physical effect on the locality, including any landscape and visual effect.

Yes (attached to application)

No (please outline reasons why this has not been provided)

9.6 Outline any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity of the point of take.

Yes (attached to application)

No (please outline reasons why this has not been provided)

9.7 Does the taking of water from the water body cause it to dry up during summer or does the water body naturally dry up downstream of the take?

Yes

No

If Yes, your application should explain approximately how far downstream from your this occurs and in approximately which month in a wet year, average year and dry year this happens.

Note: Please discuss and attach any evidence to the application (e.g. photographs of water body downstream):

9.8 Assess effects on cultural values.

Yes (attached to application)

No (please outline reasons why this has not been provided)

9.8 Assess any effect on other water users or other human use values.

Yes (attached to application)

No (please outline reasons why this has not been provided)

9.9 Describe any positive effects from the take.

Yes (attached to application)

No (please outline reasons why this has not been provided)

9.10 Outline the mitigation you propose in your application. This should include a consideration of the following:

A residual flow

Fish screening on water intakes

Measures for management where there are low flows

Flow sharing measures

Whether base flow is necessary to maintain the water race

Any other applicable measures

9.10 Outline if your instantaneous abstraction rate (litres per second) will be reduced by increasing the length of time over which water is taken.

Yes (attached to application)

No

9.11 Provide a description of any possible alternative water sources or methods for undertaking the activity and why these alternatives have not been selected.

Yes (attached to application)

No (please outline reasons why this has not been provided)

10. Consultation

10.1 Include evidence of any consultation undertaken for this application.

10.2 Identify persons affected by this application. See AEE Section 5.

10.3 Which persons approval have been provided to the application (attach copies of approvals)?

*Note: This **may** include (but not be limited to) consultation with adjoining landowners, other consent holders in the immediate area such as downstream permit holders, iwi (e.g. Te Rūnanga O Ngāi Tahu, Aukaha, Te Ao Marama Inc.), government departments/ministries (e.g. DOC), territorial authorities and recreational associations. To reduce costs and processing times, we recommended that written approval is obtained and submitted with the application for parties which may be affected. Such approval must be unconditional to avoid notification.*

11. Statutory Assessment

Please note that in accordance with Schedule 4 of the RMA, you are also be required to provide an assessment against the relevant provisions of the following documents (if relevant):

National Policy Statement for Freshwater Management.

National Policy Statement for Renewable Electricity Generation.

Resource Management (Measurement and Reporting of Water Takes) Regulations 2010.

National Environmental Standard for Sources of Human Drinking Water.

New Zealand Coastal Policy Statement.

Operative Regional Policy Statement 1998, Proposed Regional Policy Statement and Partially Operative Regional Policy Statement 2019.

Regional Plan: Water for Otago (including description of permitted activities and compliance with permitted activity standards).

Kai Tahu ki Otago Natural Resource Management Plan 2005.

Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan 2008 (for takes from the south side of the Clutha River/Mata-Au)

Any other relevant plan, proposed plan and any other relevant regulations.

LANDPRO

Make the most of your land

Resource Consent Application To Otago Regional Council for Replacement of Deemed Permits

Prepared for Smallburn Limited

January 2020

Prepared For
Smallburn Limited

Prepared By
Landpro Ltd
13 Pinot Noir Drive
PO Box 302
Cromwell

Tel +64 3 445 9905

QUALITY INFORMATION

Reference: L:\18249 - Smallburn Limited - Deemed Permit replacement\Docs\Lodgement package\20191016_18249_Smallburn_AEE_FINAL.docx

Date: 14 January 2020

Prepared by: Will Nicolson

Reviewed by: Zoe McCormack

Client Review: Brad and Peter Morton on behalf of Smallburn Limited

Version Number: Final

TABLE OF CONTENTS

LIST OF APPENDICES

1. INTRODUCTION

1.1 Overview of Proposal

Smallburn Limited (the applicant) hold deemed permits and water permits authorising the take and use of water from the Amisfield Burn and Park Burn catchments. Table 1 summarises the permits to be replaced as part of this application and the existing activities for which authorisation is sought.

Table 1: Summary of Smallburn Limited existing and proposed permits

Permit	Details	Watercourse
Deemed Permit 96320.V1	To take and use up to 200,000 L/hour (55.6 L/s) from Breakneck Creek for irrigation. Combined maximum with 96321.V1 of 350,000 L/hour (97.3 L/s).	Breakneck Creek (tributary of Amisfield Burn)
Deemed Permit 96321.V1	To take and use up to 150,000 L/hour (41.7 L/s) from the Amisfield Burn for irrigation. Combined maximum with 96320.V1 of 350,000 L/hour (97.3 L/s).	Amisfield Burn
Water Permit RM15.007.01 (replaced 96740)	To take and use up to 222 L/s (800,000 L/hour) from the Park Burn for irrigation and stock water. Same take location as 94394.	Park Burn
Deemed Permit 94394	To take and use up to 100,000 L/hour (27.8 L/s) from the Park Burn for the purpose of irrigation. Same take location as RM15.007.01.	Park Burn
Consent to re-take (proposed)	To retake up to 97.3 L/s of Breakneck Creek and Amisfield Burn water from a tributary of the Park Burn.	Park Burn tributary
Consent to re-take (proposed)	To retake up to 217.3 L/s of Breakneck Creek, Amisfield Burn and Park Burn water from Five Mile Creek.	Five Mile Creek

The existing permits are due to expire 1 October 2021, and this application is made for the replacement of these permits. Table 1 also presents two new consents that are sought to authorise consequential re-takes as a result of exercising the above permits.

This application is being made more than 6 months prior to the expiry of the current permits, meaning the applicant can continue to operate under the existing consents as per s124 of the RMA until a decision is made on this application.

1.2 The Applicant

Applicant Address: Smallburn Limited c/o
ICL Limited,
Level 1, 69 Tarbert Street
Alexandra

Address for Service: C/- Landpro Limited
PO Box 302
Cromwell 9342

1.3 Purpose of Documentation

Pursuant to Section 88 of the Resource Management Act 1991 (the RMA), this report provides an assessment of the activity's effects on the environment as required by Schedule 4 of the RMA.

2. DETAILS OF PROPOSAL

2.1 Overview of scheme and permits

Figure 1, below, provides an overview of the applicant's water take and conveyance infrastructure.

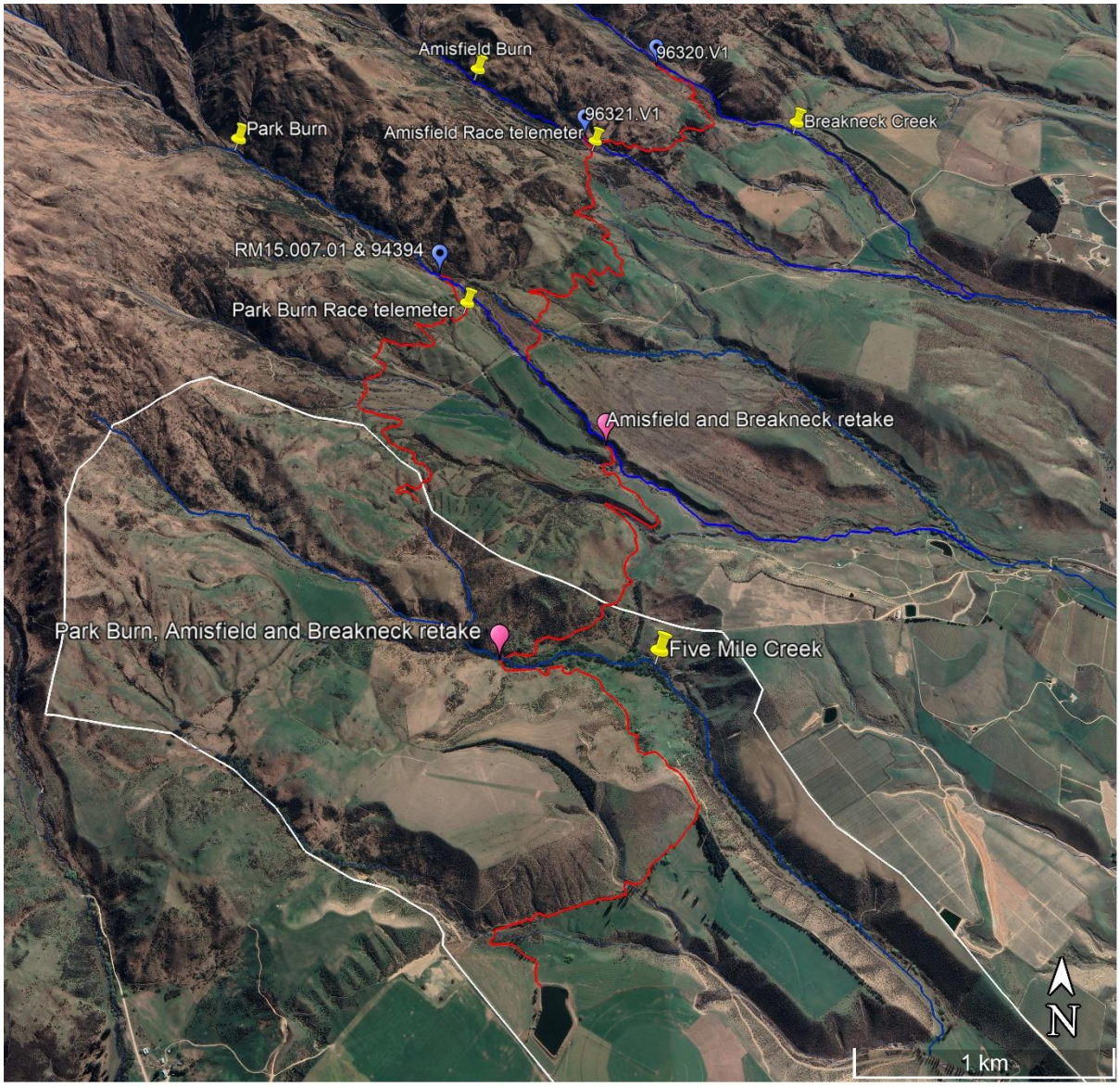


Figure 1: Overview of Smallburn Ltd's take and race infrastructure

As the figure shows, the applicant operates two overall water conveyance systems: one which transports Breakneck Creek water (96320) and Amisfield Burn water (96321) to their irrigation areas. The Amisfield race uses a tributary of the Park burn to convey water and the applicant seeks consent to authorise re-taking of water as this location. The other conveyance system has just one take point on the Park Burn (where two permits authorise abstraction being RM15.007.01 & 94394), utilising a race to transport Park Burn water in a southwesterly direction to the applicant's property. This race uses a Five Mile Creek to convey water down to the Amisfield Race. At this point all water delivered to Five Mile Creek (Amisfield, Breakneck and Parkburn) is re-taken from Five Mile creek and raced the rest of the way to the applicant's storage and irrigation areas. All of the applicant's take points are located on land owned by Mt Pisa Station, (legally described as Lot 3 DP 343853 as contained in Record of Title 180117) with the exception of the re-take from Five Mile Creek – this is located on the applicant's own property.

The races are henceforth referred to as the Amisfield Race and the Park Burn Race, and are described in more detail below.

2.1.1 Amisfield race and associated infrastructure

The Amisfield Race begins life at Breakneck Creek (a tributary of the Amisfield Burn), whereby an open channel collects a portion of the creek water (Breakneck intake). From here, water is conveyed down-race to the Amisfield Burn, traversing the flanks of the Pisa Range (see Appendix A for a detailed race map).

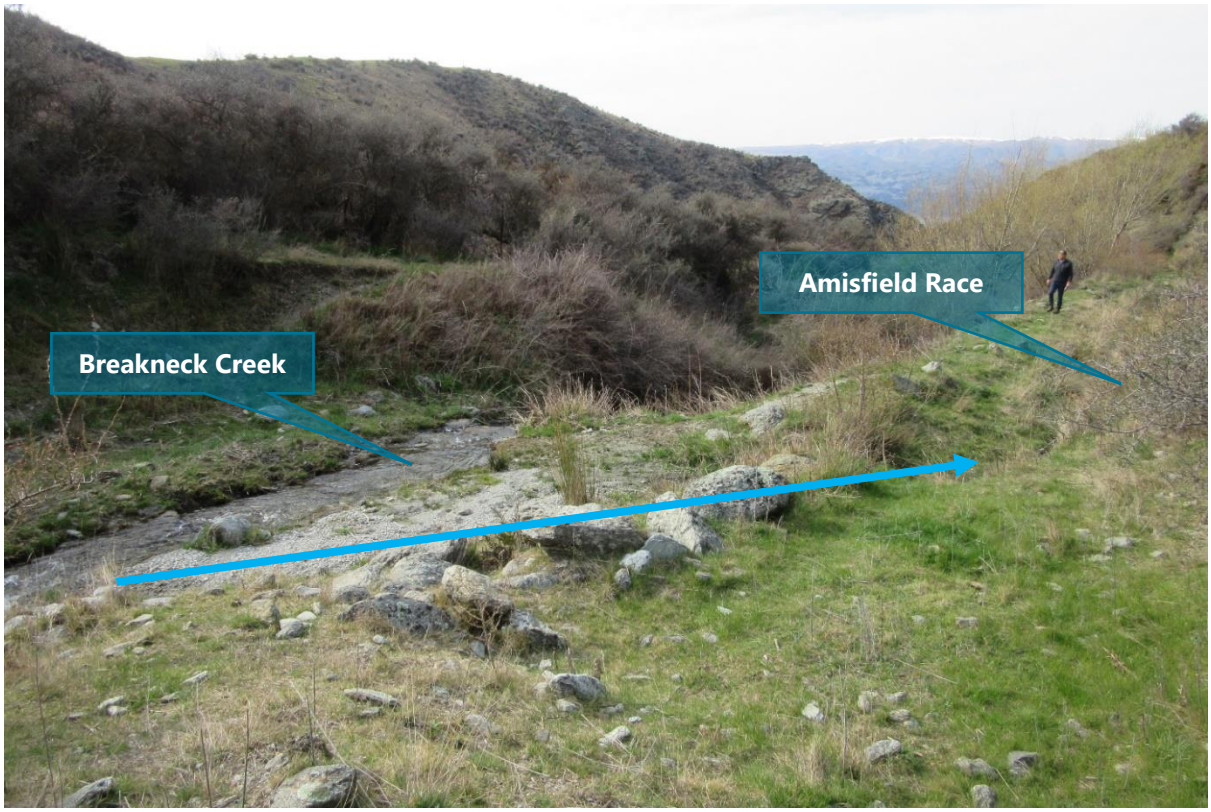


Figure 2: Breakneck Creek and 96320 intake (September 2018). Gravel is deposited at the start of the race to prevent the ingress of creek water outside of the irrigation season. This gravel is then removed at the irrigation season onset to enable creek water to flow in the direction indicated by the blue arrow, with water initially flowing via a short pipe for the first few meters (under the large rocks), then via an open race.

Figure 3: Looking upstream at Breakneck Creek and start of 96320 intake (September 2018)

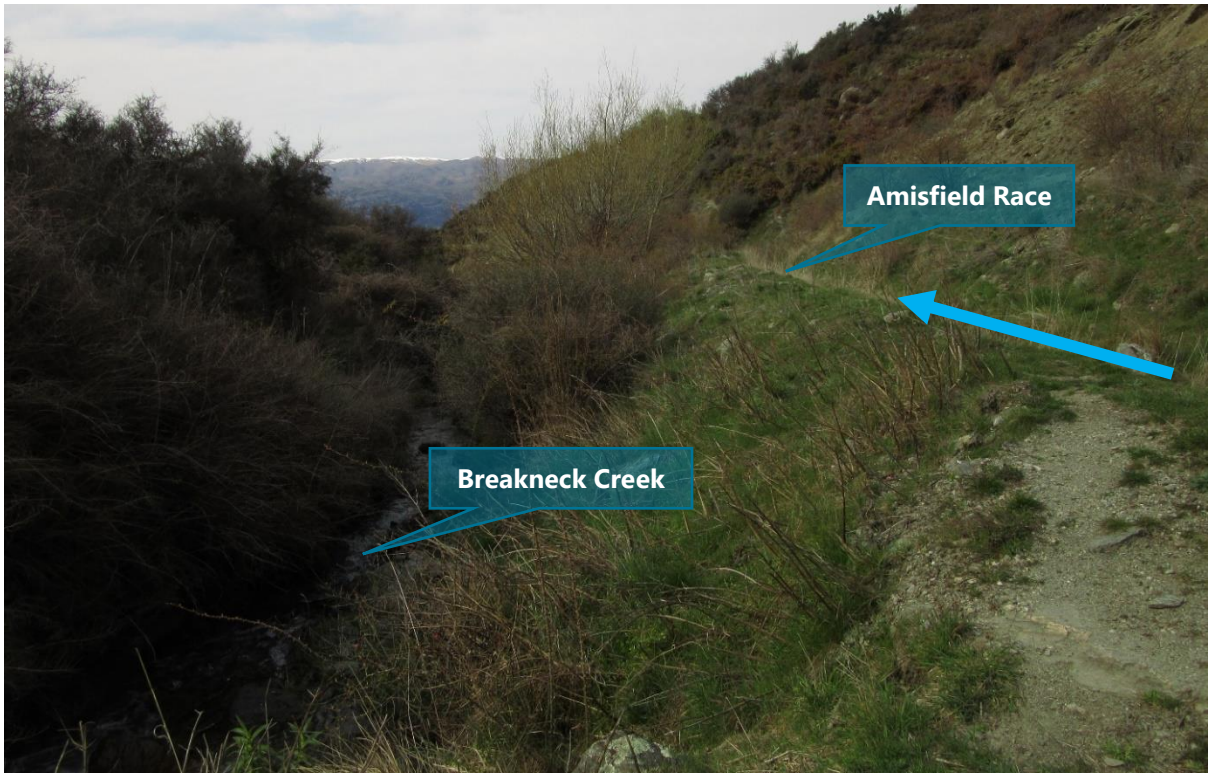


Figure 4: Breakneck Creek and the Amisfield Race (September 2018)

Figure 5: Amisfield Race as it enters the true left bank of the Amisfield Burn, with the 96321 intake on the true right bank and continuation of the Amisfield Race (September 2018)

Breakneck Creek water is discharged into the Amisfield Burn, essentially augmenting Amisfield Burn flows. On the opposite bank of the Amisfield Burn, water enters the second section of the Amisfield Race via the 96321 intake (now conveying both Breakneck Creek and Amisfield Burn water).

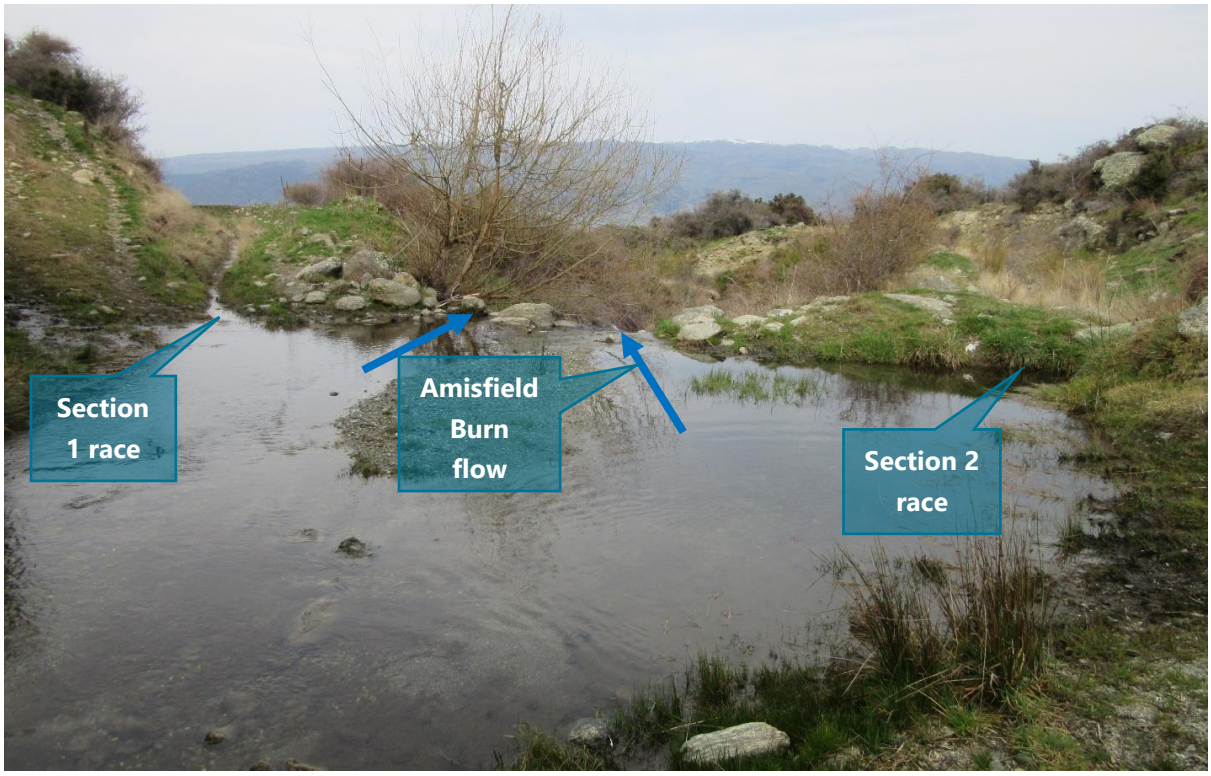


Figure 6: Amisfield Burn, showing Amisfield Race section 1 outlet on left and 96321/Amisfield Race section 2 intake on right (September 2018)

Figure 7: Amisfield Burn waterfall below the rock weir (September 2018)

As the above figure demonstrates, a waterfall is located immediately downstream from the 96321 intake. Water pools behind this embankment and flows down the race when it is opened. From here, water flows along the Amisfield Race for approximately 2.8 km, at which point it discharges into the top of a tributary of the Park Burn. 96320 and 96321 water is then retaken from the Park Burn tributary approximately 600 m downstream of where it is dropped in, then raced for approximately 5.5 km before discharging into the applicant's storage pond. A summary of all the Amisfield Race's interactions with watercourses is provided in the below table. Note that all streams affected by the activity are ephemeral in nature, as discussed in Section 3.1.

Table 2: Amisfield Race interactions with watercourses

Description	Approx. location (NZTM2000)
Discharge of Breakneck Creek water to the Amisfield Burn	1300937E 5018672N
Park Burn trib water piped under race	1300882E 5018084N
Park Burn trib water piped under race	1300619E 5017509N
Race discharged into Park Burn	1300629E 5017054N
Re-take of Breakneck Creek and Amisfield Burn water from the Park Burn	1301017E 5016576N
Race piped over Sawyers Gully	1300990E 5016472N
Park Burn, Amisfield Burn and Breakneck Creek re-take from Five Mile Creek	1300507E 5015359N

The applicant operates a water meter on the Amisfield Race, at approx. NZTM 1300971E 5018554N (around 1100 and 100 metres downstream from the Breakneck Creek and Amisfield Burn intakes, respectively). WEX0123 authorises the operation of this meter downstream from the two take points. Combined abstraction records for the Breakneck (96320) and Amisfield (96321) takes are telemetered to Council, and the meter was verified last year.

2.1.2 Park Burn Race and associated infrastructure

The combined intake for permits RM15.007.01 and 94394 is located in the upper reaches of the Park Burn, at approximately NZTM 1300163E 5017553N. The below photos show the intake in relation to the Park Burn, with photos taken prior to the race being opened for the irrigation season.

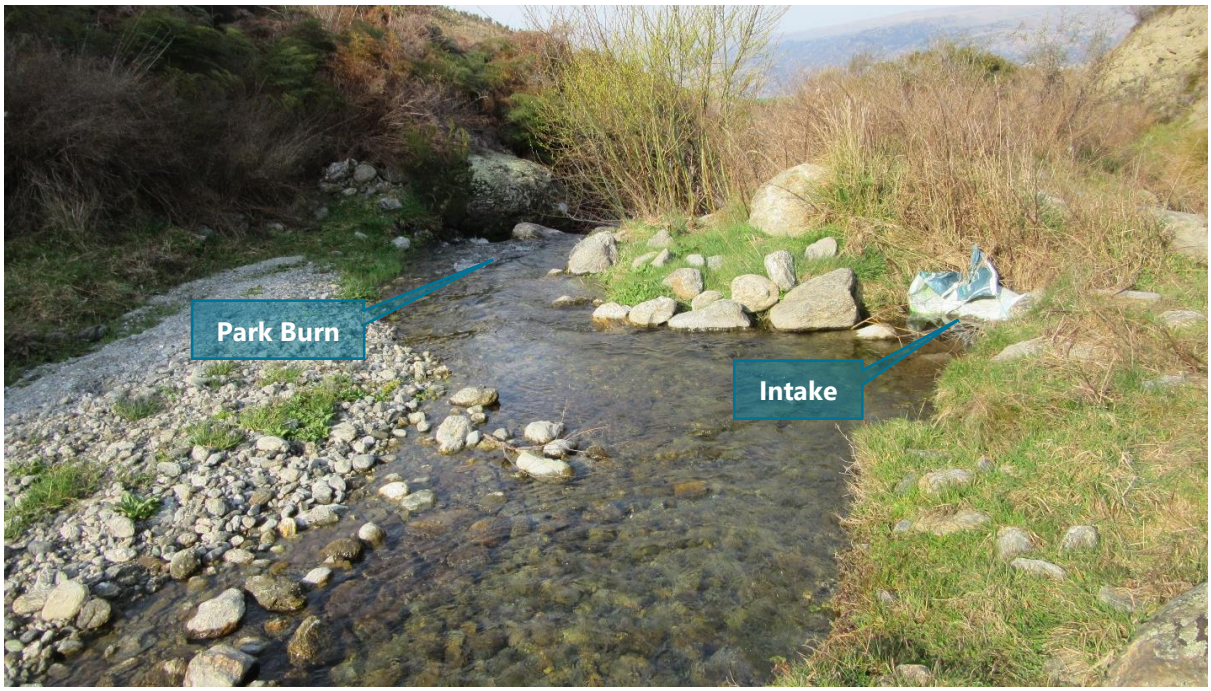


Figure 8: Park Burn, looking downstream towards RM15.007.01 and 94394 intake (September 2018)

Figure 9: View of Park Burn, looking upstream at waterfall below the intake (September 2018)

Similar to the Amisfield Burn intake (96321), the above intake is simply an open channel that allows Park Burn water to gravity-feed into the race.

From the intake, the water race traverses the flanks of the Pisa Range for approximately 2.7 km before discharging into the headwaters of a Five Mile Creek tributary. The race crosses several small gullies (catchment < 50 ha) and is piped under a tributary of the Park Burn at approximately NZTM 1299816E 5016828N.

After being discharged into the Five Mile Creek tributary, RM15.007.01 and 94394 water is retaken from the main trunk of Five Mile Creek approximately 1 km downstream, along with 96320 and 96321 water from the Amisfield Race. As described earlier, from here all of Smallburn's Amisfield and Park Burn water is raced to a storage pond. There is opportunity to flood irrigate from the race directly prior to entering the storage pond.

It is noted that Condition 6 of RM15.007.01 requires "a residual flow of no less than 10 litres per second…immediately downstream of the point of take".

Water take records are collected from a telemeter located approximately 350 m down-race from the intake, at approximately 1300295E 5017299N. The meter was last verified earlier this year, and is authorised under WEX0124. It is noted that this WEX does not include RM15.007.01, however because both 94394 and RM15.007.01 are taken and metered at the same location, this is not considered an issue.

Both races cross land owned by Mt Pisa Station Holdings Limited (Lot 3 DP 343853), with the third section of the Amisfield Race crossing land owned by Mark II Ltd (Lot 2 DP 526279). S417 rights for the Amisfield Race are registered against the titles for both of these neighbouring lots via Instrument No.

966109.1. A s417 application for the section of the Park Burn Race that crosses Mt Pisa Station land was lodged with Council in September 2019, and a decision is pending at the time of writing this application.

2.2 Irrigation

Water is conveyed to a recently expanded irrigation pond for storage and used for flood irrigation directly beneath the race. Stored water is piped from this storage pond around the applicant's property to the current irrigation areas comprising 320 ha in total. Water is used on Lot 4 DP 481936 as contained in Record of Title 677069, owned by the applicant.

Methods of irrigation include centre pivot, K-Line and flood irrigation, as shown in the below figure (a larger copy of which is provided in Appendix A.

- Flood irrigation takes place on approximately 23 ha, directly below the race. Flood irrigation occurs only infrequently, with priority given to pivot irrigation when river levels lower during the peak irrigation season. Much of the flood irrigated area on-farm was recently converted to more efficient means with the installation of a half centre pivot adjacent to the applicant's boundary with Swann Rd Farm. The applicant does not have any plans to convert remaining flood irrigated areas to spray at this stage, and an assessment of effects of the continued use of a small area of flood irrigation is discussed in Section 6.
- Approximately 24 ha is irrigated via K-Line, with a further 49 ha proposed for conversion to K-Line.
- 187 ha is currently irrigated via pivot, with a further 36 ha to be irrigated via a proposed new pivot.
- Storage consists of a recently upgraded 2.5 m deep 120,000 m^3 pond, along with a newly-installed 2.7 m deep 20,000 m3 pond to the east of the new half pivot.

Additionally, a reticulated stock water supply is fed from the dam – peak stock units currently consist of approximately 7,000 sheep and 250 beef cattle. The applicant is looking to increase sheep stocking numbers in the future, up to 10,000 units.

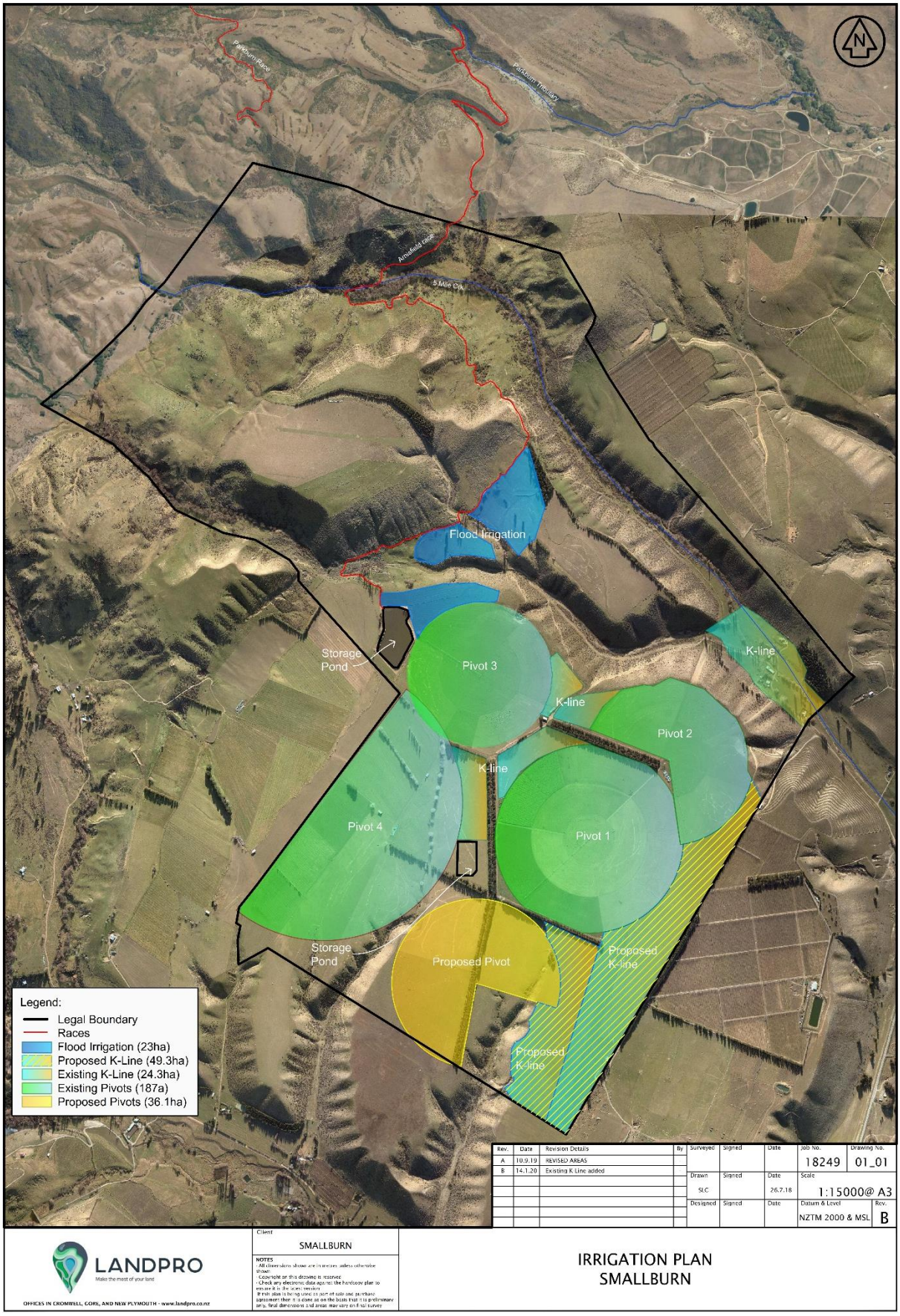


Figure 10: Applicable Smallburn Ltd irrigation areas

2.3 Historic abstraction and use

2.3.1 Permits 96320 & 96321

These permits authorise the combined abstraction of 97.2 L/s (350,000 L/hour) of water from Breakneck Creek and the Amisfield Burn, with metering since April 2013. The two permits replaced part of WR766Cr which was jointly held between Smallburn Limited (Previously W E Clark, R J Clark and P Morton) and the neighbouring property (Lowburn Landholdings Partnership Limited, previously McTanish and Swiffen). Permits 96320.V1 and 96321.V1 replaced the share of water held by Smallburn Limited, and Lowburn Landholdings applied for the replacement of their share separately, which split the joint permit into three permits. This application relates only to the replacement of 96320.V1 and 96321.V1.

The below figure shows that the applicant occasionally reaches the combined maximum abstraction rate, especially during drier seasons when the need for irrigation water is greater. The rate is presented as a daily average rate of take. The record shows that abstraction is highest during the irrigation season (October-April) and is typically shut off over winter – baseline flow records during the winter months are likely due to uncontrolled seepages and overland runoff inputs into the race, rather than active abstraction.

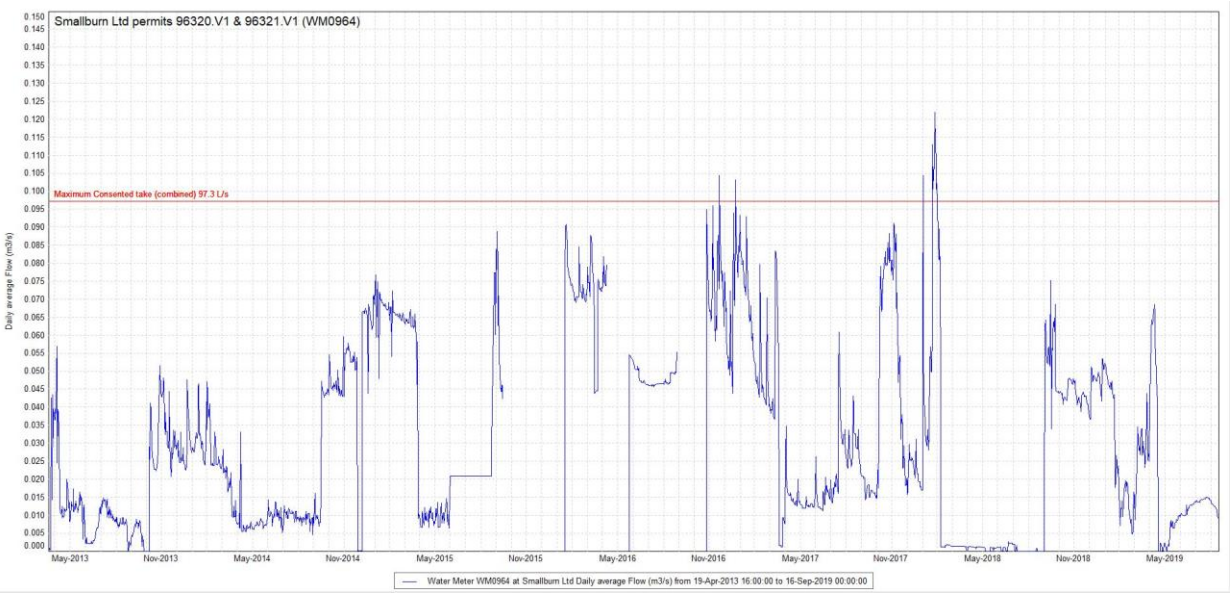


Figure 11: 96320.V1 and 96321.V1 combined abstraction records showing average daily rate of take (Source: ORC)

The following figure presents total monthly abstraction records for 96320 and 96321 dating back to 2013.

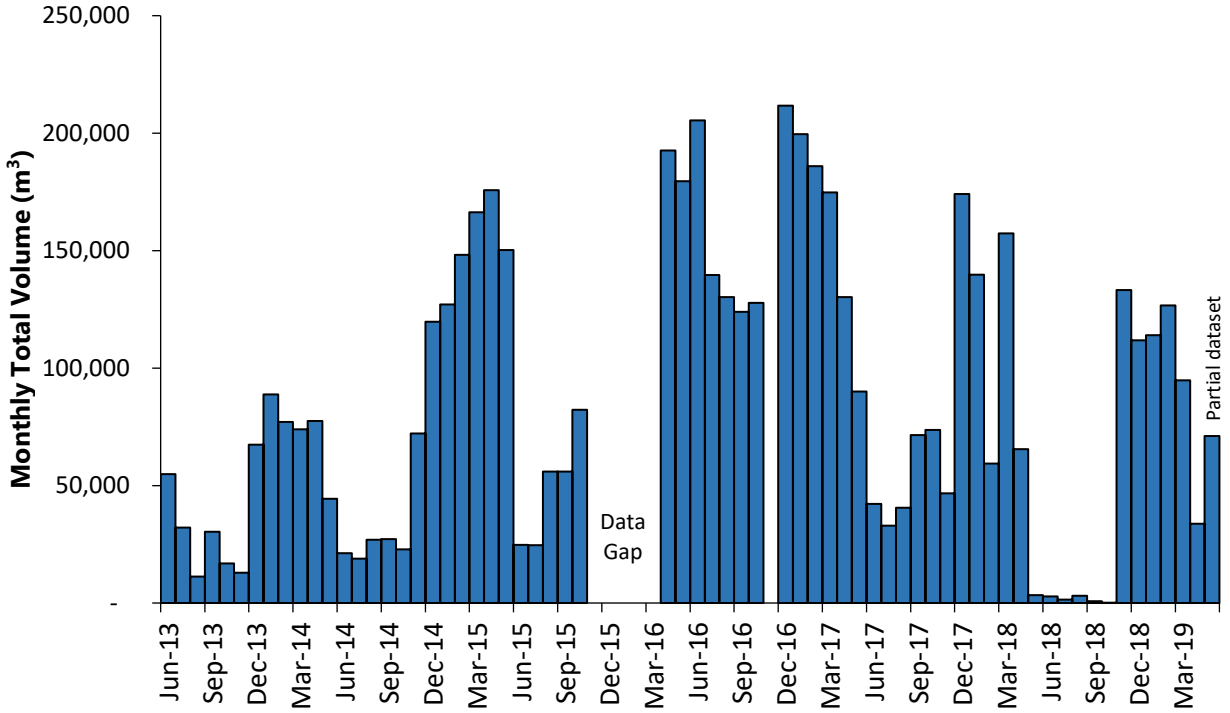


Figure 12: 96320.V1 and 96321.V1 combined abstraction records showing monthly rate of take (Source: ORC)

Based on 6 years of recorded data, maximum abstraction rates and volumes for the combined 96320 and 96321 takes are as follows:

- 120 L/s max instantaneous rate (based on daily averages)
- 211,708 m^3 max monthly take (December 2016)
- 1,261,085 m^3 max annual take (2016/17 hydrological year)

Priorities and other lawful users

Lowburn Land Holdings LP (LLHLP) hold permit 97358, which is the only other authorised take from Breakneck Creek. The applicant shares half of the water available in Breakneck Creek up to the consented maximum rate of take with Lowburn Landholdings. Lowburn Landholdings technically take this water at this same location on Breakneck Creek (or at least a short distance downstream of the Smallburn intake) and return the water to Breakneck Creek immediately downstream of that location. There is no meter at this location and no race/pipe infrastructure for Lowburn Landholdings to convey that water to their property. Instead the water immediately returned to Breakneck Creek continues downstream and past it's confluence with the Amisfield Burn. LLHLP then take water at 1303290E 5017760N by way of 97232 (which is a combination of the water authorised by way of 97358 and 97232).

Smallburn's take from the Amisfield Burn, authorised under 96321, is second in priority on the Amisfield Burn. Deemed Permit 95789 has first priority. This means that historically the permit holders of 95789

have taken the water first and any surplus water has then been taken by Smallburn Limited at their intake. This is reflected in the abstraction records presented above.

2.3.2 Permits RM15.007.01 & 94394

RM15.007.01 was granted to Smallburn Limited in April 2015 and authorised the transfer of the point of take for Deemed Permit 96470. Originally, Deemed Permit 96470 authorised water abstraction at a point upstream of the current abstraction point on Park Burn. In 1999 significant flooding occurred which washed out that point of take and a considerable length of the water race in various places.

Following the flooding and damage to this infrastructure, the abstraction point and race was not re-instated as it was deemed cost prohibitive. As such, the applicant began to abstract their 96470 water from their other established water take location on the Park Burn (at 94394). The applicant had express permission from the Otago Regional Council (Mike Kelly) in 1999 to take water under 96470 by way of the downstream intake at 94394. The RM15.007.01 application therefore sought to rationalise the existing activities and formalise the arrangement to abstract all of Smallburn's Park Burn allocation through the one intake. RM15.007.01 essentially replaces 96470, which was surrendered.

Combined, RM15.007.01 and 94394 authorise a maximum abstraction rate of 249.8 L/s (900,000 L/hr) from the Park Burn and the take has been metered since April 2013. The graph below shows that the applicant has never come close to this maximum consented abstraction rate. The take record generally reflects the natural hydrological regime of the Park Burn, with no abstraction during the winter months when the applicant closes the intake. As the intake is closed outside of the irrigation season, any spikes shown in the hydrograph reflect small overland runoff inputs into the race that the applicant has no control over.

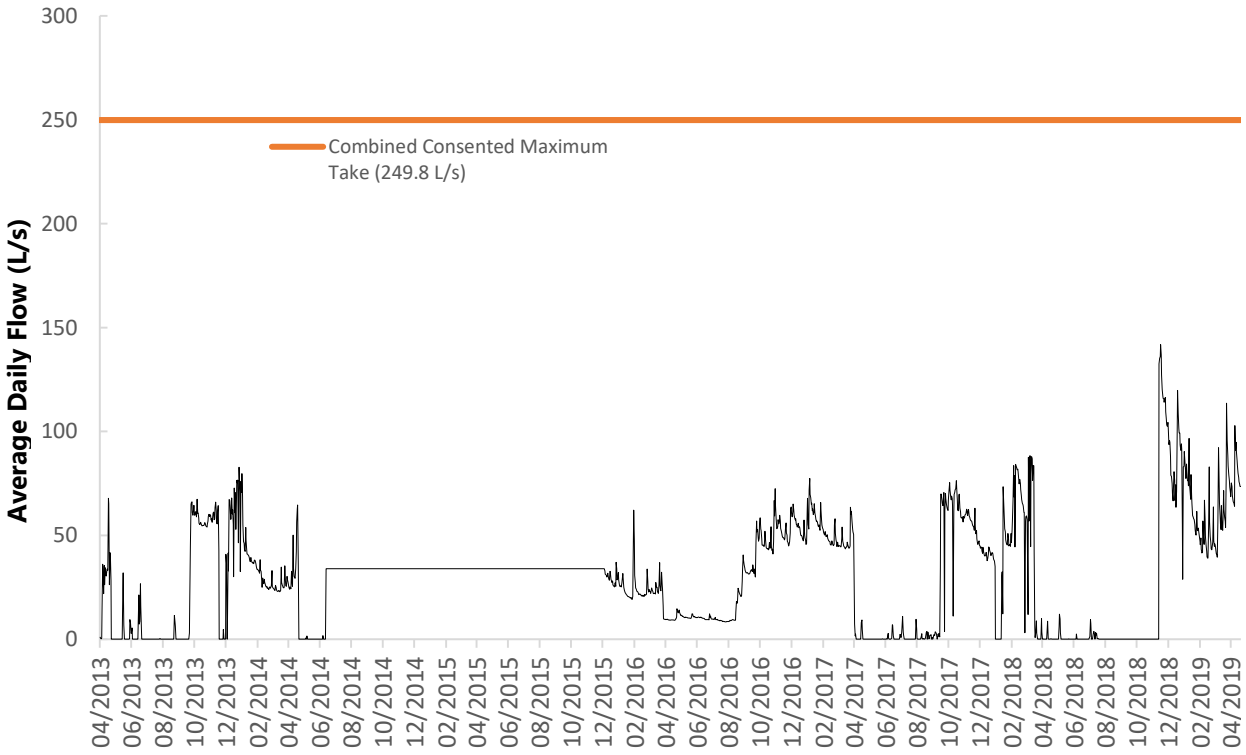


Figure 13: Combined average daily abstraction rate under RM15.007.01 & 94394 (Source: ORC)

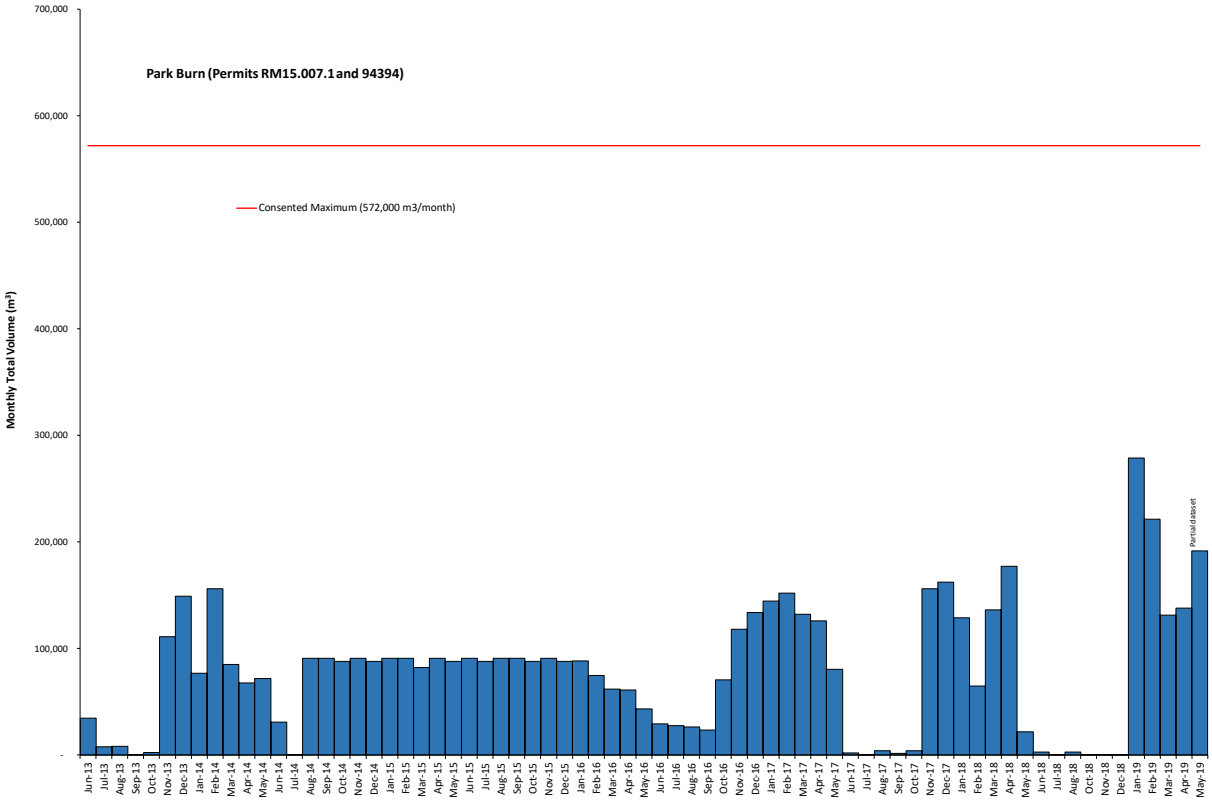


Figure 14: Combined monthly abstraction rate under RM15.007.01 & 94394 (Source: ORC)

Irrigation records for the 2014 and 2015 season are erroneous due to issues with the applicant's measuring system and telemetry unit with Datacol. The applicant has since switched to the Harvest provider and installed a new meter in December 2015.

Based on the take record, maximum abstraction rates and volumes for the combined RM15.007.01 and 94394 takes are as follows:

- 142 L/s max instantaneous rate (based on daily average)
- 278,594 m^3 max monthly take (January 2019)
- 1,036,378 m^3 max annual take (2016/17 hydrological year)

The applicant's take point is the highest on the Park Burn, with two other authorised downstream surface water takes on the same stem (98526 – Rockburn Wines Ltd, 93177 – Mark II Ltd). Of these two permits, only one (98526) is still an active take.

2.4 Augmented takes

Permit 96322 previously authorised the abstraction of water from Masons Gully at a rate no more than 50,000 L/hour. Masons Gully is also known as Five Mile Creek and the catchment is contained almost entirely within the applicant's property. This consent was surrendered by the applicant in 2015 as they did not realise that they needed a consent at this location.

The Amisfield Race crosses this creek at this location and so the applicant wishes to replace that authorisation with a permit to re-take water.

2.5 Allocation sought

The applicant is seeking the same maximum abstraction rates from Breakneck Creek and the Amisfield Burn as what is currently consented under permits 96320 and 96321, respectively. This is reflected in an abstraction record that has regularly been at or above the consented limit. The maximum rate of take sought from the Park Burn is primarily based on historic use data, as abstraction has never come close to the consented maximum. With the exception of RM15.007.01, none of the current permits specify a monthly or annual allocation, therefore monthly and annual allocation sought is based on the maximum recorded volumes in the abstraction record (see earlier).

The following abstraction rates and volumes are proposed. Note that these only relate to irrigation, and do not include stock drinking water requirements needed outside of the irrigation season.

Table 3: Proposed Smallburn Ltd abstraction limits (irrigation only)

	Breakneck Creek	Amisfield Burn	Parkburn
Permit	96320.V1	96321.V1	RM15.007.01 & 94394
Maximum take rate (L/s)	55.6	41.7	120
Total monthly volume (m^3)	490,302		
Total annual volume (m^3)	2,297,463		

As it would be very difficult and costly for the applicant to separately meter the Amisfield and Breakneck takes, it is proposed that a single permit with just one instantaneous limit of 97.3 L/s be issued as replacement for deemed permits 96320 and 96321. Also, considering that both 94394 and RM15.007.01 are now taken from the same location, it is proposed that they be combined into a single replacement permit.

Ancillary to the abstractions applied for above, the applicant seeks to authorise re-takes at two locations specified in the below table and shown in the following figures.

Table 4: Proposed re-take rates

	Tributary of Park Burn	Five Mile Creek
Approx. take point (NZTM 2000)	1301008E 5016581N	1300507E 5015359N
Maximum abstraction rate (L/s)	97.3 L/s	217.3 L/s

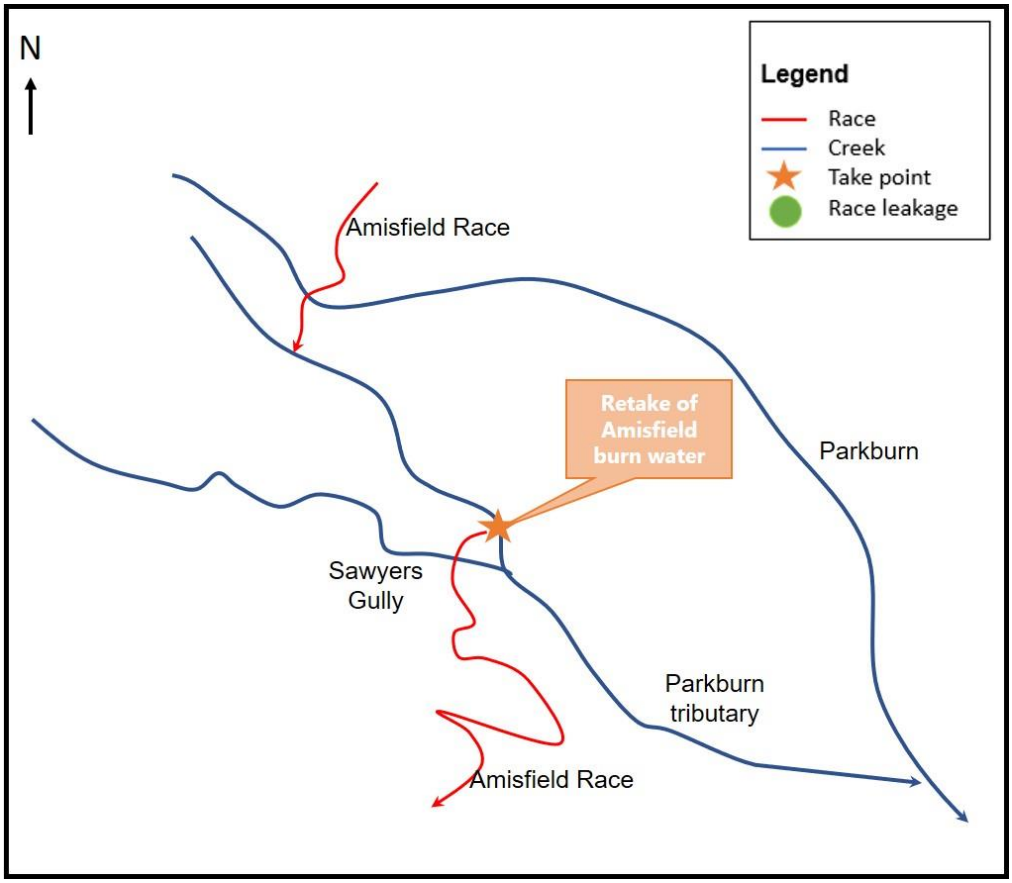


Figure 15: Park Burn tributary re-take schematic

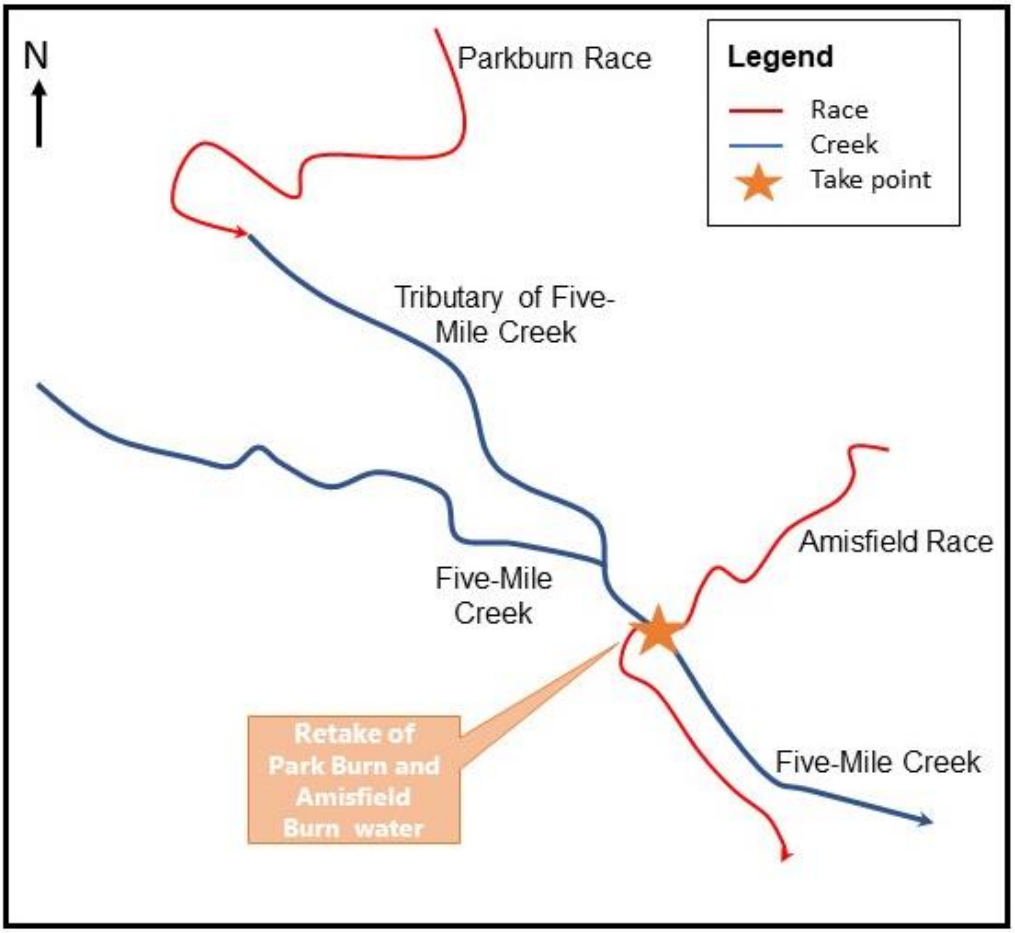


Figure 16: Five Mile Creek re-take schematic

2.6 Consents not to be replaced

The applicant holds Permit 2000.430, authorising the abstraction of Five Mile Creek water approximately 2 km northwest of SH6. This permit authorised the abstraction of water near to the applicant's house, which has in the past been used for domestic purposes, some stock drinking water and a small area of irrigation. This permit is not to be replaced as it has no water abstraction records, and the applicant has not utilised this permit for some time.

3. DESCRIPTION OF EXISTING ENVIRONMENT

3.1 Surface water hydrology and ecology

3.1.1 Amisfield Burn and Breakneck Creek

3.1.1.1 Hydrology

The headwaters of the Amisfield Burn originate at the top of the eastern face of the Pisa Range, at an elevation of approximately 1880 masl and just below the Column Rocks. The upper reaches of the catchment are steep and incised, with a sharp drop down to approximately 800 masl, where the channel begins to widen and a valley begins to form. Below the take point, the channel becomes less confined, picking up several smaller tributaries and flowing across degraded gravel beds before it's confluence with Lake Dunstan.

Breakneck Creek is a tributary of the Amisfield Burn, with its headwaters located to the north of the main trunk of the Amisfield Burn. The morphology and characteristics of the creek are similar to that of the Amisfield, and it joins the Amisfield Burn approximately 2.3 km downstream from the take point.

Figure 17: Amisfield Burn, upstream from the take point (January 2019)

Figure 18: Looking upstream at the Amisfield Burn above State Highway 6 (September 2018)

Figure 19: Breakneck Creek, upstream from take point (January 2019)

ORC has maintained a flow meter in the Amisfield Burn above all abstraction (approx. 1 km above the applicant's take point) since October 2013. As the below figure shows, the creek follows the typical behaviour of steep headwater streams, with fast response event-specific hydrographs. Highest flows

tend to be during spring and early summer, corresponding to snowmelt runoff, with a notable drop in flows in the new year. Based on the ORC's flow data for the Amisfield Burn, the mean annual flow is 162 L/s and the 7-day MALF is 65 L/s.

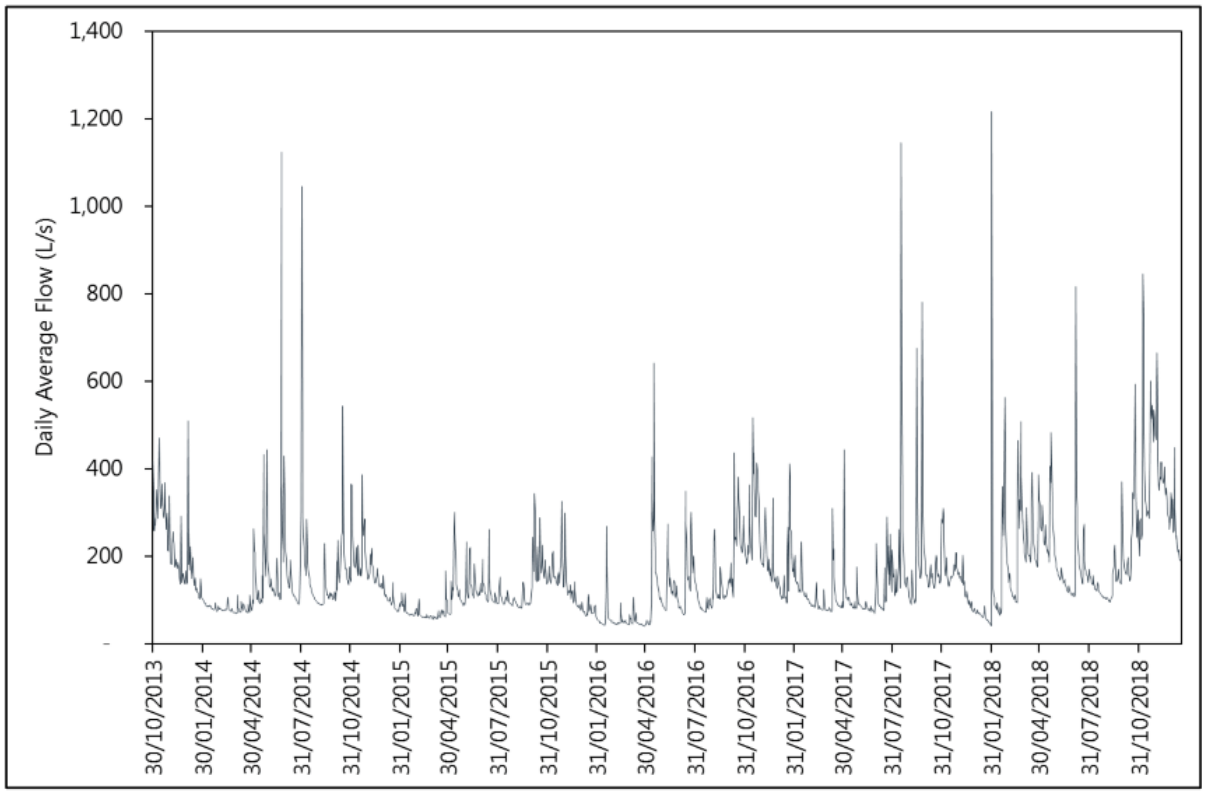


Figure 20: Average daily flow for Amisfield Burn monitoring site (Source: ORC)

No flow monitoring data is available for Breakneck Creek, however MfE river flow modelling estimates the mean flow of Breakneck Creek in the vicinity of the applicant's take point to be 63 L/s, with a MALF of 19 L/s.

To supplement the above data, a series of flow gaugings were undertaken on the 15 January 2019 by Landpro Limited to determine the quantity of water flowing at various sites throughout the Amisfield Burn. A total of five reaches were selected for assessment. These were located upstream from the uppermost Amisfield Burn water take, through the middle reaches of the Amisfield Burn, and lower in the catchment on the lowland alluvial gravels. A flow assessment was also conducted on the upper reach of Breakneck Creek, above the point of take. For the duration of the survey and for 24hours prior the applicants ceased taking water from their respective points of take, enabling the survey to identify where in the catchment losses of water to the sub-surface zone were occurring.

The below figure shows the gauging sites, while Table 5 presents the results of the investigation.

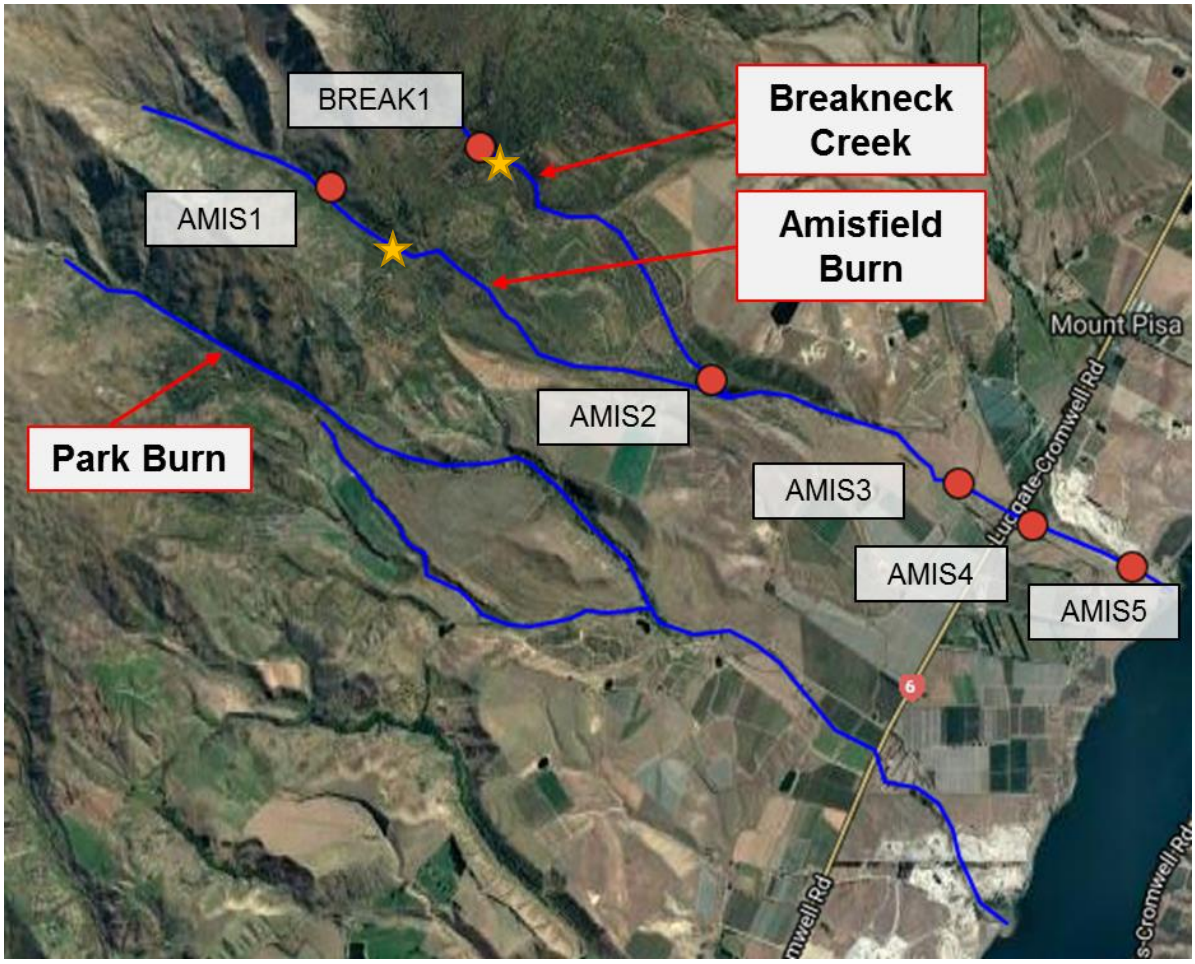


Figure 21: Location of flow gauging sites in the Amisfield Burn catchment. Stars denote the approximate location of the applicant's take points.

Table 5: Flow gauging results

Easting (NZTM 2000)	Northing (NZTM 2000)	Date	Measured flow (L/sec)	†Gauging uncertainty flow range (L/sec)	Site Name
1300319	5019044	15/01/2019	140.6	134-147	AMIS1
1301316	5019364	15/01/2019	54.9	53-57	BREAK1
1302972	5017853	15/01/2019	210.6	203-218	AMIS2
1304670	5017233	15/01/2019	152.7	147-158	AMIS3
1305196	5016969	15/01/2019	72	70-74	AMIS4

At the time of the investigation (15 January 2019), daily average flow at the ORC's Amisfield Burn monitoring station was 194 L/s while the Low Burn (another nearby rated flow site at Chinamans Gully) was approximately 360 L/s. These flows are above the mean flow of the Amisfield Burn and Low Burn

(144L/s and 267L/s respectively) indicating that the survey was carried out during a period of above average flow conditions, likely typical of the spring transition into summer.

Results of the flow gaugings suggest that flow in the lower reaches of the Amisfield Burn interacts with the underlying fine loose alluvial gravels, and that this provides a mechanism for water loss to the sub-surface zone. The survey identified a net loss of 210 L/s between the Amisfield Burn/Breakneck Creek confluence and the final gauging location (AMIS5) well above Lake Dunstan, where the creek had run dry. This is despite gauging taking place during an uncharacteristically wet summer, and suggests that the Amisfield Burn would naturally go to ground much further up-channel than what was observed in January.

It should be noted that the losing nature of the Amisfield Burn is typical of similar streams draining the eastern face of the Pisa Range, with similarly losing reaches found via Landpro gauging exercises in the nearby Park Burn, Stratford Creek, Schoolhouse Creek, the Albert Burn, and Poison Creek (relevant flow gauging reports can be made available upon request).

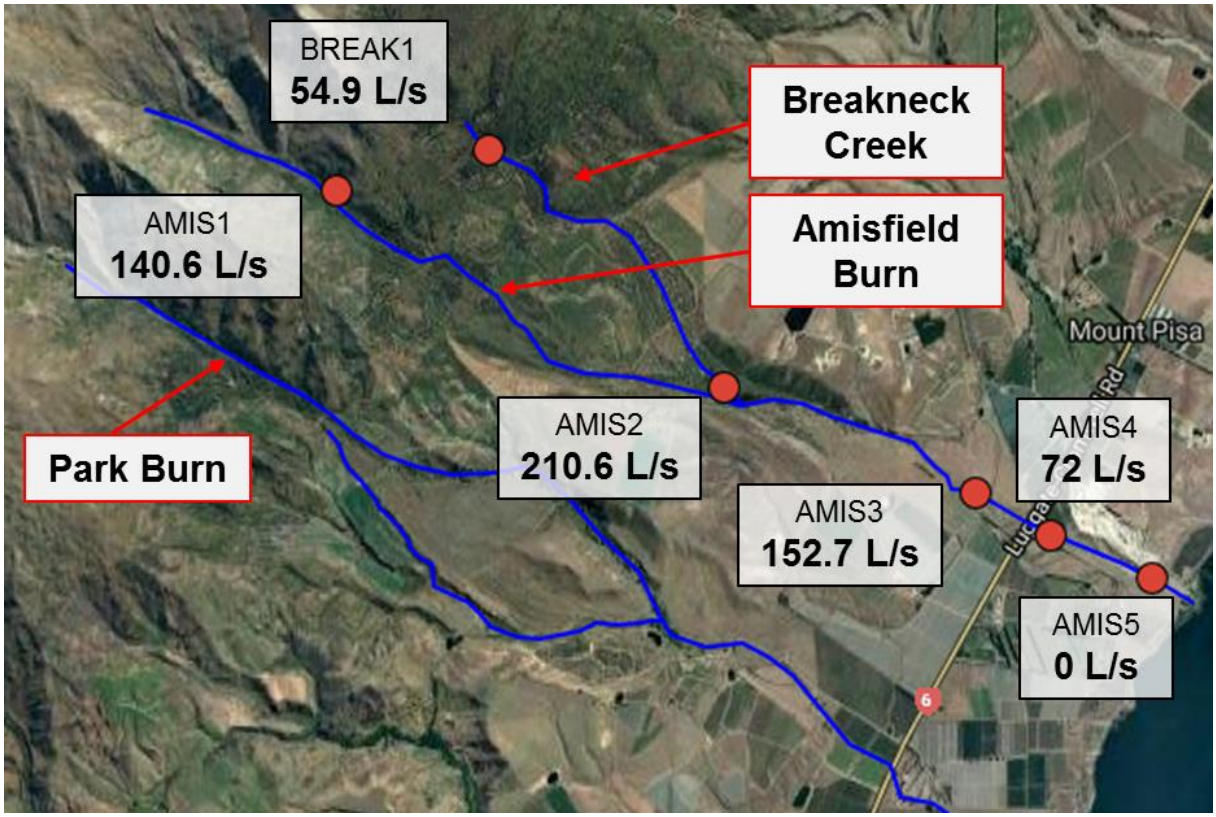


Figure 22: Amisfield Burn and Breakneck Creek flow gauging results

Figure 23: Amisfield Burn d/s of confluence with Breakneck Creek (AMIS2, January 2019)

Figure 24: Amisfield Burn upstream of Lake Dunstan confluence (AMIS5); left: looking upstream & right: looking downstream (January 2019)Temperature records obtained from ORC (as a proxy for flow monitoring data) for two locations in the lower reaches of the Amisfield Burn (2013-14 & 2018-19) reinforce the conclusion that the creek naturally loses water to the underlying gravels in late summer and early autumn (see Section 4.2 of the attached hydrology report, Appendix B).

3.1.1.2 Aquatic ecology

In April 2019, Richard Allibone of Water Ways Consulting Limited was retained to undertake aquatic surveys and subsequently develop residual flow recommendations for several deemed permit water takes from the Amisfield Burn and Park Burn (see Appendix C). The following summarises the findings presented in that report.

New Zealand Freshwater Fish Database records

Eight records for the Amisfield Burn are registered on the New Zealand Freshwater Fish Database (NZFFD):

- The earliest three (1996) records report brown trout at all three sites, a single large koaro at the middle site, and a single upland bully in a lower tributary of the Amisfield Burn (see Figure 25).
- 2001 surveys reported no fish at State Highway 6 and brown trout and a single koaro were present at the same site as the koaro was found in 1996.
- In 2018, three Amisfield Burn sites were fished with brown trout present at the lower two sites, upland bully at the lowest site, and no fish recorded at the uppermost survey site. Note that the second highest survey site on the Amisfield Burn is effectively the same location as the applicant's intake.
- Breakneck Creek in the vicinity of the applicant's take point was fished in 2018, with no species identified.

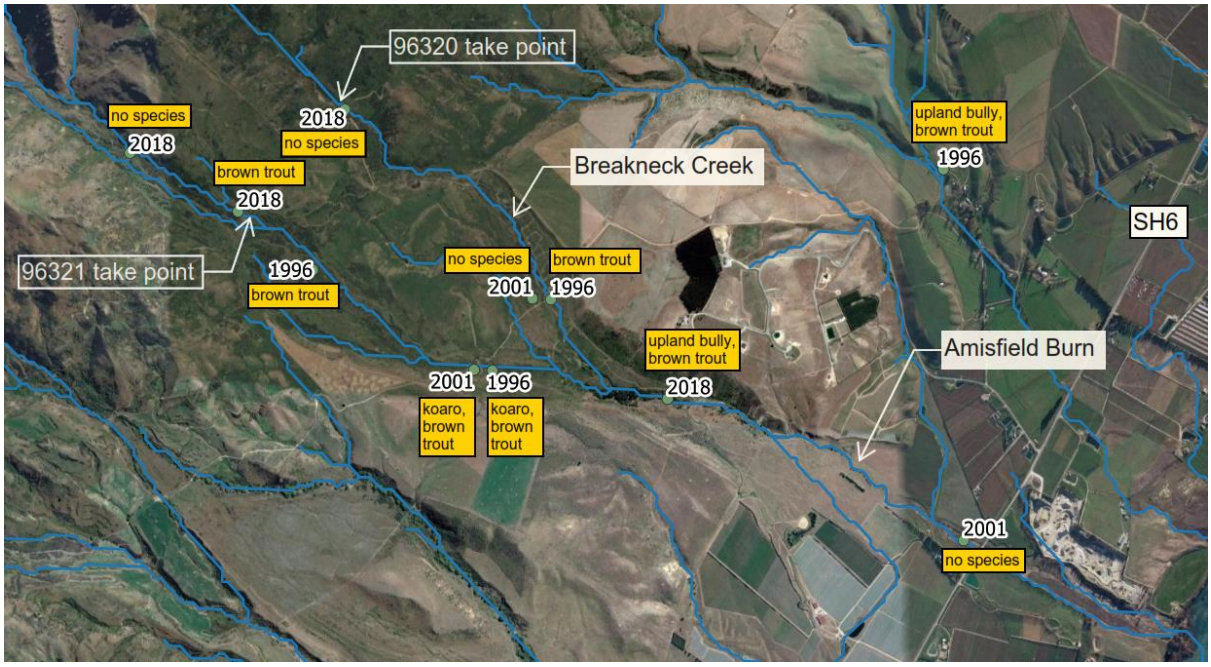


Figure 25: NZFFD records for the Amisfield Burn

The NZFFD records indicate that brown trout are common in the Amisfield Burn, while native fish (koaro, upland bully) are rare. It is worth noting that no critically threatened Clutha flathead galaxiids have been located in the catchment. All of the pre-2018 surveys were conducted by Department of Conservation (DoC).

2019 fish survey

Water Ways Consulting Ltd conducted three surveys on the Amisfield Burn and Breakneck Creek in April 2019 to fill in any data gaps in the historic fish survey record (see below figure). The surveys found brown trout at the two Breakneck Creek sites, while the Amisfield Burn survey site (just 700 m upstream of the applicant's point of take, at the uppermost (95789) abstraction point) did not record any fish. No additional surveys of the lower reaches of the creek were possible, as the creek bed was dry at State Highway 6.

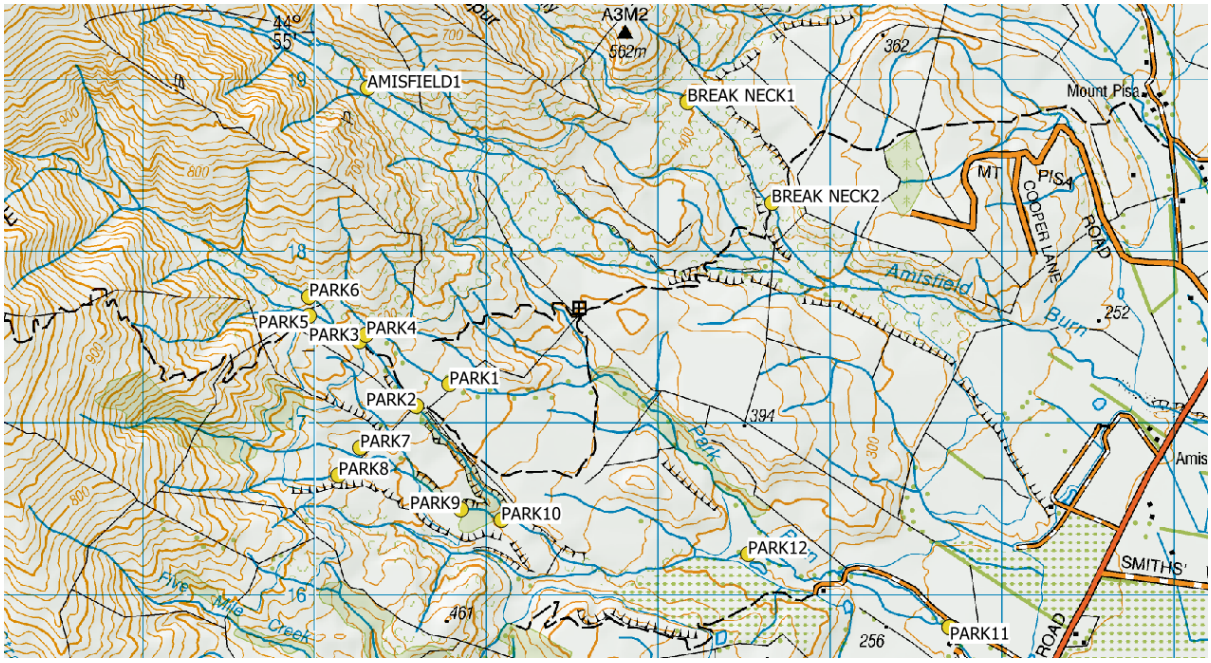


Figure 26: 2019 fish survey locations (Source: Water Ways Consulting Ltd)

3.1.1.3 Schedule 1 values

Schedule 1 of the RPW records values associated with waterbodies in the Otago Region. The Amisfield Burn is identified in Schedule 1A, with ecosystem values listed as "weedfree" (absence of aquatic pest plants) and "rarefish" (presence of indigenous fish species threatened with extinction). In relation to the "rarefish" designation, the Amisfield Burn is identified within the Schedule as "significant habitat for koaro."

Breakneck Creek is not listed in Schedule 1 of the RPW.

3.1.2 Park Burn

3.1.2.1 Hydrology

The geohydrology of the Park Burn is similar to that of the Amisfield Burn, with its headwaters beginning at around 1800 masl on the Pisa Range. After a steep descent, the channel gradient eases at an elevation of around 650 masl, with the applicant's take point located approximately 1.3 km downstream from this point. The Park Burn then meanders across the terraces below the Pisa Range foothills before passing under SH6 and ultimately discharging into Lake Dunstan.

There is no flow monitoring data for the Park Burn, however MfE river flow modelling estimates the mean flow of the Park Burn in the vicinity of the applicant's take point to be 123 L/s, with a MALF of 34 L/s.

Figure 27: Park Burn looking upstream, above the applicant's point of take (January 2019)

As with the Amisfield Burn, gauging was undertaken by Landpro on January 16, 2019 to quantify Park Burn flows at various sites throughout the catchment. For the duration of the survey and for 24 hours prior, the applicants ceased taking water from their respective points of take.

The below table and figure present the findings from this gauging exercise.

Table 6: Park Burn gauging results

Easting (NZTM 2000)	Northing (NZTM 2000)	Date	Measured flow (L/sec)	†Gauging flow uncertainty range (L/sec)	Site Name
1300141	5017562	16/01/2019	92.4	90 – 95	Park1
1301722	5017250	16/01/2019	113.5	110 – 117	Park2
1302532	5016438	16/01/2019	83.5	80 – 87	Park3
1303013	5016126	16/01/2019	85.9	83 – 89	Park4
1302290	5016214	16/01/2019	10.1	10 – 11	Park5C
1304218	5015366	16/01/2019	43.5	42 – 45	Park6

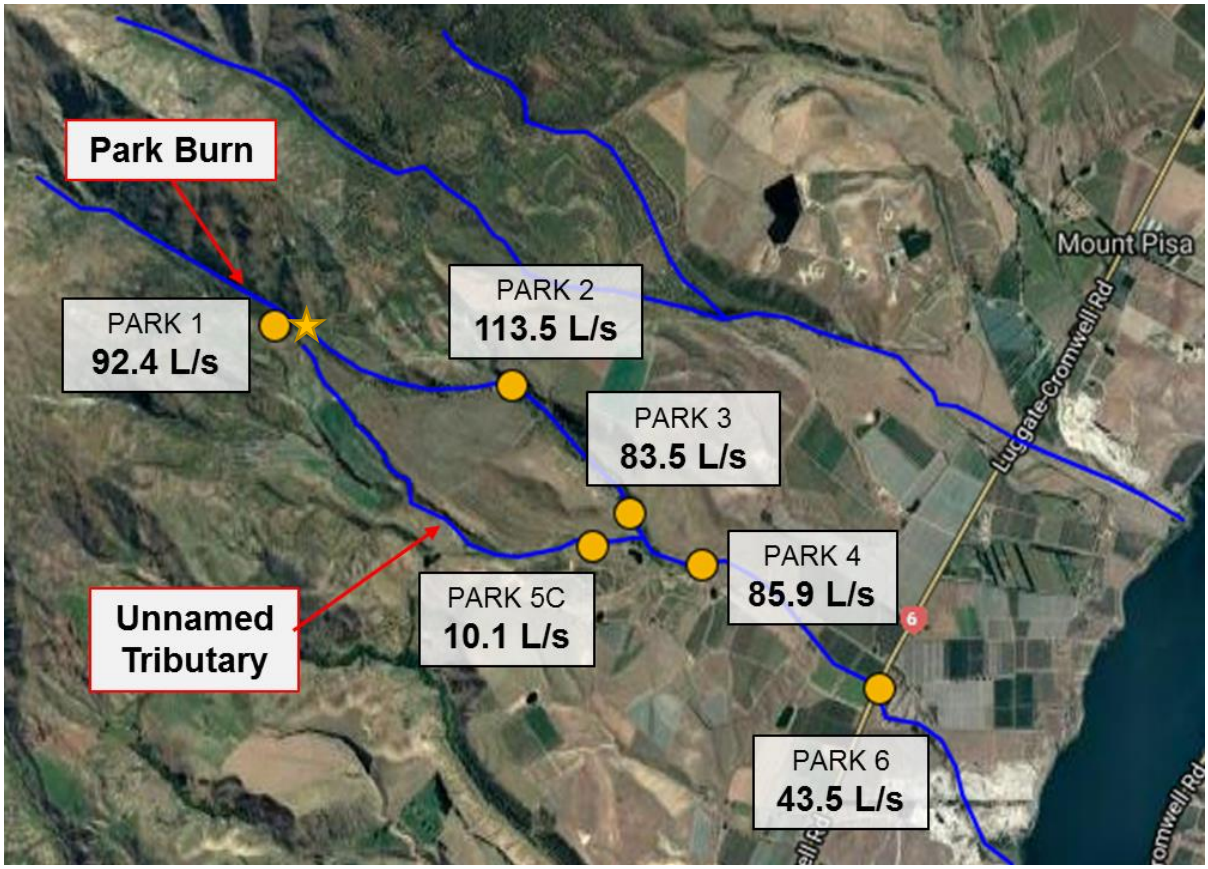


Figure 28: Park Burn flow gauging sites with measured flow. The star denotes the approximate location of the intake.

Similar to the Amisfield Burn gauging findings, there were considerable surface water losses between the upstream reaches of the creek and the lower reaches, with a net loss of 70 L/s between the second gauging site (Park 2) and the bottom gauging site (Park 6). No gauging below the State Highway was possible due to a quarry, which prevented access, however it is unlikely that there was any surface flow discharge into Lake Dunstan, considering the rate at which water was lost further upstream and the

relatively minimal flows left in the creek at the State Highway. This conclusion is supported by other gauging results from similar creeks on the eastern face of the Pisa Range.

3.1.2.2 Aquatic ecology

Three records for the Park Burn are registered on the New Zealand Freshwater Fish Database (NZFFD), as shown in the below figure.

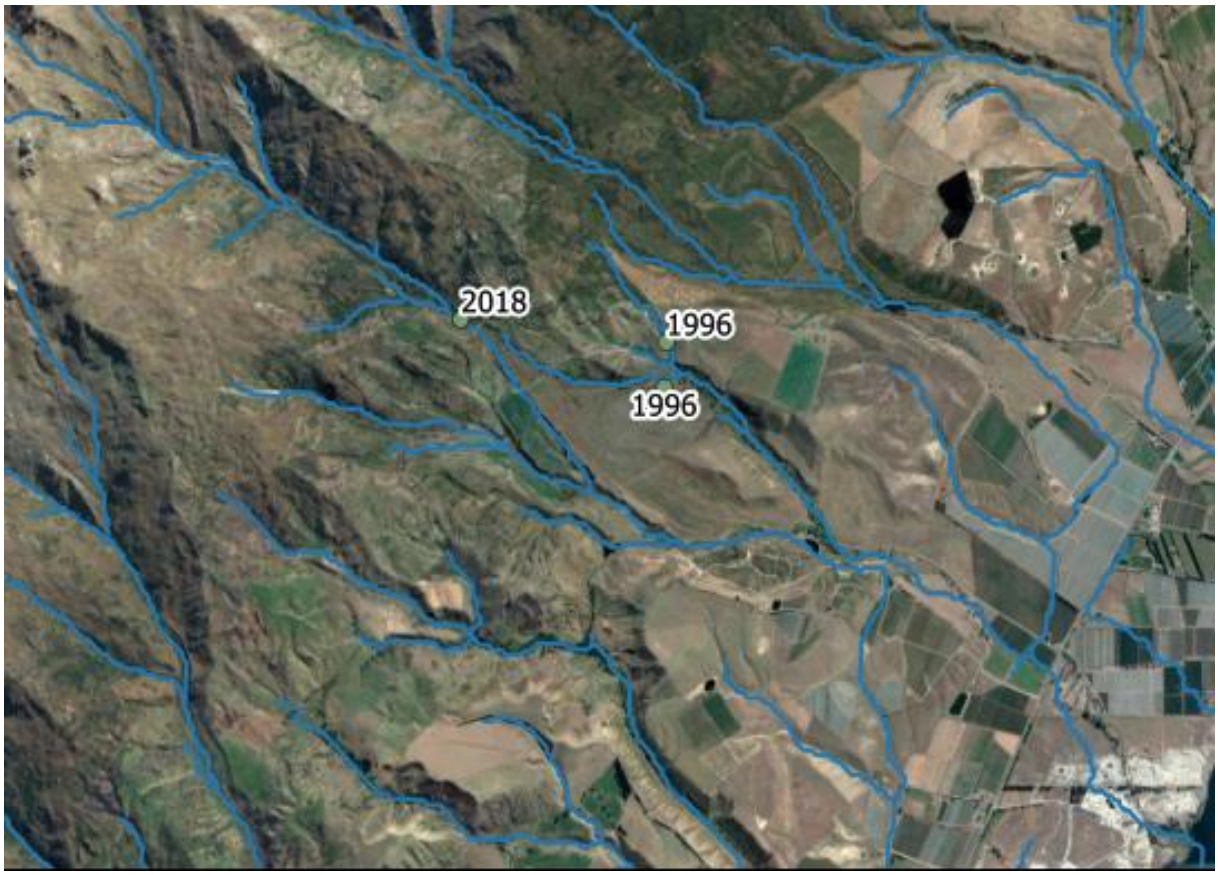


Figure 29: NZFFD survey locations

All three surveys found brown trout only, with no other species present. Note that the 2018 survey location is at the applicant's Amisfield Burn take point.

To supplement this data, Water Ways Consulting Ltd conducted further aquatic surveys of the Park Burn in April 2019. These survey locations are shown in the below figure (also presented earlier).

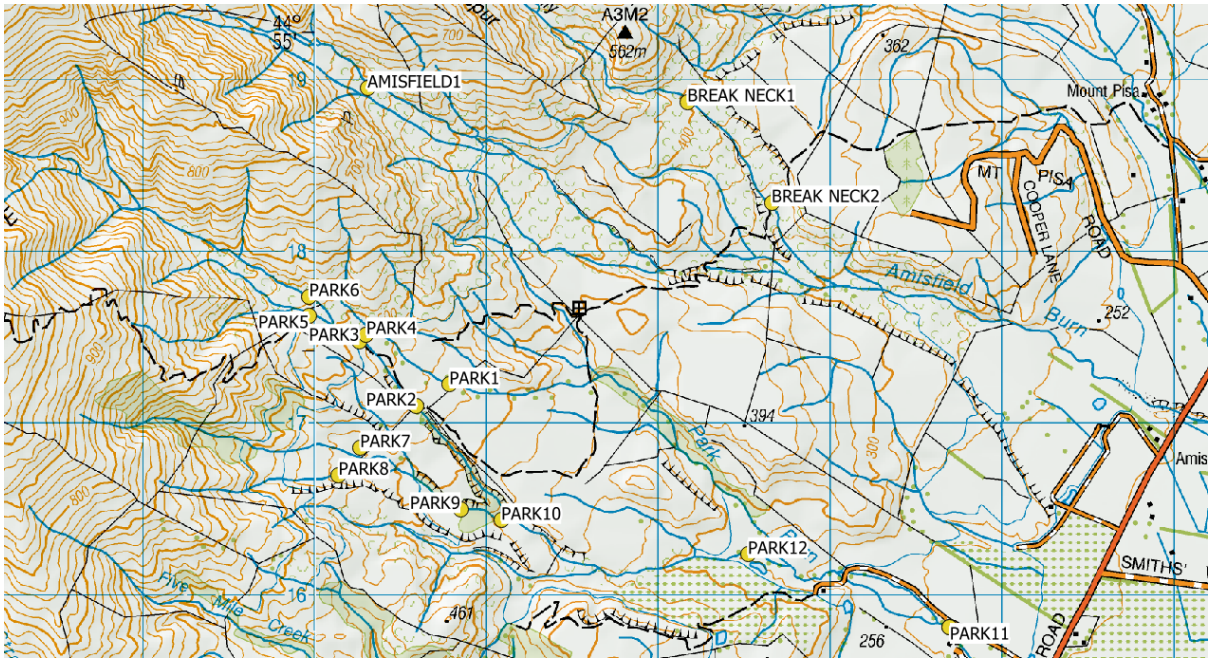


Figure 30: 2019 fish survey locations (Source: Water Ways Consulting Ltd)

Brown trout were identified at several sites on the Park Burn, with a single rainbow trout found at one site. No native fish were identified in the Park Burn, with results presented in the below table.

Table 7: Park Burn survey locations and results (Source: Water Ways Consulting Ltd)

Site	Area fished (m^2) and stream type	Species caught
Park Burn 1	100 (stream, low flow)	Brown trout (219 mm)
Park Burn 2	Nil (dry stream)	Nil
Park Burn 3	10 (seepage)	Nil
Park Burn 4	80 (stream)	Brown trout (length 67-80 mm)
Park Burn 5	20 (seepage)	Nil
Park Burn 6	80 (stream)	Brown trout (length 77-97 mm)
Park Burn 7	Nil (Natural very small stream))	Nil
Park Burn 8	Nil (Natural very small stream)	Nil
Park Burn 9	30 (small stream)	Brown trout (78-205 mm)
Park Burn 10	50 (high flow small stream)	Nil
Park Burn 11	100 (stream)	Brown trout (length 104, 151 Rainbow trout (length 127 mm)
Park Burn 12	80 (stream high flow)	Nil

Note that the Park 6 site is above the applicant's take point.

3.1.2.3 Schedule 1 values

The Park Burn is not listed in Schedule 1 of the RPW.

3.1.3 Five Mile Creek

3.1.3.1 Hydrology

Five Mile Creek has a considerably smaller catchment than the Amisfield Burn and the Park Burn, with its headwaters originating in on the lower flanks of the Pisa Range, at approximately 900 masl. Little hydrological data is available for creek, however Recommending Report 2000/559 notes that "the creek has normal seasonal variation and due to the small size of the catchment and the porous gravels

between the lower terraces and Lake Dunstan, flows in the creek only reach the lake during heavy rain events."

Based on discussions with the applicant and data gathered in neighbouring streams (Park Burn and Stratford Creek), it is concluded that the recommending report's assertion that the creek normally has no connection with Lake Dunstan is correct. MfE river flow modelling estimates the naturalised flow of Five Mile Creek in the vicinity of the applicant's Amisfield Race crossing (see appended Race Map) to be 24 L/s mean flow with a MALF of 5 L/s, however it is possible that this may reflect inputs from the Park Burn Race into the Five Mile Creek tributary. The applicant has noted that they don't see flowing water in the Creek unless there has been a recent rainfall event.

3.1.3.2 Aquatic ecology

There are no fish survey records listed on NIWA's freshwater fish database, however it is assumed that due to the small stature of the creek and its lack of connectivity with Lake Dunstan, there would be relatively few ecological values associated with this watercourse. The aforementioned recommending report states that "there are no significant fishery or recreational values in this Creek."

3.1.3.3 Schedule 1 values

Five Mile Creek is not listed in Schedule 1 of the RPW.

3.2 Land use, topography and vegetation

The applicant's property boundary encompasses approximately 1000 hectares of land on the flanks of the Pisa Range, with elevation ranging from ~700 masl at the top end of the property to ~300 m at the bottom end. The irrigation command area is located on the bottom (eastern) half of the property, where slopes are gentler and access to infrastructure is more readily available.

The applicant runs merino sheep and cattle on their property as well as a homestay operation that utilises the farming enterprise as a tourism venture. Irrigation is necessary for healthy pastures during the growing season and is either eaten by stock in the summer or harvested as surplus feed for winter.

This property has been owned by the Morton and Clark family for almost 100 years and is described as a sheep breeding and finishing property with some cattle store stock trading. The farm is a family business, which supports some contractors such as shearing gangs, and the works required for converting from flood to spray irrigation (i.e. fencing, cultivation of border dykes, installation of irrigation infrastructure). Shelter belts are being retained as much as possible with planting of new shelter belts underway.

Virtually all of the irrigation area is classified in the New Zealand Land Cover Database as high producing exotic grassland, which is consistent with the improved pastures and winter crops sown at these locations.

Vegetation in the vicinity of the applicant's points of take and retake is generally comprised of willows, rosehip and exotic grasses.

3.3 Climate

The study area is subject to characteristically hot, dry summers and cold winters. MAR for the irrigable land areas is estimated at 450 mm/year, based on ORC's GIS viewer.

3.4 Soils and geology

SMap-designated soils within the command area are summarised in the Soils Map, provided in Appendix A. The GNS Science New Zealand Geology Web Map indicates that virtually all of the land within the irrigation command area is underlain by Middle Quaternary glacial outwash deposits, described as 'muddy to sandy gravel'.

4. ACTIVITY CLASSIFICATION

This application seeks to replace existing water permits that have primary allocation status. Replacement of the 4 deemed permits from Breakneck Creek, the Amisfield Burn and the Park Burn as part of the proposal is authorised by Rule 12.1.4.5 of the RPW:

Rule 12.1.4.5

Taking and use of surface water as primary allocation applied for prior to 28 February 1998 in catchments not listed in Schedule 2A:

(i) This rule applies to the taking of surface water, as primary allocation, in catchment areas not listed in Schedule 2A, if the taking was the subject of a resource consent or other authority:
  (a) Granted before 28 February 1998; or
  (b) Granted after 28 February 1998, but was applied for prior to 28 February 1998; or.
  (c) Granted to replace a resource consent or authority of the kind referred to in paragraph (a) or (b).

*(ii) Unless covered by Rule 12.1.1A.1, the taking and use of surface water to which this rule applies is a **restricted discretionary** activity. The matters to which the Otago Regional Council has restricted the exercise of its discretion are set out in Rule 12.1.4.8.*

(iii) Unless covered by Rule 12.1.1A.1, the taking and use of surface water in the Waitaki catchment to which this rule applies is a restricted discretionary activity provided that by itself or in combination with any other take, use, dam, or diversions, the sum of the annual volumes authorised by resource consent, does not exceed the allocation to activities set out in Table 12.1.4.2. The matters to which the Otago Regional Council has restricted the exercise of its discretion are set out in Rule 12.1.4.8.

(iv) Takes to which this rule applies will not be subject to a minimum flow condition until the minimum flow has been determined by investigation and added to Schedule 2A by a plan change. Note: If a minimum flow has been determined for a catchment previously not listed in Schedule 2A, and that minimum flow has been set by a plan change, the catchment will then be listed in Schedule 2A and Rule 12.1.4.2 or Rule 12.1.4.4 will apply.

Rule 12.1.4.8 Restricted discretionary activity considerations

In considering any resource consent for the taking and use of water in terms of Rules 12.1.4.2 to 12.1.4.7 and 12.2.3.1A, the Otago Regional Council will restrict the exercise of its discretion to the following:

(i) The primary and supplementary allocation limits for the catchment; and

(ii) Whether the proposed take is primary or supplementary allocation for the catchment; and

(iii) The rate, volume, timing and frequency of water to be taken and used; and

(iv) The proposed methods of take, delivery and application of the water taken; and

(v) The source of water available to be taken; and

(vi) The location of the use of the water, when it will be taken out of a local catchment; and

(vii) Competing lawful local demand for that water; and

(viii) The minimum flow to be applied to the take of water, if consent is granted; and

(ix) Where the minimum flow is to be measured, if consent is granted; and

(x) The consent being exercised or suspended in accordance with any Council approved rationing regime; and

(xi) Any need for a residual flow at the point of take; and

(xii) Any need to prevent fish entering the intake and to locate new points of take to avoid adverse effects on fish spawning sites; and

(xiii) Any effect on any Regionally Significant Wetland or on any regionally significant wetland value; and

(xiv) Any financial contribution for regionally significant wetland values or Regionally Significant Wetlands that are adversely affected; and

(xv) Any actual or potential effects on any groundwater body; and

(xvi) Any adverse effect on any lawful take of water, if consent is granted, including potential bore interference; and

(xvii) Whether the taking of water under a water permit should be restricted to allow the exercise of another water permit; and

(xviii) Any arrangement for cooperation with other takers or users; and

(xix) Any water storage facility available for the water taken, and its capacity; and

(xx) The duration of the resource consent; and

(xxi) The information, monitoring and metering requirements; and

(xxii) Any bond; and

(xxiii) The review of conditions of the resource consent; and

(xxiv) For resource consents in the Waitaki catchment the matters in (i) to (xxiii) above, as well as matters in Policies 6.6A.1 to 6.6A.6.

<u>Notification and written approvals</u>

(a) For applications for resource consent to which this Rule applies, to take and use water from a river, the Consent Authority is precluded from giving public notification, if the application is to take and use water from:

(i) A river for which a minimum flow has been set by or under this Plan; or

(ii) A river for which it is not necessary for the Council to consider whether, if consent is granted, the taking should be subject to a condition requiring a residual flow to remain in the river at the point of take, or a condition requiring other provision for native fish, other than a condition requiring fish screening.

Other applications for resource consent to take and use water from a river may be considered without notification as allowed by the Resource Management Act.

(b) For applications for resource consent to which this rule applies, to take and use water from a water body other than a river, the Consent Authority is precluded from giving public notification.

All water sought as replacement for the applicant's deemed permits (96320, 96321, 94394, RM15.007.01) is the same or less than that allocated via permit prior to 28 February 1998, as per Rule 12.1.4.5(i)(a).

None of the catchments are listed in Schedule 2A of the RPW. This means these permit replacements are **restricted discretionary** activities.

Additionally, the applicant is seeking resource consent for the re-taking of water from a tributary of the Park Burn and Five Mile Creek, as detailed earlier in this document. These activities are authorised by Rule 12.1.4.1 of the RPW:

Rule 12.1.4.1
Except as provided for by Rule 12.1.2.3, the taking and use of surface water from any lake or river which has already been delivered to that lake or river for the purpose of this subsequent taking is a ***restricted discretionary*** *activity.*

In considering any resource consent for the taking and use of water in terms of this rule, the Otago Regional Council will restrict the exercise of its discretion to the following:

(a) The amount of water which can be taken, having regard to the amount delivered to the lake or river and any losses that may have occurred between the point of augmentation and the take; and
(b) Any need to prevent fish entering the intake; and
(c) The duration of the resource consent; and
(d) The information and monitoring requirements; and
(e) Any bond; and
(f) The review of conditions of the resource consent.

Applications may be considered without notification under Section 93 and without service under Section 94(1) of the Resource Management Act on persons who, in the opinion of the consent authority, may be adversely affected by the activity.

Overall, the proposed water abstractions are a **restricted discretionary** activity.

4.1 Associated Permitted Activities

As specified earlier, three discharges of water to water occur as part of the proposal:

- Breakneck Creek water to the Amisfield Burn, via the Amisfield Race.
- Amisfield Burn water to a tributary of the Park Burn, via the Amisfield Race.
- Park Burn water to a tributary of Five Mile Creek, via the Park Burn Race.

These are permitted activities under Rule 12.C.1.1 of the RPW:

The discharge of water or any contaminant to water, or onto or into land in circumstances which may result in a contaminant entering water, is a permitted activity.

None of the provisions that might confound the permitted status of these activities (i.e. causing flooding, discharge between catchments, etc.) are triggered by the three discharges.

In addition, the applicant may, at times, need to conduct maintenance to the intake infrastructure. This will involve instream works, and is a permitted activity under Rule 13.5.1 of the RPW:
The disturbance of any lake or river…and any resulting discharge or deposition of bed material associated with: (iii) The maintenance or reinstatement of a water intake, in order to enable the exercise of a lawful take of water…is a ***permitted activity.***

All conditions of this rule will be adhered to, including the notification of DoC and Fish and Game (F&G) in advance of any instream works between 1 May and 30 September.

Use of Amisfield Burn and Park Burn water for stock drinking purposes is in accordance with the provisions of Section 14 of the Resource Management Act 1991 (RMA), permitting the take and use of water for the reasonable needs of an individual's animals for stock drinking. Calculations relating to on-farm stock drinking water needs are provided in Section 6.6 and Appendix D.

The applicant operates two storage ponds, both of which are located out-of-stream near to existing water races on the property which enables the storage of water for irrigation and stock drinking purposes. These storage ponds are not subject to rules of the RPW and are not considered 'large' dams.

5. NON-NOTIFICATION & CONSULTATION

A consent authority has the discretion whether to publicly notify an application unless a rule or National Environmental Standard (NES) precludes public notification (in which case the consent authority must not publicly notify) or section 95A(2) applies.

The effects of the activities will be no more than minor, the applicant does not request public notification and there are no rules or NES' which require the public notification of the application. In addition, there are no special circumstances relating to the application. As such, notification of the application is not necessary.

Clause 6(1)(f) of Schedule 4 of the RMA requires the identification of, and any consultation undertaken with, persons affected by the activity. Parties who ORC might consider to be affected may include other water users as a result of their existing water abstractions from the same creeks as Smallburn Limited. These include:

- Breakneck Creek (LLHLP: 97358);
- the Amisfield Burn (Various: 95789, LLHLP: 97232);
- the Park Burn (Rockburn Wines Ltd: 98526)

There are no other known water users of Five Mile Creek. The revised rate of take proposed in this application may, however, satisfy any issues the above parties might have with the proposal. It is also worth noting that all permit holders on the Amisfield Burn and Park Burn catchments have prepared their replacement applications concurrently to facilitate more efficient processing of these applications.

Due to the presence of sportfish in the Amisfield Burn and Park Burn catchments and of native fish in the Amisfield Burn, DoC, iwi (Aukaha), and Fish & Game (F&G) may be considered affected by the proposal. However, due consideration should be given to the ecological assessment of the two catchments conducted earlier this year by Water Ways Consulting Limited, discussed in Section 3.1 and attached in Appendix C:

- With regards to native fish, only two surveys have identified the presence of koaro in the Amisfield Burn – a single specimen in 1996 and again in 2001, both in the same location. The report notes that "*given the expansion of the koaro in the Lake Dunstan is considered a potential threat to the remaining Clutha flathead galaxiid populations in the Pisa Range streams and the Lindis River catchment provision for extra koaro habitat and fish passage for upstream migrating*

koaro is potentially contrary to conservation efforts for the Clutha flathead galaxiid." Upland bully has also been found in the Amisfield Burn downstream of the Breakneck Creek confluence, however it is not considered a threatened fish and prefers low gradient, low water velocity habitats – thereby limiting it to the lower reaches of the creek.

- With regards to sportfish, no rainbow trout have ever been recorded in the Amisfield Burn, and only one specimen has been recorded in the Park Burn. Brown trout are widespread throughout, with findings indicating that these are self-sustaining, stunted populations that do not provide any recreational fishing activity.
- No native fish have ever been found in the Park Burn catchment.

Whether or not the above parties are considered affected by the application should also be determined based on the following:

- None of the subject creeks have a natural connection with Lake Dunstan during the late summer/early autumn months, which coincide with the height of the irrigation season.
- The presence of native fish and trout is not significant in any of the subject creeks, effects are existing, and proposed allocation is no more than that already consented to occur.
- Both the Amisfield Burn and the Park Burn are considered too small to have upstream spawning runs of brown trout, and survey findings suggest that rainbow trout spawning is not present.

Overall, it is considered that this application will be processed non-notified. Iwi are considered to be affected by the proposal due to their interest in water in Otago, however the other parties are considered to be interested only, and the proposal will not adversely affect the instream values under the existing environment, given that the status quo, in terms of actual access to water, is to remain as a result of this proposal.

6. ASSESSMENT OF ENVIRONMENTAL EFFECTS

In addition to the application being made in the prescribed forms and manner, Section 88 of the RMA also requires that every application for consent includes an assessment of the effects of the activity on the environment as set-out in Schedule 4 of the RMA.

6.1 Assessment of Alternatives

Alternative sources of water within the study area include the Clutha River and groundwater. Both of these sources may provide viable irrigation and stock drinking water for the applicants, however both would require significant investment in order to establish a secure connection – particularly in the case of Clutha water, which would need substantial surveying, easement and resource consent investment along with pump and conveyance infrastructure capable of moving large volumes of water over a long distance (~3 km) and up a steep ascent (~170 m elevation gain).

In contrast, the applicant's abstractions are long-established, and the conveyance and storage infrastructure is already in place (at considerable cost to keep these in working condition). These sources represent the most practical means of taking water for the applicant's farm, given that they are located above the irrigable areas, meaning the water can be gravity fed to wherever it is needed without pumping or electrical requirements.

6.2 Effects on stream ecology and hydrology

As discussed in Section 3.1, both the hydrology and ecology of the Amisfield Burn and Park Burn catchments are well understood. The race intakes effectively act as open diversion channels, meaning abstraction is only ever a subset of total natural flow in the respective creeks. This, combined with historical priorities, means that there is always water left in the creeks downstream of the take points. Furthermore, due to the open nature of the intakes, taking generally matches the natural hydrological cycles of the watercourses, with higher rates of take during times of high natural flows, and lower rates of take during times of low flow. This ensures that the natural hydrological dynamics of the creeks are maintained downstream of the takes.

With regards to fish values, the current effects assessment is able to draw upon numerous historic surveys along with a suite of recent surveys (particularly in the case of the Park Burn) to develop a detailed picture of what is present in the creeks. As discussed in Section 3.1, native fish values in the catchments are relatively limited, with no native fish identified in the Park Burn and just several upland bully and two koaro found well downstream of the Amisfield Burn abstraction. Notably, no galaxiids have ever been recorded in the Amisfield Burn or Park Burn catchments.

With regards to introduced species, brown trout have been found throughout the Amisfield Burn but no rainbow trout have been recorded. With the exception of the one small rainbow trout found, the same holds true for the Park Burn. It should be noted that this rainbow trout was likely introduced to the creek via a Pisa Irrigation Company water race, which is known to contain both brown and rainbow trout and which discharges any unused water into the Park Burn above State Highway 6.

While abstraction will likely have some effect on the migratory species that may be present (trout, and potentially koaro in the case of the Amisfield Burn) by having a minor impact on creek connectivity with Lake Dunstan, it is likely that a number of other factors play a more significant role in controlling the up-migration of these species. The first of these is the fact that both the Park Burn and Amisfield Burn naturally dry up in the summer, regardless of abstraction (see Section 3.1). The second is the presence of barriers in the creek, natural (like the waterfalls below the Amisfield and Park Burn take points) and anthropogenic, such as Mt Pisa Station's culvert crossings across the Amisfield Burn, Breakneck Creek and the Parkburn, which at times of low flow may perch. Control of these structures is outside the control of the applicant.

Finally, due consideration should be given to the results of the stream gauging completed in January 2019, which indicated that the Amisfield Burn and Park Burn naturally go to ground well upstream of their confluence with Lake Dunstan during the summer months. The gauging took place during a particularly wet summer, with above-average flows, indicating that the creeks would normally run dry considerably further up-channel of the Dunstan confluence in typically drier summers. This gauging took place while all water abstraction had ceased on the creeks, and as such the following can be concluded:

- The applicant's abstractions do not impact sportfish values in the Amisfield Burn or Park Burn. Surveys indicate a self-sustaining population of stunted brown trout that have persisted in the catchments despite ongoing abstractions. In the case of the Park Burn, this proposal is for a significantly lowered rate of take from the status quo, meaning any brown trout habitat downstream of the take would in fact be improved. As both creeks appear to lose surface connectivity with Lake Dunstan regardless of abstraction, the proposal has no effect on the ability of sportfish to up-migrate.

- Upland bully prefer low water velocity habitats that would be characteristic of the lower reaches of the Amisfield Burn (and verified by fish surveys). Upland bully populations often respond favourably to summer low flow conditions, meaning the abstractions actually have the potential to benefit this species by slowing water velocities downstream. Regardless, upland bully is not considered a threatened fish and is nationally widespread.

- The impact of the activity on koaro populations is difficult to determine, but given the low abundance of koaro in the Amisfield Burn, the natural fish passage limitations and the potential threat koaro pose to Clutha flathead galaxiids, any impact would be limited and may in fact promote upstream Clutha flathead populations if they were indeed present.

Maintenance of the status quo in the Amisfield Burn catchment and a proposed lower rate of take from the Park Burn should ensure that any invertebrate values in the vicinity of the abstractions are not adversely affected.

While there is a lack of data with regards to Five Mile Creek, it is noted that this is an ephemeral creek that (based on anecdotal evidence) only has a surface connection with Lake Dunstan during high rainfall events. Furthermore, much of the water that is present in the creek is likely water discharged from the applicant's Park Burn Race. As such, the ecological and hydrological values of Five Mile Creek are assumed to be relatively limited. It is recognised, however, that the applicant's discharge and re-take operations on the creek have likely significantly impacted the natural state of the creek.

Due to the relatively low fish values in all of the subject creeks, it is not envisaged that the installation of fish screens on any of the intakes would provide a measurable benefit to aquatic ecology. Based on the fish survey findings, the only trout that may be present in the vicinity of any of the applicant's intakes would be stunted, isolated individuals that provide little or no value to the catchments. Migratory native fish species are virtually absent from all of the creeks (bar one individual found in the lower portion of the Amisfield Burn), meaning fish screens would likely not provide any additional benefits to native fish values.

6.3 Residual flow

Any residual flow considerations should be determined based on the above in-stream effects assessment. The ecological report prepared by Water Ways Consulting Limited earlier this year concluded the following:

> *The flow loss to groundwater is substantially higher than the 7dMALF for the Amisfield Burn. Therefore, a connecting flow cannot be provided even when natural flows are provided. A residual flow at any abstraction point in the Amisfield Burn will not be able to create a stream that flows from above the abstractions to the Clutha River [Lake Dunstan] and fish passage is not available during the summer low flow period. For the Amisfield Burn and Breakneck Creek the requirement for a residual flow at any take point will only be needed to address ecological issues at the point of take, not downstream habitat and connectivity issues, as these cannot be provided for naturally.*

The report concluded the same for the Park Burn, with a lack of natural connectivity during summer low flows meaning providing a residual flow past the applicant's RM15.007.01/94394 take point would provide little value. It is, however, noted that Condition 6 of RM15.007.01 requires a residual flow of no less than 10 L/s downstream of the take point on the Park Burn (exclusive of domestic and stock drinking needs). For this reason, a continuation of this 10 L/s residual flow requirement past the applicant's take point on the Park Burn is proposed.

While the Amisfield Burn is monitored upstream of the applicant's take point, the value of a residual flow requirement past the 96321 abstraction point is difficult to determine. Conversely, imposing a strict residual flow condition could significantly affect the applicant's ability to obtain sufficient water during the summer and early autumn months, thereby putting stock, crops and livelihoods at risk. The same applies to the 96320 take point on Breakneck Creek.

A residual flow on Five Mile Creek is not considered applicable, given that the watercourse is generally dry in summer, and any flows during this time are likely due to augmented water from the Park Burn Race.

6.4 Effects on other water users

The following table presents a summary of current water users on the Amisfield Burn (including Breakneck Creek) and Park Burn. Five Mile Creek has been omitted as the applicant is the only water user on that creek.

Table 8: Summary of other water users on the Breakneck Creek, the Amisfield Burn and the Park Burn

Permit No.	Creek	Location	Rate of take (L/s)	Primary consent holder
97358	Breakneck Creek	Approximately the same location as the 96320 take.	55.6	LLHLP
95789	Amisfield Burn	Approx. 680 m u/s of the 96321 take.	166.7	Pisa Holdings Limited
97232	Amisfield Burn	Approx. 2.4 km d/s of the 96321 take.	83.3	Lowburn Land Holdings LP
98526	Park Burn	Approx. 2.5 km d/s of the RM15.007.01/ 94394 take.	27.8	Rockburn Wines Limited
93177	Park Burn	Approx. 1.3 km d/s of the RM15.007.01/ 94394 take.	55.6 (unexercised)	Mark II

Based on the above, the only users/permits with the potential to be impacted by the current proposal are Pisa Holdings Ltd, LLHLP and Rockburn Wines Ltd, as 93177 has not been exercised for some time. As discussed in Section 2.3.1, the applicant has historically coordinated with LLHLP to ensure that Breakneck Creek water is shared. Furthermore, all of the surface water users in the Amisfield Burn and Park Burn catchments have prepared their deemed permit applications concurrently to facilitate a streamlined approach to discussions around water sharing in the catchments.

Given the small size, steep topography and relative inaccessibility of the subject creeks, it is unlikely that there will be any adverse effects on recreational users due to the proposal – particularly considering the unsuitability of the creeks for angling, and that the creeks are non-navigable and access is by permission of the private land owners bounding the creeks.

6.5 Available water allocation

Policy 6.4.2 of the RPW defines the primary allocation limit for each catchment:

> *To define the primary allocation limit for each catchment, from which surface water takes and connected groundwater takes may be granted, as the greater of:*
>
> *(a) That specified in Schedule 2A, but where no limit is specified in Schedule 2A, 50% of the 7-day mean annual low flow; or*
>
> *(b)* ***The sum of consented maximum instantaneous, or consented 7-day, takes of:***
>
> *(i)* ***Surface water as at:***
>
> *(1) 19 February 2005 in the Welcome Creek catchment; or*
>
> *(2) 7 July 2000 in the Waianakarua catchment; or*
>
> *(3)* ***28 February 1998 in any other catchment****; and*
>
> *(ii) Connected groundwater as at 10 April 2010,*
>
> *less any quantity in a consent where:*
>
> *(1) In a catchment in Schedule 2A, the consent has a minimum flow that was set higher than that required by Schedule 2A.*
>
> *(2) All of the water taken is immediately returned to the source water body.*
>
> *(3) All of the water being taken had been delivered to the source water body for the purpose of that subsequent take.*
>
> *(4) The consent has been surrendered or has expired (except for the quantity granted to the existing consent holder in a new consent).*
>
> *(5) The consent has been cancelled (except where the quantity has been transferred to a new consent under Section 136(5)).*
>
> *(6) The consent has lapsed.*

This proposal seeks to take water from Breakneck Creek, the Amisfield Burn and the Park Burn that is within the allocation limit as defined by Policy 6.4.2(b)(i)(3), as no more water than was consented on 28 February 1998 is being sought for replacement of permits 96320, 96321, 94394 and RM15.007.01. In the case of 94394 and RM15.007.01, the amount of water being sought as replacement to these permits is actually significantly lower than the current paper allocation. However, to avoid freeing up allocation between now and the existing consents' expiry, the applicant proposes to commence replacement consents from 2 October 2021.

6.6 Efficiency of use

Policy 6.4.0A of the RPW requires an application to prove that the quantity of water granted to take is no more than that required for the purpose of use. This efficiency assessment needs to take into account climate, soil, crop or pasture type, along with the efficiency of the proposed water transport, storage and application system. The actual quantity required for the purpose of use of the water taken must be reflected in any consent granted.

An assessment of reasonable irrigation demand has been undertaken for the irrigation areas of the applicant in accordance with Aqualinc 2017[1] guidelines, which involved determining soil types within the command area via Landcare Research's S-Map[2] online tool. The soil types encompassed within the irrigable areas are presented in Appendix A. Aqualinc was then used in conjunction with ORC mean annual rainfall (MAR) data to determine the peak monthly and annual irrigation demand.

[1] McIndoe I, Brown P, Rajanayaka C, KC. B, 2017. Guidelines for Reasonable Irrigation Water Requirements in the Otago Region. Otago Regional Council, 2. Aqualinc Research Limited.

[2] https://smap.landcareresearch.co.nz/app

Table 9 provides a summary of the Aqualinc outputs, with full calculations and explanations presented in Appendix D.

Table 9: Aqualinc modelled application requirements for existing and reasonably foreseeable future irrigated areas of Smallburn Ltd, compared to current allocation.

Volume	Daily (m^3)	Monthly (m^3)	Annual (m^3)
Required (per Aqualinc calcs)	17,509	544,324	2,938,206
Current paper allocation	30,000[3]	572,000[4]	Not specified
Stock drinking requirements	60	1,825	21,900
Volume sought	-	492,127	2,319,363

As the table shows, less monthly and annual water is being sought than the Aqualinc (100th %ile) calculations suggest is required for efficient irrigation of current and proposed areas within the farm. This reflects adherence to Policy 6.4.2A of the RPW, which states that Council will not grant any more water than has been taken under the existing consents over the past 5 years or more. The volumes therefore sought in the above table are based on maximum abstraction volume records, as presented in Section 2.5. Note that daily volume calculations are provided for information only, and no daily limit is sought as per ORC requirements.

Stock drinking requirements are in addition to the allocation sought for irrigation, as the RMA does not place a limit on water taken for an animal's drinking needs:

> *14(3)(b)(ii) A person is not prohibited by subsection (2) from taking, using…any water…if…the water…is required to be taken or used for…the reasonable needs of a person's animals for drinking water.*

Full stock drinking calculations are provided in Appendix D.

Whilst the majority of the irrigation within the applicant's command area is spray, some areas of flood irrigation will remain. This is due to a range of factors, including location, topography, soil types and cost of conversion. However, the applicant continues to improve on-farm water use efficiency where it is feasible to do so, including the recent installation of a half pivot and the planned installation of another pivot towards the southern corner of the property. The applicant has also taken steps towards more efficient storage of water with the construction of a new pond.

Overall, the monthly and annual volumes sought are in fact less than that which is required to efficiently irrigate the applicant's current irrigable land, and the reasonably foreseeable needs of the property, and therefore the proposal is entirely consistent with policy 6.4.0A. The conveyance of water throughout the property is efficient with the installation of pipework where necessary. Continual maintenance of the water races will ensure that losses from these are not so significant.

6.7 Effects on cultural values

While none of the subject creeks are identified in Schedule 1D of the RPW, it is recognised that these creeks may still have cultural significance and every effort has been made to preserve and enhance them

[3] Based on combined 1,250,000 L/hour limit specified across the applicant's four permits

[4] Only RM15.007.01 specifies a monthly limit. All other permits do not specify a monthly limit, so the monthly paper allocation would technically be much higher.

in light of these values. In particular, iwi values as they relate to the watercourses in this application have been addressed in Section 7.2.6.

6.8 Monitoring

All abstractions under 96320, 96321, 94394 and RM15.007.01 will continue to be metered and reported as per the current arrangement. As discussed earlier, both meters are located down-race from the points of take (due to issues of communication, maintenance and other practicalities), and corresponding WEXs are held.

6.9 Effects on groundwater

There are no designated aquifers within the study area, with the closest designated aquifer being the Lowburn Alluvial Ribbon Aquifer approximately 550 m to the south of the applicant's southernmost property boundary. It is noted, however, that the closest actual abstraction point is almost 5 km from the aquifer, and that the Amisfield Burn and Park Burn catchments are not likely to interact with the Lowburn aquifer.

The closest neighbouring groundwater take to the 96320 and 96321 abstraction points is around 4.2 km to the southeast (2010.152.V1), while the closest groundwater take to the 94394/RM15.007.01 intake is around 4.7 km to the southeast (2001.A47.V1). Due to the distance between the take points and any neighbouring bores, it is unlikely that the activity will adversely affect any groundwater users in the area. However, as some bores may be hydraulically linked to the subject watercourses, there may be some effect on other groundwater users in the vicinity of these creeks. It is noted, however, that these bores are likely also strongly hydraulically connected to Lake Dunstan, meaning any effects from the applicant's abstractions would be less than minor.

No adverse effects on underlying groundwater resources, such as aquifer compaction or degraded groundwater quality, are expected as a result of the proposal.

6.10 Positive effects

The positive effects of the take and use of Breakneck Creek, Amisfield Burn and Park Burn water under the respective permits are numerous, and include:

- Enabling the continued operation of a large and productive farm operation, which is a key contributor to the local and regional economies.
- Low energy consumption – because the water takes and much of the irrigation systems from these sources are gravity-fed, energy consumption can be kept to a minimum. Alternative sources of water (groundwater, Lake Dunstan water) would require considerable investment in electrical connections and pump infrastructure, and would place more pressure on the national grid. The result is a more sustainable operation.
- Supporting the community by providing job opportunities, supporting local businesses (through equipment and supply acquisition, for example), and improving land value.

6.11 Re-take of water

As discussed earlier, Rule 12.1.4.1 applies to the taking and use of surface water from any river which has already been delivered to that river for the purpose of subsequent taking. Council consideration restrictions with regards to this rule are explored below.

a) *The amount of water which can be taken, having regard to the amount delivered to the lake or river and any losses that may have occurred between the point of augmentation and the take;*

No more water will be taken at the re-take locations than what is abstracted at the point of take.

b) *Any need to prevent fish entering the intake;*

Based on 2019 fish survey data, there does not appear to be any viable fish habitat at or above the Park Burn tributary re-take. Given the ephemeral nature of Five Mile Creek, it is also unlikely that any fish reside in the creek in the vicinity of that re-take.

c) *The duration of the resource consent;*

Consent duration is discussed in Section 8.

d) *The information and monitoring requirements;*

While the Park Burn tributary and Five Mile Creek typically have no to very little flowing water during the irrigation season, it is recognised that there may occasionally be flows due to rain events during this time. As such, the applicant is open to guidance from Council regarding how best to ensure that only the amount of water taken from the Amisfield Burn and Park Burn catchments is retaken from Five Mile Creek.

e) *Any bond;*

A bond is not applicable.

f) *The review conditions of the resource consent;*

Review conditions are addressed in the below section.

6.12 Proposed consent conditions

The following consent conditions are proposed to ensure that any potential adverse effects from the activity are appropriately managed.

Breakneck Creek and Amisfield Burn replacement permit

- Purpose: to take water as primary allocation from Breakneck Creek and the Amisfield Burn for irrigation and stock drinking.
- Location 1: Breakneck Creek, approximately 2.75 km northwest of the intersection of Mt Pisa Road and MacMillan Lane.
    - Legal description: Lot 3 Deposited Plan 343853
    - Map reference: NZTM 2000: 1301340E 5019329N
- Location 2: Amisfield Burn, approximately 2.9 km west of the intersection of Mt Pisa Road and MacMillan Lane.
    - Legal description: Lot 3 Deposited Plan 343853
    - Map reference: NZTM 2000: 1300930E 5018663N

- This permit shall not commence until Deemed Permits 96320.V1 and 96321.V1 have expired or been surrendered.

- The combined rate of take shall not exceed 97.3 L/s.

- The combined volume of water taken under this consent [replacement to permits 96320 & 96321] and [replacement consent to 94394 & RM15.007.01] shall not exceed:

    - 492,127 m^3/month

    - 2,319,363 m^3/year

- The holder of this consent shall cooperate with the holder of [replacement to Deemed Permit 97358] to ensure both consent holders jointly share Breakneck Creek and Amisfield Burn water.

- The consent holder shall maintain a water meter to record the water takes, at or close to the points of take, within an error accuracy of +/- 5% over the meter's nominal flow range, and a telemetry compatible datalogger with at least 24 months data storage and a telemetry unit to record the rate and volume of take, and the date and time this water was taken. The datalogger shall record the date, time and flow in L/s. Data shall be provided to the Consent Authority by means of telemetry. The consent holder shall ensure data compatibility with the Consent Authority's time-series database. The water meter shall be installed according to the manufacturer's specifications and instructions. There shall be enough space in the pipe/flume to allow for verification of the accuracy of the meter under Condition (X).

- The Consent Holder shall ensure the full operation of the water meter, data logger and telemetry unit at all times during the exercise of this consent. All malfunctions of the water meter and/or datalogger during the exercise of this consent shall be reported to the Consent Authority within 5 working days of observation and appropriate repairs shall be performed within 5 working days. Once the malfunction has been remedied, a Water Measuring Device Verification Form completed with photographic evidence must be submitted to the Consent Authority within 5 working days of the completion of repairs.

- If a mechanical insert water meter is installed it shall be verified for accuracy each and every year from the first exercise of this consent. An electromagnetic or ultrasonic flow meter shall be verified for accuracy every 5 years from the first exercise of this consent. Each verification shall be undertaken by a Consent Authority approved operator and a Water Measuring Device Verification Form shall be provided to the Consent Authority within 5 days of the verification being performed, and at any time upon request.

- The consent holder shall take all practicable steps to ensure that:
    - There is no leakage from pipes and structures;
    - The use of water is confined to the target areas.

- The Consent Authority may, in accordance with Sections 128 and 129 of the RMA 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:
    - Adjusting the consented rate or volume of water under Conditions X and X, should monitoring under Condition X or future changes in water use indicate that the consented rate or volume is not able to be fully utilised; or

- 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
- Ensuring the conditions of this consent are consistent with any NES, relevant plans and/or the Otago RPS; or
- Adjusting or altering the method of water take data recording and transmission.

Note that the proposed map references are slightly different to those entered on the existing permits, however these new references reflect the actual ground-truthed take locations.

Park Burn replacement permit

- Purpose: to take water as primary allocation from the Park Burn for irrigation and stock drinking.
- Location: Park Burn, approximately 4.9 km upstream of the Luggate-Cromwell Road (State Highway 6).
- Legal description of land at point of take: Lot 3 Deposited Plan 343853
- Map reference: NZTM 2000: 1300164E 5017554N
- This permit shall not commence until permits 94394 and RM15.007.01 have expired.
- The rate of take shall not exceed 120 L/s
- Other than exercising this permit for reasonable stock drinking water purposes, a residual flow of no less than 10 L/s shall be maintained in the Park Burn immediately downstream of the point of take.
- The combined volume of water taken under this consent [replacement to permits 94394 & RM15.007.01] and [replacement to permits 96320 & 96321] shall not exceed:
    - 492,127 m^3/month
    - 2,319,363 m^3/year
- The consent holder shall maintain a water meter to record the water takes, at or close to the points of take, within an error accuracy of +/- 5% over the meter's nominal flow range, and a telemetry compatible datalogger with at least 24 months data storage and a telemetry unit to record the rate and volume of take, and the date and time this water was taken. The datalogger shall record the date, time and flow in L/s. Data shall be provided to the Consent Authority by means of telemetry. The consent holder shall ensure data compatibility with the Consent Authority's time-series database. The water meter shall be installed according to the manufacturer's specifications and instructions. There shall be enough space in the pipe/flume to allow for verification of the accuracy of the meter under Condition (X).
- The Consent Holder shall ensure the full operation of the water meter, data logger and telemetry unit at all times during the exercise of this consent. All malfunctions of the water meter and/or datalogger during the exercise of this consent shall be reported to the Consent Authority within 5 working days of observation and appropriate repairs shall be performed within 5 working days. Once the malfunction has been remedied, a Water Measuring Device

Verification Form completed with photographic evidence must be submitted to the Consent Authority within 5 working days of the completion of repairs.

- If a mechanical insert water meter is installed it shall be verified for accuracy each and every year from the first exercise of this consent. An electromagnetic or ultrasonic flow meter shall be verified for accuracy every 5 years from the first exercise of this consent. Each verification shall be undertaken by a Consent Authority approved operator and a Water Measuring Device Verification Form shall be provided to the Consent Authority within 5 days of the verification being performed, and at any time upon request.

- The consent holder shall take all practicable steps to ensure that:
    - There is no leakage from pipes and structures;
    - The use of water is confined to the target areas.

- The Consent Authority may, in accordance with Sections 128 and 129 of the RMA 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:
    - Adjusting the consented rate or volume of water under Conditions X and X, should monitoring under Condition X or future changes in water use indicate that the consented rate or volume is not able to be fully utilised; or
    - 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
    - Ensuring the conditions of this consent are consistent with any NES, relevant plans and/or the Otago RPS; or
    - Adjusting or altering the method of water take data recording and transmission.

Note that the proposed map references are slightly different to that entered on the existing permits, however these new references reflect the actual ground-truthed take locations.

Tributary of Park Burn re-take permit

- Location of retake: Park Burn tributary, approximately 3.7 km upstream of the Cromwell-Luggate Road (State Highway 6)

- Legal description of consent location: Lot 3 Deposited Plan 343853

- Map reference: NZTM 2000: 1301008E 5016581N

- The rate of retake shall be relative to the combined abstraction rate from Deemed Permits 96320.V1 and 96321.V1 and any subsequent replacement permits, and shall not exceed:

    - 97.3 L/s

- ORC's standard review conditions as they relate to Section 128 and 129 of the RMA.

Note to consent officer: due to the nature of the applicant's re-take infrastructure, there is a possibility of exceeding the consented rate of take during rainfall events or times of high flow in the Park Burn.

Five Mile Creek re-take permit

- Location of retake: Five Mile Creek, approximately 3.8 km northwest of the intersection of the Luggate-Cromwell Road (SH6) and Pisa Moorings Road.
- Legal description of consent location: Lot 4 Deposited Plan 481936
- Map reference: NZTM 2000: 1300507E 5015359N
- The rate of retake shall be relative to the combined abstraction rate from Deemed Permits 96320.V1 and 96321.V1 and any subsequent replacement permits, and shall not exceed:
    - 217.3 L/s
    - 492,127 m^3/month
    - 2,319,363 m^3/year
- ORC's standard review conditions as they relate to Section 128 and 129 of the RMA.

Note to consent officer: due to the nature of the applicant's re-take infrastructure, there is a possibility of exceeding the consented rate of take during rainfall events or times of high flow in Five Mile Creek.

7. STATUTORY CONSIDERATIONS

Schedule 4 of the RMA requires that an assessment of the activity against the matters set out in Part 2 and any relevant provisions of a document referred to in Section 104 of the RMA is provided when applying for a resource consent for any activity. These matters are assessed as follows.

7.1 Part 2 of the RMA

The proposal is consistent with the purpose and principles of the RMA. The proposal will have a less than minor effect on the Amisfield Burn's ability to meet the reasonably foreseeable needs of future generations, or on the life-supporting capacity of the Amisfield Burn and any ecosystems associated with it. The proposal ensures that adverse effects on the environment are avoided, remedied or mitigated.

There are no matters of national importance under Section 6 of the RMA that will be affected by the proposal. The proposal is also consistent with the requirements of Section 7 of the RMA, with particular regard given to the efficient use of natural resources, intrinsic values of ecosystems, and the maintenance and enhancement of the quality of the environment. Regarding Section 8, the proposed activity is not inconsistent with the principles of the Treaty of Waitangi.

Overall, the activity is considered to be consistent with Part 2 of the RMA, given the minor nature of the activities and the proposed mitigation.

7.2 Section 104(1)(b) of the RMA

In accordance with Schedule 4 of the RMA, an assessment of the activity against the relevant provisions of a document referred to in 104(1)(b) of the RMA must be included in an application for resource consent. Documentation in this section are noted as being:

(i) National Policy Statement for Freshwater Management, 2014

(ii) Resource Management (Measurement and Reporting of Water Takes) Regulations, 2010

(iii) Kāi Tahu ki Otago Natural Resource Management Plan, 2005
(iv) Partially Operative Otago Regional Policy Statement, 2019
(v) Partially Operative Regional Policy Statement for Otago, 1998
(vi) Proposed Regional Policy Statement for Otago, 2015
(vii) Regional Plan: Water for Otago, 2004

Under the RMA, regional plans need to give effect to national policy statements (NPSs), NESs and regional policy statements (RPSs). Thus, for a consent application, an assessment of the application against the regional plan is usually adequate as these plans ultimately give effect to the higher order statutory instruments. In 2015, however, ORC released the Proposed Regional Policy Statement for Otago and have subsequently released the Partially Operative Regional Policy Statement for Otago earlier this year. As the RPW does not reflect these latest versions of the RPS, consideration of these two documents has been considered below.

Additionally, for the sake of completeness, the national policy statement and Resource Management (Measurement and Reporting of Water Takes) Regulations have also been considered below.

7.2.1 National Policy Statement for Freshwater Management

The National Policy Statement for Freshwater Management 2014 (NPSFM) sets objectives and policies for the management of freshwater quality and quantity, emphasising the need for safeguarding of the values of freshwater, avoiding over-allocation, improving efficiency and providing reasonable opportunity for iwi and hapū involvement in overall freshwater management including planning and decision-making. The following policies, which give effect to the NPS's objectives, are of most relevance to this application for resource consent.

Policy B5
By every regional council ensuring that no decision will likely result in future over-allocation – including managing fresh water so that the aggregate of all amounts of fresh water in a freshwater management unit that are authorised to be taken, used, dammed or diverted does not over-allocate the water in the freshwater management unit.

Policy B6
By every regional council setting a defined timeframe and methods in regional plans by which overallocation must be phased out, including by reviewing water permits and consents to help ensure the total amount of water allocated in the freshwater management unit is reduced to the level set to give effect to Policy B1.

Policy B8
By every regional council considering, when giving effect to this national policy statement, how to enable communities to provide for their economic well-being, including productive economic opportunities, while managing within limits.

With regards to Policies B5 and B6, the proposal sees a significant reduction in the current level of allocation for the Amisfield Burn and Park Burn catchments, from an instantaneous, monthly and annual standpoint. The water sought by the applicant is within the allocation limits defined by Policy 6.4.2 of the RPW.

With regards to Policy B8, the proposal will enable the applicant's farm to continue operating at its fullest potential. This land use is a fundamental aspect of the local and regional economies, and the proposal therefore supports the continued economic well-being of the people who work this land and of the local community in general.

Council considers that the current and proposed policies in the RPS and RPW generally meet the requirements of the NPS. Consideration of these documents in light of the activities proposed is given below.

7.2.2 Resource Management (Measurement and Reporting of Water Takes) Regulations

Section 4(1) of the Regulations states that "These regulations apply only to a water permit that allows fresh water to be taken at a rate of 5 litres/second or more." Because all of the proposed takes are greater than 5 L/s, the activity must be in accordance with the Regulations. Specifically, the Regulations require the following:

- That the permit holder "keep records that provide a continuous measurement of the water taken under a water permit, including water taken in excess of what the permit allows." As a minimum, this typically means taking measurements of the volume of water taken each day.
- The water measurement device must be verified as accurate by a suitably qualified person:
    - Before the end of a permit's first water year; and
    - Every 5 years thereafter.
- The permit holder must provide records that cover each water year of the permit to the regional council that granted the permit, no later than 1 month after the end of the water year.
- The regional council that granted a water permit may, at its discretion, grant approval to the permit holder to keep records using a device or system that is installed as near as practicable to the location from which water is taken under the permit (instead of at that location).

The proposal is consistent with the requirements of the Regulations, with the applicant's abstraction record indicating ongoing adherence to the Regulations with no proposed change to this system of water measurement and reporting.

7.2.3 Partially Operative Regional Policy Statement for Otago

The following policies from the 2019 Partially Operative Regional Policy Statement are relevant to this application. Policies in this version of the plan (January 2019, updated March 2019) that have not yet been made operative have been omitted.

Table 10: Relevant policies from the Partially Operative Regional Policy Statement for Otago, 2019

Policy		Comments
2.2.1	*Manage the natural environment to support Kāi Tahu wellbeing by all of the following:* *a) Recognising and providing for their customary uses and cultural values in Schedules 1A and B; and*	As no increase in rates of take are proposed, the life-supporting capacity of the catchments will be safeguarded. In general, it is envisaged that Kāi Tahu values, as

	b) Safe-guarding the life-supporting capacity of natural resources.	detailed in Schedule 1A, will be protected and potentially enhanced as a result of the proposal. No Schedule 1B sites are located within the study area.
2.2.2	*Recognise and provide for the protection of wāhi tūpuna, by all of the following:* *a) Avoiding significant adverse effects on those values that contribute to the identified wāhi tūpuna being significant;* *b) Avoiding, remedying, or mitigating other adverse effects on the identified wāhi tūpuna;* *c) Managing the identified wāhi tūpuna sites in a culturally appropriate manner.*	Consideration has been given to Schedule 1C sites of cultural significance (wāhi tupuna). No specific wāhi tupuna sites are known within the study area, however the Amisfield Burn and Park Burn may have some small significance in terms of Wāhi Mahika kai (food and natural material gathering sites).
3.1.1	*Safeguard the life-supporting capacity of fresh water and manage fresh water to:* *a) Maintain good quality water and enhance water quality where it is degraded, including for:* *i. Important recreation values, including contact recreation; and, ii. Existing drinking and stock water supplies;* *b) Maintain or enhance aquatic:* *i. Ecosystem health;* *ii. Indigenous habitats; and,* *iii. Indigenous species and their migratory patterns.* *c) Avoid aquifer compaction and seawater intrusion;* *d) Maintain or enhance, as far as practicable:* *i. Natural functioning of rivers, lakes, and wetlands, their riparian margins, and aquifers;* *ii. Coastal values supported by fresh water;* *iii. The habitat of trout and salmon unless detrimental to indigenous biological diversity; and* *iv. Amenity and landscape values of rivers, lakes, and wetlands;* *e) Control the adverse effects of pest species, prevent their introduction and reduce their spread;* *f) Avoid, remedy or mitigate the adverse effects of natural hazards, including flooding and erosion; and,* *g) Avoid, remedy or mitigate adverse effects on existing infrastructure that is reliant on fresh water.*	The ecological and hydrological features of the subject watercourses are discussed in Section 3.1, while the potential effects on these features, and any mitigation proposed, are discussed in Sections 6.2 and 6.3, respectively. Water quality is unlikely to be affected by the activities. Kāi Tahu and other cultural values have been assessed above and in Section 7.2.6 of this document. Recreational values are addressed in Section 6.4, aesthetic and landscape values will be unaffected by the proposal, and no flooding, erosion, or other natural hazards will be caused or exacerbated by the activity.
3.1.2	*Manage the beds of rivers, lakes, wetlands, their margins, and riparian vegetation to:* *a) Safeguard the life supporting capacity of fresh water;* *b) Maintain good quality water, or enhance it where it has been degraded;*	See response to 3.1.1 above.

	c) Maintain or enhance bank stability; *d)Maintain or enhance ecosystem health and indigenous biological diversity;* *e) Maintain or enhance, as far as practicable:* *i. Their natural functioning and character; and* *ii. Amenity values;* *f) Control the adverse effects of pest species, prevent their introduction and reduce their spread; and,* *g) Avoid, remedy or mitigate the adverse effects of natural hazards, including flooding and erosion.*	
3.1.3	*Manage the allocation and use of fresh water by undertaking all of the following:* *a) Recognising and providing for the social and economic benefits of sustainable water use;* *b) Avoiding over-allocation, and phasing out existing over-allocation, resulting from takes and discharges;* *c) Ensuring the efficient allocation and use of water by:* *i) Requiring that the water allocated does not exceed what is necessary for its efficient use;* *ii) Encouraging the development or upgrade of infrastructure that increases use efficiency;* *iii. Providing for temporary dewatering activities necessary for construction or maintenance.*	An evaluation of efficient water use in relation to the proposal is provided in Section 6.6. The proposal will see a reduction in allocation from the Amisfield Burn and Park Burn based on historic use records and the aforementioned efficient use calculations. The catchments are fully allocated in accordance with Policy 6.4.2 of the RPW, and the proposal will not over-allocate the catchment with regards to these terms. The applicant has committed to ongoing improvements in water use infrastructure, exemplified by conversion from flood irrigation to spray.
3.1.4	*Manage for water shortage by undertaking all of the following:* *a) Encouraging land management that improves moisture capture, infiltration, and soil moisture holding capacity.* *b) 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;* *c) Providing for water harvesting and storage, subject to allocation limits and flow management, to reduce demand on water bodies during periods of low flows.*	The applicant continues to take steps towards more efficient use of water, with an emphasis on converting historic flood irrigation areas (which have the potential to negatively impact soil health) to spray. Water harvesting and storage takes place within the command area via two reservoirs.
4.1.4	*Assess activities for natural hazard risk to people, property and communities, by considering all of the following:* *a) The natural hazard risk identified, including residual risk; and*	According to ORC's Natural Hazard Database, the Pisa Fault runs just to the north of the applicant's larger storage pond. As this pond is not classified as a large dam and is located above land that is owned and

	b) Any measures to avoid, remedy or mitigate those risks, including relocation and recovery methods; and *c) The long term viability and affordability of those measures; and* *d) Flow-on effects of the risk to other activities, individuals and communities; and* *e) The availability of, and ability to provide, lifeline utilities, and essential and emergency services, during and after a natural hazard event.*	operated by the applicant, it is not envisaged that there is any significant hazard risk posed by this arrangement.
4.2.2	*Ensure Otago's people and communities are able to mitigate and adapt to the effects of climate change, over no less than 100 years, by all of the following:* *a) Taking into account the effects of climate change, including by using the best relevant climate change data; and* *b) Applying a precautionary approach when assessing and managing the effects of climate change where there is scientific uncertainty and potentially significant or irreversible effects; and* *c) Encouraging activities that assist to reduce or mitigate the effects of climate* *change; and* *d) Encouraging system resilience.*	The uncertainty of the effects of climate change are such that providing future water security to the applicant, both in terms of sufficient volume and duration, is critical to the ongoing operation of the farm.
5.2.1	*Recognise all of the following elements as characteristic or important to Otago's historic heritage:* *a) Residential and commercial buildings;* *b) Māori cultural and heritage values;* *c) 19th and early 20th century pastoral sites;* *d) Early surveying, communications and transport, including roads, bridges and routes;* *e) Early industrial historic heritage, including mills and brickworks;* *f) Gold and other mining systems and settlements;* *g) Dredge and ship wrecks;* *h) Coastal historic heritage, particularly takata whenua occupation sites and those associated with early European activity such as whaling;* *i) Memorials;* *j) Trees and vegetation.*	As the applicant's deemed permits are based on historic mining privileges and water race licences, they may have some heritage value as a remnant of Central Otago's gold mining heritage. This application outlines how the races and infrastructure associated with these heritage values will be managed in the future, with continued operation under the status quo helping to preserve these features.
5.3.1	*Manage activities in rural areas, to support the region's economy and communities, by:* *a) Enabling primary production and other rural activities that support the rural economy; and* *b) Providing for mineral exploration, extraction and processing; and*	Replacement of the applicant's permits with sufficient instantaneous and volumetric rates of take will ensure the farming activities that take place within the command area can continue into the future. This will also

	c) Minimising the loss of significant soils; and *d) Restricting the establishment of activities in rural areas that may lead to reverse sensitivity effects; and* *e) Minimising the subdivision of productive rural land into smaller lots that may result in rural residential activities; and* *f) Providing for other activities that have a functional need to locate in rural areas, including tourism and recreational activities that are of a nature and scale compatible with rural activities.*	help to minimise any chance of future subdivision of productive rural land. Water use is already, for the most part, via efficient means (spray), meaning the proposal does not pose any risk to soil health – particularly considering any further water security provided by the replacement permits will help the applicant to continue converting to more efficient forms of irrigation.
5.4.3	*Apply a precautionary approach to activities where adverse effects may be uncertain, not able to be determined, or poorly understood but are potentially significant or irreversible.*	Due to reliable historic abstraction records and a long history of use, uncertainty is low and a precautionary approach is not considered necessary. The effects of taking and use of water are well known and not significant. Any effect is not irreversible. Where information gaps occur, Council has the ability to review consent conditions and adjust methods or approaches to better manage adverse effects.

7.2.4 Proposed Regional Policy Statement for Otago

The following policies from the 2015 Proposed Regional Policy Statement are relevant to this application. Only those policies that have not been directly superseded by operative policies have been included.

Table 11: Relevant policies from the Proposed Regional Policy Statement for Otago, 2015

Policy		Comments
1.1.2	*Ensure that local authorities exercise their functions and powers, to:* *a) Accord Kāi Tahu a status distinct from that of interest groups and members of the public, consistent with their position as a Treaty partner; and,* *b) Involve Kāi Tahu in resource management decision-making processes and implementation; and* *c) Take into account Kāi Tahu views in resource management decision-making processes and implementation, particularly regarding the relationship of their culture and traditions with their ancestral lands, water, sites, wāhi tapu, and other taoka; and* *d) Ensure Kāi Tahu have the prerogative to:* *i. Identify their relationship with their ancestral lands, water, sites, wāhi tapu, and other taoka; and*	Aukaha have been given due consideration as a stakeholder in Section 5. Applicable provisions of the Kāi Tahu ki Otago Natural Resource Management Plan as they relate to this application have also been considered below. The Clutha River/Mata-Au (Lake Dunstan), which the catchments drain into, has been identified as a statutory acknowledgement area.

	ii. Determine how best to express that relationship; and *e) Ensure Kāi Tahu are able to exercise kaitiakitaka; and* *f) Ensure that district and regional plans:* *i. Give effect to the Ngāi Tahu Claims Settlement Act 1998; and* *ii. Recognise and provide for statutory acknowledgement areas, as detailed in Schedule 2; and* *iii. Provide for other areas in Otago that are recognised as significant to Kāi Tahu in a manner similar to that prescribed for statutory acknowledgement areas.*	
2.1.1	*Recognise freshwater values, and manage freshwater, to:* *a) Support healthy ecosystems in all Otago aquifers, and rivers, lakes, wetlands, and* *their margins; and* *b) Retain the range and extent of habitats provided by freshwater; and* *c) Protect outstanding water bodies and wetlands; and* *d) Protect migratory patterns of freshwater species, unless detrimental to indigenous biodiversity; and* *e) Avoid aquifer compaction, and seawater intrusion in aquifers; and* *f) Maintain good water quality, including in the coastal marine area, or enhance it where it has been degraded; and* *g) Maintain or enhance coastal values supported by freshwater values; and* *h) Maintain or enhance the natural functioning of rivers, lakes, and wetlands, their riparian margins, and aquifers; and* *i) Retain the quality and reliability of existing drinking water supplies; and* *j) Protect Kāi Tahu values; and* *k) Provide for other cultural values; and* *l) Protect important recreation values; and* *m) Maintain the aesthetic and landscape values of rivers, lakes, and wetlands; and* *n) Avoid the adverse effects of pest species, prevent their introduction and reduce their spread; and* *o) Mitigate the adverse effects of natural hazards, including flooding and erosion; and* *p) Maintain the ability of existing infrastructure to operate within their design parameters.*	The ecological and hydrological features of the subject watercourses are discussed in Section 3.1, while the potential effects on these features, and any subsequent mitigation proposed, are discussed in Sections 6.2 and 6.3, respectively. Water quality is unlikely to be affected by the activities. Kāi Tahu and other cultural values have been assessed above and in Section 7.2.6 of this document. Recreational values are addressed in Section 6.4, existing established aesthetic and landscape values will be unaffected by the proposal, and no flooding, erosion, or other natural hazards will be caused or exacerbated by the activities. Replacement of the applicant's permits will enable them to continue operating their existing infrastructure within their design parameters.

2.1.2	*Recognise the values of beds of rivers and lakes, wetlands, and their margins, and manage them to:* *a) Protect or restore their natural functioning; and* *b) Protect outstanding water bodies and wetlands; and* *c) Maintain good water quality, or enhance it where it has been degraded; and* *d) Maintain ecosystem health and indigenous biodiversity; and* *e) Retain the range and extent of habitats supported; and* *f) Maintain or enhance natural character; and* *g) Protect Kāi Tahu values; and* *h) Provide for other cultural values; and* *i) Maintain their aesthetic and amenity values; and* *j) Avoid the adverse effects of pest species, prevent their introduction and reduce their spread; and* *k) Mitigate the adverse effects of natural hazards, including flooding and erosion; and* *l) Maintain bank stability.*	Much of this policy is also reflected in Policy 2.1.1, which is discussed above.
2.1.6	*Recognise the values of ecosystems and indigenous biodiversity, and manage ecosystems and indigenous biodiversity, to:* *a) Maintain or enhance ecosystem health and indigenous biodiversity; and* *b) Maintain or enhance areas of predominantly indigenous vegetation; and* *c) Buffer or link existing ecosystems; and* *d) Protect important hydrological services, including the services provided by tussock grassland; and* *e) Protect natural resources and processes that support indigenous biodiversity; and* *f) Maintain habitats of indigenous species that are important for recreational, commercial, cultural or customary purposes; and* *g) Protect biodiversity significant to Kāi Tahu; and* *h) Avoid the adverse effects of pest species, prevent their introduction and reduce their spread.*	The ecosystem values of the Amisfield Burn and Park Burn catchments are discussed in Section 3.4, while the potential effects on these values and subsequent mitigation measures proposed are provided in Sections 6.2 and 6.3, respectively.
2.1.7	*Recognise the values of natural features, landscapes, seascapes and the coastal environment are derived from the following attributes, as detailed in Schedule 4:* *a) Biophysical attributes, including:* *i. Natural science factors;* *ii. The presence of water;*	The values of applicable natural features potentially affected by the proposal (namely the Amisfield Burn, Park Burn and Five Mile Creek) have been recognised in Sections 3.1 and 3.2. The applicant utilises a network of water races that are a

	iii. Vegetation (indigenous and introduced); *iv. The natural darkness of the night sky;* *b) Sensory attributes, including:* *i. Legibility or expressiveness;* *ii. Aesthetic values;* *iii. Transient values, including nature's sounds;* *iv. Wild or scenic values;* *c) Associative attributes, including:* *i. Whether the values are shared and recognised;* *ii. Cultural and spiritual values for Kāi Tahu;* *iii. Historical and heritage associations.*	remnant of the region's gold mining history – a continuation of abstraction under the status quo will ensure that these heritage features can persist into the future.
2.2.1	*Identify areas and values of significant indigenous vegetation and significant habitats of indigenous fauna, using the attributes detailed in Schedule 5.*	The Amisfield Burn is listed in Schedule 1A of the RPW as significant habitat for koaro. It should be noted that only 1 koaro has ever been found in both catchments.
2.2.2	*Protect and enhance the values of areas of significant indigenous vegetation and significant habitats of indigenous fauna, by:* *a) Avoiding adverse effects on those values which contribute to the area or habitat being significant; and* *b) Avoiding significant adverse effects on other values of the area or habitat; and* *c) Assessing the significance of adverse effects on those values, as detailed in Schedule 3; and* *d) Remediating, when adverse effects cannot be avoided; and* *e) Mitigating where adverse effects cannot be avoided or remediated; and* *f) Encouraging enhancement of those areas and values.*	See above. A report attached to this AEE notes that providing habitat for koaro is not necessarily in the interests of native biodiversity, given its rapidly increasing numbers and due to the fact that it feeds on small galaxiids and other native fish, such as the local, Nationally Critical Clutha flathead galaxiid.
2.2.12	*Identify outstanding water bodies and wetlands and their values, using the following criteria:* *a) A high degree of naturalness;* *b) Outstanding aesthetic or landscape values;* *c) Significant takata whenua cultural values;* *d) Significant recreational values;* *e) Significant ecological values;* *f) Significant hydrological values.*	Outstanding water bodies are largely determined through the regional plan framework, with the RPW listing the Amisfield Burn in Schedule 1A for its notable absence of pest plants and significant native fish habitat. It should be noted that these Schedule 1 values were determined over two decades ago and are based on incomplete information. Regardless, effects on these features have been assessed in Section 6 of this document. The Park Burn and Five Mile Creek are

		unlikely to be considered outstanding water bodies.
2.2.13	*Protect the values of outstanding water bodies and wetlands by:* *a) Avoiding significant adverse effects, including cumulative effects, on those values which contribute to the water body or wetland being outstanding; and* *b) Avoiding, remedying or mitigating other adverse effects on the water body or wetland's values; and* *c) Assessing the significance of adverse effects on values, as detailed in Schedule 3; and* *d) Controlling the adverse effects of pest species, preventing their introduction and* *reducing their spread; and* *e) Encouraging enhancement of outstanding water bodies and wetlands.*	See above.
3.1.1	*Recognise the natural and physical environmental constraints of an area, the effects of those constraints on activities, and the effects of those activities on those constraints, including:* *a) The availability of natural resources necessary to sustain the activity; and* *b) The ecosystem services the activity is dependent on; and* *c) The sensitivity of the natural and physical resources to adverse effects from the proposed activity/land use; and* *d) Exposure of the activity to natural and technological hazard risks; and* *e) The functional necessity for the activity to be located where there are significant constraints.*	The existing natural environment as it relates to the proposal is examined in Section 3 of this document, while the effects of the activities on the natural environment are assessed in Section 6. Based on ORC's GIS mapping, the Pisa Fault runs roughly through the middle of the command area.

7.2.5 Regional Plan: Water for Otago

The following policies, which give effect to the plan's objectives, are relevant to this application for resource consent.

Table 12: Assessment of RPW policies

Policy		Comments
5.4.1	*To identify the following natural and human use values supported by Otago's lakes and rivers, as expressed in Schedule 1:* *(a) Outstanding natural features and landscapes;* *(b) Areas with a high degree of naturalness;*	As discussed in Section 3.1, the Amisfield Burn is listed in Schedule 1A for its ecosystem values and significant habitat for koaro. No other Schedule 1 values directly relate to the activity.

Policy	Comments
(c) Areas of significant indigenous vegetation, significant habitats of indigenous fauna, and significant habitats of trout and salmon; *(d) Ecosystem values;* *(e) Water supply values;* *(f) Registered historic places; and* *(g) Spiritual and cultural beliefs, values and uses of significance to Kai Tahu.*	
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 Kai 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.*	The Amisfield Burn Schedule 1A values relate to the absence of aquatic pest plants and the importance of the creek as habitat for koaro. The proposal is not expected to have any effect on Amisfield Burn flora. The conundrum presented by koaro was discussed in Section 6, but an overview is provided here for clarity: • Koaro populations in the tributaries that feed the Clutha River and Lake Dunstan have increased considerably following the installation of the Clyde Dam. Their numbers are now relatively stable in the area. • Koaro feed on Clutha flathead galaxiids, populations of which are far more localised than koaro and are at a much higher risk of extinction (Nationally Critical vs At Risk: Declining for koaro). • Promoting koaro values by imposing residual flow conditions past the point of take may therefore directly harm any Clutha flathead populations that could exist upstream (but have not yet been identified in fish surveys). Regardless, providing connectivity during summer and early autumn would likely be impossible as the Amisfield Burn appears to naturally run dry prior to reaching Lake Dunstan.

Policy	Comments
	The Park Burn and Five Mile Creek are not listed in Schedule 1. No adverse effects on the natural character or amenity values of the Park Burn are anticipated due to the proposal, however it is acknowledged that there may be some discernible effects on Five Mile Creek as a result of the retake. Five Mile Creek is, however, an ephemeral watercourse and generally only has naturally flowing water during rain events. The proposal will not cause or exacerbate flooding, erosion, land instability, sedimentation or property damage.
5.4.3 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 adverse effects on: *(a) Existing lawful uses; and* *(b) Existing lawful priorities for the use of lakes and rivers and their margins.*	All other lawful water users on the Amisfield Burn and Park Burn catchments have been consulted and have prepared their deemed permit replacement applications concurrently to ensure that everyone's needs are considered and met. Permit 95789 (Pisa Holdings *et al.*) is the only existing lawful priority over Smallburn's Breakneck Creek and Amisfield Burn permits (96320 & 96321). In turn, these permits hold priority over 97232 (LLHLP). Smallburn's Park Burn permits hold highest priority in the catchment.
5.4.4 To recognise Kai Tahu's interests in Otago's lakes and rivers by promoting opportunities for their involvement in resource consent processing.	The Kai Tahu ki Otago Natural Resource Management Plan (NRMP) is considered later in this report.
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*	The natural flow characteristics of the subject watercourses are discussed earlier in this report. The abstraction of water will undeniably have some influence on the natural flow regime of the creeks, however the open nature of the intakes is such that the natural character of the creeks should remain largely uncompromised, with the water level fluctuations, colour, clarity and ecology that would typically be expected of a natural watercourse.

Policy	Comments
(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.	It should be noted that all of the applicant's takes have been occurring for over 140 years, meaning the ecology and (to a lesser extent) hydrology of the creeks have likely adapted to account for the abstractions. Any significant changes to these takes would likely change the character of the creeks themselves. It should also be noted that the takes have enabled the development and ongoing operation of a large and successful farm while ensuring that enough water remained in the Amisfield Burn and Park Burn to maintain the core values of the watercourses.
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.*	Considering the long history of abstraction from the Amisfield Burn and Park Burn, it could be argued that the aesthetic values of the creeks are intrinsically tied to the long-established water takes. Furthermore, virtually all of the watercourses are located on private land and are unsupportive of recreation, with the small size of the creek unsupportive of angling.
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 regime of the subject watercourses are discussed earlier in this report.
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 proposed irrigation volumes have been calculated in accordance with guidelines which ORC accepts as representing reasonable water requirements for irrigation of pasture. The irrigation volumes account for all factors mentioned in the policy (climate, crop, efficiency of use, etc.). The applicant maintains two storage ponds to reduce reliance on instantaneous water demand, and with the exception of some small areas of flood irrigation, the command area is irrigated via efficient (spray) irrigation techniques. The races themselves are of limited efficiency, given that a fraction of the

Policy	Comments
	water taken is likely to be lost during conveyance to leaks and evaporation.
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.*	There is currently an arrangement between the applicant and LLHLP to share Breakneck Creek/Amisfield Burn water, as discussed earlier and specified in LLHLP's consent.
6.4.0C To promote and give preference, as between alternative sources, to the take and use of water from the nearest practicable source.	The proposal seeks to enable the continued taking of water from the nearest practicable sources.
6.4.1 To enable the taking of surface water, by: *(a) Defined allocation quantities; and* *(b) Provision for water body levels and flows,* *except when:* *(i) The taking is from Lakes Dunstan, Hawea, Roxburgh, Wanaka or Wakatipu, or the main stem of the Clutha River/Mata-Au or Kawarau Rivers.* *(ii) All of the surface water or connected groundwater taken is immediately returned to the source water body.* *(iii) Water is being taken which has been delivered to the source water body for the purpose of that subsequent take.*	The proposal seeks to take water that is within the current primary allocation limit for the Amisfield Burn and Park Burn catchments.

Policy	Comments
6.4.2 To define the primary allocation limit for each catchment, from which surface water takes and connected groundwater takes may be granted, as the greater of: *(a) That specified in Schedule 2A, but where no limit is specified in Schedule 2A, 50% of the 7-day mean annual low flow; or* ***(b) The sum of consented maximum instantaneous, or consented 7-day, takes of:*** ***(i) Surface water as at:*** *(1) 19 February 2005 in the Welcome Creek catchment; or* *(2) 7 July 2000 in the Waianakarua catchment; or* ***(3) 28 February 1998 in any other catchment**; and* *(ii) Connected groundwater as at 10 April 2010,* *less any quantity in a consent where:* *(1) In a catchment in Schedule 2A, the consent has a minimum flow that was set higher than that required by Schedule 2A.* *(2) All of the water taken is immediately returned to the source water body.* *(3) All of the water being taken had been delivered to the source water body for the purpose of that subsequent take.* *(4) The consent has been surrendered or has expired (except for the quantity granted to the existing consent holder in a new consent).* *(5) The consent has been cancelled (except where the quantity has been transferred to a new consent under Section 136(5)).* *(6) The consent has lapsed.*	The proposal seeks to take water that is within the current primary allocation limit for Breakneck Creek, the Amisfield Burn and Park Burn, per Policy 6.4.2(b)(i)(3).
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 a registered community drinking water supply where an allowance may be made for growth that is reasonably anticipated.	The rate of takes sought is no more than what has been taken under the existing consents.
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.	Residual flow considerations are discussed earlier in this report (Section 6.3).

Policy	Comments
6.4.16 In granting resource consents to take water, or in any review of the conditions of a resource consent to take water, to require the volume and rate of take to be measured in a manner satisfactory to the Council unless it is impractical or unnecessary to do so.	The takes will continue to be metered in accordance with the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010.
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.*	These matters are discussed in Section 8.

7.2.6 Cultural policies assessment

Iwi planning documents are not statutory instruments, but they do have statutory weight under the RMA in relation to the plan preparation process. The RPS must take into account any relevant planning document recognised by an iwi authority, however, iwi management plans retain their ability to address concepts from a Maori paradigm without constraint from the RMA.

7.2.6.1 Statutory Acknowledgements

The Amisfield Burn, Park Burn and Five Mile Creek are all tributaries of the Clutha River/Mata-Au, which is a Statutory Acknowledgement Area. Pursuant to the Ngai Tahu Claims Settlement Act 1998, Te Runanga o Ngai Tahu should be advised of this application.

7.2.6.2 Te Runanga o Ngai Tahu Freshwater Policy Statement

The Ngai Tahu Freshwater Policy Statement has status as an iwi management plan, to complement and be read alongside the Kai Tahu Ki Otago Natural Resource Management Plan (NRMP).

In terms of integrated management, whilst this document is mostly directed at the organizational level, the policy statement confirms that catchment management planning is the preferred approach. This includes catchment-specific strategies as providing a better basis for achieving integrated sustainable management of natural and physical resources.

Where Ngai Tahu values have been identified, they should be maintained as a minimum, but preferably enhanced. Particular consideration of the mauri (life force) of the watercourses has been given throughout the application, exemplified in reduced instantaneous, monthly and annual allocations and future improvements to water infrastructure to improve water use efficiencies.

7.2.6.3 Kāi Tahu ki Otago NRMP

The policies within the Kāi Tahu ki Otago NRMP that are considered particularly relevant to this application are presented in the below table. The proposal is considered generally consistent with these policies, as discussed in the table.

Table 13: Relevant policies of the Kai Tahu ki Otago NRMP

Policy	Comments
To require an assessment of instream values for all activities affecting water.	Values of the subject watercourses are considered in Section 3.1.
To require that resource consent applicants seek only the amount of water actually required for the purpose specified in the application.	The proposed water take volumes are considered to be reasonable for the proposed uses, based on the specific characteristics of the sites and recognised reasonable water use guidelines for irrigation (see Section 6.6). As discussed earlier, the volume sought is in fact less than that which is required to efficiently irrigate the applicant's property.
To require that all water takes are metered and reported on, and information be made available upon request to Kāi Tahu ki Otago.	The water takes will continue to be metered as detailed in Section 6.8. Metering data will be made available to ORC, and Kāi Tahu ki Otago can request this data either from ORC or from the applicant, if desired.
To oppose the granting of water take consents for 35 years. Consistent with a precautionary approach, either a review clause or a reduced term may be sought.	Consent duration is discussed in Section 8.
To require that fish passage is provided for at all times, both upstream and downstream.	As discussed in Section 6.3, the Amisfield Burn and Park Burn naturally lose connectivity with Lake Dunstan in mid to late summer and early autumn, meaning it would be virtually impossible to provide for fish passage year-round regardless of any residual or minimum flow conditions imposed.
To require that fish screens be fitted to all pumps and race intakes.	Based on ecological assessment and historic fish survey data, no fish screens are proposed. This is discussed in further detail in Section 6.2.

Policy	Comments
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.*	Most of the applicant's command area is irrigated via spray, which is considered an efficient means of irrigation. A small area of pasture within the property still uses flood irrigation, however this has been reduced over time, with remaining flood areas unsupportive of conversion to spray due to practical reasons and/or cost. Flood irrigation occurs only infrequently, and it is reiterated that less water is being sought than is actually needed to irrigate the property, meaning the applicant will need to use the water very efficiently to ensure nothing is wasted.
To encourage irrigation to occur at times when winds are light and evaporation low.	Irrigation at the most efficient times is in the applicant's best interests as well, although it is noted that it will not be practical to avoid irrigation in adverse conditions 100 % of the time.

8. CONSENT DURATION, REVIEW AND LAPSE

A consent term of 35 years is sought. In accordance with Section 123 of the RMA, a term of up to 35 years may be granted for a resource consent to take and use water. This consent duration satisfies the criteria set out in Policy 6.4.19 of the RPW due to the following:

- The use of the water for irrigation supply is very likely to be in effect for a duration of at least 35 years, given the suitability of the property for farming. It is also worth noting that the proposed takes will supply irrigation infrastructure that is in place and established, with recognition of reasonably foreseeable future expansion.
- There is close to 6 years of flow data for the Amisfield Burn above the uppermost point of take (held by another permit holder: 95789), meaning the hydrological characteristics of the watercourse are well understood. There are also records of consistent drying of the creek at the Highway. This makes understanding the ongoing effects of takes from this creek a lot easier, and can ensure informed decision making. While there is no such historic flow data for the Park Burn, the similarity between this catchment and that of the Amisfield Burn means data relating to the latter can be used as a reliable proxy for the former, along with other data from nearby similar streams, such as the Low Burn. This means that the existing environment and the anticipated effects on it are well understood.
- Abstraction has taken place under the permits for over 140 years – with three of the four mining privileges dating back to 1866 and the other to 1878. This long history of take and use makes it easier to forecast future potential effects on natural and cultural values due to the continuing operation of the activity.

- The local climate is likely to become more variable and less predictable in the coming decades due to climate change, based on the climate change projections for the Otago region prepared by the Ministry for the Environment in 2018 as available on their website. In particular, temperatures (and therefore evapotranspiration) are expected to increase, and while precipitation may also increase, changes in the timing (largest increases in winter and spring) and form (more rain and less snow) may reduce water security in the region. More frequent droughts are predicted. Securing reliable water access to the Amisfield Burn and Park Burn, while preserving the values of these creeks, will enable the farm to continue operating at its fullest potential into the future.

- This report and the supporting documents demonstrate that the activities will have no more than minor actual or potential adverse environmental effects. The probability that this assessment and proposed mitigation measures have not addressed all actual or potential adverse effects is low and the scope of remaining unforeseen adverse effects is limited. Review conditions can adequately manage unforeseen adverse effects if required.

- The applicant has invested much time, energy and money into the farm, and all of the applicant's economic and social welfare lies in the productive capacity of their lands. Without water for irrigation, pastures could not be supported during the growing season. Feed would have to be imported onto the farm at a huge cost. Furthermore, the permits subject to this application provide the only secure and consistent source of water for stock drinking, which is an important animal welfare consideration. It would therefore be contrary to the purpose and principles of the RMA to cease or curtail the exercise of these permits, particularly as they form part of the existing environment. The request for a 35-year consent duration gives the applicant the security to make ongoing investment decisions based on the returns from their operation over this duration.

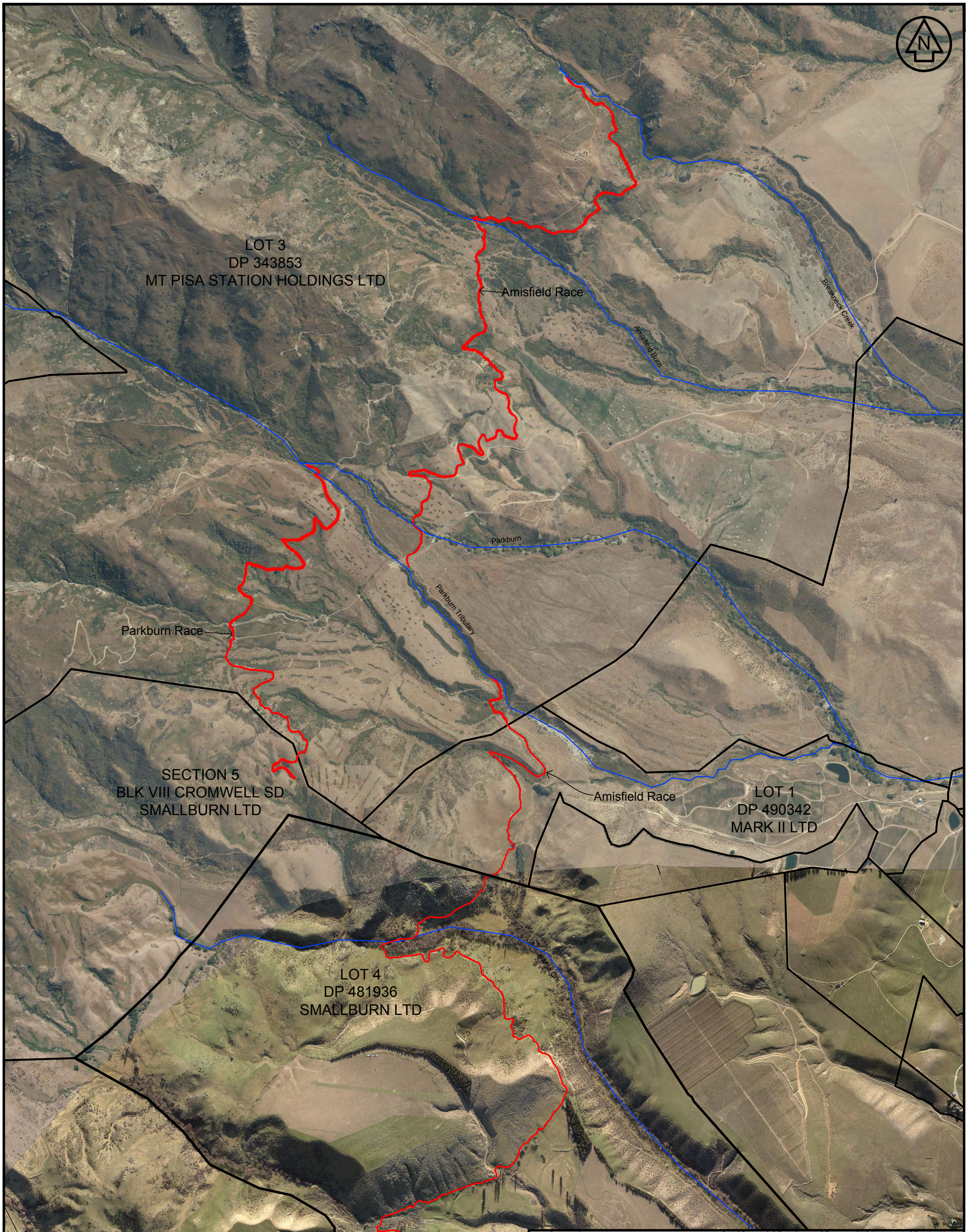
9. CONCLUSION

A decision to grant consent pursuant to Section 104C under delegated authority can be made on the basis that:

a) It is expected that the adverse effects on the environment will be minor or less than minor;
b) The proposal meets the non-notification requirements of Section 95A of the RMA; and
c) The proposal is consistent with the requirements of the RMA, Council policy and other relevant matters.

Granting of the consents will be consistent with the purpose of the RMA for the reasons explained within this report. The proposed activities are not expected to result in further degradation of water quality and potential adverse effects will be avoided, remedied or mitigated as far as practicable.

Appendix A: Scheme maps



Rev.	Date	Revision Details	By
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Surveyed	Signed	Date	Job No.	Drawing No.	
			18249	02_01	
Drawn	Signed	Date	Scale		
SLC		10.10.19	1:16000@ A3		
Designed	Signed	Date	Datum & Level	Rev.	
			NZTM 2000 & MSL	-	

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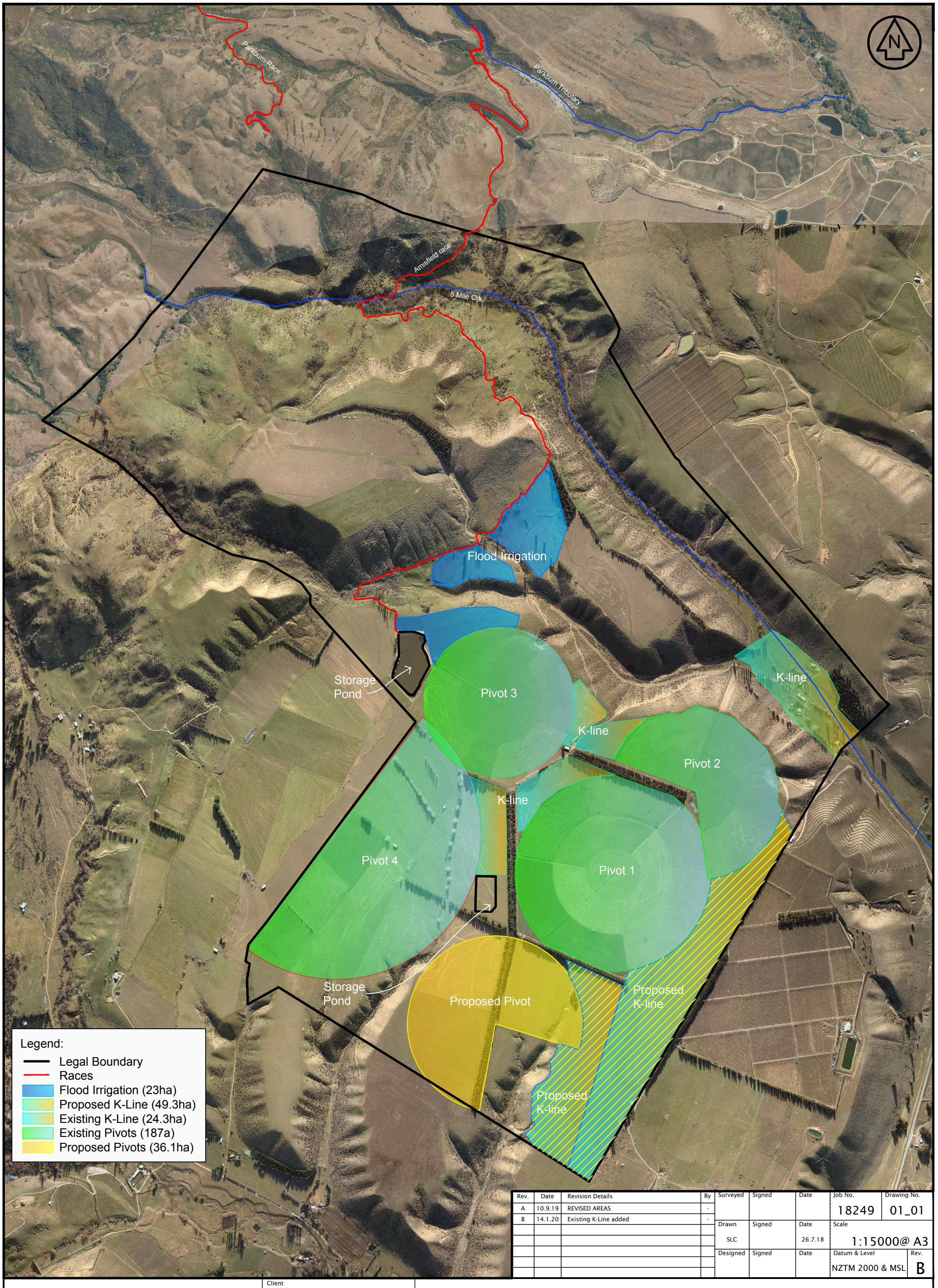
RACE PLAN

L:\18249 - Smallburn Limited - Deemed Permit replacement\CAD\18249_02_RACE.dwg Plotted: 10.10.2019



Rev.	Date	Revision Details	By
A	10.9.19	REVISED AREAS	-
B	14.1.20	Existing K-Line added	-

Surveyed	Signed	Date	Job No. 18249	Drawing No. 01_01	
Drawn SLC	Signed	Date 26.7.18	Scale 1:15000@ A3		
Designed	Signed	Date	Datum & Level NZTM 2000 & MSL	Rev. B	

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IRRIGATION PLAN SMALLBURN

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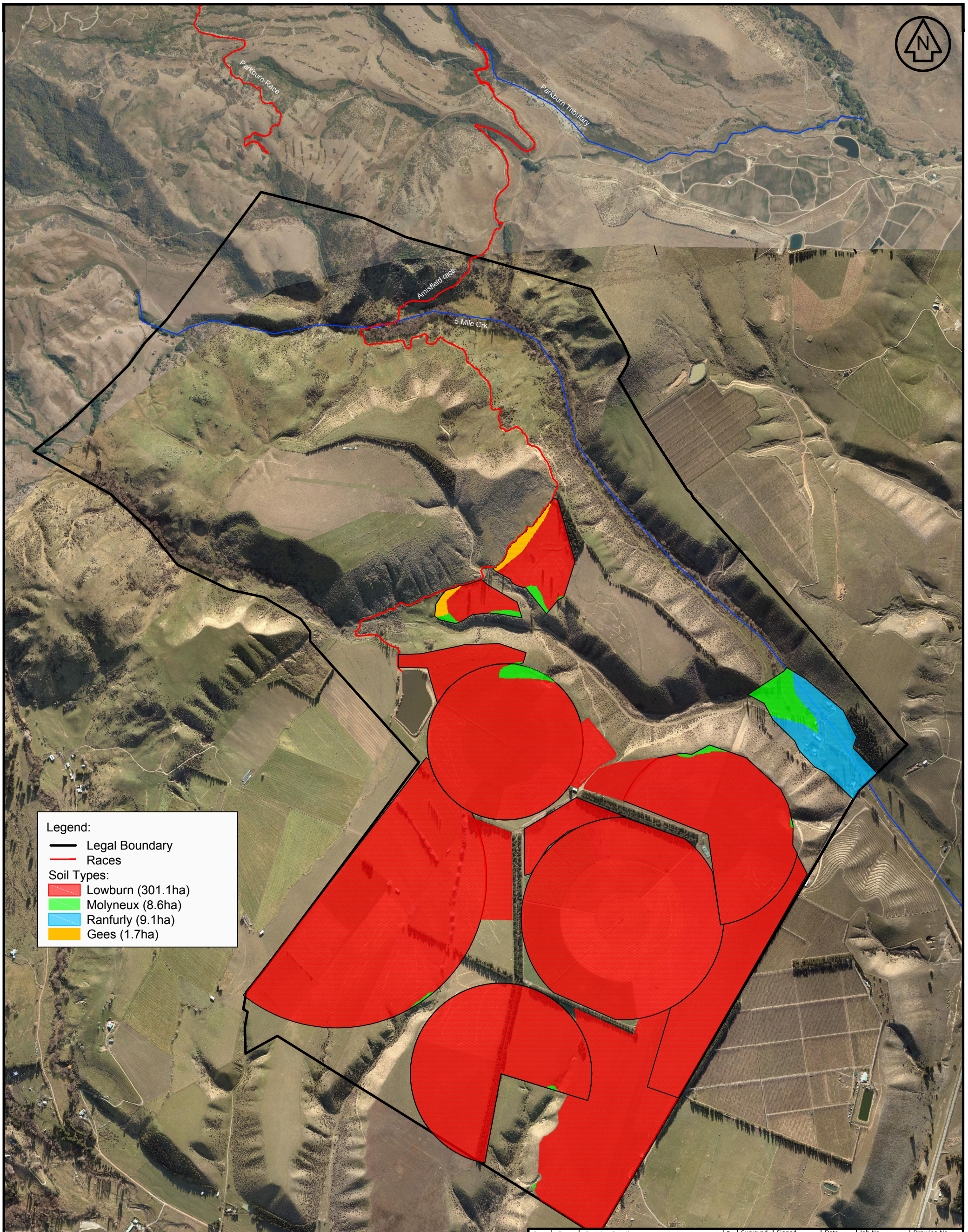

Rev.	Date	Revision Details	By
A	9.10.19	UPDATED AREAS	SLC

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Designed	Signed	Date	Datum & Level NZTM 2000 & MSL	Rev. A

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SOILS PLAN
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Appendix B: Hydrology assessment report

TECHNICAL COMMENT

Date: 24 May 2019 Our Ref: 18249; 18251; 18344

To: Zoe McCormack, Senior Planner, Landpro Ltd

From: Christina Bright, Environmental Scientist, Landpro Ltd

Subject: Hydrological assessment prepared for the water users of the Amisfield Burn; Smallburn Limited, Pisa Holdings Ltd, and Lowburn Land Holdings Ltd.

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1. Background

Smallburn Limited, Pisa Holdings Ltd, and Lowburn Land Holdings Partnership wishes to obtain resource consent from the Otago Regional Council to continue abstracting water from the Amisfield Burn for pasture and crop irrigation. The consent numbers relevant to this assessment on the Park Burn are RM15.007.1, 94394, 98527.V1 and 98526.V1. A summary of these consents is provided in Table 1.

The purpose of this report is to provide a hydrological assessment of the Amisfield Burn. Specifically, to:

- Estimate the natural loses and gains of a preidentified reach of the Amisfield Burn;
- Estimate the naturalised 7-day mean annual low flow (7-day MALF) for the abstraction points on the property so that available allocation can be determined;
- Estimate the mean annual flow of0
- the Amisfield Burn so that available supplementary allocation can be determined;
- Determine the flow of a spring fed tributary of the Amisfield Burn; and

Determine potential residual flows based on in-stream ecological values.

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Table 1: Summary of permits for Amisfield Burn Catchment.

Permit	Permit holder	Creek	Consented Rate of take/volume	Location of intake (NZTM 2000)
97358A (take)	Lowburn Landholdings Limited Partnership	Breakneck	200,000 L/hour (55.6 L/s)	1301270E 5019397N
97358B (discharge)	Lowburn Landholdings Limited Partnership	Breakneck	200,000 L/hour (55.6 L/s)	1301270E 5019397N
96320.V1	W E Clark, R J Clark and P Morton	Breakneck	200,000 L/hour (55.6 L/s)	1301270E 5019397N
96321.V1	W E Clark, R J Clark and P Morton	Amisfield Burn	150,000 L/hour (41.7 L/s)	1300929E 5018701N
95789	Wakefield Estates Limited; Rockburn Wines Limited; Pisa Holdings Limited; Mark II Limited; J&J Sinclair; S&P Hawker; Albany Heights Limited	Amisfield burn	600,000 L/hour (166.7 L/s) 416,570 m3/month	1300755E 5018662N
97232	Lowburn Landholdings Limited Partnership	Amisfield Burn	300,000 L/hour (83.3L/s)	1303300E 5017791N

Figure 1 shows the location of the creek in relation to the Smallburn Limited, Pisa Holdings Ltd, and Lowburn Land Holdings Partnership properties and other watercourses in the vicinity.

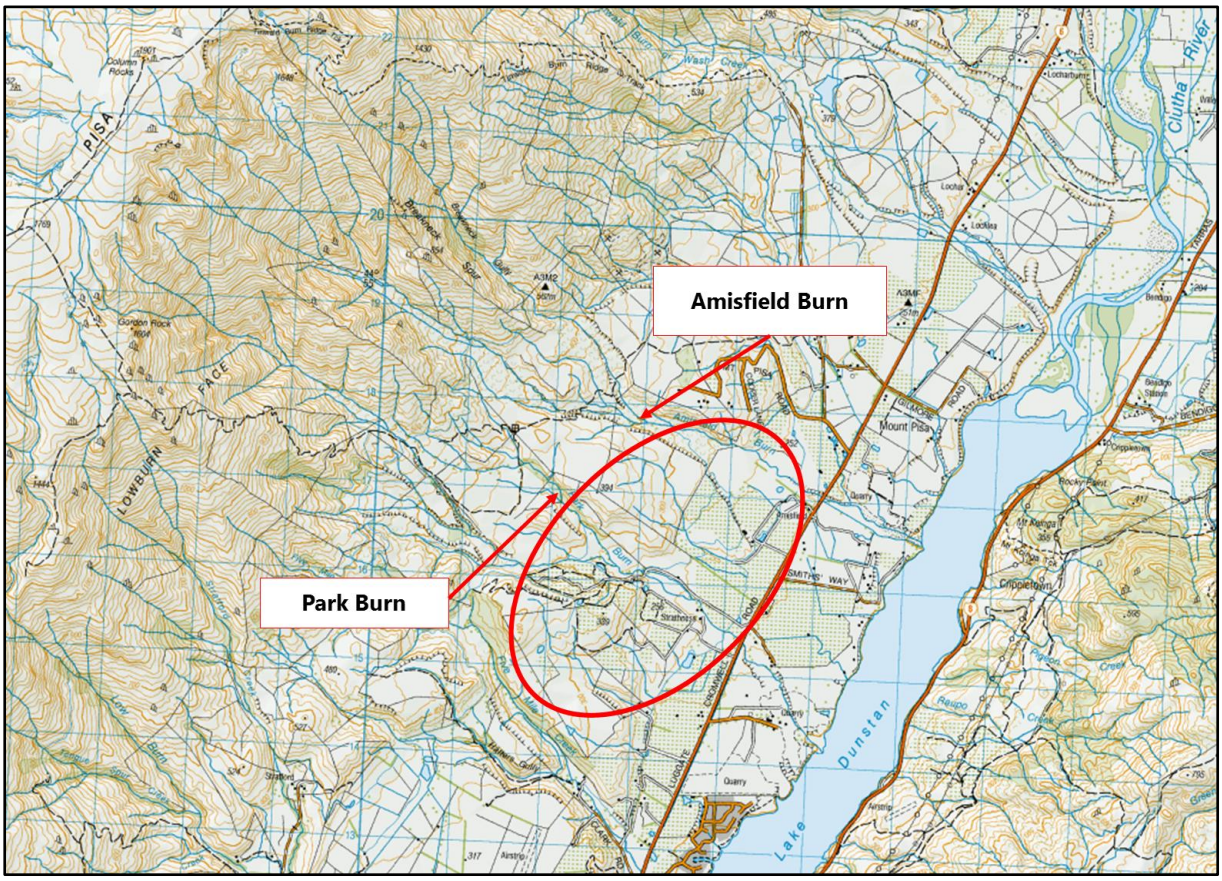

Figure 1: Site location map in relation to surface water bodies and general location of properties (red circle). [Source: NZ topo map]

2. Catchment Description

The properties are located in the Clutha River catchment in Central Otago and flows in a general north to south direction with a catchment area of 21,022 km2. The catchment drains a significant area of the Otago region with its headwaters characteristically mountainous, bordering the Southern Alps in the far north-west, gradually becoming more rolling through the midsections and in contrast the lower reaches of the catchment are dominated by alluvial plans and lowland. The Park Burn Catchment is situated in the northern Upper Clutha Catchment and drains directly to Lake Dunstan, an artificial lake constructed as the result of damming the Clutha River at Clyde. The area receives a mean annual rainfall of approximately 430 mm.

The Clutha River is the second longest river in New Zealand and the longest in the South Island, stretching 338 kilometers. The Clutha has a mean annual flow of 575 m3/s of which around 75% is derived from the main lake catchments in the north of the catchment, including lakes Hawea, Wanaka and Wakatipu. Flow rates range between 120,000 L/s (minimum) and 1,250,000 L/s (maximum) throughout the year. There are approximately 24 natural and artificial lakes within the Clutha Catchment, and therefore flow rates vary significantly.

2.1 Localised hydrology

The applicants own an area of land northwest of Lake Dunstan along the Pisa Range. The Amisfield Burn flows from the northwest to the southeast through the Lowburn Face of Pisa Range terminating at Lake Dunstan. The stream traverses steep land in the headwaters of the creek with river terraces and gorges, falling onto relatively flat to rolling land at the foothills of the range.

The hydrology of the Amisfield Burn is fed primarily through runoff from the upper Pisa Range, and in winter and spring runoff is predominately driven by snow melt. The Amisfield Burn originates high up in a gully of the Low Burn face at approximately 1700 meters above sea level (mamsl) where it drains down to 200 mamsl at its confluence with Lake Dunstan. Breakneck Creek is a significant tributary of the Amisfield Burn and drains from a similar elevation, joining the main stem of the Amisfield Burn at 300mamsl.

Since October 2013, a continuous flow monitoring site has been maintained by the Otago Regional Council on the Amisfield Burn above the upper most point of take. This continuous record (Figure 2) shows the creek follows the typical behavior of steep headwater streams, with fast to respond event specific hydrographs. Based on this record, basic flow statistics have been determined (Table 2).

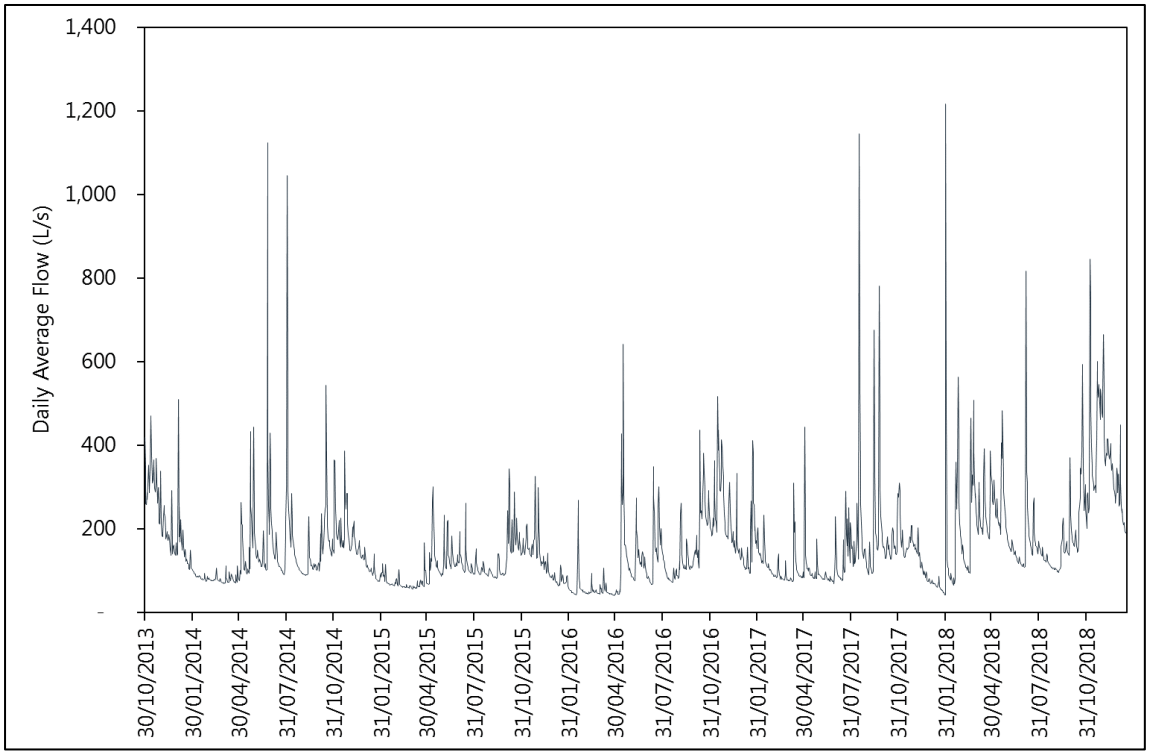

Figure 2 Daily flow for Amisfield Burn monitoring site located in upper reaches of the catchment, unaffected by abstraction.

The Otago Regional Council also maintain flow monitoring sites on the Lowburn, located nearby. The flow statistics for the Lowburn are also shown in Table 2.

Table 2: Flow statistics for the Amisfield Burn and Lowburn. [Source: ORC, data records]

Site Name	7-day mean annual low flow (L/s)	Mean flow (L/s)
Amisfield Burn (upstream of all abstraction)	65	162
Lowburn at Chinamans Gully	84*	304*

*Affected by upstream irrigation takes

2.2 Abstraction Records

Permits 96320.V1 and 96321.V1 authorise the combined abstraction of 97.3 L/s of water from the Amisfield Burn and Breakneck Creek and has been metered (WM0964) since April 2013. The graph below (Figure 1) shows that the applicant only occasionally reaches, or gets close to, this maximum abstraction rate. Figure 4 shows the monthly abstraction volumes. The record shows that abstraction is highest during the irrigation season, but is reduced over winter, as water is not required for irrigation purposes. Figure 5 shows the hydrological year volume.

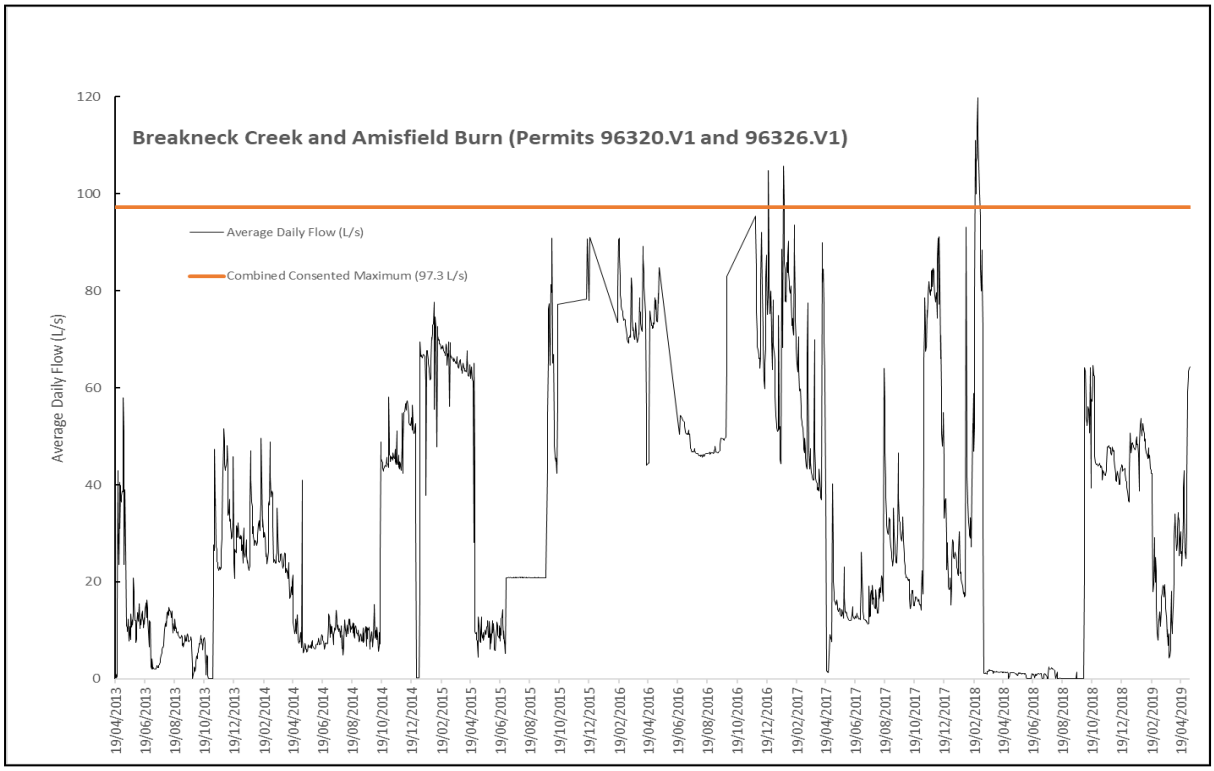

Figure 3 Amisfield Burn 96321.V1and Breakneck Creek 96320.V1 combined abstraction records showing actual rate of take, with consented maximum rate.

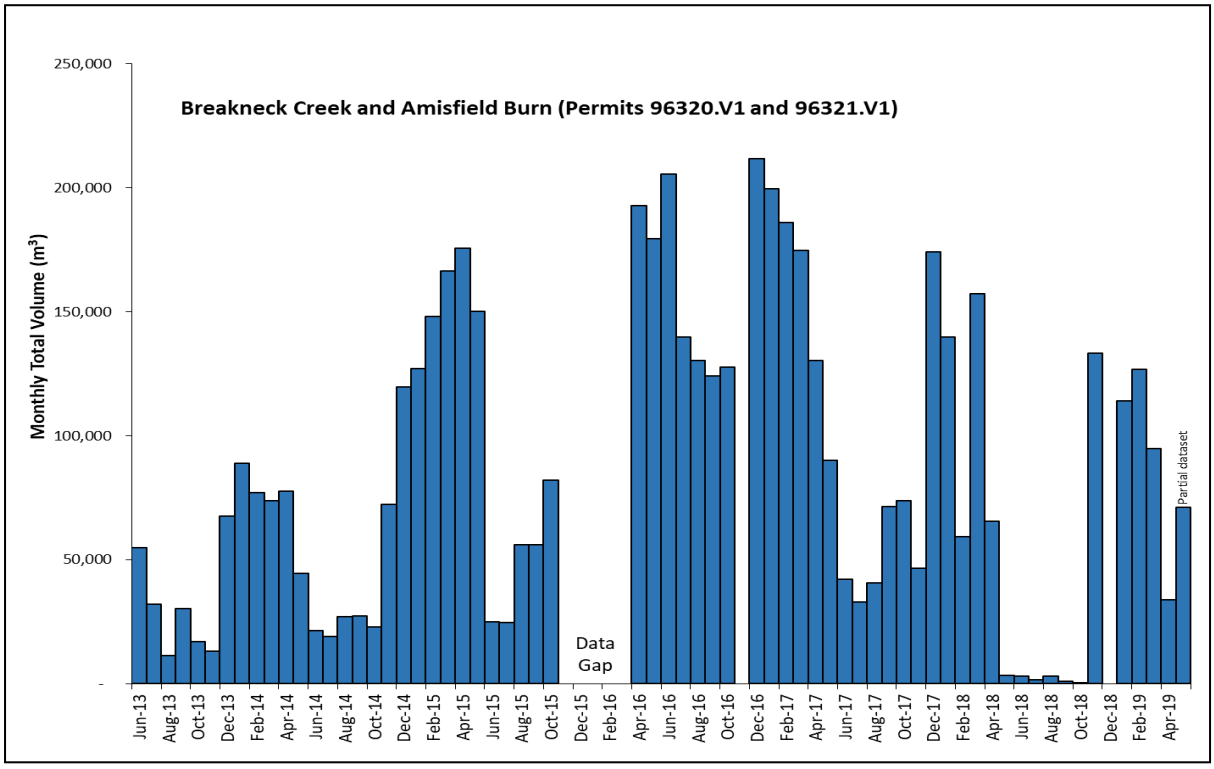

Figure 4 Amisfield Burn 96321.V1and Breakneck Creek 96320.V1 combined abstraction records showing actual monthly volume.

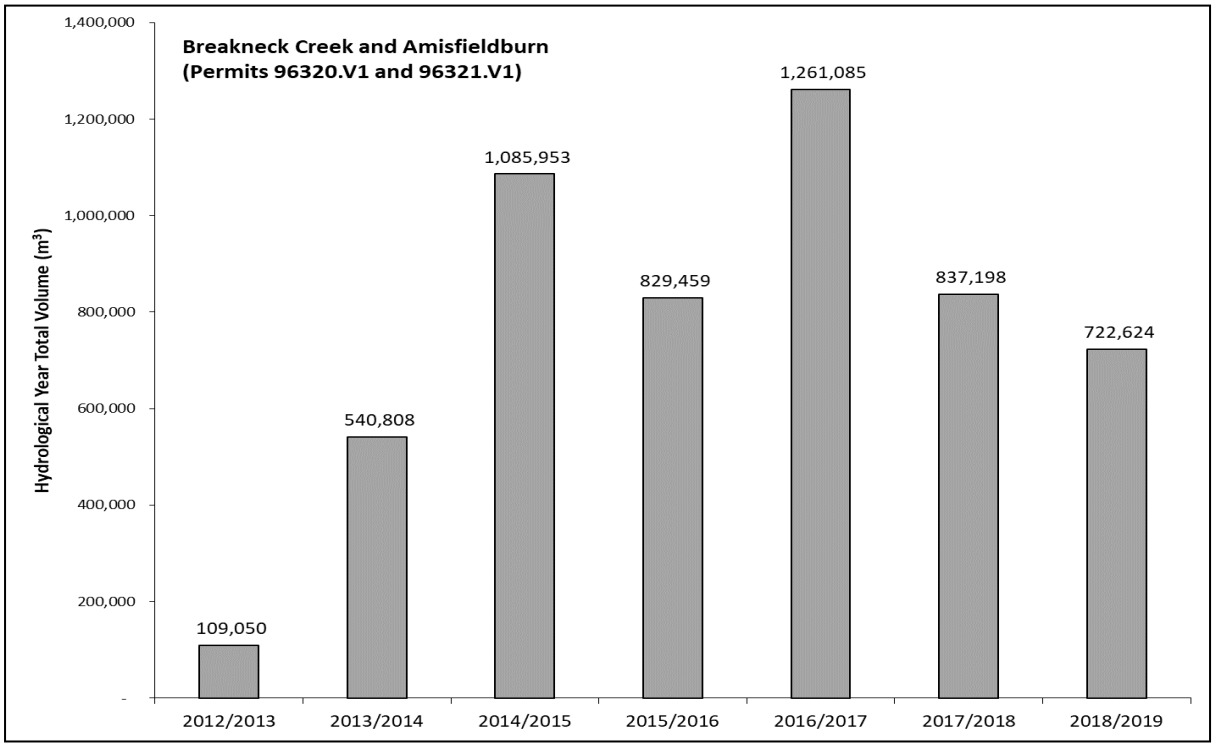

Figure 5 Amisfield Burn 96321.V1and Breakneck Creek 96320.V1 combined abstraction records showing actual hydrological year volume.

3. Data Collection and Results

3.1 Site flow assessments

A series of flow gaugings were undertaken on the 15 January 2019 by Landpro Limited to determine the quantity of water flowing at various sites throughout the Amisfield Burn. A total of five reaches were selected for assessment. These were located upstream from the upper most water take, through the middle reaches of the Amisfield Burn catchment, and lower in the catchment on the lowland alluvial gravels. A flow assessment was also conducted on the upper reach of the Breakneck Creek, above the upper most point of take. For the duration of the survey and for 24hours prior the applicants ceased taking water from their respective points of take, this enabled the survey to identify where in the catchment loses of water to the sub-surface zone were occurring.

The data was collected in accordance with the National Environmental Monitoring Standard: Open Channel Flow Measurement . This data, included in the appendices, has been used on an as-is basis.

3.2 Results

3.2.1 Gauging sites

AMIS1: Amisfield Burn Upper

Flow gauging site approximately 3 meters upstream from point of take diversion. True left side of stream grassy whilst the true right side had much taller woody vegetation. River Bed relatively sandy with pebbles, stream bounded by bedrock boulder on true right side.

BREAK1: Breakneck Creek Upper

Flow gauging site approximately 1.5 meters upstream from point of take diversion. True left and right sides of the stream had low lying vegetation, with scrub. Stream bed consisted of sand with pebbles, little algae cover.

AMIS2: Amisfield Burn mid catchment

Flow gauging site approximately 5 meters down from Breakneck Creek and Amisfield Burn confluence. True left and right side express significant vegetation growth with large trees. Stream bed consisted of boulders and cobbles with significant algae covering.

AMIS3: Amisfield Burn mid catchment

Flow gauging site approximately 200 meters upstream from state highway 6 crossing. True left and right side of the stream had minimal low-lying vegetation. Streambed made up of cobbles and boulders with algae. Wetted perimeter narrower than outermost boundaries of the alluvial channel (exposed dry alluvial rock).

AMIS4: Amisfield Burn Lower

Flow gauging site approximately 100 meters downstream from State Highway 6. Very minimal vegetation on both true left side of stream, small trees present on true right. Streambed made up of cobbles and boulders with algae. Wetted perimeter narrower than outermost boundaries of the alluvial channel (exposed dry alluvial rock).

AMIS5: Amisfield Burn above confluence with Lake Dunstan

Observation site where the Amisfield Burn ceased to flow. Upstream of this location the creek was braided, and flow was pooling behind bars and depressions in the streambed. At this point flow ceased, and water was disappearing to gravels.

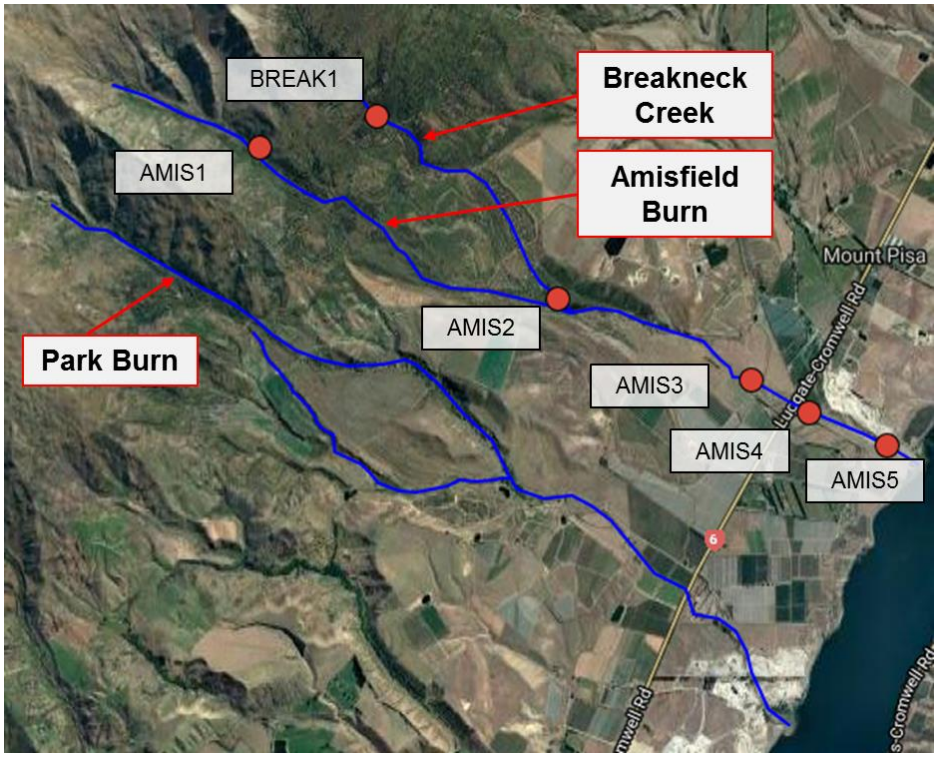

Figure 6 Location of flow gauging sites in the Amisfield Burn Catchment.

3.2.2 Site Photos

Figure 6 Amisfield Burn upstream of upper point of take (AMIS1), left: looking upstream and right: looking downstream to diversion.

Figure 7 Amisfield Burn downstream of confluence between Amisfield Burn and Breakneck Creek (AMIS2), left: looking upstream and right: looking downstream.

Figure 8 Amisfield Burn upstream of State Highway (AMIS3), left: looking upstream and right: looking downstream.

Figure 9 Amisfield Burn downstream of State Highway (AMIS4), left: looking upstream and right: looking downstream.

Figure 10 Amisfield Burn upstream of Lake Dunstan confluence (AMIS5), left: looking upstream and right: looking downstream.

Figure 11 Breakneck Creek upstream of point of take (BREAK1), left: looking upstream and right: looking downstream to diversion.

3.2.3 Measured Flow

Table 3: Field measurements for Amisfield Burn.

Easting (NZTM 2000)	Northing (NZTM 2000)	Date	Measured flow (L/sec)	†Gauging uncertainty flow range (L/sec)	Site Name
1300319	5019044	15/01/2019	140.6	134-147	AMIS1
1301316	5019364	15/01/2019	54.9	53-57	BREAK1
1302972	5017853	15/01/2019	210.6	203-218	AMIS2
1304670	5017233	15/01/2019	152.7	147-158	AMIS3
1305196	5016969	15/01/2019	72	70-74	AMIS4

†As with many flow measurements there is a degree of uncertainty and New Zealand Standards use ISO5168:2005 and ISO748:2007 to report on the accuracy of gaugings.

4. Hydrology Assessment

4.1 Flow Assessment

At the time of the site visit (15 January 2019), daily average flow at the nearest rated flow site located in the upper reaches of the Amisfield Burn was 194 L/s while the Low Burn (another nearby rated flow site at Chinamans Gully) was approximately 360 L/s. These flows are only slightly above the mean flow

of the Amisfield Burn and Low Burn (144L/s and 267L/s respectively; Table 2) indicating the assessment was carried out during a period of slightly above average flow conditions, likely typical of the spring transition into summer.

To identify potentially losing/gaining reaches of the Amisfield Burn, flow measurements were collected longitudinally down the Amisfield Burn main stem, and included a gauging on Breakneck Creek, a significant tributary of the Amisfield Burn. A differential gauging approach was used to identify differences in flow that related to either a gain or loss of water.

A losing or gaining reach as identified in this assessment refers to the assumption that flow is interacting with the hyporheic zone (sub-surface zone) due to factors such as topography, geology, and geomorphology that control the movement of water, including flow and wetted perimeter. The assessment assumes that this hyporheic water may or may not be specifically linked to groundwater as groundwater level data is not available or not included as part of this assessment. This zone of sub-surface and surface water exchange (hyporheic zone) is relatively active where water ways traverse steep gullies passing down to river valleys and alluvial lowlands. In these types of environments, the hyporheic zone can be more substantial, and the typically porous alluvial media may extend for a larger depth, creating more space for underflow into the sub-surface environment to occur. Under hot dry weather conditions, this water rarely returns to the surface due to intense evaporation processes that occur as water comes to the surface.

Results of the flow gaugings undertaken on the Amisfield Burn suggest that flow in the lower reaches of the Amisfield Burn interacts with the hyporheic zone and fine loose alluvial gravels, and that this provides a mechanism for water loss to the sub-surface zone. The survey identified a net loss of 210 L/s between the confluence of the Amisfield Burn and Breakneck Creek, and below State Highway 6 where the Amisfield Burn ran dry, as summarised in Figure 3.

General survey findings:

- Gauging was carried out above the upper point of take in the Amisfield Burn Catchment and 141 L/s was measured. Flow increased to 211 L/s below the confluence of the main stem Amisfield Burn and Breakneck Creek. Flow in Breakneck Creek was 55 L/s, and therefore an additional 15 L/s is picked up and converges at this confluence. This was an expected gain in flow as this is typical behavior of runoff driven systems, and under the uncharacteristically wet environmental conditions smaller unnamed tributaries that are typically ephemeral have a small quantity of water to contribute.

- Below the confluence, as the gradient decreased and the alluvial channel widened loses of water were measured; above the State Highway 6 bridge, flow was 153 L/s. A total of 58 L/s was lost over 1.5km (Amisfield Burn Breakneck Confluence to State Highway 6).
- 100m below the State Highway 6 crossing flow was substantially lower at 72L/s than the measured flow upstream, a measured loss of 81 L/s.
- A further 800m downstream the Amisfield Burn ceased to flow, the 72L/s measured upstream was reduced to an unmeasurable flow, before disappearing entirely. The possible wetted perimeter at this location and nature of the tall woody vegetation suggested that the gravels were absorbing water. The surface area of the wider alluvial channel at this location and further downstream increases the potential for water to be lost to the sub-surface zone. Humps and hollows in the river bed also prevented flow from remaining in a single channel and hence the 72 L/s could not maintain connection downstream to Lake Dunstan.

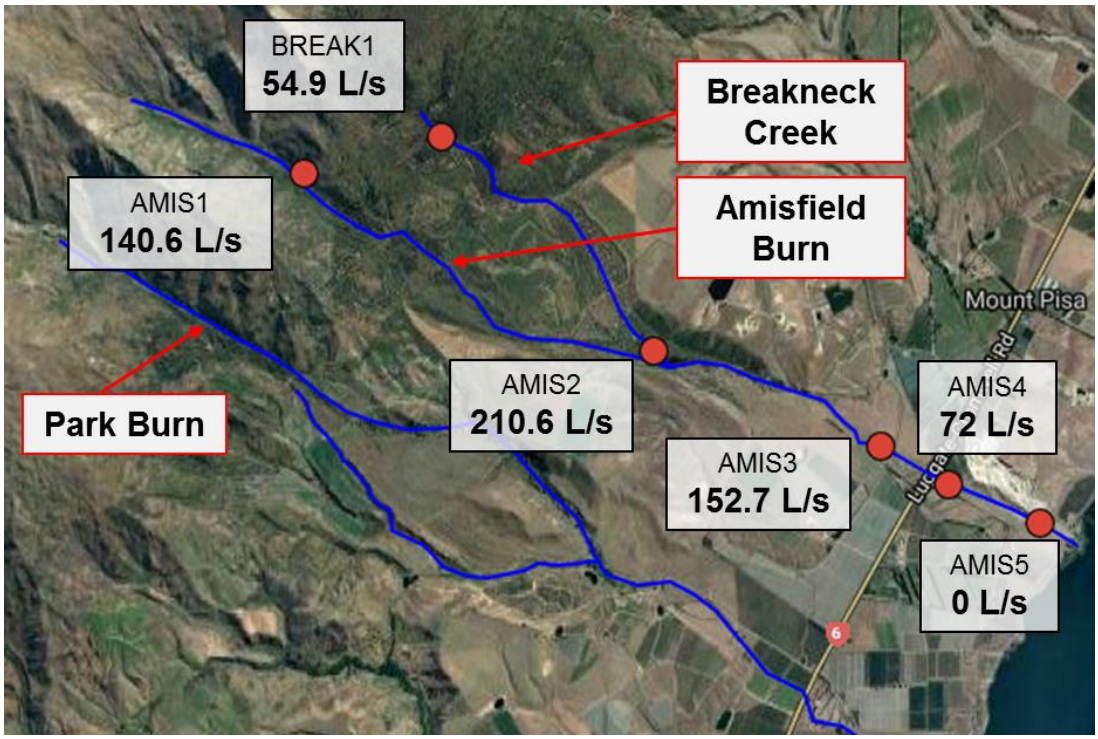

Figure 12 Flow gauging sites with measured flows.

The geology of the catchment is variable, with schist geology in the upper headwaters, and loess and alluvium in the lower reaches (Figure 12). Loess and fine alluvial gravels are typically quite porous and therefore can leak surface water to the sub-surface zone or groundwater zone, and therefore likely promote the interaction of surface water with the sub-surface zone in the Amisfield Burn Catchment in the lower reaches. explaining the observed water loses.

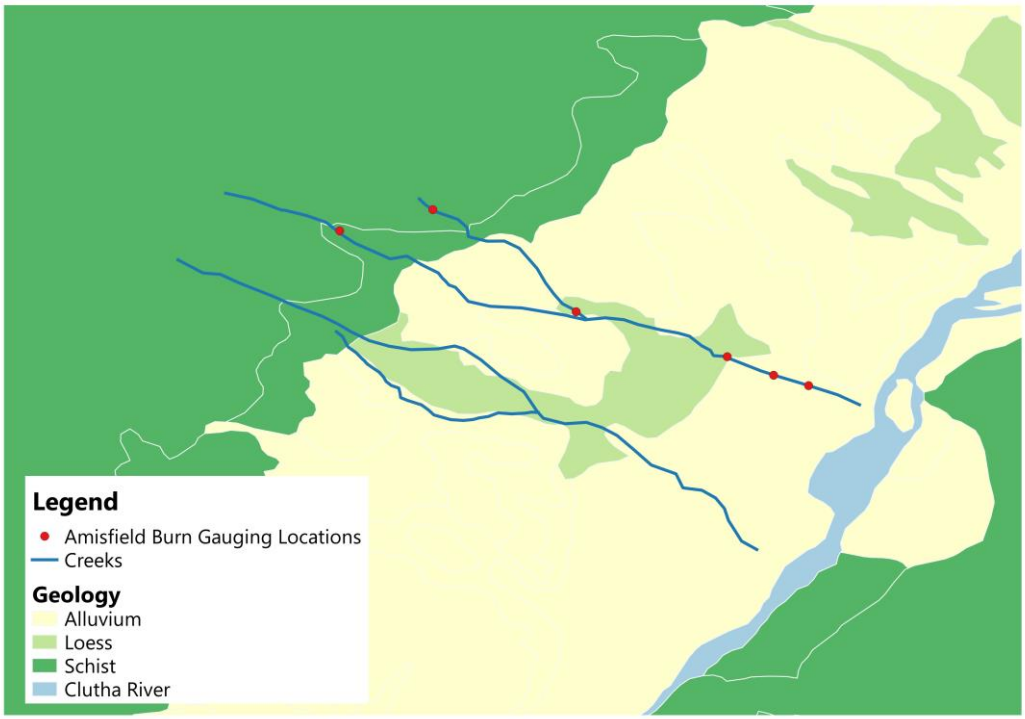

Figure 13 Geology of the Amisfield Burn Catchment (source: MfE Geology).

4.2 Temperature Records

Temperature is often used as a tracer for groundwater surface water interactions, as temperature can be used to identify locations of exchange between surface water and groundwater. Air temperature is commonly used as a comparison to identify the thermal behavior of a stream. Flow affects water temperature due to the difference in the thermal capacity of water and air, and therefore a larger volume of water, deeper water, and faster moving water will dampen the effects of the surrounding air temperature and incoming solar radiation. Likewise, rainfall patterns can help understand the thermal behavior of streams.

Flow and water temperature data are available for the upper Amisfield Burn, with an additional two temperature records for the lower reaches of the Amisfield Burn:

- Upstream flow monitoring site (November 2013 – December 2018)
- State Highway 6 Bridge (August 2018 – January 2019)
- Amisfield Burn Quarry (December 2013 – December 2014)

The quarry site is further downstream than the State Highway site and would be expected to be dry more often than the State Highway site, all else being equal. However, given the short data series

available and lack of data overlap, temporal variation in stream conditions is likely to be a more significant influence on the data, than this spatial difference.

The three temperature records were used to assess the validity of using temperature monitoring data for the lower Amisfield Burn to determine when the stream is dry and understand flow losses in the catchment. It was expected that one or both of the following metrics could be used to predict the absence of water in the lower reaches of the stream:

- Daily maximum temperature measured at the downstream site (quarry or State Highway). Very high temperatures are likely to indicate water is not present; and or,
- Daily temperature range (i.e. max. minus min. temperature) at the downstream site. The presence of water is expected to moderate temperature extremes, and therefore large variations in temperature during the course of a day may indicate that the stream is dry.

Analysis and visualisation was carried out in R (version 3.5.3) and RStudio (version 1.1.463). The packages clifro, lubridate, readxl, scales and tidyverse were also used.

Figure 14 below illustrates the raw temperature, which is broadly consistent with the expected behavior, in that both the variability of the absolute water temperature and daily water temperature are significantly higher downstream than upstream, particularly during the summer and autumn months when the stream is most likely to be dry. Also evident is that the degree of difference between the upstream and downstream site is greater in spring-summer compared to autumn-winter. Higher temperatures (and potentially greater variability) downstream would be expected even when water is present, due to the longer flow path, lower altitude, gravel bed, and the extreme climatic variations experienced at this location in Central Otago. It is therefore possible that this observed variability can be used as a proxy for indicating when the creek is dry, or when the probability of dryness occurring due to natural conditions may be likely.

Although Figure 14 shows the data for two different time periods, the general increase in observed downstream temperature in the 2013-2014 quarry site record is mimicked by the 2018-19 data record which ends in January 2019; both records show maximum temperatures reaching up to 50 degrees Celsius. The 2013-2014 record shows that the greatest variability occurs in the later part of the irrigation season, i.e. March and April. The abstraction record for this period of the 2013/2014 season shows that as abstraction begins to taper off in March-April, temperature maximums of 30 degrees Celsius are still observed downstream, and the difference between the average daily temperature at the upstream and quarry temperature sites is a magnitude of 10 degrees Celsius or so, showing the thermal warming affect in the downstream direction. The upstream versus downstream difference late in the irrigation

season likely indicates environmental factors that contribute to natural flow loses. Data for the later end of the 2018/2019 was not available at the time of producing this report to see if these trends are repeated season on season.

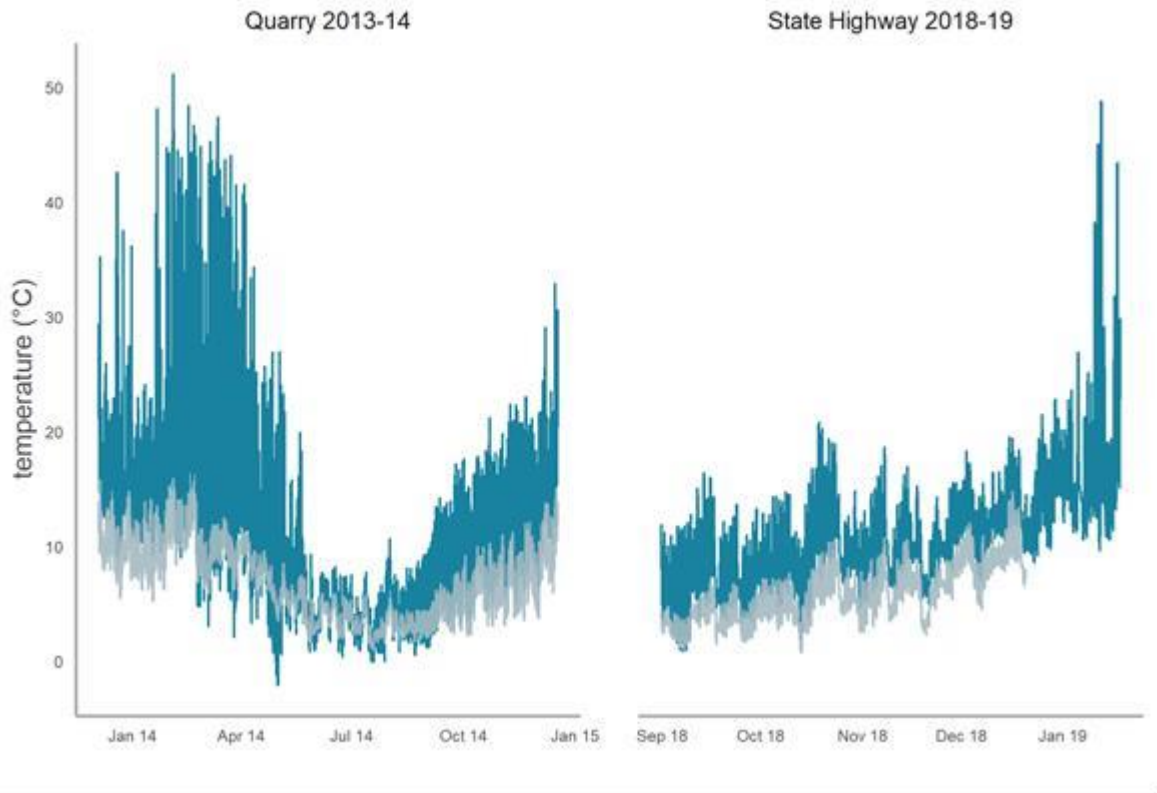

Figure 14 Temperatures measured at the downstream (blue) Amisfield Burn monitoring sites show significantly higher daily maxima and variability than the upstream (grey) monitoring site. Note different x scales for the two monitoring periods.

Figures 15 and 16 below show the frequency (count) of the daily maximum temperature and the daily temperature range. Figure 6 shows that the downstream dataset is skewed significantly higher in comparison to the equivalent upstream temperature, in that greater maximums are observed downstream more often. This trend is true also for the daily temperature range shown in Figure 7, in that the downstream sites observes a greater daily range in temperature more often than upstream. This is particularly true for the 2013-14 record, probably because this dataset includes late summer/early autumn 2013, whereas the 2018-19 record ends in January 2019. The extreme difference in temperature between the upstream and downstream sites in the 2013-14 record is highlighted in Figure 6 and 7, as there are more occurrences where temperature exceeds 30 degrees Celsius at the downstream quarry site than the State Highway site for 2018-19 record. Highlighting that times of dryness are probably associated with late summer early autumn. Furthermore, it is likely that the stream bed was dry for significantly more of the 2013-14 monitoring period than the 2018-19 period; the 2018/2019 season

has been significantly wet in comparison to previous seasons with substantial rainfall in both early and late summer. There is some evidence of biomodial or multimodal distribution of the 2013-14 record; this is to be expected as stream behavior is significantly different when the stream is dry.

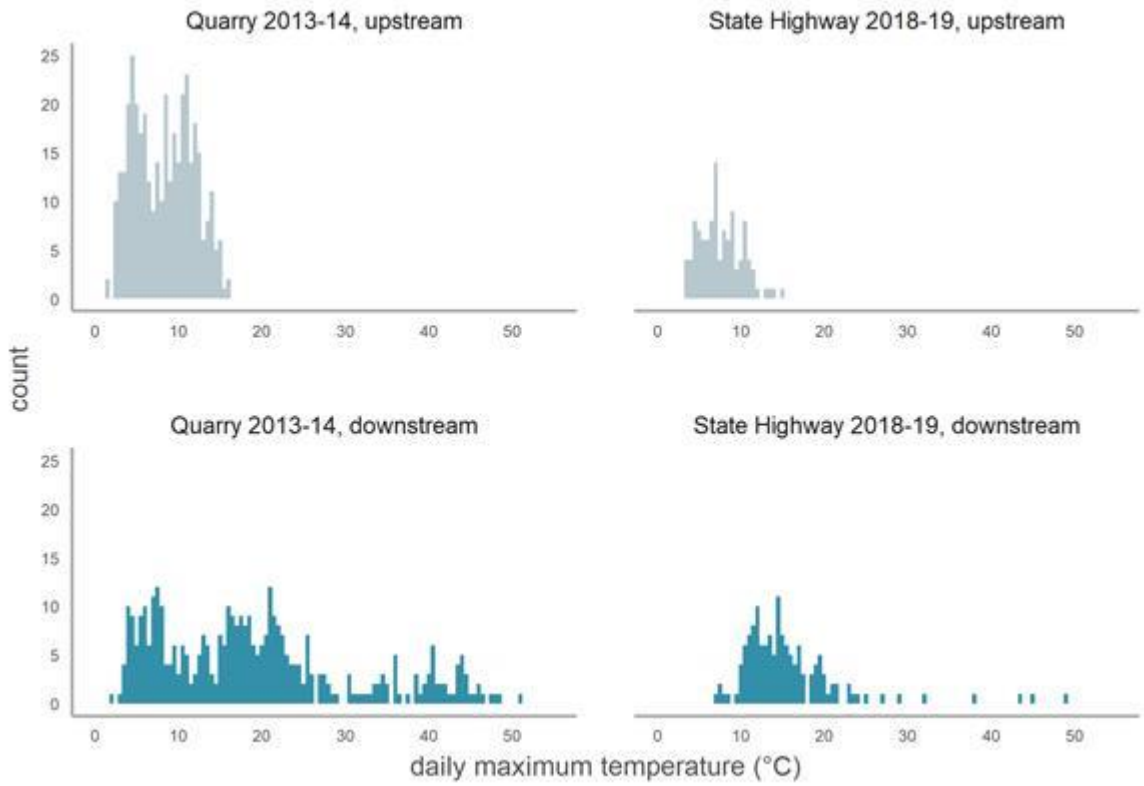

Figure 15 Histogram of daily maximum temperature showing that the downstream data is skewed significantly higher relative to the upstream data.

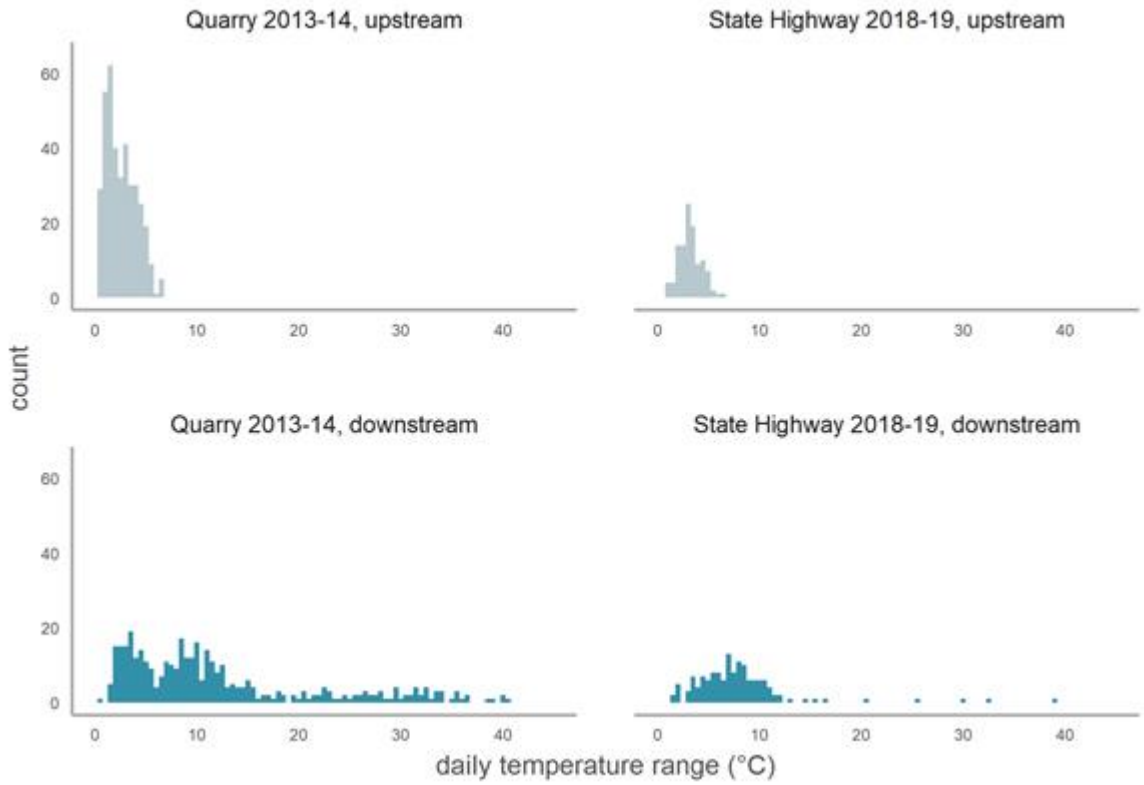

Figure 16 Histogram of daily temperature range showing that, again, the downstream data is skewed significantly higher than the upstream data.

The upstream temperature record and the flow record at this site has been used as a naturalised site for comparison to the two records of water temperature downstream. Based on a combination of the data distribution and local knowledge, it was decided to use the following thresholds for the downstream temperature monitoring data to indicate that the stream is likely to be dry:

- Daily maximum temperature of 25 °C or higher.
- Daily temperature range of 15 °C or higher.

Graphs illustrating the predicted dry spells based on the two potential thresholds identified are shown below in Figure 8 for daily max. downstream temperature of > 25°C, and Figure 17 for daily downstream temperature range of > 15 °C. Both give predicted dry spells which are generally consistent with each other, and with the expected behavior. For instance, the predicted dry spells occur primarily in late summer/early autumn, and generally coincide with periods of low upstream flows, low rainfall, and high air temperatures.

Note differing scales for the time periods and variables illustrated, on both graphs, and that all statistics (maxima, means, ranges and accumulations) are on a daily basis.

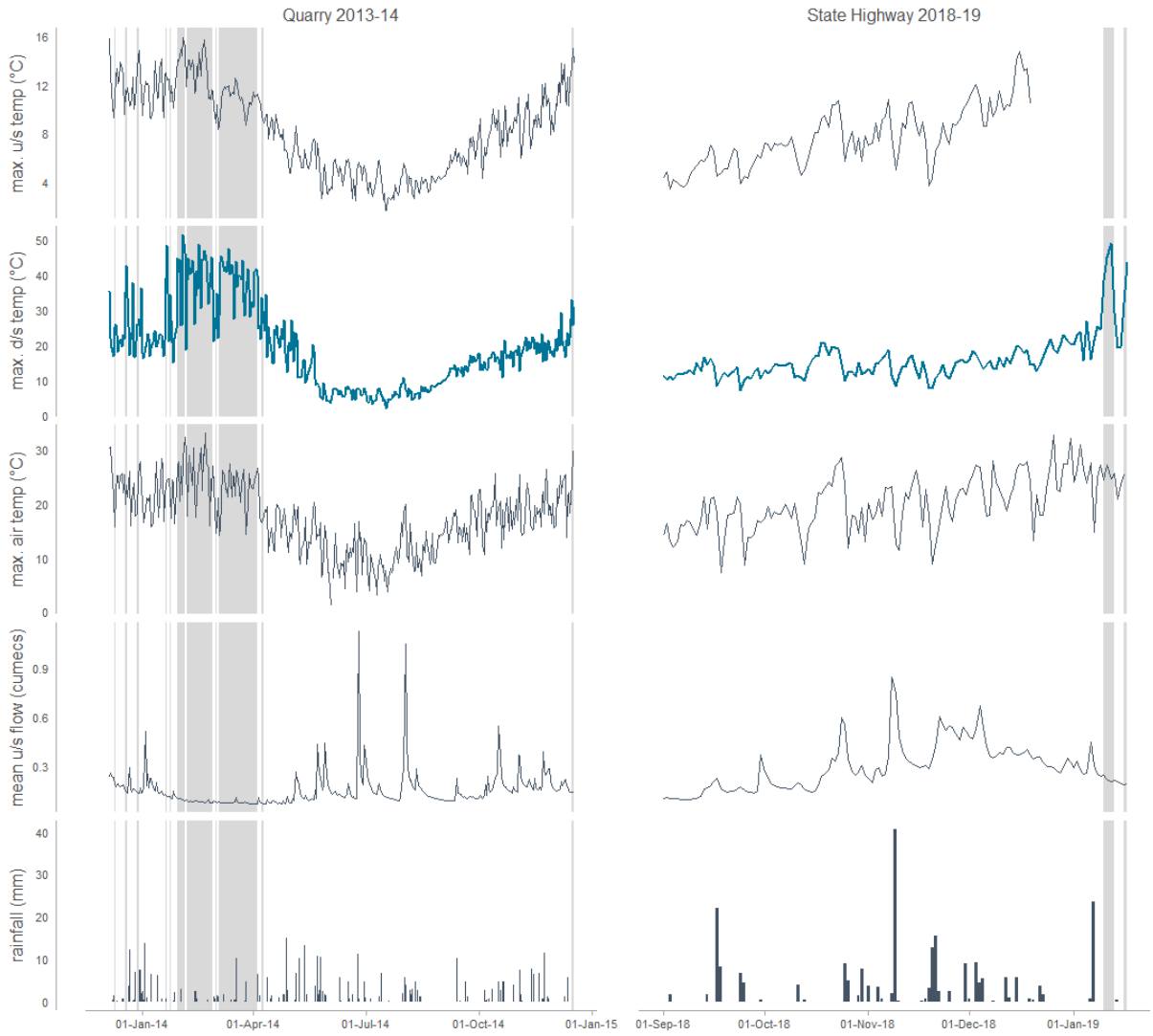

Figure 17 Predicted dry periods (grey shading) based on daily max temperature at the downstream site (blue line) > 25 °C, overlaid on daily maximum water temperature measured at upstream and downstream sites, daily maximum air temperature measured at Cromwell, daily mean flow at the upstream site, and daily rainfall measured at Cromwell. Note differing scales.

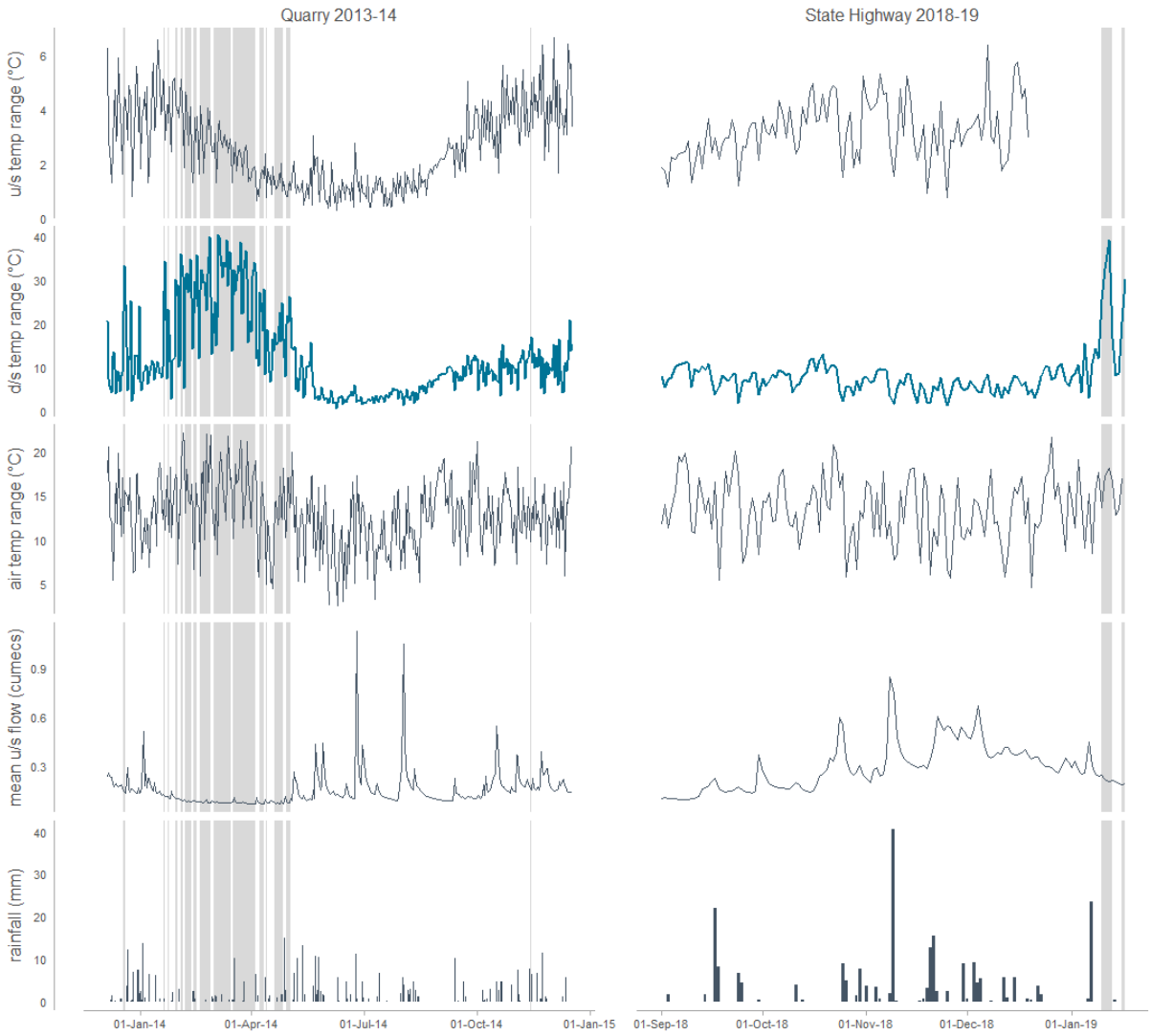

Figure 18 Predicted dry periods (grey shading) based on daily temperature range at the down stream site (blue line) > 15 °C, overlaid on daily water temperature range measured at upstream and downstream sites, daily maximum air temperature measured at Cromwell, daily mean flow at the upstream site, and daily rainfall measured at Cromwell. Note differing scales.

To ground truth the analysis somewhat, a corresponding record of direct observations of when the stream is dry (e.g. from a photos) has been collated. These photos apply only to the 2018/2019 season at the State Highway.

The temperature analysis carried out suggests that both the maximum daily temperature and the daily temperature range have potential as predictors of when the stream is dry downstream.

In summary:

- Absolute and daily temperature records are significantly higher downstream than upstream, particularly during summer and autumn;

- Higher temperatures would be expected downstream regardless of wet or dry conditions due to longer flow path, lower altitude and gravel bed, affecting the thermal regime of the stream in the lower reaches;
- Bimodal or multimodal behavior present in the 2013-14 record of daily max temperature and daily temperature range suggest the affect of dryness was more extreme in this season;
- Predicted dry spells occur primarily in late summer and early autumn, and coincide with period of low upstream flows, low rainfall, and high air temperatures, also coinciding with a general trend of decreasing abstraction at this time of year; and
- Predicted dryness coincides with natural low flows in the upper reaches of the Amisfield Burn, and warmer upstream temperatures.

5. Conclusion and Recommendation

It is likely that there are natural flow losses in the Amisfield Burn Catchment, as the predicted dry behavior determined by the temperature record analysis responds to upstream low flows and warm water temperatures, higher air temperature and low rainfall, all of which increase thermal capacity and promote dry conditions. The stream gauging survey identified that when abstraction is not occurring in the catchment, the geomorphology of the river channel promotes flow losses, as wide gravel channels with alluvial bed morphology promotes flow losses to subsurface zones; the wetted perimeter in the lower reaches was much narrower than the outermost boundaries of the alluvial channel with exposed dry alluvial rock. This coupled with the temperature analysis suggest that any discussions relating to residual flow recommendations and water permit abstraction limits must consider the potential for natural flow losses. It is likely that abstraction in the catchment exacerbates natural flow losses, and a staggered residual flow at the beginning and end of the irrigation season (note, temperature extremes are more likely to occur late in the irrigation season) may prove beneficial to the thermal regime of the stream.

6. Appendices

Gauging Raw Data

Amisfield Burn – AMIS1

Discharge Measurement Summary

Date Generated: Wed Apr 10 2019

File Information

File Name	20190115_AMISUP.WAD
Start Date and Time	2019/01/14 09:21:28

Site Details

Site Name	AMISUP
Operator(s)	CEB

System Information

Sensor Type	FlowTracker
Serial #	P3911
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units (Metric Units)

Distance	m
Velocity	m/s
Area	m^ 2
Discharge	m^ 3/s

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.2%	2.6%
Velocity	2.3%	4.2%
Width	0.2%	0.2%
Method	2.7%	-
# Stations	2.5%	-
Overall	**4.5%**	**5.1%**

Summary

Averaging Int.	40	# Stations	20
Start Edge	LEW	Total Width	3.000
Mean SNR	36.5 dB	Total Area	0.907
Mean Temp	8.95 °C	Mean Depth	0.302
Disch. Equation	Mean-Section	Mean Velocity	0.1550
		Total Discharge	**0.1406**

Measurement Results

St	Clock	Loc	Method	Depth	% Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	% Q
0	09:21	0.00	None	0.210	0.0	0.0	0.0000	0.00	0.0000	0.000	0.0000	0.0
1	09:25	0.30	0.6	0.230	0.6	0.092	-0.0075	1.00	-0.0037	0.066	-0.0002	-0.2
2	*09:26*	*0.45*	*0.6*	*0.230*	*0.6*	*0.092*	*-0.0387*	*1.00*	*-0.0231*	*0.035*	*-0.0008*	*-0.6*
3	*09:28*	*0.60*	*0.6*	*0.250*	*0.6*	*0.100*	*-0.0310*	*1.00*	*-0.0348*	*0.036*	*-0.0013*	*-0.9*
4	09:29	0.75	0.6	0.280	0.6	0.112	-0.0100	1.00	-0.0205	0.040	-0.0008	-0.6
5	*09:31*	*0.90*	*0.6*	*0.340*	*0.6*	*0.136*	*0.0033*	*1.00*	*-0.0033*	*0.047*	*-0.0002*	*-0.1*
6	09:33	1.05	0.6	0.330	0.6	0.132	0.0174	1.00	0.0103	0.050	0.0005	0.4
7	*09:34*	*1.20*	*0.6*	*0.320*	*0.6*	*0.128*	*0.0475*	*1.00*	*0.0324*	*0.049*	*0.0016*	*1.1*
8	09:39	1.35	0.6	0.340	0.6	0.136	0.0816	1.00	0.0645	0.050	0.0032	2.3
9	*09:41*	*1.50*	*0.6*	*0.260*	*0.6*	*0.104*	*0.1496*	*1.00*	*0.1156*	*0.045*	*0.0052*	*3.7*
10	09:42	1.65	0.6	0.320	0.6	0.128	0.2369	1.00	0.1932	0.044	0.0084	6.0
11	*09:44*	*1.80*	*0.6*	*0.390*	*0.6*	*0.156*	*0.2839*	*1.00*	*0.2604*	*0.053*	*0.0139*	*9.9*
12	*09:45*	*1.95*	*0.6*	*0.380*	*0.6*	*0.152*	*0.3801*	*1.00*	*0.3320*	*0.058*	*0.0192*	*13.6*
13	09:47	2.10	0.6	0.400	0.6	0.160	0.4321	1.00	0.4061	0.059	0.0238	16.9
14	*09:49*	*2.25*	*0.6*	*0.400*	*0.6*	*0.160*	*0.5054*	*1.00*	*0.4687*	*0.060*	*0.0281*	*20.0*
15	*09:51*	*2.40*	*0.6*	*0.400*	*0.6*	*0.160*	*0.1667*	*1.00*	*0.3360*	*0.060*	*0.0202*	*14.3*
16	*09:52*	*2.55*	*0.6*	*0.280*	*0.6*	*0.112*	*0.1198*	*1.00*	*0.1432*	*0.051*	*0.0073*	*5.2*
17	*09:54*	*2.70*	*0.6*	*0.250*	*0.6*	*0.100*	*0.0648*	*1.00*	*0.0923*	*0.040*	*0.0037*	*2.6*
18	*09:57*	*2.95*	*0.6*	*0.240*	*0.6*	*0.096*	*0.2055*	*1.00*	*0.1351*	*0.061*	*0.0083*	*5.9*
19	09:57	3.00	None	0.000	0.0	0.0	0.0000	0.00	0.1027	0.006	0.0006	0.4

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Amisfield Burn – AMIS2

Discharge Measurement Summary

Date Generated: Wed Apr 10 2019

File Information

File Name	20190115_AMISMID1.WAD
Start Date and Time	2019/01/14 12:08:21

Site Details

Site Name	AMISMID1
Operator(s)	CEB

System Information

Sensor Type	FlowTracker
Serial #	P3911
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units (Metric Units)

Distance	m
Velocity	m/s
Area	m^ 2
Discharge	m^ 3/s

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.2%	1.4%
Velocity	1.6%	4.1%
Width	0.1%	0.1%
Method	2.2%	-
# Stations	2.3%	-
Overall	**3.7%**	**4.5%**

Summary

Averaging Int.	40	# Stations	22
Start Edge	LEW	Total Width	3.300
Mean SNR	40.1 dB	Total Area	0.715
Mean Temp	12.61 °C	Mean Depth	0.217
Disch. Equation	Mean-Section	Mean Velocity	0.2947
		Total Discharge	**0.2106**

Measurement Results

St	Clock	Loc	Method	Depth	% Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	% Q
0	12:08	0.00	None	0.000	0.0	0.0	0.0000	0.00	0.0000	0.000	0.0000	0.0
1	*12:09*	*0.30*	*0.6*	*0.110*	*0.6*	*0.044*	*-0.0727*	*1.00*	*-0.0363*	*0.017*	*-0.0006*	*-0.3*
2	*12:11*	*0.45*	*0.6*	*0.120*	*0.6*	*0.048*	*-0.0279*	*1.00*	*-0.0503*	*0.017*	*-0.0009*	*-0.4*
3	*12:12*	*0.60*	*0.6*	*0.110*	*0.6*	*0.044*	*0.0590*	*1.00*	*0.0155*	*0.017*	*0.0003*	*0.1*
4	*12:14*	*0.75*	*0.6*	*0.150*	*0.6*	*0.060*	*0.0984*	*1.00*	*0.0787*	*0.020*	*0.0015*	*0.7*
5	*12:15*	*0.90*	*0.6*	*0.200*	*0.6*	*0.080*	*0.1752*	*1.00*	*0.1368*	*0.026*	*0.0036*	*1.7*
6	*12:17*	*1.05*	*0.6*	*0.240*	*0.6*	*0.096*	*0.2150*	*1.00*	*0.1951*	*0.033*	*0.0064*	*3.1*
7	12:18	1.20	0.6	0.290	0.6	0.116	0.3561	1.00	0.2855	0.040	0.0114	5.4
8	12:20	1.35	0.6	0.320	0.6	0.128	0.3447	1.00	0.3504	0.046	0.0160	7.6
9	12:21	1.50	0.6	0.350	0.6	0.140	0.3713	1.00	0.3580	0.050	0.0180	8.5
10	12:23	1.65	0.6	0.370	0.6	0.148	0.3557	1.00	0.3635	0.054	0.0196	9.3
11	12:24	1.80	0.6	0.380	0.6	0.152	0.3646	1.00	0.3601	0.056	0.0203	9.6
12	12:25	1.95	0.6	0.380	0.6	0.152	0.4279	1.00	0.3962	0.057	0.0226	10.7
13	*12:27*	*2.10*	*0.6*	*0.370*	*0.6*	*0.148*	*0.6155*	*1.00*	*0.5217*	*0.056*	*0.0293*	*13.9*
14	*12:28*	*2.25*	*0.6*	*0.330*	*0.6*	*0.132*	*0.3203*	*1.00*	*0.4679*	*0.053*	*0.0246*	*11.7*
15	12:30	2.40	0.6	0.270	0.6	0.108	0.0434	1.00	0.1818	0.045	0.0082	3.9
16	*12:32*	*2.55*	*0.6*	*0.220*	*0.6*	*0.088*	*0.3584*	*1.00*	*0.2009*	*0.037*	*0.0074*	*3.5*
17	*12:33*	*2.70*	*0.6*	*0.140*	*0.6*	*0.056*	*0.2960*	*1.00*	*0.3272*	*0.027*	*0.0088*	*4.2*
18	12:35	2.85	0.6	0.170	0.6	0.068	0.1570	1.00	0.2265	0.023	0.0053	2.5
19	12:36	3.00	0.6	0.120	0.6	0.048	0.2779	1.00	0.2174	0.022	0.0047	2.2
20	12:37	3.15	0.6	0.070	0.6	0.028	0.2198	1.00	0.2488	0.014	0.0035	1.7
21	12:37	3.30	None	0.000	0.0	0.0	0.0000	0.00	0.1099	0.005	0.0006	0.3

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Amisfield Burn – AMIS3

Discharge Measurement Summary

Date Generated: Wed Apr 10 2019

File Information

File Name	20190115_AMISMID2.WAD
Start Date and Time	2019/01/14 13:35:15

Site Details

Site Name	AMISMID2
Operator(s)	CEB

System Information

Sensor Type	FlowTracker
Serial #	P3911
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units (Metric Units)

Distance	m
Velocity	m/s
Area	m^ 2
Discharge	m^ 3/s

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	1.3%
Velocity	1.1%	2.0%
Width	0.1%	0.1%
Method	2.0%	-
# Stations	2.4%	-
Overall	**3.5%**	**2.5%**

Summary

Averaging Int.	40	# Stations	21
Start Edge	LEW	Total Width	3.000
Mean SNR	38.5 dB	Total Area	0.551
Mean Temp	16.77 °C	Mean Depth	0.184
Disch. Equation	Mean-Section	Mean Velocity	0.2775
		Total Discharge	**0.1527**

Measurement Results

St	Clock	Loc	Method	Depth	% Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	% Q
0	13:35	0.00	None	0.000	0.0	0.0	0.0000	0.00	0.0000	0.000	0.0000	0.0
1	*13:36*	*0.15*	*0.6*	*0.140*	*0.6*	*0.056*	*0.0034*	*1.00*	*0.0017*	*0.011*	*0.0000*	*0.0*
2	13:37	0.30	0.6	0.180	0.6	0.072	0.2685	1.00	0.1359	0.024	0.0033	2.1
3	13:39	0.45	0.6	0.200	0.6	0.080	0.3150	1.00	0.2917	0.029	0.0083	5.4
4	13:40	0.60	0.6	0.230	0.6	0.092	0.4220	1.00	0.3685	0.032	0.0119	7.8
5	13:41	0.75	0.6	0.250	0.6	0.100	0.3700	1.00	0.3960	0.036	0.0143	9.3
6	*13:43*	*0.90*	*0.6*	*0.260*	*0.6*	*0.104*	*0.3769*	*1.00*	*0.3734*	*0.038*	*0.0143*	*9.4*
7	13:44	1.05	0.6	0.250	0.6	0.100	0.4172	1.00	0.3970	0.038	0.0152	9.9
8	13:46	1.20	0.6	0.250	0.6	0.100	0.3349	1.00	0.3760	0.038	0.0141	9.2
9	13:47	1.35	0.6	0.250	0.6	0.100	0.2370	1.00	0.2859	0.038	0.0107	7.0
10	13:48	1.50	0.6	0.250	0.6	0.100	0.2837	1.00	0.2603	0.038	0.0098	6.4
11	13:49	1.65	0.6	0.250	0.6	0.100	0.2392	1.00	0.2614	0.038	0.0098	6.4
12	13:51	1.80	0.6	0.180	0.6	0.072	0.2175	1.00	0.2283	0.032	0.0074	4.8
13	13:52	1.95	0.6	0.170	0.6	0.068	0.2497	1.00	0.2336	0.026	0.0061	4.0
14	13:54	2.10	0.6	0.180	0.6	0.072	0.2765	1.00	0.2631	0.026	0.0069	4.5
15	13:55	2.25	0.6	0.170	0.6	0.068	0.2715	1.00	0.2740	0.026	0.0072	4.7
16	13:56	2.40	0.6	0.150	0.6	0.060	0.1873	1.00	0.2294	0.024	0.0055	3.6
17	*13:58*	*2.55*	*0.6*	*0.140*	*0.6*	*0.056*	*0.0535*	*1.00*	*0.1204*	*0.022*	*0.0026*	*1.7*
18	14:02	2.70	0.6	0.100	0.6	0.040	0.2224	1.00	0.1379	0.018	0.0025	1.6
19	14:03	2.85	0.6	0.070	0.6	0.028	0.1692	1.00	0.1958	0.013	0.0025	1.6
20	14:03	3.00	None	0.000	0.0	0.0	0.0000	0.00	0.0846	0.005	0.0004	0.3

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Amisfield Burn – AMIS4

Discharge Measurement Summary

Date Generated: Wed Apr 10 2019

File Information	
File Name	20190115_AMISDOWN.WAD
Start Date and Time	2019/01/14 14:26:10

Site Details	
Site Name	AMISDOWN
Operator(s)	CEB

System Information	
Sensor Type	FlowTracker
Serial #	P3911
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(Metric Units)
Distance	m
Velocity	m/s
Area	m^ 2
Discharge	m^ 3/s

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	3.6%
Velocity	1.3%	4.0%
Width	0.1%	0.1%
Method	1.8%	-
# Stations	2.1%	-
Overall	**3.2%**	**5.4%**

Summary

Averaging Int.	40	# Stations	24
Start Edge	LEW	Total Width	2.600
Mean SNR	36.9 dB	Total Area	0.236
Mean Temp	19.36 °C	Mean Depth	0.091
Disch. Equation	Mean-Section	Mean Velocity	0.3051
		Total Discharge	**0.0720**

Measurement Results

St	Clock	Loc	Method	Depth	% Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	% Q
0	14:26	0.00	None	0.000	0.0	0.0	0.0000	0.00	0.0000	0.000	0.0000	0.0
1	*14:29*	*0.20*	*0.6*	*0.080*	*0.6*	*0.032*	*0.0146*	*1.00*	*0.0073*	*0.008*	*0.0001*	*0.1*
2	14:31	0.30	0.6	0.080	0.6	0.032	0.1181	1.00	0.0663	0.008	0.0005	0.7
3	14:32	0.40	0.6	0.060	0.6	0.024	0.3253	1.00	0.2217	0.007	0.0016	2.2
4	14:33	0.50	0.6	0.060	0.6	0.024	0.2426	1.00	0.2839	0.006	0.0017	2.4
5	14:34	0.60	0.6	0.090	0.6	0.036	0.1137	1.00	0.1781	0.008	0.0013	1.9
6	14:35	0.70	0.6	0.090	0.6	0.036	0.1653	1.00	0.1395	0.009	0.0013	1.7
7	14:37	0.80	0.6	0.100	0.6	0.040	0.2898	1.00	0.2275	0.010	0.0022	3.0
8	14:38	0.90	0.6	0.100	0.6	0.040	0.4408	1.00	0.3653	0.010	0.0037	5.1
9	14:40	1.00	0.6	0.090	0.6	0.036	0.3627	1.00	0.4017	0.010	0.0038	5.3
10	14:41	1.10	0.6	0.090	0.6	0.036	0.3390	1.00	0.3508	0.009	0.0032	4.4
11	14:42	1.20	0.6	0.100	0.6	0.040	0.1990	1.00	0.2690	0.010	0.0026	3.5
12	14:43	1.30	0.6	0.100	0.6	0.040	0.2982	1.00	0.2486	0.010	0.0025	3.5
13	14:44	1.40	0.6	0.100	0.6	0.040	0.2363	1.00	0.2672	0.010	0.0027	3.7
14	14:47	1.50	0.6	0.130	0.6	0.052	0.1589	1.00	0.1976	0.012	0.0023	3.2
15	14:48	1.60	0.6	0.080	0.6	0.032	0.5450	1.00	0.3519	0.011	0.0037	5.1
16	*14:49*	*1.70*	*0.6*	*0.140*	*0.6*	*0.056*	*0.0029*	*1.00*	*0.2739*	*0.011*	*0.0030*	*4.2*
17	14:51	1.80	0.6	0.150	0.6	0.060	0.5809	1.00	0.2919	0.015	0.0042	5.9
18	14:52	1.90	0.6	0.110	0.6	0.044	0.5554	1.00	0.5681	0.013	0.0074	10.3
19	14:54	2.00	0.6	0.120	0.6	0.048	0.5018	1.00	0.5286	0.012	0.0061	8.4
20	*14:55*	*2.10*	*0.6*	*0.140*	*0.6*	*0.056*	*0.3352*	*1.00*	*0.4185*	*0.013*	*0.0054*	*7.6*
21	*14:56*	*2.20*	*0.6*	*0.130*	*0.6*	*0.052*	*0.3511*	*1.00*	*0.3431*	*0.014*	*0.0046*	*6.4*
22	14:57	2.30	0.6	0.090	0.6	0.036	0.5216	1.00	0.4363	0.011	0.0048	6.7
23	14:57	2.60	None	0.000	0.0	0.0	0.0000	0.00	0.2608	0.014	0.0035	4.9

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Breakneck Creek – BREAK1

Discharge Measurement Summary

Date Generated: Wed Apr 10 2019

File Information		Site Details	
File Name	20190115_BREAKUP.WAD	Site Name	BREAKUP
Start Date and Time	2019/01/14 10:37:00	Operator(s)	CEB

System Information	
Sensor Type	FlowTracker
Serial #	P3911
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(Metric Units)
Distance	m
Velocity	m/s
Area	m^ 2
Discharge	m^ 3/s

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	1.7%
Velocity	1.2%	2.2%
Width	0.1%	0.1%
Method	2.0%	-
# Stations	2.5%	-
Overall	**3.6%**	**3.0%**

Summary

Averaging Int.	40	# Stations	20
Start Edge	LEW	Total Width	1.000
Mean SNR	38.5 dB	Total Area	0.161
Mean Temp	10.56 °C	Mean Depth	0.161
Disch. Equation	Mean-Section	Mean Velocity	0.3419
		Total Discharge	**0.0549**

Measurement Results

St	Clock	Loc	Method	Depth	% Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	% Q
0	10:37	0.00	None	0.000	0.0	0.0	0.0000	0.00	0.0000	0.000	0.0000	0.0
1	10:37	0.10	0.6	0.140	0.6	0.056	-0.0001	1.00	0.0000	0.007	0.0000	0.0
2	*10:40*	*0.15*	*0.6*	*0.150*	*0.6*	*0.060*	*-0.0050*	*1.00*	*-0.0025*	*0.007*	*0.0000*	*0.0*
3	10:41	0.20	0.6	0.180	0.6	0.072	0.0391	1.00	0.0170	0.008	0.0001	0.3
4	10:43	0.25	0.6	0.180	0.6	0.072	0.0919	1.00	0.0655	0.009	0.0006	1.1
5	10:44	0.30	0.6	0.170	0.6	0.068	0.1655	1.00	0.1287	0.009	0.0011	2.1
6	10:45	0.35	0.6	0.200	0.6	0.080	0.4154	1.00	0.2904	0.009	0.0027	4.9
7	10:46	0.40	0.6	0.200	0.6	0.080	0.5000	1.00	0.4577	0.010	0.0046	8.3
8	10:48	0.45	0.6	0.190	0.6	0.076	0.4963	1.00	0.4981	0.010	0.0049	8.9
9	10:49	0.50	0.6	0.180	0.6	0.072	0.5622	1.00	0.5292	0.009	0.0049	8.9
10	10:50	0.55	0.6	0.170	0.6	0.068	0.5161	1.00	0.5391	0.009	0.0047	8.6
11	10:51	0.60	0.6	0.180	0.6	0.072	0.4295	1.00	0.4728	0.009	0.0041	7.5
12	10:53	0.65	0.6	0.180	0.6	0.072	0.5058	1.00	0.4676	0.009	0.0042	7.7
13	10:54	0.70	0.6	0.180	0.6	0.072	0.5375	1.00	0.5216	0.009	0.0047	8.6
14	10:55	0.75	0.6	0.160	0.6	0.064	0.3126	1.00	0.4250	0.009	0.0036	6.6
15	10:56	0.80	0.6	0.170	0.6	0.068	0.2592	1.00	0.2859	0.008	0.0024	4.3
16	*10:58*	*0.85*	*0.6*	*0.200*	*0.6*	*0.080*	*0.4007*	*1.00*	*0.3299*	*0.009*	*0.0031*	*5.6*
17	*10:59*	*0.90*	*0.6*	*0.190*	*0.6*	*0.076*	*0.4506*	*1.00*	*0.4256*	*0.010*	*0.0042*	*7.6*
18	*11:03*	*0.95*	*0.6*	*0.120*	*0.6*	*0.048*	*0.6214*	*1.00*	*0.5360*	*0.008*	*0.0042*	*7.6*
19	11:03	1.00	None	0.000	0.0	0.0	0.0000	0.00	0.3107	0.003	0.0009	1.7

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

TECHNICAL COMMENT

Date: 28 May 2019 Our Ref: 18249; 18454

To: Zoe McCormack, Senior Planner, Landpro Ltd

From: Christina Bright, Environmental Scientist, Landpro Ltd

Subject: Hydrological assessment prepared for the water users of the Park Burn; Smallburn Limited and Rockburn Wines Limited.

---

1 Background

Smallburn Limited and Rockburn Wines Limited wishes to obtain resource consent from the Otago Regional Council to continue abstracting water from the Park Burn for pasture and crop irrigation. The consent numbers relevant to this assessment of the Park Burn are RM15.007.01, 94394, 98527.V1 and 98526.V1. A summary of these consents is provided in Table 1.

The purpose of this report is to provide a hydrological assessment of the Park Burn. Specifically, to:

- Estimate the natural loses and gains of a preidentified reach of the Park Burn; and
- Determine the flow of a spring fed tributary of the Park Burn.

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Table 1: Summary of permits relevant to hydrological assessment of Park Burn.

Permit	Permit holder	Creek	Consented Rate of take/volume	Location of intake (NZTM 2000)
RM15.007.01	Smallburn Limited	Park Burn	222 L/s, 800m^3/hr, 19,200m^3/day, 572,000m^3/month, 2,816,817m^3/year	1300148E 5017551N
94394	Smallburn Limited	Park Burn	100,000 L/hr (27.8 L/s)	1300148E 5017551N
98526.V1	Rockburn Wines Limited	Park Burn	112 L/s (combined with 98527.V1)	1302341E 5016695N
98527.V1 (retake of 95789)	Rockburn Wines Limited	Tributary of Park Burn	112 L/s (combined with 98526.V1)	1302342E 5016200N

Figure 1 shows the location of the creek in relation to the Smallburn Limited, and Rockburn Wines Limited properties and other significant watercourses in the vicinity.

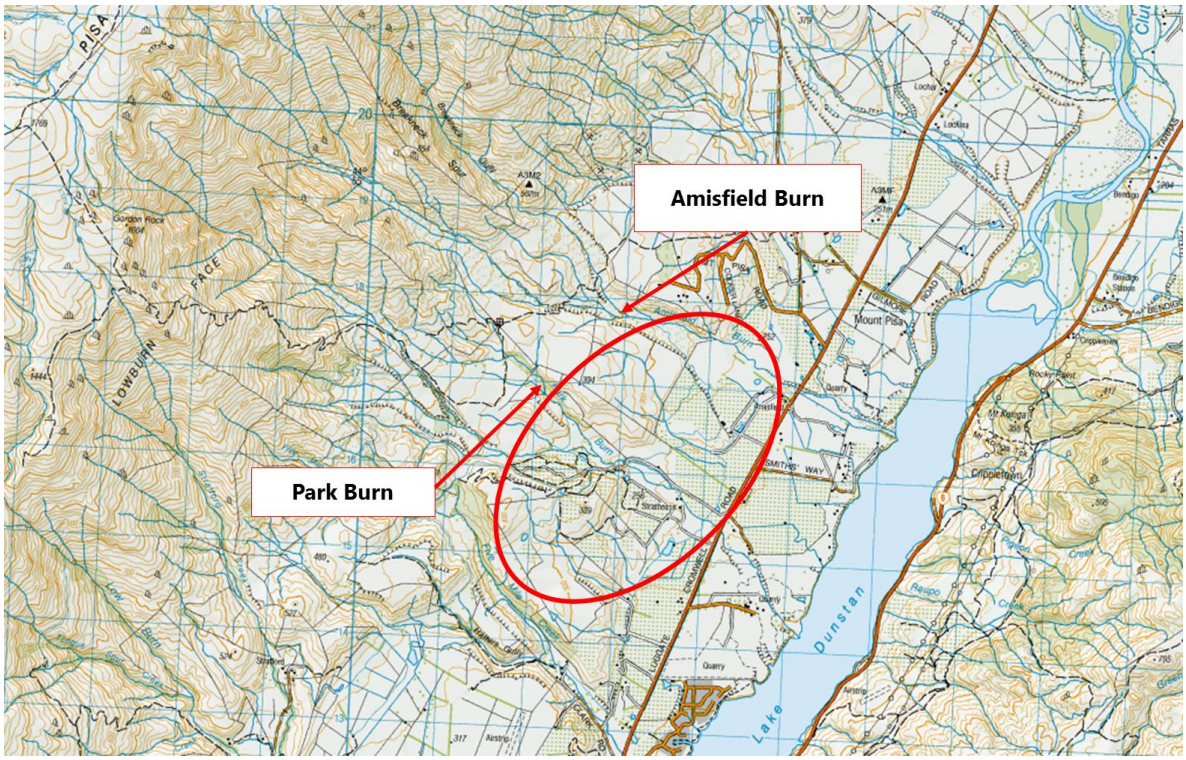


Figure 1 Site location map in relation to surface water bodies and general location of properties (red circle). [Source: NZ topo map]

2 Catchment Description

The properties are located in the Clutha River catchment in central Otago and flows in a general north to south direction with a catchment area of 21,022 km^2. The catchment drains a significant area of the Otago region with its headwaters characteristically mountainous, bordering the Southern Alps in the far north-west, gradually becoming more rolling through the midsections and in contrast the lower reaches of the catchment are dominated by alluvial plans and lowland. The Park Burn Catchment is situated in the northern Upper Clutha Catchment and drains directly to Lake Dunstan, an artificial lake constructed as the result of damming the Clutha River at Clyde. The area receives a mean annual rainfall of approximately 430 mm.

The Clutha River is the second longest river in New Zealand and the longest in the South Island, stretching 338 kilometers. The Clutha has a mean annual flow of 575 m3/s of which around 75% is derived from the main lake catchments in the north of the catchment, including lakes Hawea, Wanaka and Wakatipu. Flow rates range between 120,000 L/s (minimum) and 1,250,000 L/s (maximum) throughout the year. There are approximately 24 natural and artificial lakes within the Clutha Catchment, and therefore flow rates vary significantly.

2.1 Localised hydrology

The permit holders irrigate land northwest of Lake Dunstan along the Pisa Range. The Park Burn flows from the northwest to the southeast through the Lowburn Face of Pisa Range terminating at Lake Dunstan. The stream traverses steep land in the headwaters of the creek with river terraces and gorges, falling onto relatively flat to rolling land at the foothills of the range.

The hydrology of the Park Burn is fed primarily by runoff from the surrounding Pisa Range, and in winter and spring runoff is snow melt driven. The Park Burn originates high up in a gully approximately 1,700 meters above sea level (mamsl) where it drains down to 200 mamsl at its confluence with Lake Dunstan.

There has been no previous flow monitoring carried out on the Park Burn and no continuous monitoring records. Although records are available for the nearby Amisfield catchment where since October 2013, a continuous flow monitoring site has been maintained by the Otago Regional Council above the upper most point of take in that catchment. The Amisfield Burn is located parallel to the Park Burn and, on all accounts, the two catchments are very similar. The Amisfield Burn continuous record shows the creek follows the typical behavior of steep headwater streams, with fast to respond event specific hydrographs (Figure 2). Based on this record, basic flow statistics have been determined (Table 2).

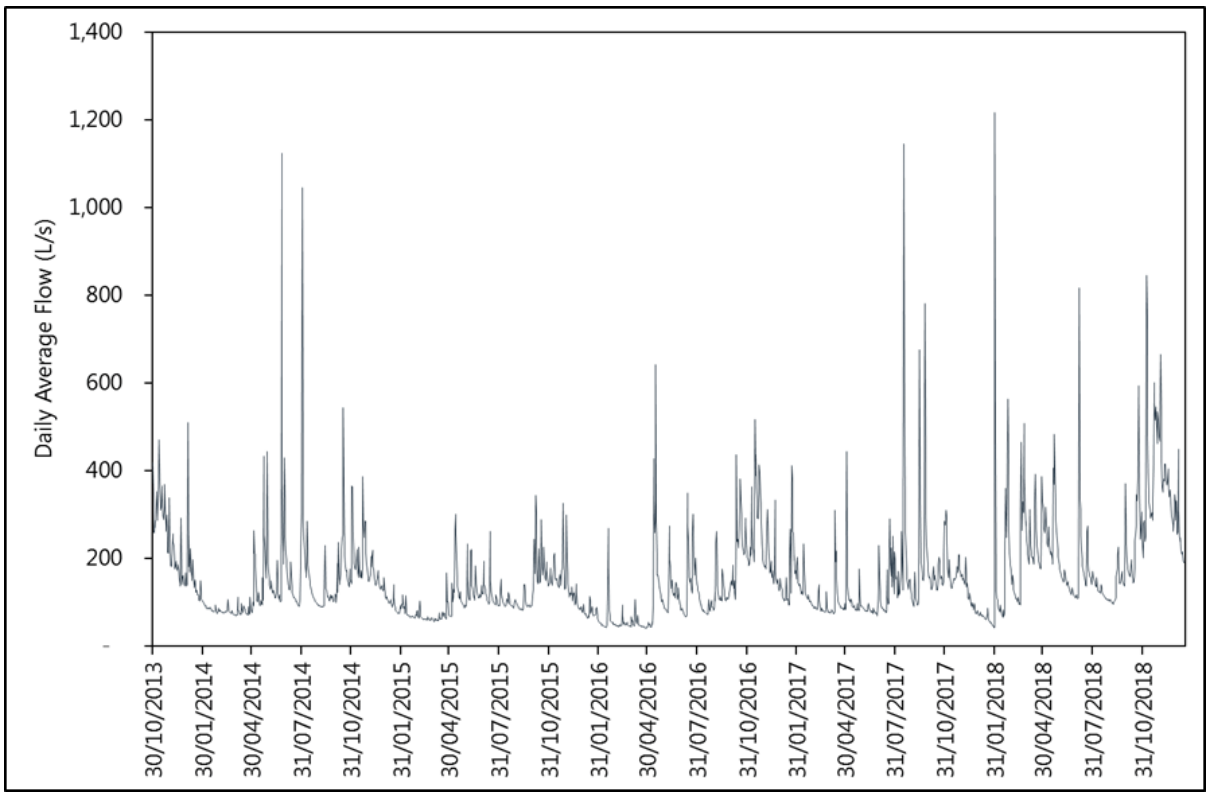


Figure 2: Daily flow for Amisfield Burn monitoring site located in upper reaches of the catchment, unaffected by abstraction.

The Otago Regional Council also maintain flow monitoring sites on the Low Burn, located nearby. The flow statistics for the Low Burn are also shown in Table 2.

Table 2: Flow statistics for the Amisfield Burn and Low Burn. [Source: ORC, data records]

Site Name	7-day mean annual low flow (L/s)	Mean flow (L/s)
Amisfield Burn (upstream of all abstraction)	65	162
Low Burn at Chinamans Gully	84*	304*

*Affected by upstream irrigation takes

3 Data Collection and Results

3.1 Site flow assessments

A series of flow gaugings were undertaken on the 16 January 2019 by Landpro Limited to determine the quantity of water flowing at various sites throughout the Park Burn. A total of six reaches were selected. These were located upstream from the upper most water take, through the middle reaches of the Park Burn, and in the lower catchment on the lowland alluvial gravels. A flow assessment was also

conducted on a tributary that met the Park Burn mid-way down, anecdotally said to be spring fed. For the duration of the survey and for 24 hours prior the applicants ceased taking water from their respective points of take, this enabled the survey to identify where in the catchment loses of water to the sub-surface zone were occurring.

The data was collected in accordance with the National Environmental Monitoring Standard: Open Channel Flow Measurement. This data, included in the appendices, has been used on an as-is basis.

3.2 Results

3.2.1 Gauging sites

PARK1:

Flow gauging site approximately 2 metres upstream from point of take diversion. Both the true left and right sides of the creek are predominately grass with scrub. Bed consisted of cobble sized rocks largely covered in algae.

PARK2:

Flow gauging site downstream from point of take diversion. The true left bank is low consisting of low-lying grass whereas the true right bank is much higher with scrub. River bed was predominately covered in weed. Step-pool type geomorphology up stream with fallen tree branches.

PARK3:

Flow gauging site mid-way down Park Burn. True left and right banks are low with grazed grass. Willow trees downstream. River bed composed of boulders and cobbles with minimal algae covering. Downstream fallen trees observed.

PARK4:

True right and left bank are low lying predominately grassy with stream edge being less well defined and relatively swampy. River bed consisted of boulders and cobbles with high algae covering.

PARK5:

Flow gauging site on an unnamed tributary approximately 500 metres upstream from Park Burn confluence. True left and right sides of stream very swampy with low lying grass. River bed was sandy with silt, few pebbles with algae covering.

PARK6:

Flow gauging site approximately 10 meters downstream from state highway 6 crossing. True left and right side of stream well overgrown with grass and woody vegetation. River bed composed of few boulders, primarily pebbles and cobbles.

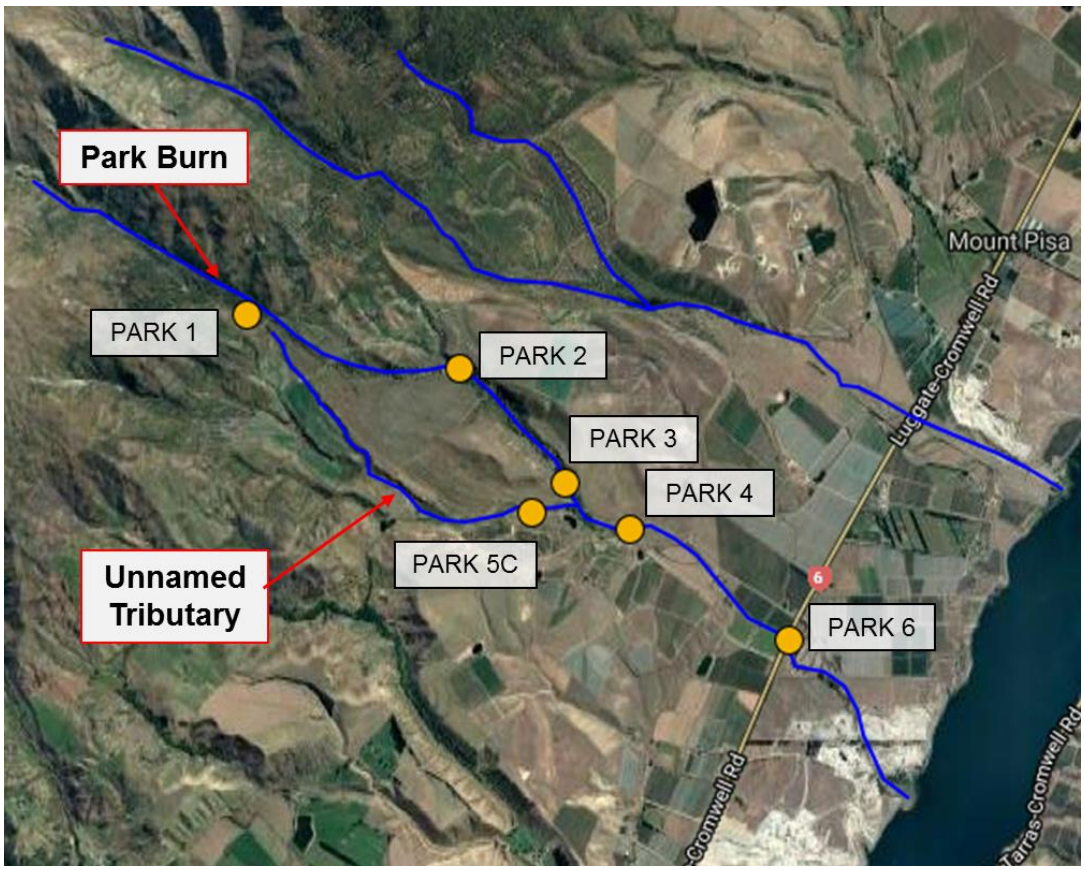


Figure 3: Location of flow gauging sites in the Park Burn Catchment.

3.2.2 Site Photos

Figure 4: Park Burn upstream of upper point of take (PARK1), left: looking upstream and right: looking downstream.

Figure 5: Park Burn downstream from upstream point of take (PARK2), left: looking upstream and right: looking downstream.

Figure 6: Park Burn upstream unnamed tributary (PARK3), left: looking upstream and right: looking downstream.

Figure 7: Park Burn downstream unnamed tributary (PARK4), left: looking upstream and right: looking downstream.

Figure 8: Park Burn downstream State Highway 6 (PARK6), left: looking upstream and right: looking at stream bed in downstream direction.

Figure 9: Park Burn unnamed tributary, upstream of confluence with Park Burn (PARK5C), left: looking upstream and right: looking at stream bed in downstream direction.

3.2.3 Measured Flow

Table 3: Field measurements for Park Burn.

Easting (NZTM 2000)	Northing (NZTM 2000)	Date	Measured flow (L/sec)	†Gauging uncertainty flow range (L/sec)	Site Name
1300141	5017562	16/01/2019	92.4	90 – 95	Park1
1301722	5017250	16/01/2019	113.5	110 – 117	Park2
1302532	5016438	16/01/2019	83.5	80 - 87	Park3
1303013	5016126	16/01/2019	85.9	83 - 89	Park4
1302290	5016214	16/01/2019	10.1	10 - 11	Park5C
1304218	5015366	16/01/2019	43.5	42 – 45	Park6

†As with many flow measurements there is a degree of uncertainty and New Zealand Standards use ISO5168:2005 and ISO748:2007 to report on the accuracy of gaugings.

4 Hydrology Assessment

4.1 Flow Assessment

At the time of the site visit (16 January 2019), daily average flow at the nearest rated flow site which located in the upper reaches of the Amisfield Burn was 184 L/s while the Low Burn (another nearby rated flow site at Chinamans Gully) was approximately 348 L/s. These flows are only slightly above the mean flow of the Amisfield Burn and Low Burn (144L/s and 267L/s respectively) indicating the assessment was carried out during a period of slightly above average flow conditions, likely typical of the spring transition into summer.

To identify potentially losing/gaining reaches of the Amisfield Burn, flow measurements were collected longitudinally down the Park Burn main stem, and included a gauging on an unnamed tributary of the Park Burn believed to be spring fed. A differential gauging approach was used to identify differences in flow that related to either a gain or loss of water.

A losing or gaining reach as identified in this assessment refers to the assumption that flow is interacting with the hyporheic zone (sub-surface zone) due to factors such as topography, geology, and geomorphology that control the movement of water, including flow and wetted perimeter. The assessment assumes that this hyporheic water may or may not be specifically linked to groundwater as groundwater level data is not available or not included as part of this assessment. This zone of sub-surface and surface water exchange (hyporheic zone) is relatively active where water ways traverses step gullies passing down to river valleys and alluvial lowlands. In these types of environments, the hyporheic zone can be more substantial, and the typically porous alluvial media may extend for a larger depth, creating more space for underflow into the sub-surface environment to occur. Under hot dry weather conditions, this water rarely returns to the surface due to intense evaporation processes that occur as water comes to the surface.

Results of the flow gaugings undertaken on the Park Burn suggest that flow in the lower reaches of the Park Burn interacts with the hyporheic zone and fine loose alluvial gravels, and that this provides a mechanism for water loss to the sub-surface zone. The survey identified a net loss of 70 L/s between the confluence of the Park Burn with the unnamed tributary and below the State Highway 6 as summarized in Figure 3.

General survey findings:

- Gauging was carried out above the upper point of take in the Park Burn Catchment and determined flow to be 92 L/s. Flow increased to 114 L/s downstream, below the confluence of

the main stem Park Burn and other unnamed smaller tributaries. This was an expected gain in flow as this is typical behavior as water runs off the hills, and under the current environmental conditions these smaller tributaries have a small quantity of water to contribute. These small tributaries contributed approximately 21 L/s.

- As the creek traversed the less steep terrain of the alluvial plain, losses of water were measured between the foothills and the state highway. A total of 30 L/s was unaccounted for approximately 1.2km downstream from where the gain in flow was observed.
- A small gain was measured approximately 600m downstream from the first observed loss. This site is located downstream of the confluence of the Park Burn with an unnamed tributary that had a measured flow of 10 L/s. The addition of 10 L/s from the unnamed tributary had minimal impact on the Park Burn main stem flow, and likely is the result of a small increase in flow. There is an unaccounted loss of this 10L/s in the Park Burn mainstem and is likely due to the swamp like nature of this tributary and its confluence with the Park Burn.
- Flow measured below the State Highway 6 crossing was substantially lower than the measured flow upstream, and a measured loss of 42 L/s was recorded.
- Because of the quarry located downstream of the state highway, flows further downstream of the state highway crossing were not determined, and therefore whether flows reached the Clutha or not on this day is unknown. Given the disturbed nature of this area from quarry activities, and susceptibility of the alluvial gravels to absorb water, it is unlikely the 44 L/s measured below the state highway made it to Lake Dunstan. This is supported by similar work undertaken in the Amisfield Burn where it was possible to access the lower reaches. In this situation it was found that an even greater amount of flow was completely lost to the gravels. The underlying geology of Amisfield Burn and Park Burn are the same which supports the conclusion that flow in Park Burn does not reach Lake Dunstan under these conditions.

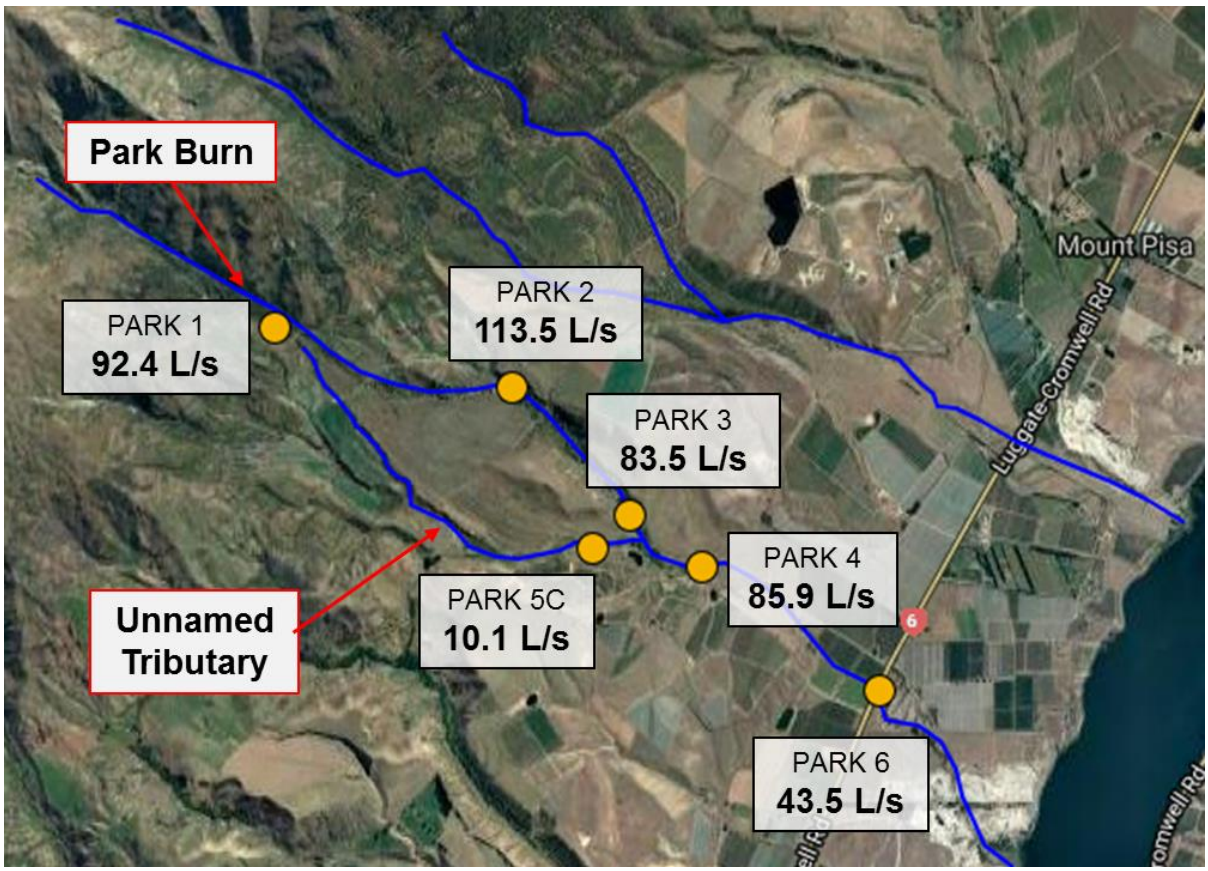


Figure 10: Flow gauging sites with measured flows.

The geology of the catchment is variable, with schist geology in the upper headwaters, and loess and alluvium in the lower reaches (Figure 14). Loess and fine alluvial gravels are typically quite porous and therefore can leak surface water to the sub-surface zone or groundwater zone, and therefore likely promote the interaction of surface water with the sub-surface zone in the Park Burn catchment in the lower reaches. explaining the observed water loses.

Figure 11: Geology of the Park Burn Catchment (source: MfE Geology).

4.2 Temperature Records

Temperature is often used as a tracer for groundwater surface water interactions, as temperature can be used to identify locations of exchange between surface water and groundwater. Air temperature is commonly used as a comparison to identify the thermal behavior of a stream. Flow affects water temperature due to the difference in the thermal capacity of water and air, and therefore a larger volume of water, deeper water, and faster moving water will dampen the effects of the surrounding air temperature and incoming solar radiation. Likewise, rainfall patterns can help understand the thermal behavior of streams.

A series of water temperature records exists for the Amisfield Burn Catchment, a neighboring catchment that is topographically similar to the Park Burn. The temperature records that are available for the Amisfield Burn can be used to make inferences about the Park Burn. There are three records of temperature for the Amisfield Burn:

- Upstream flow monitoring site (2013 – current)
- State Highway 6 Bridge (2018 – current)
- Amisfield Burn Quarry (2013 – 2014)

An in depth investigation was carried out in the Amisfield Burn using these temperature records to assess the validity of using temperature monitoring data as a proxy to determine when the stream is dry in the lower reaches and understand flow loses in the catchment. It was expected that one or both of the following metrics could be used to predict the absence of water in the lower reaches of the stream:

- Daily maximum temperature measured at the downstream site (quarry or State Highway). Very high temperatures are likely to indicate water is not present; and or,
- Daily temperature range (i.e. max. minus min. temperature) at the downstream site. The presence of water is expected to moderate temperature extremes, and therefore large variations in temperature during the course of a day may indicate that the stream is dry.

The investigation suggested that both the maximum daily temperature and the daily temperature range have potential as predictors of when the stream is dry downstream in the Amisfield Burn Catchment, and in summary:

- Absolute and daily temperature records are significantly higher downstream than upstream, particularly during summer and autumn;
- Higher temperatures would be expected downstream regardless of wet or dry conditions due to longer flow path, lower altitude and gravel bed, affecting the thermal regime of the stream in the lower reaches;
- Bimodal or multimodal behavior present in the 2013-14 record of daily max temperature and daily temperature range suggest the affect of dryness was more extreme in this season;
- Predicted dry spells occur primarily in late summer and early autumn, and coincide with period of low upstream flows, low rainfall, and high air temperatures, also coinciding with a general trend of decreasing abstraction at this time of year; and
- Predicted dryness coincides with natural low flows in the upper reaches of the Amisfield Burn, and warmer upstream temperatures.

The Park Burn likely behaves in a similar way to the Amisfield Burn based on similarities in topography and geology. Typically when observations of dryness are made in the Amisfield Burn, dryness is also observed in the Park Burn.

5 Conclusion and Recommendation

It is likely that there are natural flow losses in the Park Burn Catchment, as the predicted dry behavior determined by the temperature record analysis in the Amisfield Burn catchment responds to upstream low flows and warm water temperatures, higher air temperature and low rainfall, all of which increase

thermal capacity and promote dry conditions. The stream gauging survey identified that when abstraction is not occurring in the catchment, the geomorphology of the river channel promotes flow losses, as wide gravel channels with alluvial bed morphology allows losses to subsurface zones; the wetted perimeter in the lower reaches was much narrower than the outermost boundaries of the alluvial channel with exposed dry alluvial rock. This coupled with the temperature analysis suggest that any discussions relating to residual flow recommendations and water permit abstraction limits must consider the potential for natural flow losses. It is likely that abstraction in the catchment exacerbates natural flow losses, and a staggered residual flow at the beginning and end of the irrigation season (note, temperature extremes are more likely to occur late in the irrigation season) may prove beneficial to the thermal regime of the stream.

6 Appendices

Gauging Raw Data

Park Burn – Site PARK1

Discharge Measurement Summary

Date Generated: Wed Apr 10 2019

File Information	
File Name	20190116_PARK1.WAD
Start Date and Time	2019/01/15 08:40:18

Site Details	
Site Name	PARK1
Operator(s)	CEB

System Information	
Sensor Type	FlowTracker
Serial #	P3911
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(Metric Units)
Distance	m
Velocity	m/s
Area	m^ 2
Discharge	m^ 3/s

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	1.4%
Velocity	1.0%	3.1%
Width	0.1%	0.1%
Method	1.8%	-
# Stations	2.0%	-
Overall	**3.0%**	**3.5%**

Summary

Averaging Int.	40	# Stations	26
Start Edge	LEW	Total Width	1.300
Mean SNR	38.2 dB	Total Area	0.213
Mean Temp	11.03 °C	Mean Depth	0.164
Disch. Equation	Mean-Section	Mean Velocity	0.4342
		Total Discharge	**0.0924**

Measurement Results

St	Clock	Loc	Method	Depth	% Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	% Q
0	08:40	0.00	None	0.000	0.0	0.0	0.0000	0.00	0.0000	0.000	0.0000	0.0
1	08:42	0.10	0.6	0.090	0.6	0.036	-0.0068	1.00	-0.0034	0.005	0.0000	0.0
2	*08:43*	*0.15*	*0.6*	*0.100*	*0.6*	*0.040*	*0.0296*	*1.00*	*0.0114*	*0.005*	*0.0001*	*0.1*
3	*08:45*	*0.20*	*0.6*	*0.130*	*0.6*	*0.052*	*0.0693*	*1.00*	*0.0494*	*0.006*	*0.0003*	*0.3*
4	08:47	0.25	0.6	0.120	0.6	0.048	0.0530	1.00	0.0611	0.006	0.0004	0.4
5	*08:49*	*0.30*	*0.6*	*0.160*	*0.6*	*0.064*	*0.0841*	*1.00*	*0.0685*	*0.007*	*0.0005*	*0.5*
6	08:50	0.35	0.6	0.180	0.6	0.072	0.1199	1.00	0.1020	0.009	0.0009	0.9
7	08:51	0.40	0.6	0.180	0.6	0.072	0.5768	1.00	0.3483	0.009	0.0031	3.4
8	08:52	0.45	0.6	0.180	0.6	0.072	0.5490	1.00	0.5629	0.009	0.0051	5.5
9	08:54	0.50	0.6	0.210	0.6	0.084	0.4033	1.00	0.4761	0.010	0.0046	5.0
10	08:55	0.55	0.6	0.200	0.6	0.080	0.5651	1.00	0.4842	0.010	0.0050	5.4
11	08:56	0.60	0.6	0.200	0.6	0.080	0.7171	1.00	0.6411	0.010	0.0064	6.9
12	08:57	0.65	0.6	0.200	0.6	0.080	0.7342	1.00	0.7256	0.010	0.0073	7.9
13	*08:58*	*0.70*	*0.6*	*0.190*	*0.6*	*0.076*	*0.6530*	*1.00*	*0.6936*	*0.010*	*0.0068*	*7.3*
14	09:00	0.75	0.6	0.200	0.6	0.080	0.6484	1.00	0.6507	0.010	0.0063	6.9
15	*09:01*	*0.80*	*0.6*	*0.180*	*0.6*	*0.072*	*0.6459*	*1.00*	*0.6471*	*0.010*	*0.0061*	*6.7*
16	09:02	0.85	0.6	0.210	0.6	0.084	0.6556	1.00	0.6507	0.010	0.0063	6.9
17	*09:04*	*0.90*	*0.6*	*0.210*	*0.6*	*0.084*	*0.0331*	*1.00*	*0.3443*	*0.011*	*0.0036*	*3.9*
18	09:06	0.95	0.6	0.220	0.6	0.088	0.4190	1.00	0.2260	0.011	0.0024	2.6
19	*09:07*	*1.00*	*0.6*	*0.180*	*0.6*	*0.072*	*0.6030*	*1.00*	*0.5110*	*0.010*	*0.0051*	*5.5*
20	09:08	1.05	0.6	0.170	0.6	0.068	0.5847	1.00	0.5938	0.009	0.0052	5.6
21	09:10	1.10	0.6	0.170	0.6	0.068	0.4608	1.00	0.5227	0.009	0.0044	4.8
22	09:11	1.15	0.6	0.190	0.6	0.076	0.4202	1.00	0.4405	0.009	0.0040	4.3
23	09:12	1.20	0.6	0.180	0.6	0.072	0.4753	1.00	0.4477	0.009	0.0041	4.5
24	09:14	1.25	0.6	0.160	0.6	0.064	0.3740	1.00	0.4246	0.009	0.0036	3.9
25	09:14	1.30	None	0.000	0.0	0.0	0.0000	0.00	0.1870	0.004	0.0007	0.8

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Park Burn – Site PARK2

Discharge Measurement Summary

Date Generated: Wed Apr 10 2019

File Information	
File Name	20190116_PARK2.WAD
Start Date and Time	2019/01/15 09:54:10

Site Details	
Site Name	PARK2
Operator(s)	CEB

System Information	
Sensor Type	FlowTracker
Serial #	P3911
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(Metric Units)
Distance	m
Velocity	m/s
Area	m^ 2
Discharge	m^ 3/s

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	2.2%
Velocity	1.1%	2.3%
Width	0.1%	0.1%
Method	1.8%	-
# Stations	2.2%	-
Overall	**3.2%**	**3.3%**

Summary

Averaging Int.	40	# Stations	23
Start Edge	LEW	Total Width	3.200
Mean SNR	42.9 dB	Total Area	0.364
Mean Temp	13.54 °C	Mean Depth	0.114
Disch. Equation	Mean-Section	Mean Velocity	0.3118
		Total Discharge	**0.1135**

Measurement Results

St	Clock	Loc	Method	Depth	% Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	% Q
0	09:54	0.00	None	0.000	0.0	0.0	0.0000	0.00	0.0000	0.000	0.0000	0.0
1	*09:54*	*0.15*	*0.6*	*0.060*	*0.6*	*0.024*	*0.0000*	*1.00*	*0.0000*	*0.005*	*0.0000*	*0.0*
2	09:55	0.30	0.6	0.090	0.6	0.036	0.0010	1.00	0.0005	0.011	0.0000	0.0
3	*09:56*	*0.45*	*0.6*	*0.080*	*0.6*	*0.032*	*0.2163*	*1.00*	*0.1086*	*0.013*	*0.0014*	*1.2*
4	09:59	0.60	0.6	0.080	0.6	0.032	0.2863	1.00	0.2513	0.012	0.0030	2.7
5	10:00	0.75	0.6	0.100	0.6	0.040	0.3290	1.00	0.3076	0.014	0.0042	3.7
6	10:02	0.90	0.6	0.090	0.6	0.036	0.3177	1.00	0.3233	0.014	0.0046	4.1
7	10:03	1.05	0.6	0.100	0.6	0.040	0.3028	1.00	0.3102	0.014	0.0044	3.9
8	10:04	1.20	0.6	0.090	0.6	0.036	0.4648	1.00	0.3838	0.014	0.0055	4.8
9	10:06	1.35	0.6	0.080	0.6	0.032	0.5177	1.00	0.4912	0.013	0.0063	5.5
10	10:07	1.50	0.6	0.090	0.6	0.036	0.5175	1.00	0.5176	0.013	0.0066	5.8
11	10:08	1.65	0.6	0.070	0.6	0.028	0.4838	1.00	0.5006	0.012	0.0060	5.3
12	10:09	1.80	0.6	0.100	0.6	0.040	0.4292	1.00	0.4565	0.013	0.0058	5.1
13	10:11	1.95	0.6	0.100	0.6	0.040	0.6186	1.00	0.5239	0.015	0.0079	6.9
14	10:12	2.10	0.6	0.100	0.6	0.040	0.5744	1.00	0.5965	0.015	0.0089	7.9
15	*10:13*	*2.25*	*0.6*	*0.120*	*0.6*	*0.048*	*0.4045*	*1.00*	*0.4894*	*0.017*	*0.0081*	*7.1*
16	10:15	2.40	0.6	0.160	0.6	0.064	0.2910	1.00	0.3477	0.021	0.0073	6.4
17	10:16	2.55	0.6	0.180	0.6	0.072	0.2302	1.00	0.2606	0.026	0.0066	5.9
18	10:17	2.70	0.6	0.210	0.6	0.084	0.3028	1.00	0.2665	0.029	0.0078	6.9
19	10:19	2.85	0.6	0.200	0.6	0.080	0.2267	1.00	0.2647	0.031	0.0081	7.2
20	10:20	3.00	0.6	0.200	0.6	0.080	0.2448	1.00	0.2357	0.030	0.0071	6.2
21	10:22	3.15	0.6	0.190	0.6	0.076	0.0192	1.00	0.1320	0.029	0.0039	3.4
22	10:22	3.20	None	0.000	0.0	0.0	0.0000	0.00	0.0096	0.005	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Park Burn – Site PARK3

Discharge Measurement Summary

Date Generated: Wed Apr 10 2019

File Information	
File Name	20190116_PARK3.WAD
Start Date and Time	2019/01/15 12:21:46

Site Details	
Site Name	PARK3
Operator(s)	CEB

System Information	
Sensor Type	FlowTracker
Serial #	P3911
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(Metric Units)
Distance	m
Velocity	m/s
Area	m^ 2
Discharge	m^ 3/s

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	3.4%
Velocity	1.3%	4.9%
Width	0.1%	0.1%
Method	2.1%	-
# Stations	2.4%	-
Overall	**3.6%**	**6.0%**

Summary

Averaging Int.	40	# Stations	21
Start Edge	LEW	Total Width	2.000
Mean SNR	39.1 dB	Total Area	0.287
Mean Temp	17.19 °C	Mean Depth	0.144
Disch. Equation	Mean-Section	Mean Velocity	0.2910
		Total Discharge	**0.0835**

Measurement Results

St	Clock	Loc	Method	Depth	% Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	% Q
0	12:21	0.00	None	0.000	0.0	0.0	0.0000	0.00	0.0000	0.000	0.0000	0.0
1	*12:22*	*0.10*	*0.6*	*0.130*	*0.6*	*0.052*	*0.0275*	*1.00*	*0.0137*	*0.007*	*0.0001*	*0.1*
2	*12:24*	*0.20*	*0.6*	*0.160*	*0.6*	*0.064*	*0.1151*	*1.00*	*0.0713*	*0.015*	*0.0010*	*1.2*
3	*12:25*	*0.30*	*0.6*	*0.220*	*0.6*	*0.088*	*0.4913*	*1.00*	*0.3032*	*0.019*	*0.0058*	*6.9*
4	*12:26*	*0.40*	*0.6*	*0.200*	*0.6*	*0.080*	*0.1861*	*1.00*	*0.3387*	*0.021*	*0.0071*	*8.5*
5	*12:28*	*0.50*	*0.6*	*0.180*	*0.6*	*0.072*	*0.0765*	*1.00*	*0.1313*	*0.019*	*0.0025*	*3.0*
6	12:29	0.60	0.6	0.150	0.6	0.060	0.0181	1.00	0.0473	0.017	0.0008	0.9
7	*12:30*	*0.70*	*0.6*	*0.180*	*0.6*	*0.072*	*0.1877*	*1.00*	*0.1029*	*0.017*	*0.0017*	*2.0*
8	12:31	0.80	0.6	0.180	0.6	0.072	0.3433	1.00	0.2655	0.018	0.0048	5.7
9	12:32	0.90	0.6	0.180	0.6	0.072	0.4361	1.00	0.3897	0.018	0.0070	8.4
10	12:33	1.00	0.6	0.190	0.6	0.076	0.6606	1.00	0.5483	0.019	0.0101	12.1
11	12:34	1.10	0.6	0.200	0.6	0.080	0.5759	1.00	0.6182	0.020	0.0121	14.4
12	12:36	1.20	0.6	0.160	0.6	0.064	0.4349	1.00	0.5054	0.018	0.0091	10.9
13	12:37	1.30	0.6	0.170	0.6	0.068	0.2080	1.00	0.3214	0.017	0.0053	6.4
14	*12:38*	*1.40*	*0.6*	*0.170*	*0.6*	*0.068*	*0.0294*	*1.00*	*0.1187*	*0.017*	*0.0020*	*2.4*
15	*12:40*	*1.50*	*0.6*	*0.080*	*0.6*	*0.032*	*0.3791*	*1.00*	*0.2042*	*0.013*	*0.0026*	*3.1*
16	12:41	1.60	0.6	0.100	0.6	0.040	0.4016	1.00	0.3903	0.009	0.0035	4.2
17	12:42	1.70	0.6	0.080	0.6	0.032	0.3553	1.00	0.3784	0.009	0.0034	4.1
18	12:43	1.80	0.6	0.080	0.6	0.032	0.2369	1.00	0.2961	0.008	0.0024	2.8
19	12:45	1.90	0.6	0.060	0.6	0.024	0.2912	1.00	0.2640	0.007	0.0018	2.2
20	12:45	2.00	None	0.000	0.0	0.0	0.0000	0.00	0.1456	0.003	0.0004	0.5

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Park Burn – Site PARK4

Discharge Measurement Summary

Date Generated: Wed Apr 10 2019

File Information

File Name	20190116_PARK4.WAD
Start Date and Time	2019/01/15 13:14:02

Site Details

Site Name	PARK4
Operator(s)	CEB

System Information

Sensor Type	FlowTracker
Serial #	P3911
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units (Metric Units)

Distance	m
Velocity	m/s
Area	m^ 2
Discharge	m^ 3/s

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	2.7%
Velocity	1.3%	1.7%
Width	0.1%	0.1%
Method	2.2%	-
# Stations	2.6%	-
Overall	**3.8%**	**3.3%**

Summary

Averaging Int.	40	# Stations	19
Start Edge	LEW	Total Width	1.800
Mean SNR	41.0 dB	Total Area	0.269
Mean Temp	19.61 °C	Mean Depth	0.149
Disch. Equation	Mean-Section	Mean Velocity	0.3196
		Total Discharge	**0.0859**

Measurement Results

St	Clock	Loc	Method	Depth	% Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	% Q
0	13:14	0.00	None	0.000	0.0	0.0	0.0000	0.00	0.0000	0.000	0.0000	0.0
1	13:15	0.15	0.6	0.130	0.6	0.052	0.0136	1.00	0.0068	0.010	0.0001	0.1
2	*13:17*	*0.20*	*0.6*	*0.130*	*0.6*	*0.052*	*0.0445*	*1.00*	*0.0290*	*0.007*	*0.0002*	*0.2*
3	*13:18*	*0.30*	*0.6*	*0.140*	*0.6*	*0.056*	*0.0695*	*1.00*	*0.0570*	*0.014*	*0.0008*	*0.9*
4	*13:19*	*0.40*	*0.6*	*0.140*	*0.6*	*0.056*	*0.0831*	*1.00*	*0.0763*	*0.014*	*0.0011*	*1.2*
5	*13:20*	*0.50*	*0.6*	*0.160*	*0.6*	*0.064*	*0.1513*	*1.00*	*0.1172*	*0.015*	*0.0018*	*2.0*
6	*13:21*	*0.60*	*0.6*	*0.200*	*0.6*	*0.080*	*0.1611*	*1.00*	*0.1562*	*0.018*	*0.0028*	*3.3*
7	13:22	0.70	0.6	0.190	0.6	0.076	0.2432	1.00	0.2021	0.020	0.0039	4.6
8	13:24	0.80	0.6	0.170	0.6	0.068	0.2679	1.00	0.2555	0.018	0.0046	5.4
9	13:25	0.90	0.6	0.190	0.6	0.076	0.3547	1.00	0.3113	0.018	0.0056	6.5
10	13:26	1.00	0.6	0.170	0.6	0.068	0.4808	1.00	0.4177	0.018	0.0075	8.8
11	13:28	1.10	0.6	0.120	0.6	0.048	0.5802	1.00	0.5305	0.015	0.0077	9.0
12	13:29	1.20	0.6	0.110	0.6	0.044	0.7459	1.00	0.6630	0.012	0.0076	8.9
13	*13:30*	*1.30*	*0.6*	*0.160*	*0.6*	*0.064*	*0.5572*	*1.00*	*0.6515*	*0.014*	*0.0088*	*10.2*
14	13:32	1.40	0.6	0.180	0.6	0.072	0.6613	1.00	0.6092	0.017	0.0104	12.1
15	*13:33*	*1.50*	*0.6*	*0.180*	*0.6*	*0.072*	*0.4375*	*1.00*	*0.5494*	*0.018*	*0.0099*	*11.5*
16	*13:34*	*1.60*	*0.6*	*0.200*	*0.6*	*0.080*	*0.3253*	*1.00*	*0.3814*	*0.019*	*0.0072*	*8.4*
17	*13:36*	*1.70*	*0.6*	*0.150*	*0.6*	*0.060*	*0.2483*	*1.00*	*0.2868*	*0.018*	*0.0050*	*5.8*
18	13:36	1.80	None	0.000	0.0	0.0	0.0000	0.00	0.1241	0.008	0.0009	1.1

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Park Burn unnamed tributary – Site PARK5C

Discharge Measurement Summary

Date Generated: Wed Apr 10 2019

File Information	
File Name	20190116_PARK5C.WAD
Start Date and Time	2019/01/15 11:31:57

Site Details	
Site Name	PARK5C
Operator(s)	CEB

System Information	
Sensor Type	FlowTracker
Serial #	P3911
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units	(Metric Units)
Distance	m
Velocity	m/s
Area	m^ 2
Discharge	m^ 3/s

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.3%	0.4%
Velocity	1.4%	2.7%
Width	0.2%	0.2%
Method	2.3%	-
# Stations	3.1%	-
Overall	**4.3%**	**2.9%**

Summary

Averaging Int.	40	# Stations	16
Start Edge	LEW	Total Width	0.900
Mean SNR	28.9 dB	Total Area	0.215
Mean Temp	21.05 °C	Mean Depth	0.239
Disch. Equation	Mean-Section	Mean Velocity	0.0470
		Total Discharge	**0.0101**

Measurement Results

St	Clock	Loc	Method	Depth	% Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	% Q
0	11:31	0.00	None	0.000	0.0	0.0	0.0000	0.00	0.0000	0.000	0.0000	0.0
1	*11:33*	*0.10*	*0.6*	*0.230*	*0.6*	*0.092*	*0.0000*	*1.00*	*0.0000*	*0.012*	*0.0000*	*0.0*
2	11:36	0.20	0.6	0.250	0.6	0.100	-0.0095	1.00	-0.0047	0.024	-0.0001	-1.1
3	*11:37*	*0.25*	*0.6*	*0.250*	*0.6*	*0.100*	*0.0043*	*1.00*	*-0.0026*	*0.013*	*0.0000*	*-0.3*
4	11:39	0.30	0.6	0.250	0.6	0.100	0.0347	1.00	0.0195	0.013	0.0002	2.4
5	11:40	0.35	0.6	0.260	0.6	0.104	0.0670	1.00	0.0508	0.013	0.0006	6.4
6	11:41	0.40	0.6	0.260	0.6	0.104	0.0599	1.00	0.0634	0.013	0.0008	8.2
7	11:44	0.45	0.6	0.260	0.6	0.104	0.0455	1.00	0.0527	0.013	0.0007	6.8
8	11:47	0.50	0.6	0.270	0.6	0.108	0.0456	1.00	0.0455	0.013	0.0006	6.0
9	11:48	0.55	0.6	0.280	0.6	0.112	0.0610	1.00	0.0533	0.014	0.0007	7.3
10	11:49	0.60	0.6	0.280	0.6	0.112	0.0749	1.00	0.0679	0.014	0.0010	9.4
11	11:50	0.65	0.6	0.290	0.6	0.116	0.0798	1.00	0.0773	0.014	0.0011	10.9
12	11:52	0.70	0.6	0.300	0.6	0.120	0.0872	1.00	0.0835	0.015	0.0012	12.2
13	11:53	0.75	0.6	0.310	0.6	0.124	0.0924	1.00	0.0898	0.015	0.0014	13.6
14	11:55	0.80	0.6	0.300	0.6	0.120	0.0749	1.00	0.0836	0.015	0.0013	12.7
15	11:55	0.90	None	0.000	0.0	0.0	0.0000	0.00	0.0374	0.015	0.0006	5.6

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Appendix C: Park Burn & Amisfield Burn aquatic ecology assessment

WATER WAYS
CONSULTING LTD

Park Burn and Amisfield Burn Ecological Considerations for Residual Flows

PREPARED FOR: LANDPRO LIMITED

DATE: MAY 2019

REPORT NUMBER: 78-2019

Table of Contents

List of Figures

1 INTRODUCTION

1.1 Consent applicants

Smallburn Limited, Pisa Holdings Ltd (and other consent holders), Parkburn Water Company Limited and Lowburn Land Holdings Limited Partnership wish to obtain resource consent from the Otago Regional Council to continue abstracting water from the Amisfield Burn and Park Burn for irrigation. The current consents also provide for discharges to water courses for the abstracted water for retakes that are further downstream. The locations of the present takes and discharges are shown in Figure 1. Further details regarding the takes and discharges can be sourced from the corresponding deemed permit replacement applications prepared by Landpro.

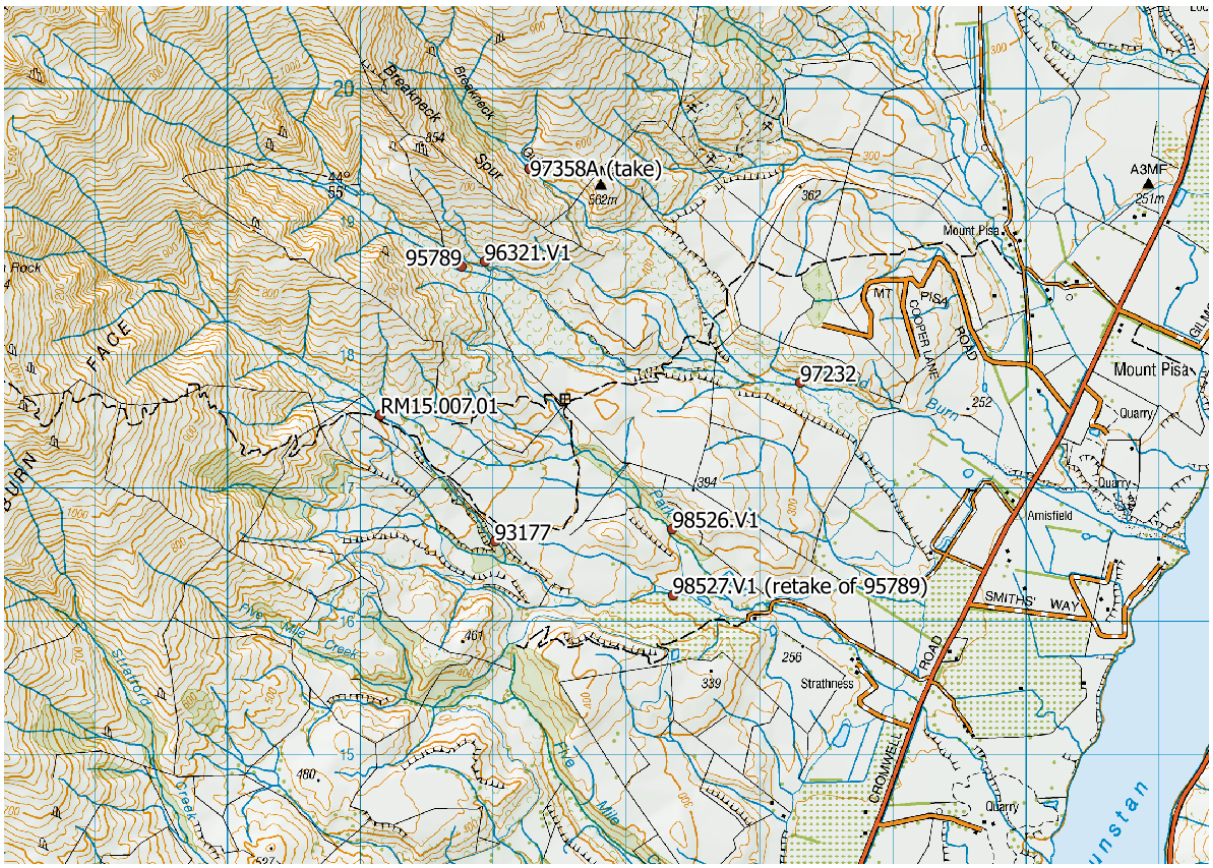


Figure 1: Take and discharge locations in the Park Burn and Amisfield Burn.

The purpose of this report is to provide an assessment of the freshwater fish communities in the Park Burn and Amisfield Burn and to make recommendations for residual flows at the most appropriate locations in these two stream catchments.

1.2 Residual Flow Policy

The Otago Regional Council Water Plan has a residual flow policy – Policy 6.4.7.

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.

Explanation

This policy requires an assessment of whether there is any need to apply a condition on any consent to take water requiring the passing of a residual flow at the point of take. Such a residual flow condition may be applied in addition to a minimum flow applied under this Plan.

A residual flow condition may be applied to any take for community water supply purposes, or on a take from a tributary stream that has different flow characteristics from the main stem.

Residual flows will be applied and monitoring arrangements made on a case-by-case basis having regard to any effects on aquatic ecosystem values and the natural character of the source water body.

Principal reasons for adopting

This policy is adopted to enable the taking of water while providing for instream values of the source water body, particularly with respect to community water supplies and takes from tributaries that have different flow characteristics from the main stem under low flow conditions.

2 METHODS

An electric fishing fish survey was conducted at sites in the Park Burn, Amisfield Burn and Breakneck Creek on the 18 April 2019. Electric fishing was conducted using a NIWA EFM 300 back pack electric fishing machine. Fishing was conducted, when possible, along reaches 30-50 m long. Sampling included pool, riffle, run and cascade habitat when present. All fish caught were identified to species level and lengths were measured for all fish captured before they were returned to the stream.

Physical habitat descriptions were made for each site including the size of the stream, the state of the riparian vegetation, flow conditions (e.g., high, low, dry) and the nature of the stream bed substrate.

Water colour and turbidity were also noted at each site. A Garmin GPS was used to record the location of each site.

To provide further data and to assess historic fish communities the New Zealand Freshwater Fish Database (NZFFD) was also searched for fish records for the catchments.

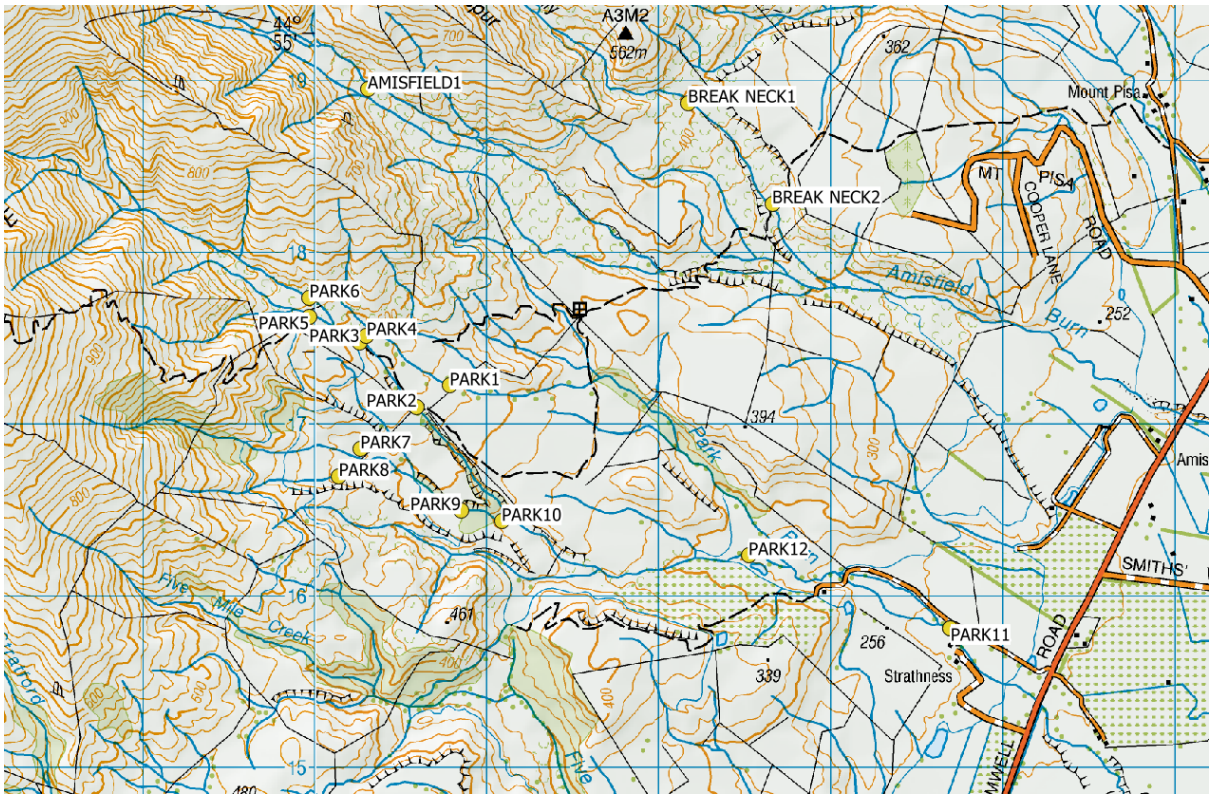


Figure 2: Park Burn and Amisfield fish survey sites, April 2019.

3 RESULTS

3.1 New Zealand Freshwater Fish Database Records

The NZFFD has eight records for the Amisfield Burn. The earliest three are from 1996 and report brown trout, upland bully and koaro present in the stream. Brown trout were present at all three sites (Figure 3) and were noted as abundant at two of the sites, a single large koaro (Figure 4) was caught at one site and upland bully was common at one site (Figure 5). Later surveys in 2001 reported no fish at State Highway 6 (Figure 6) and brown trout and a single koaro were present at the same site as the koaro was found in 1996. In 2018, a further three sites were fished with brown trout present at two sites, upland bully at one and no fish recorded at the most upstream site fished in the Amisfield Burn.

Three records exist for the Park Burn, all of which record brown trout as the only fish species present. Two sites were fished in 1996 and the last in 2018. The first two were in the mid-reaches of the catchment and the most recent situated near the upper most water take.

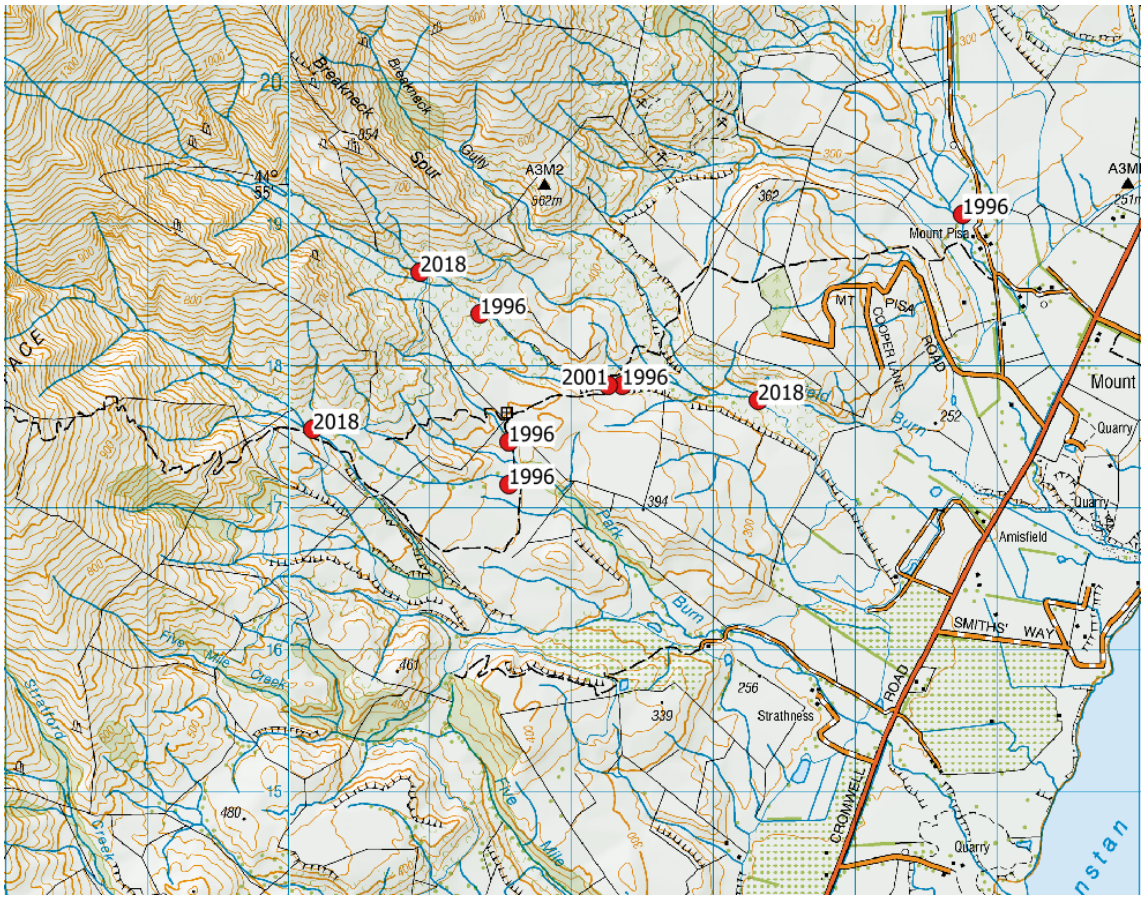


Figure 3: Brown trout locations reported in the NZFFD in the Park Burn and Amisfield Burn.

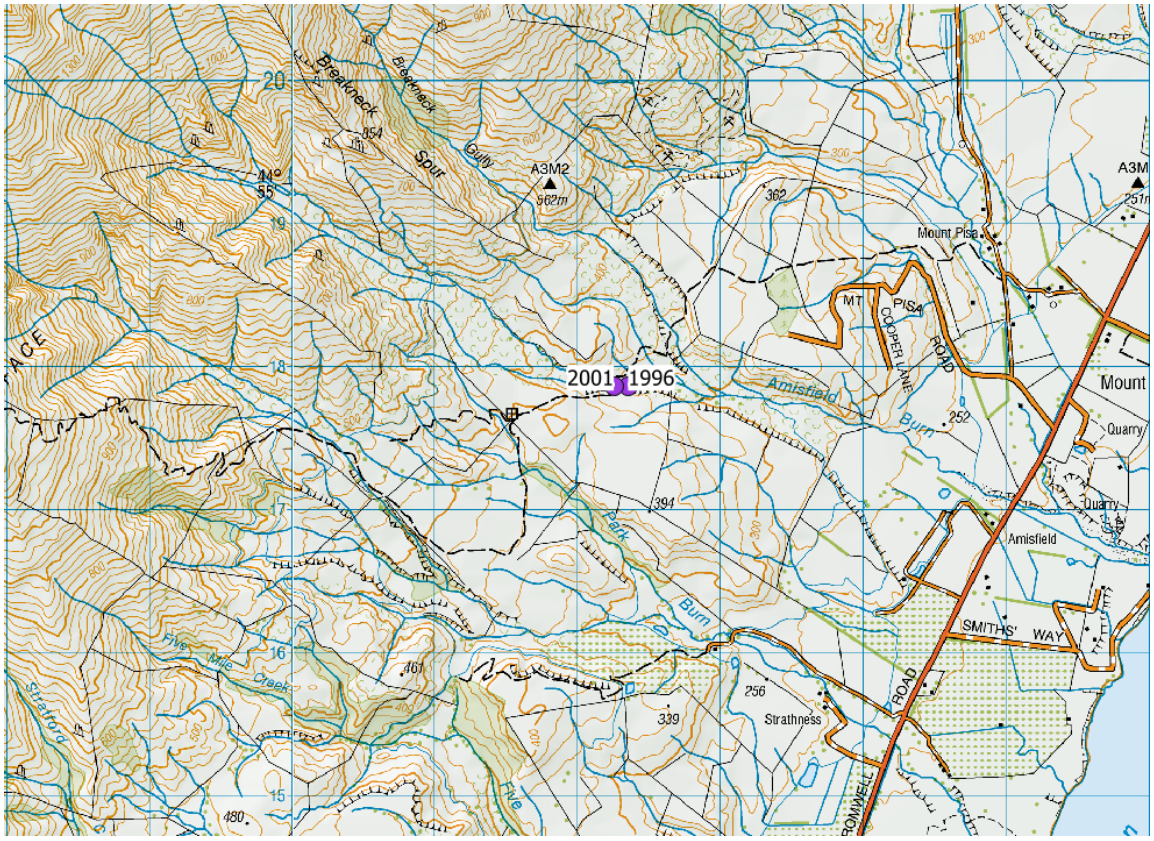


Figure 4: Koaro locations reported in the NZFFD in the Park Burn and Amisfield Burn.

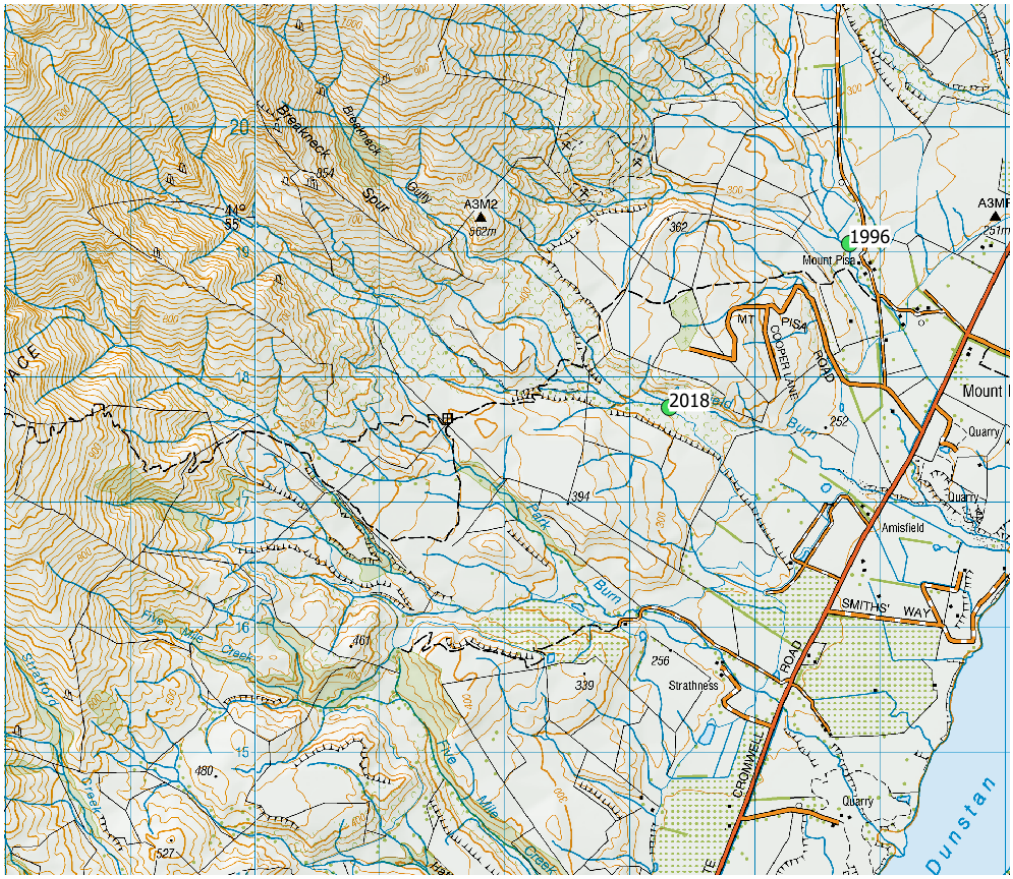


Figure 5: Upland bully locations reported in the NZFFD in the Park Burn and Amisfield Burn.

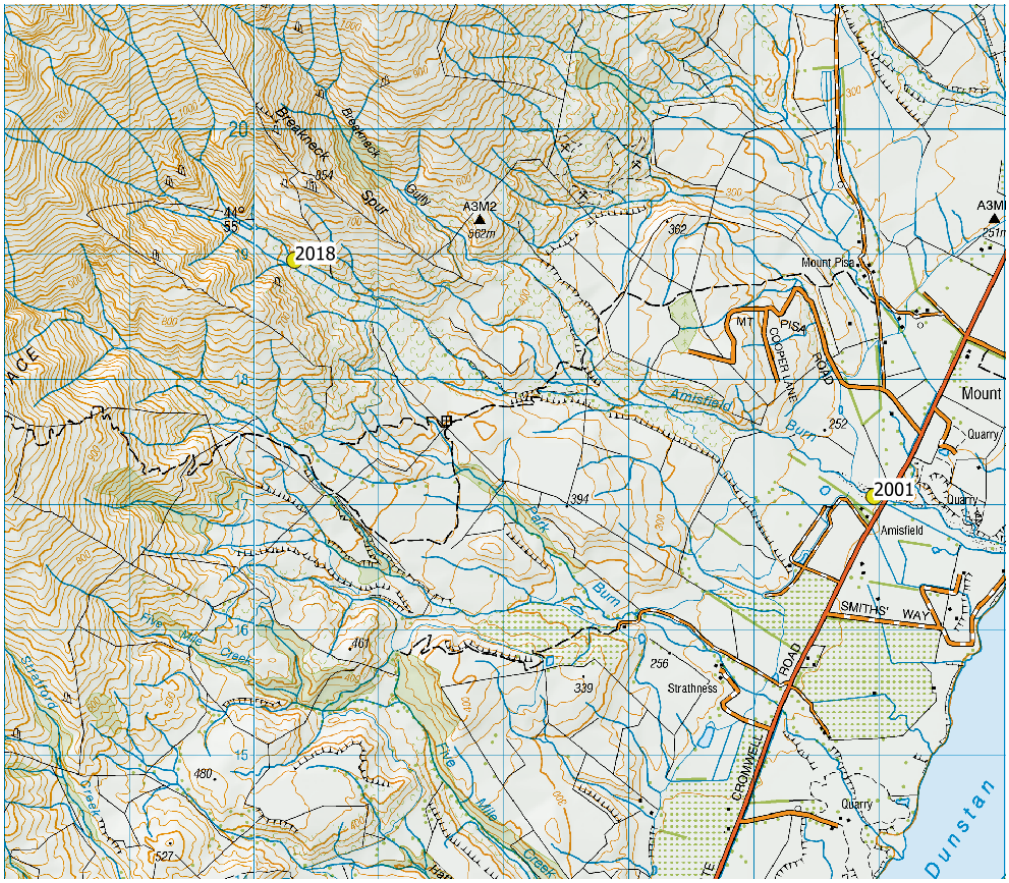


Figure 6: No fish present locations reported in the NZFFD in the Park Burn and Amisfield Burn.

The NZFFD records indicate that brown trout are common in the Amisfield Burn. Native fish, koaro and upland bully, are rare in the catchment. In the Park Burn the limited records indicate brown trout are present but no other fish have been recorded. Two key findings are that fish were absent from the upper Amisfield Burn and to date the fish surveys have not located Clutha flathead galaxiids a critically threatened native fish (Dunn et al 2018).

3.2 2019 Fish Survey

The fish survey concentrated on the Park Burn as there are few existing records for this catchment. Twelve sites were visited in the Park Burn and a further three in Amisfield Burn and Breakneck Creek (Figure 2).

The fish surveys caught brown trout at the two Breakneck Creek sites (a tributary branch of the Amisfield Burn), and at the Park Burn sites 1, 4, 6, 9 and 11 (Figure 8). A single rainbow trout was caught at Park Burn site 11 (Figure 9). No native fish were caught at any sites. Amisfield Burn Site 1 and Park Burn sites 2, 3, 5, 7, 8,10 and 12 had no fish present. Only the Park Burn site 2 was dry. Sites 3 and 5 in the head waters were sites on a small seepage stream with high macrophyte cover and little useable habitat for fish. Park Burn Sites 7 and 8 were small head water streams with very small flows.

Both these streams were in an area being developed for pasture and the riparian vegetation was highly modified by the clearance of rosehip briar and other shrubs to allow pasture development. Park Burn Sites 10 and 12 were reaches of stream with good flow that appeared to be supplemented by upstream water discharges. Site 11 in the lower reaches of Park Burn was a straightened modified channel that had reduced the habitat diversity. Further downstream, the Park Burn was flowing at the State Highway 6.

Amisfield Burn at the State Highway 6 bridge was dry and no water could be seen in an upstream or downstream direction (Figure 10). This stream section also appears to be straigthened and had reduced habitat diversity.

Figure 7: Brown trout caught at Park Burn site 9.

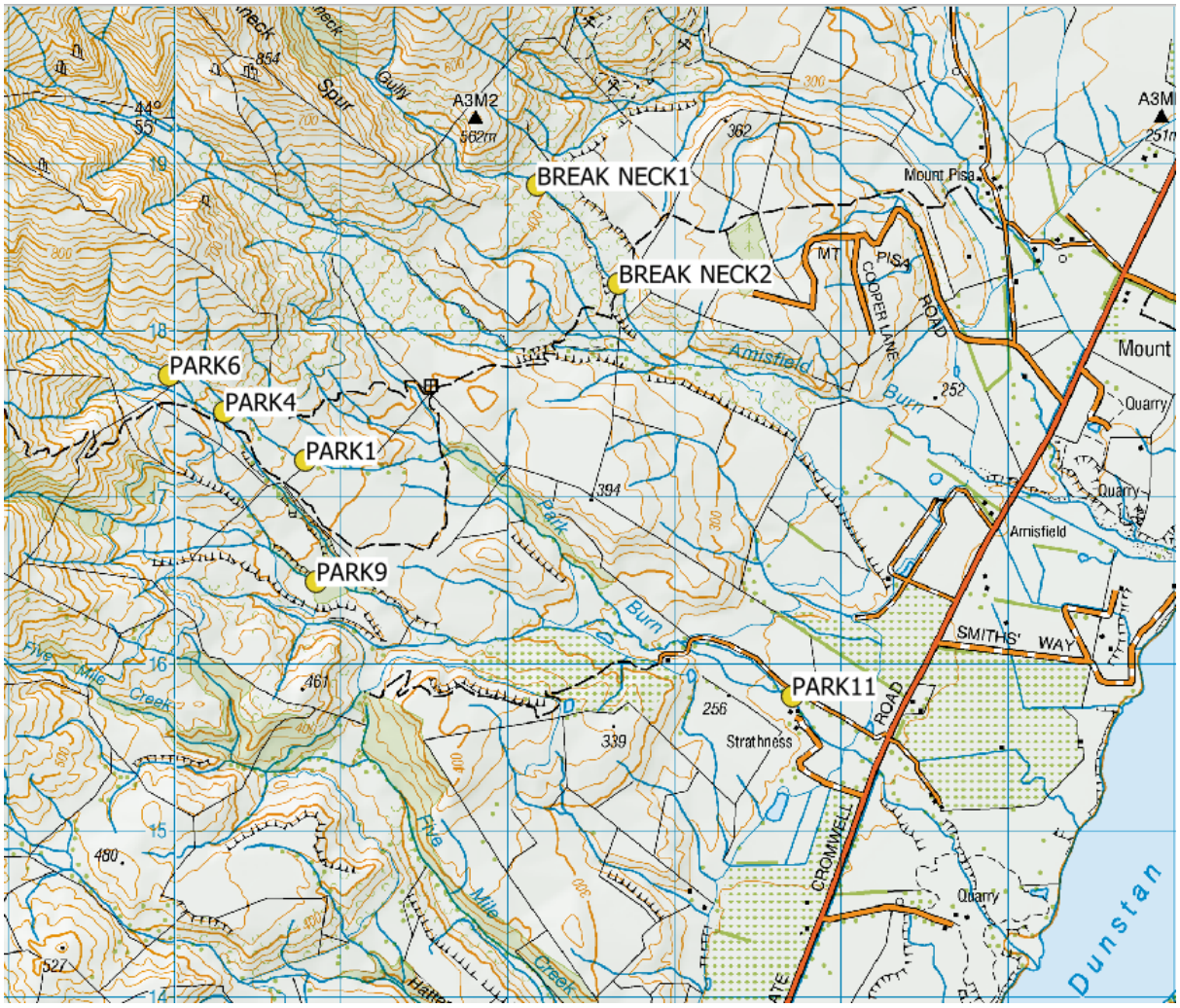


Figure 8: Fish survey sites with brown trout.

Figure 9: Rainbow trout caught at Park Burn site 11.

Figure 10: Looking downstream along the Amisfield Burn from State Highway 6.

4 DISCUSSION

4.1 General Residual Flow Considerations

The combination of NZFFD records and fish survey results from this fish survey provide key ecological information for the two catchments:

- The Clutha flathead galaxias, a critically threatened fish (Dunn et al 2018) as not been found in either the Park Burn or the Amisfield Burn;
- No fish have been recorded in either the 2018 fish survey nor during this survey upstream of the upper Amisfield Burn abstraction site;
- Brown trout are the most common fish species recorded in both stream catchments;
- Rainbow trout are very rare and appear restricted to the lower Park Burn;
- Native fish, koaro and upland bully have only been reported from the Amisfield Burn;

- Koaro is the only migratory native fish that has fish passage requirements; and
- No native fish have been reported in the Park Burn.

A further significant consideration for the Park Burn and Amisfield Burn is the natural summer low flow conditions. Stream gauging studies conducted by Landpro Limited (Landpro 2019a, b) have found that lower reaches of both the Park Burn and Amisfield Burn loose surface water to ground and the surface flow naturally declines in the lower reaches. A concurrent gauging run of the Amisfield Burn found the stream looses 210 L/s to ground and the study concluded that under natural flow conditions (i.e. no water abstraction) the stream would be dry along the reach 1400 m downstream of State Highway 6 to the confluence with the Clutha River (Landpro 2019a). The flow loss to groundwater is substantially higher than the 7dMALF for the Amisfield Burn. Therefore, a connecting flow cannot be provided even when natural flows are provided. A residual flow at any abstraction point in the Amisfield Burn will not be able to create a stream that flows from above the abstractions to the Clutha River and fish passage is not available during the summer low flow period. For the Amisfield Burn and Breakneck Creek the requirement for a residual flow at any take point will only be needed to address ecological issues at the point of take, not downstream habitat and connectivity issues, as these cannot be provided for naturally.

A similar study in the Park Burn also found a loosing reach in the lower Park Burn. The maximum loss rate was not determined due to a lack of access to the lower reaches. Anecdotal comments from landowners indicate the Park Burn also does not flow to the Clutha River confluence during summer. Therefore, the residual flow conditions should recognise that a connecting flow to the Clutha River is unlikely during summer low flow conditions in Park Burn.

A further consideration with the residual flows at the take points is the nature of the water take. The upper most water takes in Amisfield Burn and Park Burn were visited, and these are simple rock weirs that divert flow into water races. The weirs are not water-tight and a substantial portion of the flow in both streams passes downstream rather than into the take. Therefore, residual flows, although not measured nor required are provided at some of the take points due to these leaky intake structures.

4.2 Residual Flow Recommendations

4.2.1 Koaro

Koaro has been reported twice in the Amisfield Burn in 1996 and 2001. This fish is currently ranked as a threatened fish with the rank of *At Risk Declining* (Dunn et al 2018). The ranking also notes that koaro are only declining in some areas and other areas are believed to maintain stable or increasing

populations. Populations in tributary streams of Lake Dunstan are potentially increasing in abundance as the creation of Lake Dunstan has provided new rearing habitat for lake dwelling larval koaro and as a result the adult populations in the tributaries is expected to increase. However, given the expansion of the koaro in the Lake Dunstan is considered a potential threat to the remaining Clutha flathead galaxiid populations in the Pisa Range streams and the Lindis River catchment provision for extra koaro habitat and fish passage for upstream migrating koaro is potentially contrary to conservation efforts for the Clutha flathead galaxiid. In addition, the migratory period of juvenile koaro moving upstream from Lake Dunstan is unknown. Without knowledge of the migration period setting residual flows to provide for upstream migration of koaro during the summer low flow period may be unnecessary as migrations occur at other times of year. The presence of occasional koaro also indicates that at times individuals are able to enter and migrate well upstream in the Amisfield Burn (i.e. past abstraction point 97232). However, given the low abundance of koaro, the natural fish passage limitations in the Amisfield Burn and conservation concern regarding the impacts of an increasing koaro population around Lake Dunstan no residual flow requirements are recommended for the provision of habitat for adult koaro in Amisfield Burn.

4.2.2 Upland bully

Upland bully has been caught in two sites in the Amisfield Burn. It is not considered a threatened fish (Dunn et al 2018) and nationally is widespread species that frequently occupies a range of rivers and streams. It is recognised as preferring low water velocity habitats and can be very abundant in some rivers that experience low summer low flows. However, it does not occupy steep gradient streams and this is a likely limiting factor in the Park Burn and Amisfield Burn where it will be limited to the low gradient lower reaches.

Figure 11: Amisfield Burn culvert on access track.

4.2.3 Rainbow trout

A single rainbow trout was caught during the April 2019 fish survey and rainbow trout have not been reported in earlier fish surveys in Park Burn and Amisfield Burn. The fish was caught in the Park Burn at Site 11 and the lack of other rainbow trout indicates that a spawning population is not present. It is possible that the rainbow trout arrived in the Park Burn via the Pisa Irrigation Scheme bywash discharge that is located less than 500 m downstream of Site 11. The Pisa Irrigation Company take water from the Clutha River and juvenile rainbow trout will be present in the Clutha River. Given rainbow trout are absent from the Amisfield Burn and very rare in the Park Burn (i.e. unlikely to present spawning habitat) they are not considered in the residual flow assessment. Given the rainbow trout are very rare and only a single small juvenile was encountered during the survey and they have not been reported before rainbow trout are not considered to be a recreational fishing value in the Park Burn.

4.2.4 Brown trout

Brown trout are widespread in both the Amisfield Burn and Park Burn and the residual flow requirements are considered here together. The brown trout caught in both streams include young-

of-the year (YOY) juveniles and adult fish up to 210 mm long. The populations appear to be self-supporting stunted brown trout populations and as a result neither stream is likely to have any recreational fishing activity. The lack of brown trout at the upper Amisfield Burn and the low density of brown trout at the upper most Park Burn sites surveyed indicate that the populations are not large or even present upstream of the top water takes despite the stream providing good habitat at these abstractions. Therefore, there is no requirement to provide for downstream movement of brown trout from the upper reaches in either Amisfield Burn, Breakneck or Park Burn.

Both streams are considered too small to have an upstream spawning runs of brown trout from Lake Dunstan. However, if spawning runs do occur these will commence in autumn as irrigation demand decreases and stream flow increases. Even under an un-modified flow condition upstream migration from Lake Dunstan will only be possible once the natural drying reaches in the lower parts of Amisfield and Park burns are rewetted. Small residual flows at water abstraction points will not prevent this drying reach from occurring in summer, however, as this occurs in summer it will not impact on any late autumn spawning migration.

The setting of residual flows in the Park Burn is complicated by the discharge of irrigation water to the Park Burn and the downstream retaking of water. This creates reaches of the stream that have low summer flows and then downstream reaches that that have high flows. The downstream reaches require no residuals but if residuals were imposed at the upper take points this water wold flow downstream in the higher flowing reaches further increasing the flow in these high flow reaches.

Despite the various existing flow manipulations brown trout were widespread in the Park Burn, although not caught at all survey sites and various reasons are likely for their absence. The small tributaries of the Park Burn (sites 3, 5, 7, 8) are too small to provide habitat for fish and the absence can be considered natural habitat limitations. Sites in the lower Park Burn (sites 10 and 12) had large flows on the survey date, but are subject to varying flows as abstractions, discharges and natural flow losses interact creating a lower reach of the stream with very variable flow and habitat quality. At these sites that are between upstream discharge points and downstream retake points the summer flows can provide abundant habitat but lower natural flows in winter possibly limit the available habitat and also limit the trout population. It is likely, that brown trout are present at sites 10 and 12 as they are present upstream and downstream of these sites but occur at low densities due to poor habitat (e.g., a muddy bed stream at Site 12) and the high flow conditions and poor habitat reduces the capture probability. Providing a residual flow in the lower Park Burn that connects the stream to

Lake Dunstan in summer would have to be sufficient to exceed the measured losses to groundwater. Consideration should also be given to the flow gain the bywash discharge from the Pisa Irrigation Scheme to lower Park Burn creates as this provide a flow increase in the lower reaches and can provide a boost to the provision of fish passage in the lower Park Burn.

Brown trout were present in the upper reaches of Park Burn (site 6) above the top take point. However, the density was low in this natural stream area with only three juvenile brown trout (78-97 mm long) caught in a 80 m^2 survey area. Downstream of the upper most take the survey (site 4) caught seven juvenile brown trout in 80 m^2. The flow is reduced at this site, but the habitat provided supports brown trout, and in higher density than in the unmodified reach above the take. Therefore, a residual flow of the upper most take appears un-necessary.

Therefore, for the Park Burn catchment the existing flows and the flows currently passing the take points are considered sufficient to maintain the brown trout population. No additional residual flows are recommended.

Brown trout in the Amisfield Burn have not been reported from upstream of the top take point (95789 & 96321). However, sampling in the mid-reaches and in Breakneck Creek have found brown trout to be common or abundant (below 96320). The size range includes fish up to 210 mm and with a good range of juvenile fish being captured. This demonstrates there is a stream resident population of brown trout in the Amisfield Burn and Breakneck Creek within the reaches affected by water abstraction, despite brown trout being absent from the upper unmodified stream. The natural summer low flow and natural drying reach will isolate this population from Lake Dunstan. Providing a residual flow at the most downstream take point (97323) will still not provide a connecting flow to Lake Dunstan as the water loss to groundwater is well excess of the natural 7dMALF. Therefore, the lack of brown trout at the upper take and the inability to provide a connecting flow to Lake Dunstan means that residual flows will provide no gains for the brown trout populations

5 CONCLUSION

Fifteen fish survey sites were visited in April 2019 and additional data from the New Zealand Freshwater Fish database to assess the residual flow requirements at water abstraction points in the two catchments. Additional hydrological information on natural stream flows was also used to provide context on the natural fish passage availability in the two streams.

The Amisfield and Park burns are occupied by four freshwater fish. Koaro and rainbow trout have only been recorded very rarely and at a single location each. Given conservation concerns regarding the expansion of koaro populations in the upper Clutha area and its rarity in the Amisfield and Park burns no residual flows are proposed to provide for this fish species. Rainbow trout are also very rare, having been recorded only once in the Park Burn providing a residual flow for rainbow trout is not considered necessary.

Upland bully has been recorded at two locations in the Amisfield Burn. Upland bully prefer low water velocity habitats and have no migratory life history stages. The limited distribution in the Amisfield Burn and their preference for low water velocity habitat means no residual flow at any take points are proposed to provide for upland bully.

Brown trout is widespread in both catchments, although the fish surveys indicate the streams are occupied by self-supporting, stunned populations that will have no sports fishery value. The low density of brown trout in the upper Park Burn and the lack of brown trout in the upper Amisfield Burn indicate even in un-modified reaches that appear to have good brown trout habitat the populations are small or absent. In the reaches affected by water takes and supplementary flows (due to water discharges for downstream retakes) the brown trout population varies in density and size classes present. However, even sections with reduced flows support brown trout, with only the complete dried reaches having no trout. Out migration from both the Amisfield and Park burns to Lake Dunstan for juvenile trout is restricted by natural drying reaches in the lower reaches of both streams. These loss of water to groundwater in both streams is significant and residual flows at the most downstream takes points unlikely to prevent the drying. It is considered that providing residual flows at take point (which are generally leaky) will not improve the brown trout population to any degree nor provide a sports fishing resource. Therefore, no residual flows are proposed to provide for brown trout.

6 REFERENCES

Dunn, N. R., Allibone, R.M., Closs, G.P., Crow, S.K., David, D.O., Goodman, J.M., Griffiths, M., Jack, D.C., Ling, N., Waters, J.M., Rolfe, J.R. (2018). Conservation status of New Zealand freshwater fish. New Zealand threat classification series 24. Wellington, Department of Conservation.

Landpro (2019a). Hydrological assessment prepared for water users of the Amisfield Burn: Smallburn Limited, Pisa Holdings Ltd, and Lowburn Land Holdings Ltd. Technical comment

Landpro (2019b). Hydrological assessment prepared for the water users of the Park Burn: Smallburn Limited and Parkburn Water Company

7 APPENDIX 1: SITE LOCATIONS AND CATCH

Site	Latitude	Longitude	Area fished (m^2) and stream type	Species caught
Breakneck Ck 1	-44.921214	169.226331	80 (stream)	Brown trout (length 76-194 mm)
Breakneck Ck 2	-44.919712	169.202826	80 (stream)	Brown trout (length 63 – 209 mm)
Amisfield Burn 1	-44.919712	169.202826	100 (stream)	Nil
Park Burn 1	-44.93542	169.207828	100 (stream, low flow)	Brown trout (219 mm)
Park Burn 2	-44.936458	169.205328	Nil (dry stream)	Nil
Park Burn 3	-44.932926	169.201339	10 (seepage)	Nil
Park Burn 4	-44.932591	169.201885	80 (stream)	Brown trout (length 67-80 mm)
Park Burn 5	-44.930475	169.203034	20 (seepage)	Nil
Park Burn 6	-44.93047	169.197807	80 (stream)	Brown trout (length 77-97 mm)
Park Burn 7	-44.938495	169.201039	Nil (Natural very small stream))	Nil
Park Burn 8	-44.939884	169.199353	Nil (Natural very small stream)	Nil
Park Burn 9	-44.941969	169.208203	30 (small stream	Brown trout (78-205 mm)
Park Burn 10	-44.942637	169.211188	50 (high flow small stream	Nil
Park Burn 11	-44.949328	169.243865	100 (stream)	Brown trout (length 104, 151 Rainbow trout (length 127 mm)
Park Burn 12	-44.945027	169.22924	80 (stream high flow)	Nil

Appendix D: Aqualinc and stock drinking calculations

Site:	Smallburn Ltd	Sub-region	Central and Lakes District

	Land use	Soil type	Area (ha)	MAR Zone	Smaps PAW	Aqualinc PAW	peak daily demand (mm/day)	peak daily demand (m^3)	maximum monthly demand (mm/month)	maximum monthly demand (m^3)	90%ile annual demand (mm/year)	90%ile annual demand (m^3)	100%ile annual demand (mm/year)	100%ile annual demand (m^3)
Existing	Pasture	lowb_2a.1	265.00	450	36	40	5.5	14575.0	171	453,150	820	2,173,000	919	2435350.00
Existing	Pasture	moly_10a.1	8.60	450	30	40	5.5	473.0	171	14,706	820	70,520	919	79034.00
Existing	Pasture	ranf_4a.1	9.10	450	129	120	4.2	382.2	130	11,830	714	64,974	840	76440.00
Existing	Pasture	gees_1a.1	1.70	450	44	40	5.5	93.5	171	2,907	820	13,940	919	15623.00
Proposed	Pasture	lowb_2a.1	36.10	450	36	40	5.5	1985.5	171	61,731	820	296,020	919	331759.00
		Total	**320.5**					***17,509***		***544,324***		***2,618,454***		***2,938,206***

Stock drinking requirements

Stock drinking requirements were calculated based on ORC recommendations, and are presented in the below table:

Stock units/water use	ORC guidelines (per Form 4)	Water required (m^3/day)
10,000 sheep (7,000 existing, additional 3,000 proposed)	5 L/head/day	50
250 beef cows	40 L/head/day	10
Total		**60**

Thus approximately 60 m^3/day of water is needed for stock drinking within the property.

Appendix E: Records of title

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**180117**
Land Registration District	**Otago**
Date Issued	18 May 2005

Prior References
142425

Estate	Fee Simple
Area	4472.9004 hectares more or less
Legal Description	Lot 3 Deposited Plan 343853

Registered Owners
Mt Pisa Station Holdings Limited

Interests

Subject to Part IVA Conservation Act 1987

Subject to Section 11 Crown Minerals Act 1991

Subject to a right to convey water over part marked a-b DP 343853 created by Transfer 288782 - 23.7.1965 at 2:18 pm.

Subject as to a right (in gross) to convey water over part marked F,P DP 343853 to Pisa Irrigation Company Limited created by Transfer 885702 and embodied in the Register as CT OT17A/246 - 30.6.1995 at 11.52 am

966109.1 Certificate Specifying Mining Rights under s417 Resource Management Act 1991 to (now) Smallburn Limited - 21.4.1999 at 11:06 am

984267.5 Mortgage to Rabobank New Zealand Limited - 1.3.2000 at 3.13 pm

5041663.1 Gazette Notice (2001/1044) declaring adjoining road (S.H.No. 6) to be limited access road - 11.5.2001 at 9:31 am

5057573.3 Notice pursuant to Section 91 Transit New Zealand Act 1989 - 10.7.2001 at 2:30 pm

5057570.4 Notice pursuant to Section 91 Transit New Zealand Act 1989 - 10.7.2001 at 2:30 pm

5057573.4 Notice pursuant to Section 91 Transit New Zealand Act 1989 - 10.7.2001 at 2:30 pm

Subject to a Right of Way (in gross) (limited as to purpose) over part marked K,L,M,N,Z10 DP 343853 to Her Majesty the Queen created by Easement Instrument 5856123.3 - 5.1.2004 at 9:00 am

5874088.1 Conservation Covenant pursuant to Section 77 Reserves Act 1977 - 23.1.2004 at 9:00 am

6052832.2 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 23.6.2004 at 9:00 am

Subject to a right of way over part marked B DP 343853 created by Easement Instrument 6052832.5 - 23.6.2004 at 9:00 am

The easements created by Easement Instrument 6052832.5 are subject to Section 243 (a) Resource Management Act 1991

Land Covenant in Easement Instrument 6094115.2 - 28.7.2004 at 9:00 am

Land Covenant in Easement Instrument 6113532.2 - 13.8.2004 at 9:00 am

6425374.7 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 18.5.2005 at 9:00 am

Subject to a right to convey telecommunications & computer media in gross over part marked J,Z5,Z6,Z7 DP 343853 to Telecom New Zealand Limited created by Easement Instrument 6425374.9 - 18.5.2005 at 9:00 am

Identifier **180117**

The right to convey telecommunications easement created by Easement Instrument 6425374.9 is subject to Section 243 (a) Resource Management Act 1991

Subject to a right of way in gross over part marked B,C,C1,E,J DP 343853 to Her Majesty the Queen created by Easement Instrument 6425374.11 - 18.5.2005 at 9:00 am

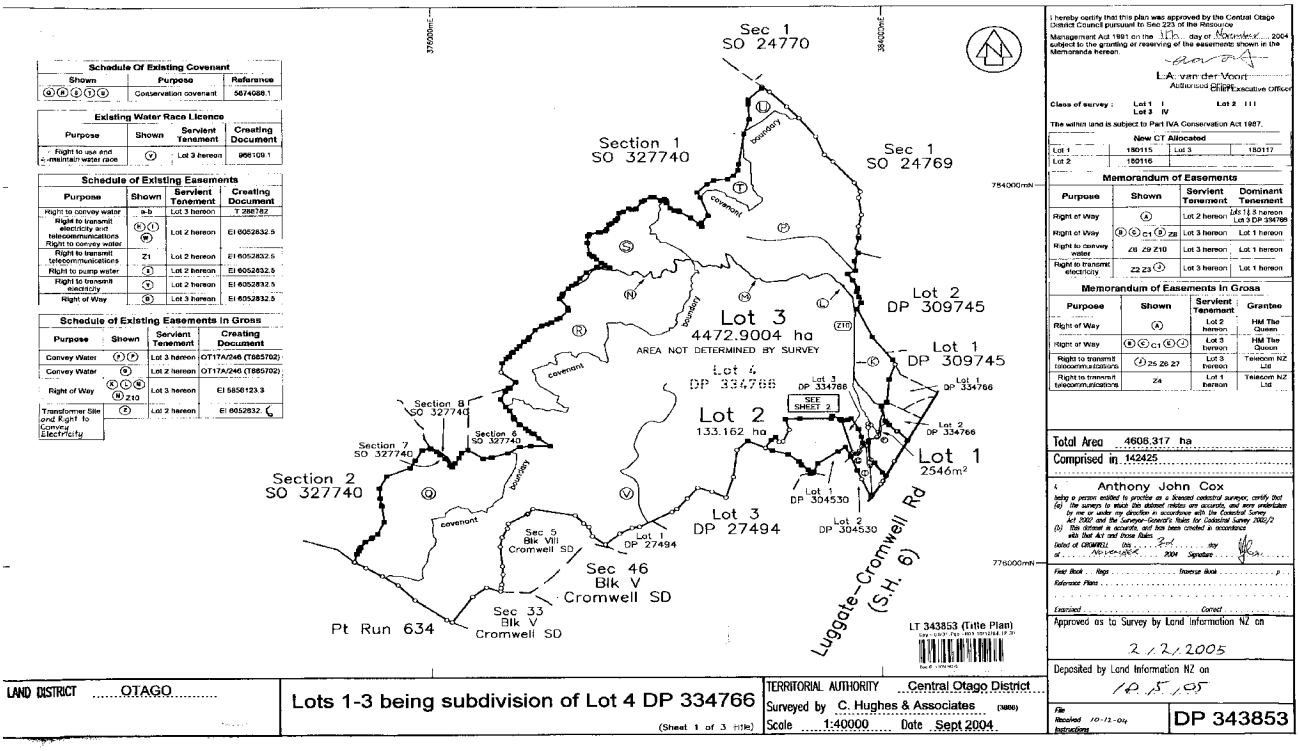
The easements created by Easement Instrument 6425374.11 are subject to Section 243 (a) Resource Management Act 1991

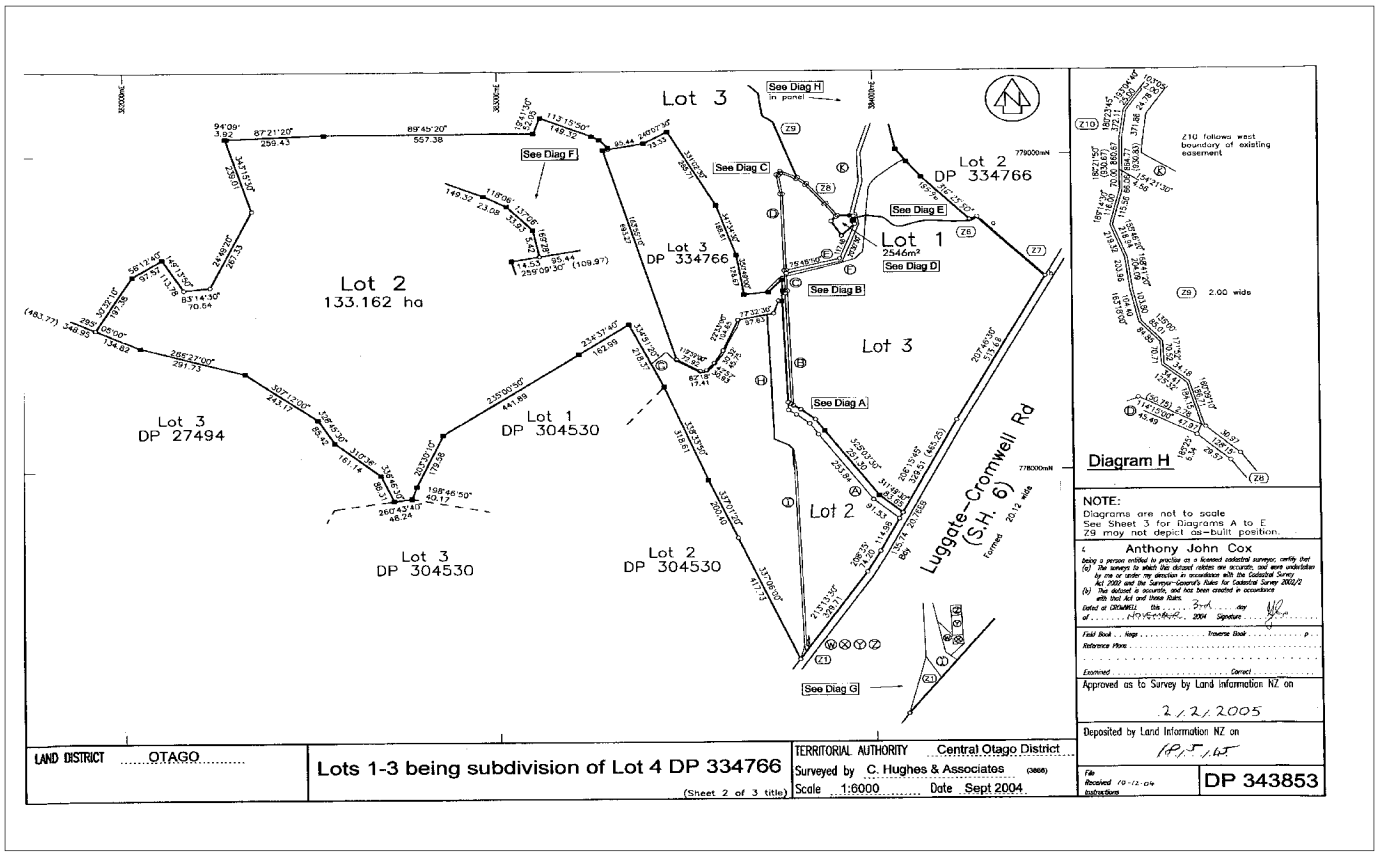
8193899.1 Mining Certificate WR 1097 pursuant to Section 417 Resource Management Act 1991 to Burn Cottage Irrigation Company Limited, David Keith George, John Patrick Webb, J R Webb & Sons Limited, Kenneth Moody, Vivienne Jean Moody, Alma Myrtle Elizabeth Jack and Lachlan Angus Ross - 15.6.2009 at 9:00 am

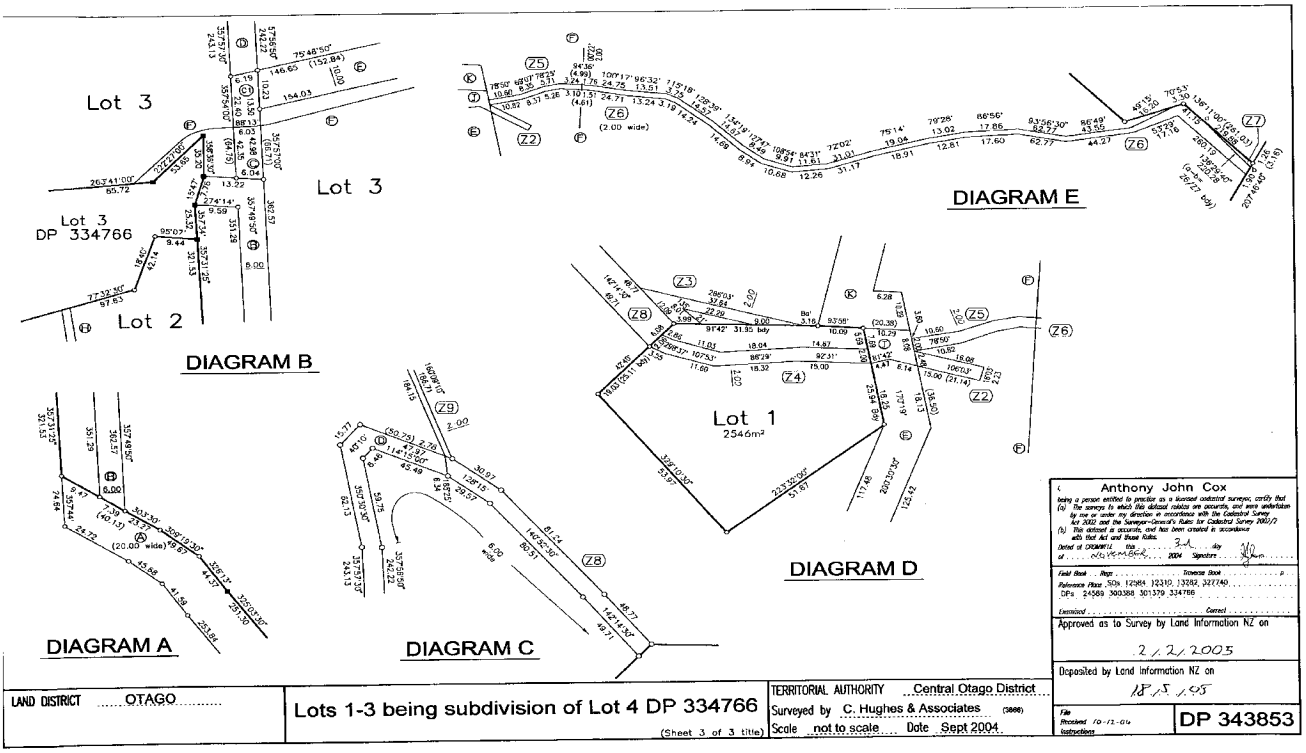
9802679.1 Variation of Mortgage 984267.5 - 22.8.2014 at 12:06 pm

10795182.1 Variation of Mortgage 984267.5 - 1.6.2017 at 12:20 pm

10994522.1 Mining Certificate 10994522.1 under Section 417 Resource Management Act 1991 to (now) Mark II Limited, Chard Farm Trustees Limited, Mt Pisa Station Holdings Limited, Stuart Douglas Hawker, Phillipa Mary Hawker and Robert Stanley Perriam in equal shares - 19.12.2017 at 12:03 pm


Schedule Of Existing Covenant
Shown | Purpose | Reference
Conservation covenant | 5674686.1
Existing Water Race Licence
Purpose | Shown | Servient Tenement | Creating Document
Right to use and maintain water race | V | Lot 3 hereon | 968109.1
Schedule of Existing Easements
Purpose | Shown | Servient Tenement | Creating Document
Right to convey water | a-b | Lot 3 hereon | T 288782
Right to transmit electricity and telecommunications Right to convey water | K I W | Lot 2 hereon | EI 6052832.5
Right to transmit telecommunications | Z1 | Lot 2 hereon | EI 6052832.5
Right to pump water | J | Lot 2 hereon | EI 6052832.5
Right to transmit electricity | H | Lot 2 hereon | EI 6052832.5
Right of Way | B | Lot 3 hereon | EI 6052832.5
Schedule of Existing Easements in Gross
Purpose | Shown | Servient Tenement | Creating Document
Convey Water | P P | Lot 3 hereon | OT17A/246 (T685702)
Convey Water | W | Lot 2 hereon | OT17A/246 (T685702)
Right of Way | A C E W Z10 | Lot 3 hereon | EI 5858123.3
Transformer Site and Right to Convey Electricity | E | Lot 2 hereon | EI 6052832
Sec 1 SO 24770
Section 1 SO 327740
Sec 1 SO 24769
Lot 3
4472.9004 ha
AREA NOT DETERMINED BY SURVEY
Lot 4 DP 334766
Lot 2
133.162 ha
Lot 2 DP 309745
Lot 1 DP 309745
Lot 1 2546m²
Lot 3 DP 334766
Lot 1 DP 334766
Lot 2 DP 334766
SEE SHEET 2
Lot 1 DP 304530
Lot 2 DP 304530
Lot 3 DP 27494
Lot 1 DP 27494
Section 8 SO 327740
Section 7 SO 327740
Section 6 SO 327740
Section 2 SO 327740
Sec 5 Blk VIII Cromwell SD
Sec 46 Blk V Cromwell SD
Sec 33 Blk V Cromwell SD
Pt Run 634
Luggate-Cromwell Rd (S.H. 6)
boundary
covenant
LT 343853 (Title Plan)
I hereby certify that this plan was approved by the Central Otago District Council pursuant to Sec 225 of the Resource Management Act 1991 on the 11th day of November 2004 subject to the granting or reserving of the easements shown in the Memoranda hereon.
L.A. van der Voort
Authorised Officer
Chief Executive Officer
Class of survey : Lot 1 I Lot 2 III Lot 3 IV
The within land is subject to Part IVA Conservation Act 1987.
New CT Allocated
Lot 1 180115 Lot 3 180117
Lot 2 180116
Memorandum of Easements
Purpose | Shown | Servient Tenement | Dominant Tenement
Right of Way | A | Lot 2 hereon | Lot 1 & 8 hereon Lot 3 DP 334766
Right of Way | B C C1 E Z8 | Lot 3 hereon | Lot 1 hereon
Right to convey water | Z8 Z9 Z10 | Lot 3 hereon | Lot 1 hereon
Right to transmit electricity | Z2 Z3 H | Lot 3 hereon | Lot 1 hereon
Memorandum of Easements in Gross
Purpose | Shown | Servient Tenement | Grantee
Right of Way | A | Lot 2 hereon | HM The Queen
Right of Way | B C C1 E J | Lot 3 hereon | HM The Queen
Right to transmit telecommunications | J Z5 Z6 Z7 | Lot 3 hereon | Telecom NZ Ltd
Right to transmit telecommunications | Z4 | Lot 1 hereon | Telecom NZ Ltd
Total Area 4608.317 ha
Comprised in 142425
Anthony John Cox
being a person entitled to practise as a licensed cadastral surveyor, certify that
(a) the surveys to which this dataset relates are accurate, and were undertaken by me or under my direction in accordance with the Cadastral Survey Act 2002 and the Surveyor-General's Rules for Cadastral Survey 2002/2
(b) This dataset is accurate, and has been created in accordance with that Act and those Rules
Dated at CROMWELL this 2nd day of NOVEMBER 2004 Signature
Field Book Pages Traverse Sheet(s)
Reference Plans
Examined Correct
Approved as to Survey by Land Information NZ on
2/2/2005
Deposited by Land Information NZ on
10/5/05
File Reference 10-12-04
Instructions
DP 343853
LAND DISTRICT OTAGO
Lots 1-3 being subdivision of Lot 4 DP 334766
(Sheet 1 of 3 Title)
TERRITORIAL AUTHORITY Central Otago District
Surveyed by C. Hughes & Associates (1886)
Scale 1:40000 Date Sept 2004


Lot 3
See Diag H in panel
See Diag F
See Diag C
Lot 2 DP 334766
See Diag E
Lot 1 2546m²
See Diag D
Lot 3 DP 334766
See Diag B
Lot 2 133.162 ha
Lot 3
See Diag A
Lot 3 DP 27494
Lot 1 DP 304530
Lot 2
Luggate-Cromwell Rd (S.H. 6) Formed 20.12 wide
Lot 3 DP 304530
Lot 2 DP 304530
See Diag G
Z10 follows west boundary of existing easement
Z9 2.00 wide
Diagram H
NOTE:
Diagrams are not to scale
See Sheet 3 for Diagrams A to E
Z9 may not depict as-built position.
Anthony John Cox
Approved as to Survey by Land Information NZ on
2/2/2005
Deposited by Land Information NZ on
LAND DISTRICT OTAGO
Lots 1-3 being subdivision of Lot 4 DP 334766
(Sheet 2 of 3 titles)
TERRITORIAL AUTHORITY Central Otago District
Surveyed by C. Hughes & Associates (3866)
Scale 1:6000 Date Sept 2004
DP 343853


Lot 3
Lot 3
Lot 3
DP 334766
Lot 2
DIAGRAM B
DIAGRAM E
Lot 1
2546m²
DIAGRAM D
DIAGRAM A
DIAGRAM C
Anthony John Cox
Approved as to Survey by Land Information NZ on
2/2/2005
Deposited by Land Information NZ on
18/5/05
LAND DISTRICT OTAGO
Lots 1-3 being subdivision of Lot 4 DP 334766
(Sheet 3 of 3 titles)
TERRITORIAL AUTHORITY Central Otago District
Surveyed by C. Hughes & Associates (3666)
Scale not to scale Date Sept 2004
DP 343853

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **844471**
Land Registration District **Otago**
Date Issued 19 February 2019

Prior References
829494

Estate	Fee Simple
Area	82.6260 hectares more or less
Legal Description	Lot 2 Deposited Plan 526279

Registered Owners
Mark II Limited

Interests

Subject to Section 59 Land Act 1948 (affects parts formerly Section 46 Block I Wakefield Survey District contained in RT OT12C/1084 and Part Section 35 Block I Wakefield Survey District contained in RT OT19A/538)

Saving and excepting all minerals within the meaning of the Land Act 1924 on or under the within land (affects part formerly Part Section 35 Block I Wakefield Survey District contained in RT OT19A/538)

Part formerly Section 35 Block I Wakefield Survey District contained in RT OT19A/538 herein is subject to a right to the Crown to enter upon the said land and thereon to take lay, construct water- races, drains and all other works for the supply of water to the said land and to take water from races so provided for irrigation purposes at a price to be fixed by the Crown and excepting the Crown from liability for any damage caused by any overflow or breakaway of any race or channel

Subject to Section 315 Land Act 1924 (affects part formerly Part Section 35 Block I Wakefield Survey District contained in RT OT19A/538)

966109.1 Certificate under Section 417 (2) Resource Management Act 1991 - 21.4.1999 at 11.06 am

Subject to a right to convey water over part marked PA, IA and IB on DP 526279 created by Transfer 975233.8 - 20.9.1999 at 10.49 am

Appurtenant hereto is a right of way and right to convey electricity and telecommunications created by Transfer 6267740.3 - 24.12.2004 at 9:00 am

7346903.1 Gazette Notice (2001/p1044) declaring the adjoining State Highway SH 6 to be a limited access road - 2.5.2007 at 9:00 am

7346903.2 Notice pursuant to Section 91 Transit New Zealand Act 1989 - 2.5.2007 at 9:00 am

Appurtenant hereto is a right of way created by Easement Instrument 7489310.13 - 3.8.2007 at 9:00 am

10435540.2 Certificate pursuant to Section 417 Resource Management Act 1991 to Rockburn Wines Limited - 2.8.2016 at 2:41 pm

10435540.3 Certificate pursuant to Section 417 Resource Management Act 1991 to Rockburn Wines Limited - 2.8.2016 at 2:41 pm

10435540.5 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 2.8.2016 at 2:41 pm

Appurtenant hereto is a right of way, right to store water and pump water and a right to convey electricity, telecommunications and computer media created by Easement Instrument 10435540.8 - 2.8.2016 at 2:41 pm

Some of the easements created by Easement Instrument 10435540.8 are subject to Section 243 (a) Resource Management Act 1991 (see DP 490342)

Identifier **844471**

Subject to a right of way over part marked RA, RB, IA, IB, G, H, T and FA and a right to store water over part marked FA all on DP 526279 created by Easement Instrument 10435540.8 - 2.8.2016 at 2:41 pm

Subject to a right to convey water over part marked IR, RI, GA, TI, H, W, AT, ER, LI, QU and ID on DP 526279 on DP 522616 created by Easement Instrument 10570977.1 - 23.9.2016 at 11:13 am

Appurtenant hereto is a right to convey water created by Easement Instrument 10570977.1 - 23.9.2016 at 11:13 am

10994522.1 Mining Certificate 10994522.1 under Section 417 Resource Management Act 1991 to (now) Mark II Limited, Chard Farm Trustees Limited, Mt Pisa Station Holdings Limited, Stuart Douglas Hawker, Phillipa Mary Hawker and Robert Stanley Perriam in equal shares - 19.12.2017 at 12:03 pm

10994522.2 Certificate pursuant to Section 417 Resource Management Act 1991 to Robert Stanley Perriam - 19.12.2017 at 12:03 pm

10994522.3 Certificate pursuant to Section 417 Resource Management Act 1991 to Stuart Douglas Hawker and Phillipa Mary Hawker - 19.12.2017 at 12:03 pm

Appurtenant hereto is a right to convey water created by Easement Instrument 11086083.1 - 7.8.2018 at 11:50 am

11245556.4 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 18.10.2018 at 9:15 am

Appurtenant hereto is a right to convey water created by Easement Instrument 11245556.5 - 18.10.2018 at 9:15 am

Appurtenant hereto is a right of way and a right to convey water, electricity, telecommunications and computer media created by Easement Instrument 11245556.7 - 18.10.2018 at 9:15 am

The easements created by Easement Instrument 11245556.7 are subject to Section 243 (a) Resource Management Act 1991

Subject to a right of way over part marked RA, RB, IA, IB, G, H, T, C and FA, a right to convey water over part marked FA, W, AT, ER, QU and C and a right to convey electricity, telecommunications and computer media over part marked FA all on DP 526279 created by Easement Instrument 11245556.7 - 18.10.2018 at 9:15 am

Land Covenant in Easement Instrument 11245556.8 - 18.10.2018 at 9:15 am

Subject to a right (in gross) to convey electricity over part marked FA on DP 526279 in favour of Aurora Energy Limited created by Easement Instrument 11284981.1 - 22.11.2018 at 3:37 pm

Subject to a right (in gross) to convey telecommunications and computer media over part marked FA on DP 526279 in favour of Chorus New Zealand Limited created by Easement Instrument 11284981.2 - 22.11.2018 at 3:37 pm

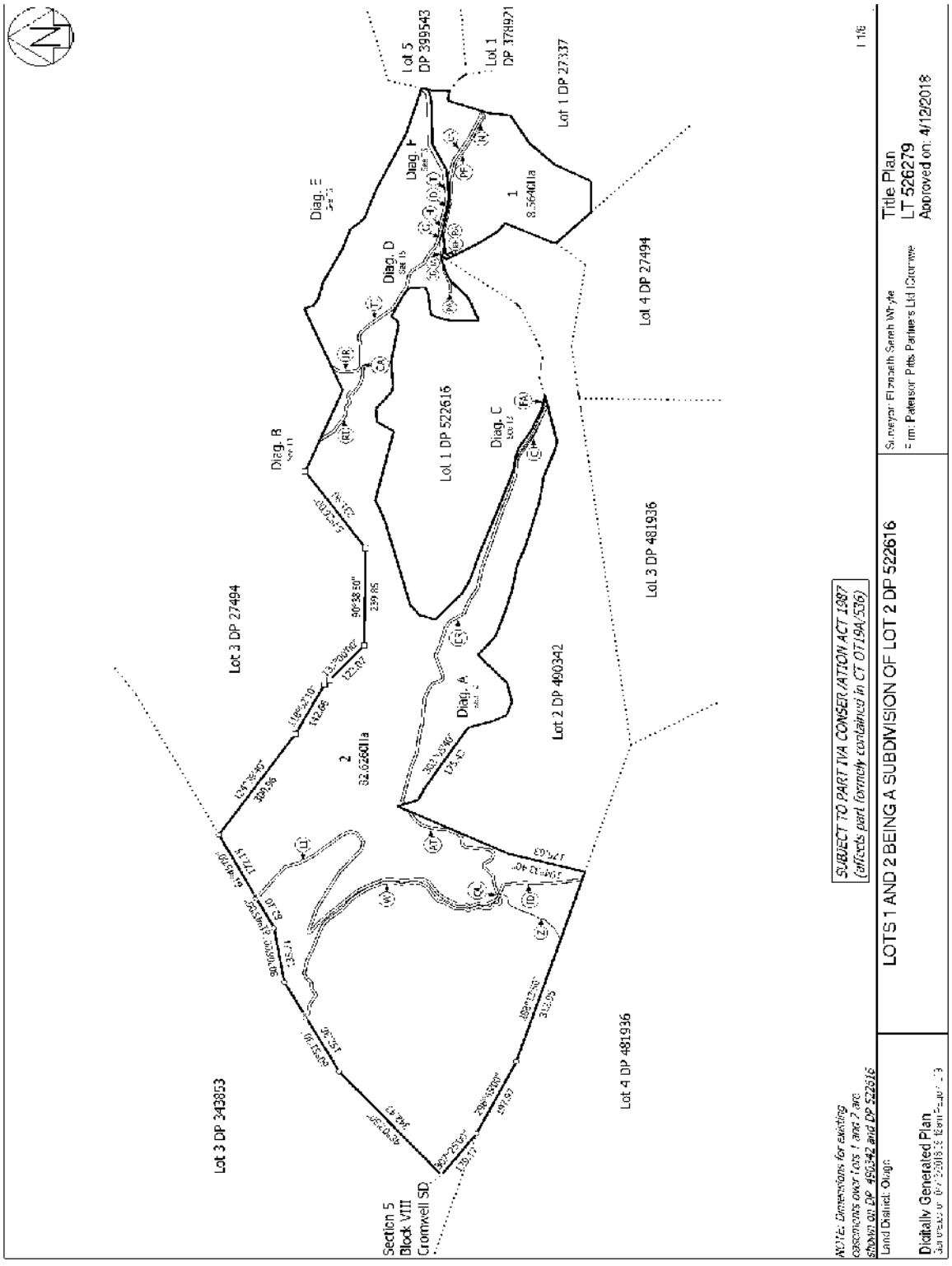
11363115.4 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 19.2.2019 at 2:49 pm

Subject to a right of way over part marked RA, RB, IA, IB, G, H and T, a right to convey water over part marked IB, RB and PA and a right to convey electricity, telecommunications and computer media over part marked RB and IB all o DP 526279 created by Easement Instrument 11363115.5 - 19.2.2019 at 2:49 pm

Some of the easements created by Easement Instrument 11363115.5 are subject to Section 243 (a) Resource Management Act 1991 (see DP 526279)

11471418.1 CAVEAT BY AURORA ENERGY LIMITED - 19.6.2019 at 3:07 pm

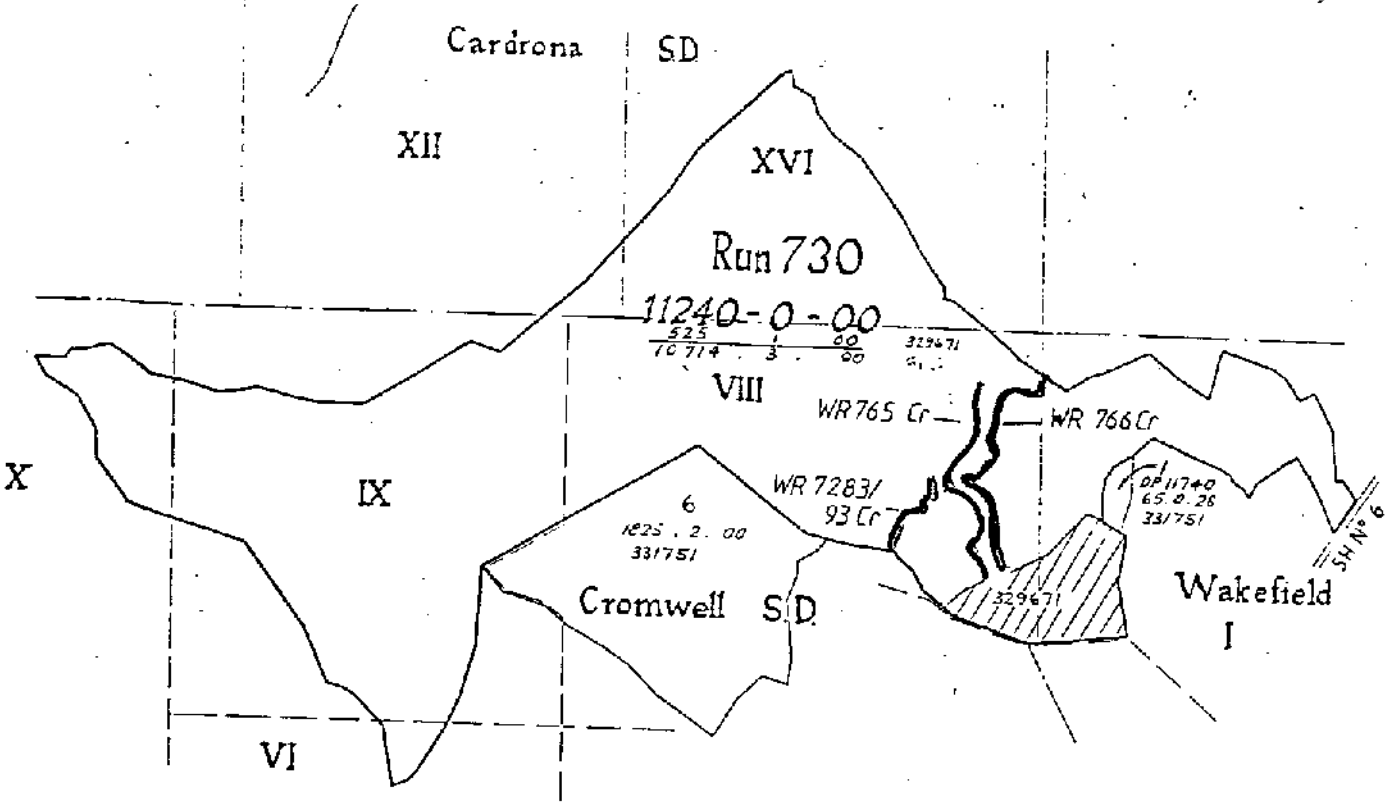
11521943.1 CAVEAT BY CHARD FARM TRUSTEES LIMITED - 3.9.2019 at 11:35 am


Lot 3 DP 343853
Lot 3 DP 27494
Lot 5 DP 399543
Lot 1 DP 378971
Lot 1 DP 27337
Lot 4 DP 27494
Lot 1 DP 522616
Lot 2 DP 490342
Lot 3 DP 481936
Lot 4 DP 481936
Diag. A
Diag. B
Diag. C
Diag. D
Diag. E
Diag. F
2
32.6260Ha
1
8.5640Ha
Section 5
Block VIII
Cromwell SD
SUBJECT TO PART IVA CONSERVATION ACT 1987
(affects part formerly contained in CT OT19A/536)
NOTE: Dimensions for existing easements over Lots 1 and 2 are shown on DP 490342 and DP 522616
Land District: Otago
LOTS 1 AND 2 BEING A SUBDIVISION OF LOT 2 DP 522616
Digitally Generated Plan
Surveyor: Elizabeth Sarah Wyatt
Firm: Paterson Pitts Partners Ltd (Cromwell)
Title Plan
LT 526279
Approved on: 4/12/2018
1 Title

966109.1

3417 966109.1 Certificate
Cpy – 01/01, Pgs – 007, 19/11/02, 11:31
Doc ID 110400926

EQUIVALENT METRIC
AREA IS 510.2345 ha



OPTIONAL EASEMENTS

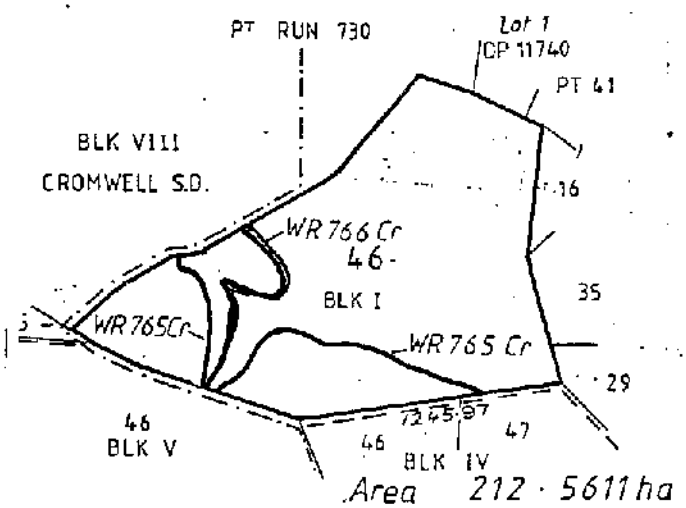
Purpose	Comprised in	Shown	Servient Tenement	Dom. Tenement
Right to Convey Water	C/T 1C/818	▬▬▬	Run 730, Blk VI, VIII, IX & X Cromwell SD, Blk I Wakefield SD Blk XII & XVI Cardrona SD	Sec 5 Blk VIII Sec 44 & 46 Blk V Cromwell SD

Plan of Water Race Over Run 730, Blk VI, VIII, IX & X Cromwell SD, Blk 1 Wakefield SD Blk XII & XVI Cardrona SD

OTAGO LAND DISTRICT
CENTRAL OTAGO D.C.

SCALE: 1:63,360
DATE: Sept 1996

Prepared by PATERSON PITTS PARTNERS LTD
SURVEYING CONSULTANTS



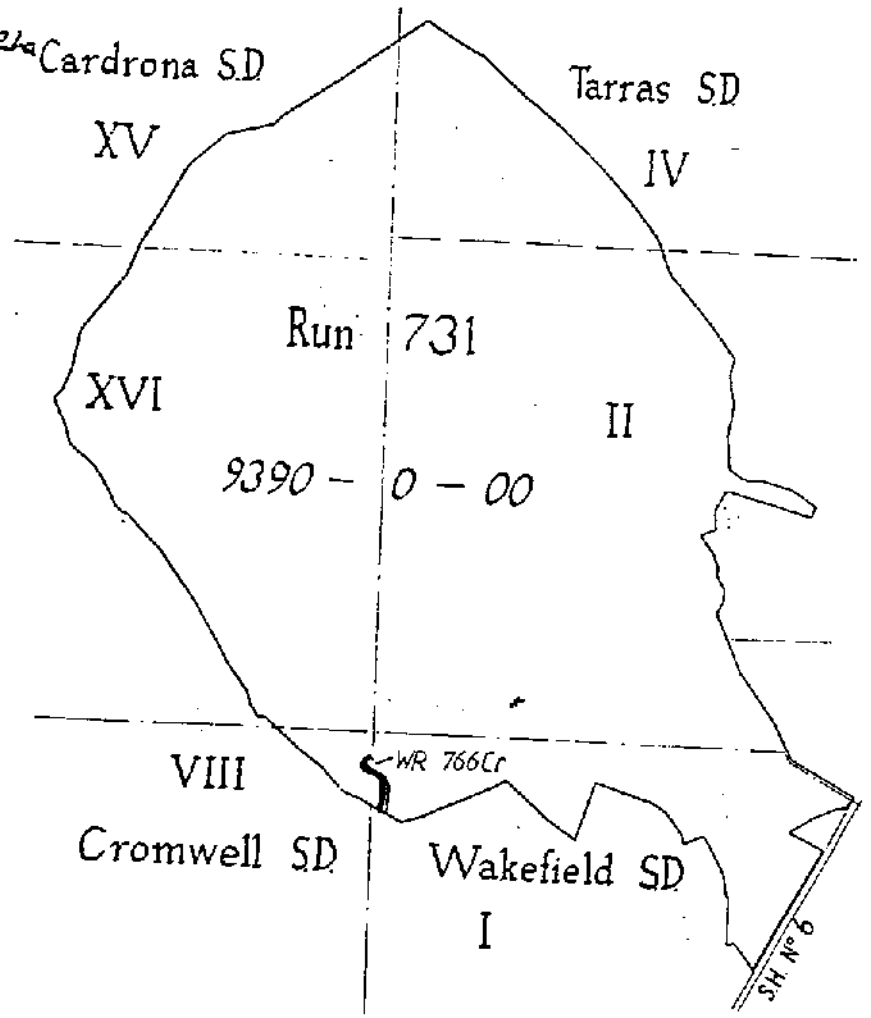
OPTIONAL EASEMENTS

Purpose	Comprised in	Shown	Servient Tenement	Dom. Tenement
Right to Convey Water	C/T 12C/1084	▬▬	Section 46 Blk I Wakefield SD	Sec 5 Blk VIII Sec 44 & 46 Blk V Cromwell SD

Plan of Water Race Over Section 46 Blk I, Wakefield SD

OTAGO LAND DISTRICT CENTRAL OTAGO D.C.	SCALE: 1:30000 DATE: Sept 1996	Prepared by PATERSON PITTS PARTNERS LTD SURVEYING CONSULTANTS

EQUIVALENT METRIC
AREA IS 3799.99824ha



OPTIONAL EASEMENTS

Purpose	Comprised in	Shown	Servient Tenement	Dom. Tenement
Right to Convey Water	C/T 1C/817	▬▬	Run 731, Blk XV & XVI Cardrona SD, Blk VIII Cromwell SD, Blk II & IV Tarras SD, Blk I Wakefield SD	Sec 5 Blk VIII Sec 44 & 46 Blk V Cromwell SD

Plan of Water Race Over Run 731, Blk XV & XVI, Cardrona SD, Blk VIII Cromwell SD, Blk II & IV Tarras SD, Blk I Wakefield SD

OTAGO LAND DISTRICT
CENTRAL OTAGO D.C.

SCALE: 1:63,360
DATE: Sept 1996

Prepared by PATERSON PITTS PARTNERS LTD
SURVEYING CONSULTANTS

46 D

MEMORIAL OF REGISTRATION.

This Instrument was registered ~~at Dunedin~~ at the office of the Mining Registrar at CROMWELL on the 12th day of September 1901 at 11 o'clock in the forenoon.

Mining Registrar.

Under "The Mining Act, 1898." [Form 81 (Reg. 24).

License for a Water-race. 766 Cr.

PURSUANT to "The Mining Act, 1898," I, the undersigned FREDERICK JAMES BURGESS, a Warden of the OTAGO Mining District, do hereby grant to

(1) Full name, residence, and occupation.

Thomas Wood
of Loudoun Miner

this License for a water-race, as specified in the First Schedule hereto.

This License is granted for a term of 42 years, commencing on the date hereof, subject to the terms, conditions, reservations, and provisions set out in the aforesaid Act and the regulations thereunder, and also to such additional terms, conditions, reservations, and provisions as are specified in the Second Schedule hereto.

In witness whereof I have hereunto subscribed my name, and affixed the seal of the Warden's Court at CROMWELL, this 4th day of September, 1901.

Fred. J. Burgess
Warden.

Provisional ... of this application (No. 1291) for this license on the 18th day of July 1901 at 11.25 a.m.

Mining Registrar.

FIRST SCHEDULE.

(2) Set out locality of race and nature of the proposed work as set forth in application, modified, however, so as to accord with the grant, adding such other particulars as are necessary, including plan of land if surveyed, number of heads authorised to be diverted, and purpose for which water is to be used.

(2) Commencing at a point on the left North Branch Shotfield Creek taking four (4) heads from there. Three (3) heads from Southern Branch and one head from Messrs Gully and terminating in fourth Northern Gully Loudoun length Nine (9) miles Right to divert eight (8) Government heads of water - priority to such water to date from and including 25th November 1868

Otago Regional Council

MC030, 96322

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:

William Edward CLARK, Raymond John CLARK and Peter Raymond MORTON
Wanaka Road, R D , **Cromwell**

being registered as holders of Licence for a Water Race No. 766, Cromwell 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 licence), 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 wide (20 feet) 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.

M E Weaver
Manager Resource Administration

This Certificate is issued by the Chairperson of the Otago Regional Council, acting under powers delegated to her by the Council and not revoked at the date of issue.

Common Seal

OTAGO REGIONAL COUNCIL
Common Seal

R W Scott
Director Corporate Services

M L Rosson
Chairperson
15/3/99

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Otago Regional Council

M030, 96322

SCHEDULE

Land Affected	Title Reference	Indicator
Run 731, Blks XV & XVI Cardrona Survey District Blk VIII Cromwell Survey District Blks II & IV Tarras Survey District Blk I Wakefield Survey District	1C/817	Trustees Executors & Agency for Estate of William George MacMillan William Murray MacMillan and Jacqueline Anne MacMillan
Run 730 Blk VI, VIII, IX & X Cromwell Survey District Blk I Wakefield Survey District Blks XII & XVI Cardrona Survey District	1C/818	Trustees Executors & Agency for Estate of William George MacMillan William Murray MacMillan and Jacqueline Anne MacMillan
Sec 46 Blk I Wakefield Survey District	12C/1084	William Alan Roxburgh

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11.06 21.APR99 966109

PARTICULARS ENTERED IN REGISTER
LAND REGISTRY OTAGO
FOR REGISTRAR - GENERAL OF LAND

REGISTRAR-GENERAL OF LAND NEW ZEALAND

RECALL FILE LABEL

F5000001455799

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **677069**
Land Registration District **Otago**
Date Issued 19 February 2016

Prior References
174921 OT5B/864

Estate	Fee Simple
Area	1009.0066 hectares more or less
Legal Description	Lot 2, 4 Deposited Plan 481936 and Section 44 Block V and Section 5 Block VIII Cromwell Survey District

Registered Owners
Smallburn Limited

Interests

Subject to Section 11 Crown Minerals Act 1991 (affects Lot 2 DP 481936)

Subject to Part IV A Conservation Act 1987 (affects Lot 2 DP 481936)

Subject to Section 206 Land Act 1924 (affects Lot 4 DP 481936, Section 44 Blk V and Section 5 Blk VIII Cromwell SD)

Reserving also a right to holders of miners rights and mining privileges to use any water-course running through or bounding the said land for the purpose of discharging therein tailings, mining debris or waste water without liability to pay compensation therefor. Subject also to the reservation to the Crown of the right at any time and from time to time without being deemed to commit a trespass and without payment of compensation to enter upon the said land and to take, lay, construct, maintain, inspect, repair or re-construct water-races, drains and all other works which the Minister of Works deems necessary for the supply of water to the said land or to any other land and subject also to the owner of the said land being required to take water from races so provided for irrigation purposes at a price to be fixed by the Crown and excepting the Crown from liability for any damage caused by any overflow or breakaway of any race or channel (affects Lot 4 DP 481936, Section 44 Blk V and Section 5 Blk VIII Cromwell SD)

Subject to Section 278 (12) Public Works Act 1928 (affects Lot 4 DP 481936, Section 44 Blk V and Section 5 Blk VIII Cromwell SD)

615367 Land Improvement Agreement pursuant to Section 30A Soil Conservation and Rivers Control Act 1941 - 25.5.1984 at 10.42 am (affects Lot 4 DP 481936, Section 44 Blk V and Section 5 Blk VIII Cromwell SD)

Appurtenant to Lot 2 DP 481936 herein are rights of way specified in Easement Certificate 885377.6 - 28.6.1995 at 10:27 am

The easements specified in Easement Certificate 885377.6 are subject to Section 243 (a) Resource Management Act 1991

8193899.1 Mining Certificate WR 1097 pursuant to Section 417 Resource Management Act 1991 to Burn Cottage Irrigation Company Limited, David Keith George, John Patrick Webb, J R Webb & Sons Limited, Kenneth Moody, Vivienne Jean Moody, Alma Myrtle Elizabeth Jack and Lachlan Angus Ross - 15.6.2009 at 9:00 am (affects Lot 4 DP 481936)

Subject to Section 241(2) and Sections 242(1) and (2) Resource Management Act 1991(affects DP 481936)

9990393.10 Mortgage to ANZ Bank New Zealand Limited - 19.2.2016 at 2:46 pm

Identifier **677069**

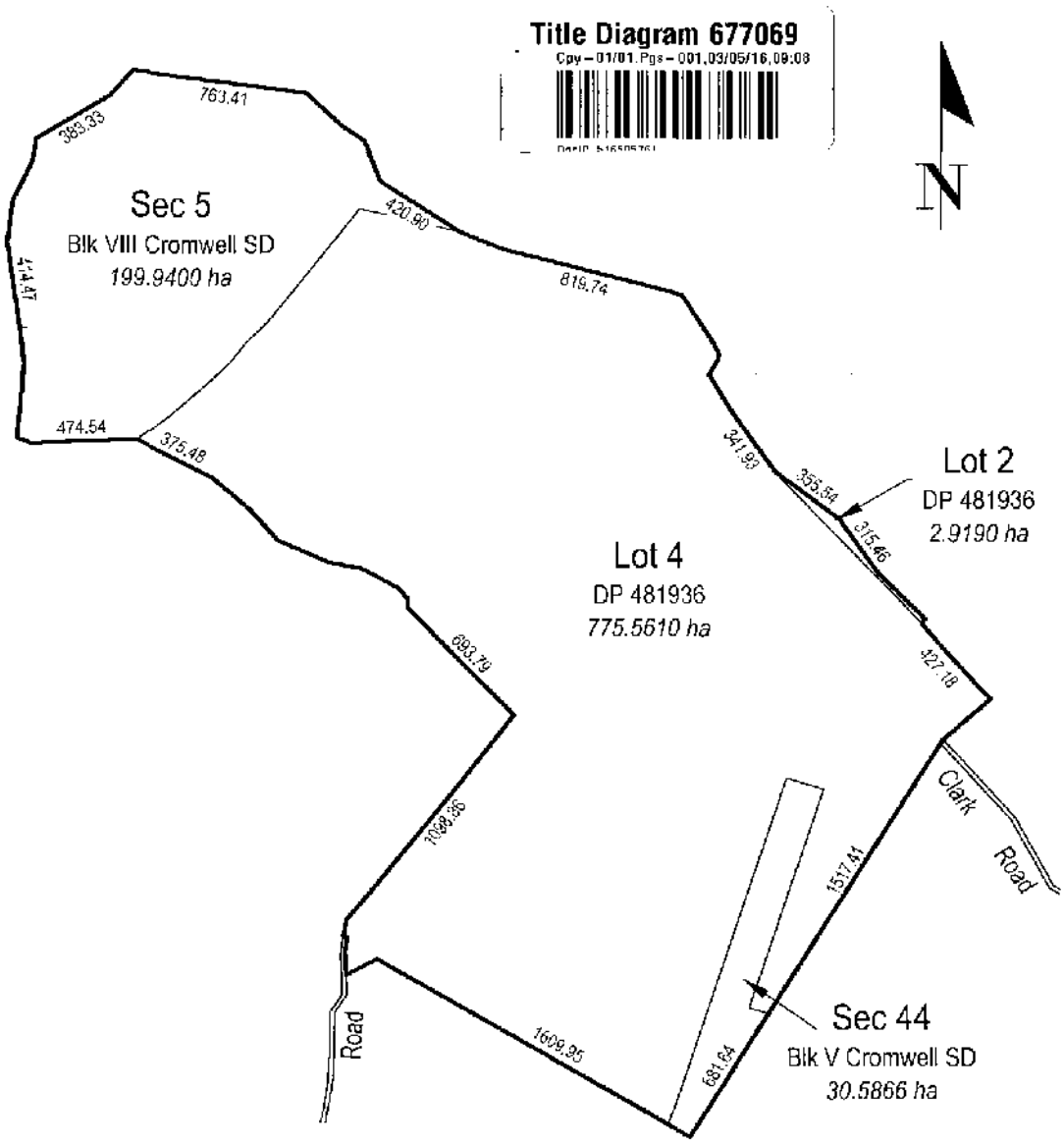
Appurtenant to Lot 4 DP 481936 is a right to convey water created by Easement Instrument 10570977.1 - 23.9.2016 at 11:13 am

10994522.2 Certificate pursuant to Section 417 Resource Management Act 1991 to Robert Stanley Perriam - 19.12.2017 at 12:03 pm

10994522.3 Certificate pursuant to Section 417 Resource Management Act 1991 to Stuart Douglas Hawker and Phillipa Mary Hawker - 19.12.2017 at 12:03 pm

11286984.2 Variation of Mortgage 9990393.10 - 14.2.2019 at 10:42 am

Subject to a right (in gross) to convey electricity over part Lot 4 DP 481936 marked A, C, D and E and over part Section 44 Block V Cromwell SD marked B and a right to transform electricity over part Lot 4 DP 481936 marked D and E all on DP 530796 in favour of Aurora Energy Limited created by Easement Instrument 11354752.2 - 8.3.2019 at 9:46 am



TOTAL AREA: 1009.0066 ha