BEFORE THE COMMISSIONERS APPOINTED ON BEHALF OF THE OTAGO REGIONAL COUNCIL

UNDER	the Resource Management Act 1991 (the **Act** or **RMA**)
IN THE MATTER	of an original submission on the Proposed Regional Policy Statement for Otago 2021 (**PRPS**)
BETWEEN	**OTAGO WATER RESOURCE USER GROUP** **Submitter OS00235 and FS00235** **FEDERATED FARMERS NZ INC** **Submitter OS00239 and FS00239** **DAIRY NZ** **Submitter FS00601**
AND	**OTAGO REGIONAL COUNCIL** **Local Authority**

EVIDENCE IN CHIEF OF SUSAN HELEN MCKEAGUE ON BEHALF OF THE SUBMITTERS

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EVIDENCE IN CHIEF OF SUSAN HELEN MCKEAGUE

Introduction

1. My full name is Susan Helen McKeague, I am an environmental farm consultant.

2. I have worked in the agriculture sector with farming families as an Adviser, Landcare co-ordinator, Facilitator, Land Resource Officer and Consultant for over 30 years. During the 1990's I worked in several farming regions of Western Australia. In 2001 I was employed by the Otago Regional Council as a Land Resource Officer and then for 13 years as the Manager Land Resources. Since October 2013 I have been self employed as a farm consultant.

3. My experience with catchment groups and farmers addressing water quality and quantity issues is extensive. While at the Otago Regional Council I assisted groups and farmers across Otago to interpret the Water Plan rules and policies, provided guidance on best management practice and strategic decisions for water quantity and quality.

4. While at the ORC, I was involved in two Plan Changes. Plan Change 1C which was introduced to enable the smooth Deemed permit transition and Plan Change 6A which set water quality limits.

5. My Environment Court and hearing experience as a consultant includes the minimum flow and permit replacement for the Lindis Catchment Plan Change 5A, the Kyeburn Catchment Group water permit application, ORC Plan Change 7 and the Glenayr water permit replacement.

6. McKeague Consultancy clients are located all over Otago and South Canterbury. We work with catchment groups of irrigators, individuals and irrigation companies. Our clients include but are not limited to:

    (a) Taieri groups such as:

        (i) Kyeburn Catchment Ltd (20 irrigators that successfully replaced their deemed permits in 2019),

(ii) Strath Taieri Water User Group (lodged group application for 21 deemed and water permits),

(iii) Paerau Waipiata: (Voluntary flow sharing group upholding Minimum flow),

(iv) Styx water users (permit replacement and flow sharing)

(v) Maniototo Irrigation Company providing guidance on environmental matters (MIC delivers stored water from the Loganburn dam and run-of-the-river water to shareholders in the Maniototo)

(b) Manuherikia

(i) Manuherikia Catchment Group (project management for the full catchment group that co-ordinates all water permits)

(ii) Ida Valley Irrigation Company (managing replacement permit applications and providing guidance on environmental matters)

(iii) Poolburn private water users (managing replacement permit applications as a group of nine)

(iv) Blackstone Irrigation Company (managing replacement permit applications)

(v) Manuherikia Irrigation Co-operative Society (managing replacement permit applications and guidance on environmental matters)

(vi) Lauder sub-catchment group (All farms utilising water in the Lauder catchment (approx. 20 families) working together to apply for their permits that includes new environmental flows, flow sharing and co-operation)

(vii) Thomson’s Creek sub-catchment group (as above for all the Thomson catchment irrigators)

(c) Cardrona Water Users (Assisting in the replacement of permits for many water users and the minimum flow plan change process)

(d) Bannockburn catchment (Managing the replacement permit applications for all private water users and the Carrick Irrigation Company)

(e) Pisa and Lowburn

(i) Replacing the water permits on many private rights in the Lowburn area for vineyards, horticultural and pastoral operations.

(ii) Pisa Irrigation Scheme (Managing the replacement of permits for the scheme and other environmental management matters)

(f) Lindis Catchment

(i) Permit replacement and minimum flow discussions for the whole catchment.

(ii) Ardgour Pipeline Ltd (Farm plan auditing).

7. This client list and responsibilities provides myself and McKeague Consultancy with a detailed understanding of the water quantity issues in the region.

Code Of Conduct for Expert Witnesses

8. I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014. This evidence is within my area of expertise, except where I state that I am relying upon material produced by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of Evidence

9. The purpose of my evidence is to explain the complexity of achieving change to farming systems and the need for long transition periods where land and water use change is anticipated through changes in policy.

10. On farm irrigation system changes take time to plan and implement.

11. Irrigation schemes and companies have complex and interconnected infrastructure that cannot be altered quickly or cheaply.

12. Over the decades the irrigators in the dry catchments of Otago have established collective water management. Irrigators, companies and catchment members all co-operate to share the scarce resource. Any alterations to the system will take time to design, introduce, and re-establish new protocols.

13. Clear goals and visions that are achievable and hold steady over time are required for any farming business to adapt.

14. It is unclear in the pRPS exactly what change is required to achieve the visions in the FMU's therefore difficult to assess if the vision is sensible for the rohe and/or achievable. That means it is impossible to predict how long change will take to implement. Although this evidence relates to the non-freshwater provisions, the need to acknowledge the difficulties in achieving change, and provide for suitable transition periods, needs to be acknowledged in the earlier chapters of the RPS.

15. As an example to explain the issue, the vision for the Manuherekia rohe to favour main stem or groundwater abstraction over tributaries is not practical or needed.

On farm systems

16. In recent times irrigators have been responding to ORC signals requiring efficient water application methods by investing in spray systems such as centre pivots, fixed grid and direct application methods. These changes also require alterations of paddock layouts,

fencing, laneways, troughs and also crop or pasture establishment. Huge amounts of money, sometimes millions of dollars per farm, have been invested in the last decade or so to responding to ORC change signals. Most farms have incurred long-term debt to adapt to spray irrigation.

17. Where landscape, land availability and funds allow, irrigators have also installed water storage options. Whether that is just a smallish pond that may hold 6-12 hours water so the pivot can operate continually for a set period. Some have built bigger storage that may assist to fill a reduced water access period for a few weeks, or to bridge the gap between water rosters from race networks set up to supply flood irrigation rather than spray. Storage design and construction is expensive. In our work we assist farming businesses with the Resource Management Act paperwork that is required.

18. Even a small pond in a paddock requires a consent if the wall is above 3m or the storage is above 20,000m^3.

19. Storage the size of 21,000m^3 is enough to only optimally water approximately three hectares in Central Otago. It is small storage. Three consents are needed: to dam, discharge and retake.

20. Irrigators are continually adopting new technologies and improving their practices. The water storage example is just one improvement that may have been made on a farm recently. The commitment to storage involves considerable paper work and funds which increases if the storage is above 4m and a Building Act consent is needed. Length of term of storage permits is generally 20+ years as it is understood storage is a long term investment.

Irrigation Schemes

21. Throughout Central Otago there are many established irrigation schemes. Brendan Sheehan describes the storage and delivery infrastructure of two of those schemes in his evidence. Others have extensive races which deliver water via gravity, measuring and flow

division equipment, and intake infrastructure. Hundreds of businesses are reliant on the water that flows to and through their land.

22. Irrigation water supplied even in the smallest amount in some localities makes a huge difference to people's lifestyle and business viability. Irrigation water in Central Otago is used for pasture to produce meat, milk and wool, horticulture, vineyards, hospitality venues such as gardens and mazes, golf courses, recreation and amenity areas.

23. If a scheme can no longer function because the flow available is too low or one of the major uses such as wool production is low priority, then the consequences for all shareholders could be quite major. In Central Otago in particular, reliable access to irrigation water is the difference between economic viability and failure

24. The irrigation schemes are shareholder owned and funded. The owners are the farmers that receive the water. Upgrades to irrigation schemes are funded off the balance sheets of the farmers and compete with other priorities such as improvements in stock performance, riparian planting, and investing in reducing or offsetting carbon emissions. There is a limit on the funds available to make any changes in response to visions and timeframes.

25. The implications of any RPS vision needs to be clear whether the economic failure of existing farming businesses through reduced access to freshwater is an intended or expected outcome. I would have expected such things to be identified in the preliminary chapters as significant resource management issues for the region.

Catchment management of water access and low flow water sharing

26. Central Otago irrigators are accustomed to working collectively to maintain access to some water and meet in stream limits. As the flows in creeks and rivers naturally decline it is common for the water users in a catchment or sub-catchment to ration their abstraction so that all users can have access to some water.

27. The water users are aware of their impact on each other and the waterways. Sharing access to a resource that may flow for 10's to 100's of kilometres is challenging.

28. The water users rationing regimes are sometimes relatively simple. Such as the Paerau Waipiata Irrigators on the main stem of the Taieri between Paerau Weir and Waipiata flow site. This section of the Taieri is shown on *Figure 1* below. McKeague Consultancy has been rationing these four irrigators since the summer of 2016-2017. Only two of the four permits include a minimum flow condition at Waipiata on the Taieri but all four decided they would share water and turn off when the flow at Waipiata was at the minimum flow in the Otago Regional Plan Water, of 1000L/sec.

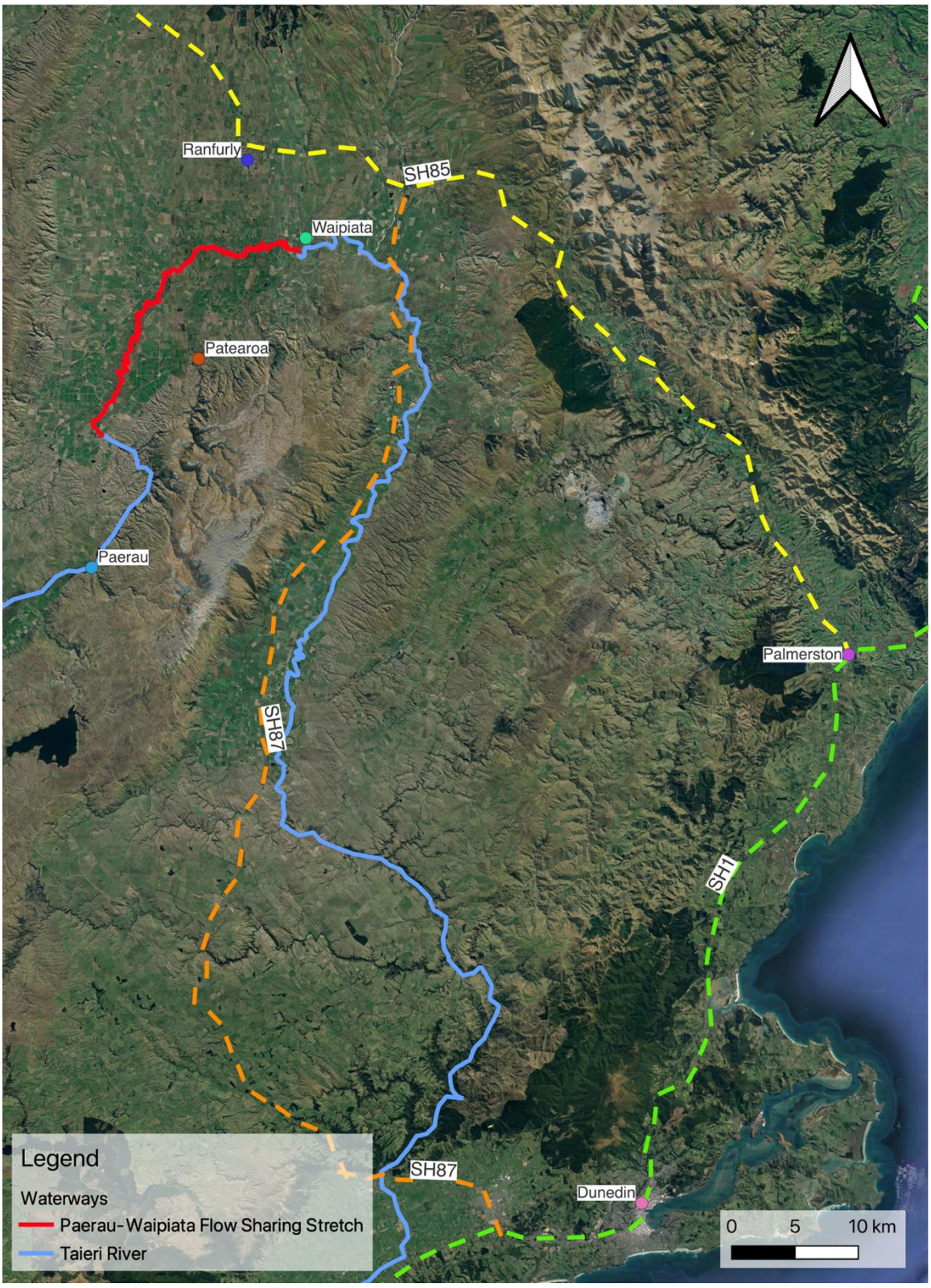

Figure 1 Location of Paerau-Waipiata Flow Sharing Group in the Taieri Catchment

29. There is 40 hours river travel between the most upstream abstraction and the lowest. And 12 hours flow travel between the most downstream abstractor and the ORC minimum flow site. Two of the permit holder's pumps can abstract at variable rates to a minimum limit and they have the flexibility to switch the water to storage. Two permit holders cannot alter their abstraction rates as their water goes directly to application systems and that equipment does not function optimally with the reduced flow rate. That means the rationing regime cannot simply be a case of every-one reducing by a set percentage. It has to be irrigators being on and off while incorporating the travel times between takes and the minimum flow site. I say this is the simple example but in reality, even this flow sharing it complicated.

30. It has taken many years to understand how the flow down the river behaves with the variable inflow of tributaries, responses to weather and water use demands of current land uses.

31. If different limits and rules (such as minimum or residual flows, abstraction constraints and land use) were introduced then how the irrigators are able to manage the flow sharing would also need to be understood and established.

32. Flow sharing is inevitable when minimum flows are activated on rivers. Any flow that is available above a minimum or environmental flow is shared among the water user community.

33. A more complicated example is the Manuherekia River. In this catchment there are over 700 water users supplied via six irrigation companies or one of 50-60 individual permits. The farming community have been sharing water in this catchment since the 1930s.

34. There is a dam at the base of the high country in the main stem Manuherekia, Falls Dam, built in 1935. At 10 Million m^3 of storage it is not a big dam for the size of the catchment. During the dry times it does assist in keeping flows up in the river and some water available for irrigation abstraction.

35. Flow sharing in the catchment is based on an agreement between the four companies that own Falls Dam and abstract water from the main stem of the Manuherekia. The companies have been working to uphold a voluntary minimum flow at the bottom of the catchment of 900L/sec. When there is not enough water to achieve both the abstraction rate of each company intake and the minimum flow then flow sharing and dam water release may be initiated. The Falls Dam agreement means that a winner is not selected but rather all irrigation abstraction is reduced and all shareholders have to accept less water.

36. Flow restrictions have an impact on both the water received by the shareholders and the functioning of the scheme race systems. The greater the cut backs for rationing the more at risk the races are of not functioning. Some races in the Manuherekia Irrigation Company Society will not function at flows less than 50%.

37. Once rationing is introduced shareholders within the irrigation companies then need to respond to decreased water for their pastures, crops, vines, horticulture or livestock. The reduced water availability coincides with the hot dry time of the year. It is a tough time for all farmers and irrigation company staff. Prolonged water stress on any plant will result in plant death. That is particularly devastating in horticulture that takes seven years to reach production maturity.

38. Since at least 2018 the ORC have been advising that a plan change for the Manuherekia (and Cardrona and Arrow catchments) was imminent. At the same time the farmers were preparing for the replacement of the bulk of the water permits. These two factors meant the water users had to complete the science, understand the values, and draft a solution for the catchment themselves. The ORC are yet to announce the details of a Plan Change (now to be the new Land and Water Plan) for the Manuherikia FMU. However the pRPS sets the framework for some of those details. The pRPS framework must enable an achievable proposal for all catchments including the Manuherekia. The RPS does not tell us what that is.

39. The proposal for water management for the Manuherekia as developed by the water users needed to include both the current water sharing system that works based on Falls Dam updated with all the new requirements addressing instream ecology, catchment values and NPSFM considerations.

40. The Overview Document as attached in Appendix A is the summary that was lodged with the water permits back in early 2021. It shows the complexity at a higher catchment level of the flow sharing. It included catchment management zones (shown in *Figure 2*), minimum flow sites, residuals on the main stem and which water permits would expect these conditions.

41. The next level of detail was worked out at the sub-catchment level. Each sub-catchment of the full catchment may need a flow sharing regime so that a suitable residual flow would be maintained at the confluence with the mainstem or at locations within the stream. Or may have individual residual flows depending on the values. Each sub-catchment also contributes to the full catchment flow. *Figure 3* illustrates the major sub-catchments.

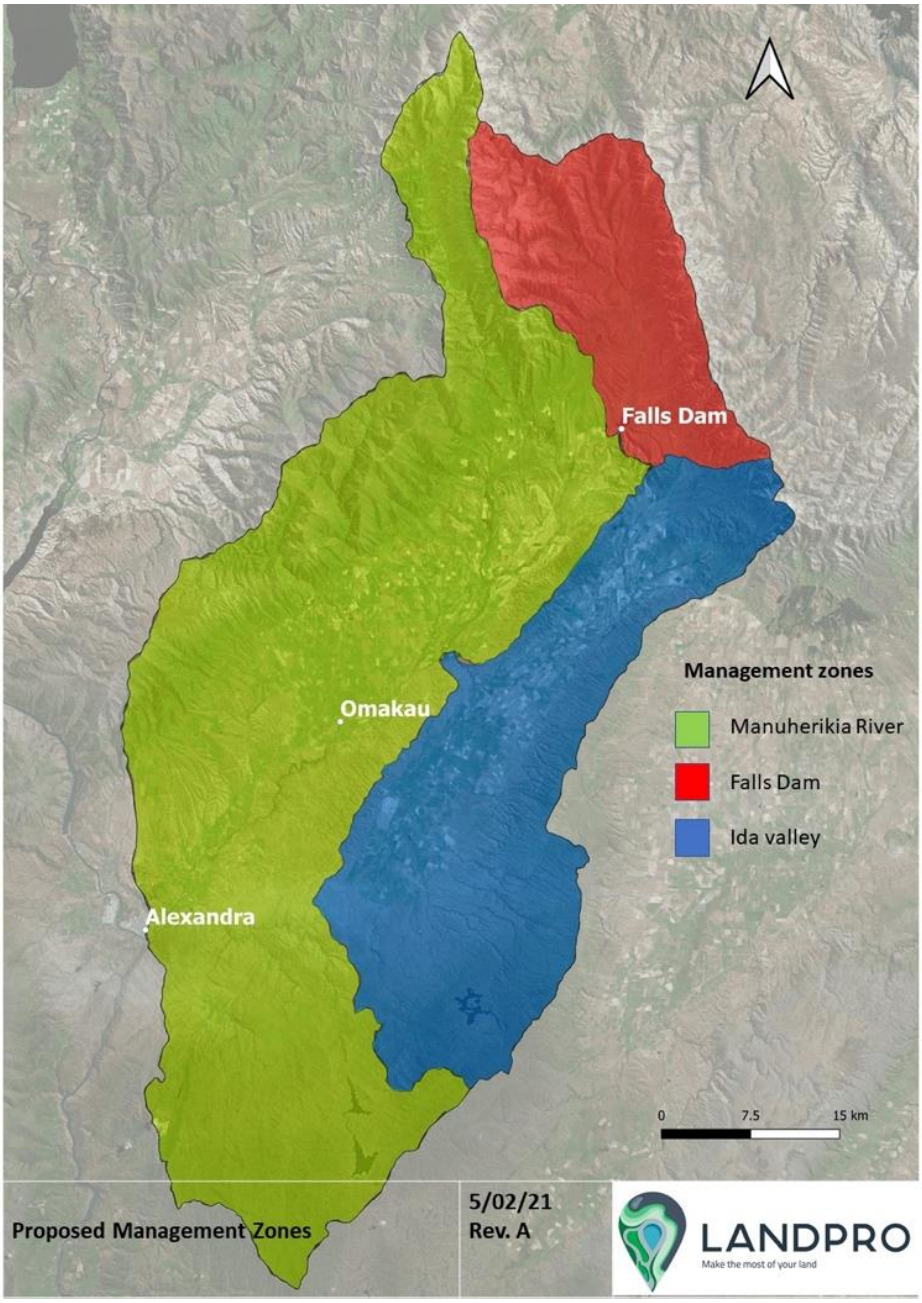

Figure 2 Proposed Manuherekia Catchment Management Zones

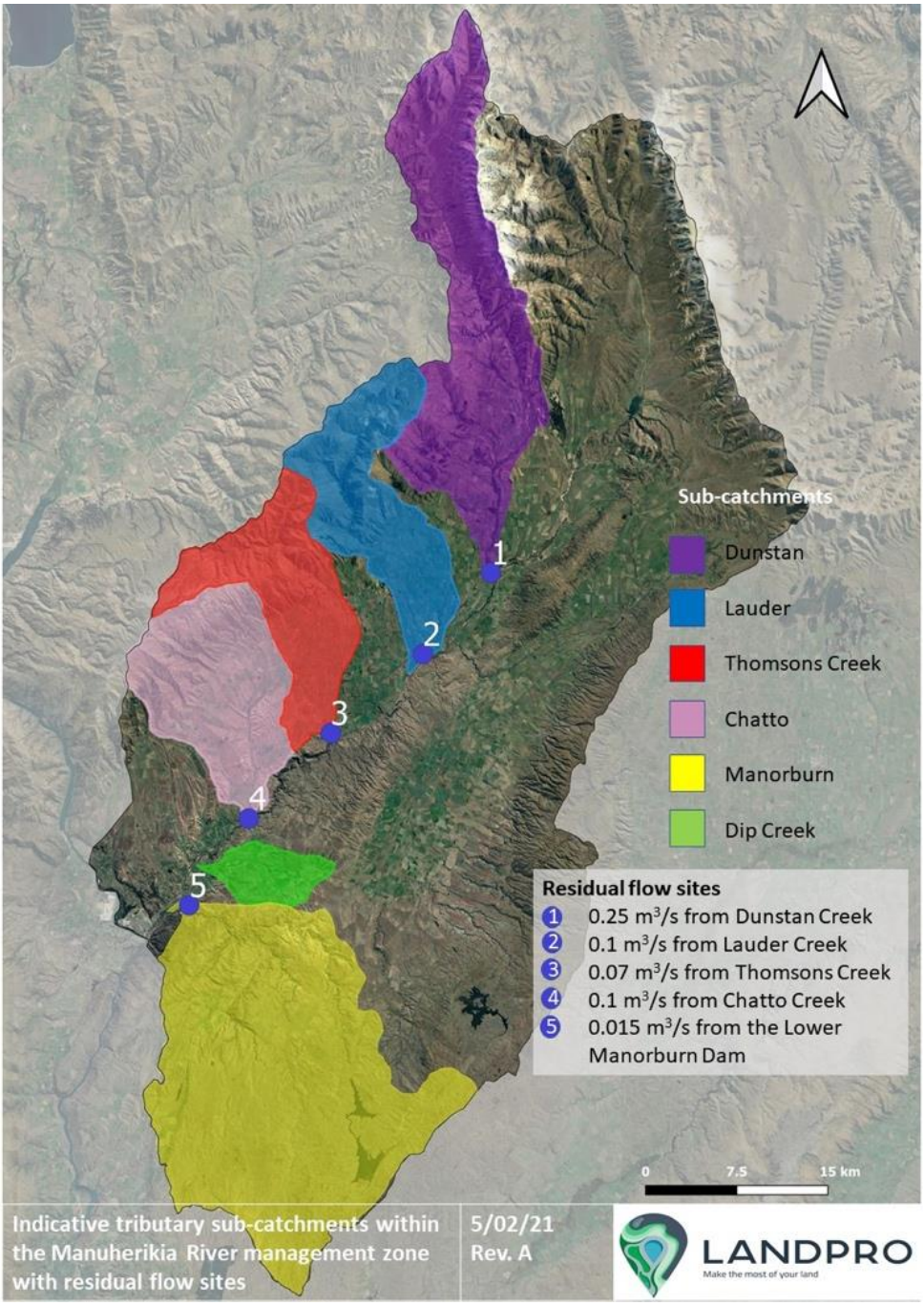

Figure 3 Major Manuherekia Sub-catchments

42. To work this out the hydrology of the streams needed to be understood and individual water users had to determine ways their own systems could work with the changes. Water users made a commitment to the proposal but still have some questions on whether they will be able to operate their systems. Some races will struggle to operate effectively with lower flows.

43. Each sub-catchment was worked out separately and then combined into the whole catchment. The work included residual flow recommendations to protect in stream values, abstraction details, efficiency calculations on farm management and group water management decisions. My role was the co-ordinating of the group decision making. There are many businesses in a catchment that need to co-operate to get to an agreed position.

44. It is a unique situation where you have a series of competing businesses that are called on to voluntarily cut their water (ultimately their profits) for the good of the catchment and their neighbours. It calls on a lot of goodwill, trust and people putting the well-being of the community over themselves.

45. In building the solution for the Manuherikia from 2018 to 2021 I witnessed again and again individuals, businesses and business profits being sacrificed so the community or stream would be in better health.

46. Using the Lauder Catchment as an example: Figure 4 below is a map of the takes that were submitted to be replaced in early 2021. There were two residual flows proposed, Upper and Lower catchment. Those above WR432B would share flow to achieve a residual and those between WR432B and 93447 would share to achieve a residual at the confluence.

47. There are 20 farming families that needed to understand this proposal and be able to make it work on their farms just for the Lauder portion of the whole catchment proposal.

48. The proposed RPS has visions for FMU's that are not well defined so it is impossible for farmers to determine whether the vision is logical or achievable, the degree of change that may be required or whether the timeframe is fair.

Vision versus reality at Lauder Creek

49. The vision in the Clutha Mata-au FMU, Manuherikia, Dunstan and Roxburgh rohes includes the vision:

> (iii) sustainable abstraction occurs from main stems or *groundwater* in preference to tributaries,

50. In *Figure 4* below you can see there are many tributary takes located on the Lauder Creek, a tributary of Manuherekia. Up to 20 businesses and farming families are supported by abstraction from the Lauder Creek. All permit holders utilise gravity to at least some degree to access the water they use.

51. The location of the water take in relation to the paddocks irrigated is what makes irrigation viable. Many farms border the creek or are part of the Lauder scheme which is a shareholder owned race that delivers water to several water users.

52. Many of these farms are not close enough to the main stem for that water to be an option. Nor do they have easement rights to the main stem.

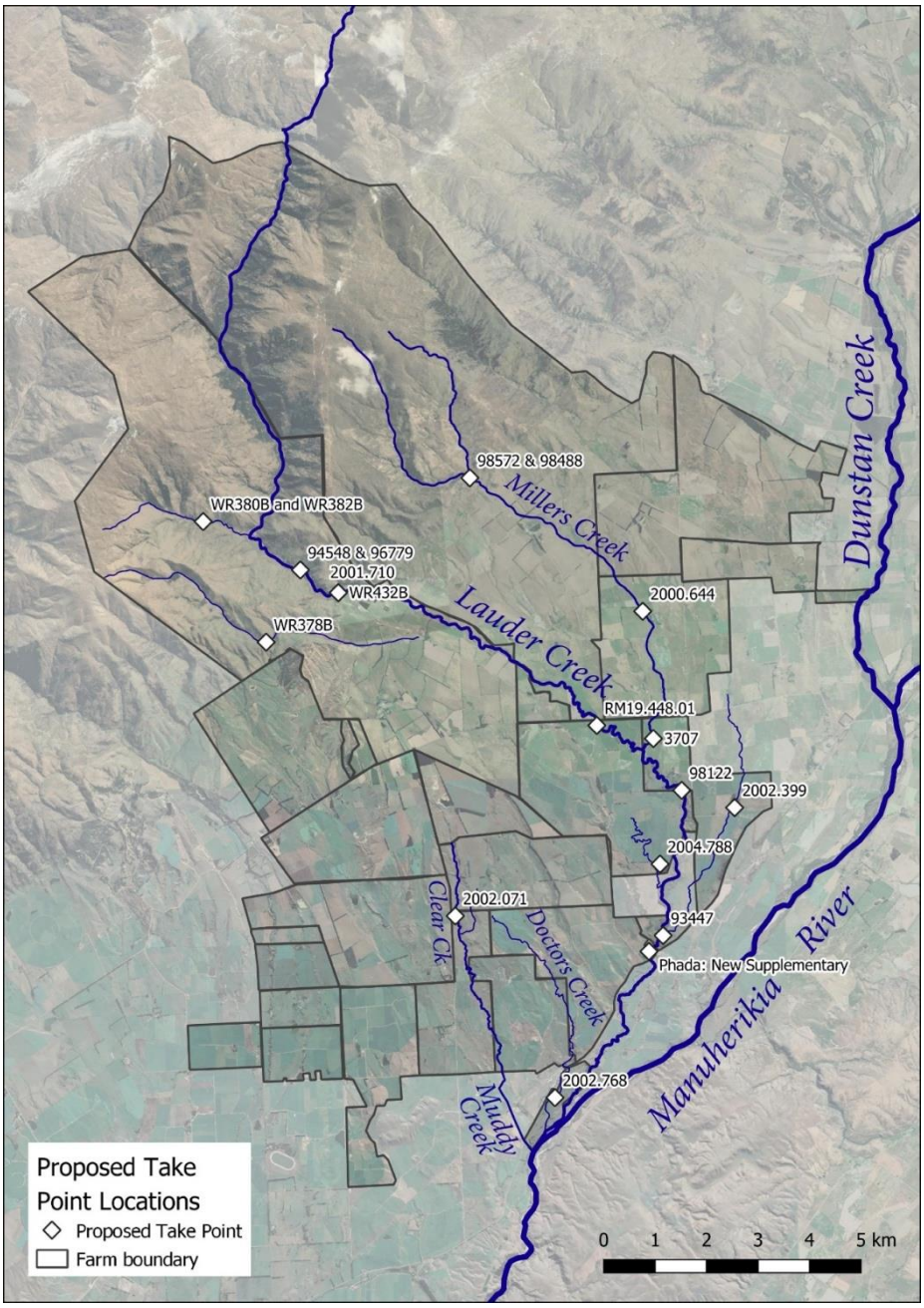

Figure 4 Lauder catchment water permit locations and numbers pre 2021(copied from permit application)

53. The wellbeing of the tributary will be protected in the future with the introduction of residual and minimum flows, efficiency improvements and further good practice adoption as required in the certified farm plans.

54. The proposed vision is neither required to protect tributaries nor feasible to implement because it fails to consider the situation on the ground.

55. The reason for explaining all this is to give the Panel an understanding of the enormous challenges and complexity involved in making changes to farming systems across whole catchments. This is truly a once-in-a-generation challenge alongside climate change and many other challenges besides. The inter-generational timescale necessary to respond to new policy settings needs to be recognised as such in the RPS, so that the intended Land and Water Regional Plan is not faced with the task of implementing a policy framework that is not achievable.

In summary

56. Water users in Central Otago have established protocols and infrastructure for flow sharing in dry times. Water storage, distribution, and application infrastructure is the result of a century of investment, trial, and error. Farming system change is unavoidably complex and slow.

57. The water users are prepared for some change and in many cases such as the Manuherekia have been proactively engaged in seeking further understanding and options to deliver the values of the catchments. However, if big changes are required then the complexity of water access and flow sharing mean long timeframes are needed. The RPS needs to acknowledge this to ensure that the Land and Water Regional Plan is not set up to fail through having to implement unachievable goals.

Date: 23 November 2022

S McKeague

Appendix A

Manuherikia Catchment Group Incorporated

Overview of

Proposed Catchment Management Approach

Prepared by McKeague Consultancy

February 2021

Quality Assurance Statement for: **McKeague Consultancy Ltd | 16 Howard Street | Macandrew Bay| Dunedin 9014**	
Prepared by	McKeague Consultancy Ltd: Sally Dicey, Susie McKeague, Ros Day Water Resource Management Ltd: Matt Hickey Landpro: Kate Scott, Christine Bright, Zoe McCormack WSP: Mike Kelly
Reviewed by	Susie McKeague
Approved for issue by	Susie McKeague

This document has been prepared for the benefit of the Manuherikia Catchment Group Inc for the purpose of obtaining consents from the Otago Regional Council. No liability is accepted by this company or sub-consultant of this company with respect to its use by any other person.

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Abbreviations

Blackstone Irrigation Company	BIC
Central Otago District Council	CODC
Falls Dam Company Ltd	FDC
Farm Environmental Plan	FEP
Freshwater Management Unit	FMU
Galloway Irrigation Society Inc	GIS
Hawkdun Idaburn Irrigation Company	HIIC
Ida Valley Irrigation Company Ltd	IVIC
Manuherikia Catchment Group Inc	MCG
Manuherikia Irrigation Co-operative Society Ltd	MICS
Manuherikia Reference Group (ORC facilitated community stakeholder group)	MRG
National Objectives Framework	NOF
National Policy Statement for Freshwater Management	NPSFM
Omakau Area Irrigation Company	OAIC
Otago Regional Council	ORC
Otago Regional Policy Statement	RPS
Otago **R**egional **P**lan: **W**ater for Otago	RPW
Otago Water Resource Users Group	OWRUG
Partially Operative Regional Policy Statement	PO-RPS
Proposed Regional Policy Statement	pRPS
Proposed Water Permits Plan Chance (Plan Change 7)	PC7
Resource Management Act	RMA
Technical Advisory Group (ORC facilitated Technical Advisory Group for the Manuherikia plan change)	TAG

Executive summary

This document provides an overview of the approach taken with applications to replace existing permits to dam, take and use water (and other associated activities) from the Manuherikia catchment. This document forms part of the supporting information for each of these applications.

The applicants include irrigation companies representing hundreds of shareholders, as well as individuals, companies or other entities that hold a permit in their own name. In total these applications represent more than 600 water users, and address over 100 existing permits, including permits to dam, discharge, take and use water.

The applicants are listed in the table below:

Table 1. Summary of applications within Manuherikia Catchment to replace existing permits

Application Number	Applicant	Sub-catchment	Consultant
RM18.458	Knapdale Farms Limited	Thomsons Creek	Landpro
RM19.121	Trevor Wayne Drake and Catherine Drake	Chatto Creek	Landpro
RM19.125	Cairnhill Limited	Dunstan Creek	Landpro
RM20.092	Thorndean Farm Limited and Others	Poolburn and Ida Burn	McKeague Consultancy
RM20.096	Paterson and others	Galloway Aquifer	WSP
RM20.335	Manchester Dairy Limited and Others	Thomsons Creek	McKeague Consultancy
RM20.437	Mt Campbell Station	Manor Burn (Little Valley)	Landpro
RM20.448	Ida Valley Irrigation Company	Pool Burn, Manor Burn	McKeague Consultancy
RM20.453	Blackstone Irrigation Company	Manuherekia Mainstem	McKeague Consultancy
RM20.454	MICS	Manuherekia Mainstem, Chatto Creek, Waikerikeri	McKeague Consultancy
RM21.003	Lauder sub-catchment	Lauder Creek	McKeague Consultancy
RM21.006	Matakanui Station Ltd	Chatto Creek	Landpro
RM21.007	Barley Station (Glencoe) Trust	Manuherekia Mainstem	Landpro
RM21.008	OAIC – County	Chatto Creek	Landpro
RM21.009	Thomsons Cub-catchment	Thomsons Creek	McKeague Consultancy
RM21.010	OAIC – Main Stem	Manuherekia Mainstem	Landpro
RM21.011	OAIC – Dunstan Race and Downs	Dunstan Creek	Landpro
RM21.012	R Naylor	Chatto Creek	Landpro
RM21.023	OAIC – Falls Dam	Manuherekia Mainstem	Landpro

RM21.052	Galloway Irrigation Society Incorporated	Manuherekia Mainstem	WSP
RM21.045	Duncan Family Trust and Hawkdun Pastoral Ltd	Dunstan Creek (Woolshed Creek)	McKeague Consultancy
RM20.255	Sinclair Trust and Lilybank Co. Ltd	Becks Creek	McKeague Consultancy
TBC	John McArthur	Scrubby Gully, Manuherekia Mainstem	McKeague Consultancy
TBC	Matangi Station	Manor Burn (Speargrass Creek)	McKeague Consultancy

The current planning framework does not include an updated minimum flow or allocation block for the catchment, and the existing regional plan does not give full effect to the NPSFM (2020).

In response to this, the vast majority of permit holders in the Manuherekia catchment have worked together to develop a proposal which considers the FMU process and the values and aspirations that the community have repeatedly expressed to the ORC through consultation. This includes the development of a catchment management framework for managing water quantity and water quality, where impacted by water use. It includes integrated limit setting, including residual flows on individual water takes, residual flows for tributaries and minimum flows for the catchment.
This approach is unprecedented in New Zealand and is both ambitious and challenging. It presents a significant opportunity to understand and recalibrate water management in a manner that protects and enhances the affected freshwater bodies and ecosystems whilst providing for values including human use.

To address the gap in the existing planning framework this proposal has been developed to give effect to the NPSFM (2020) and Te Mana o te Wai by protecting and providing for the health and well-being of water bodies and freshwater ecosystems, within the context of broader factors (outside of the applicants control) affecting the Manuherikia catchment. Specifically, the proposal seeks to:

- prioritise indigenous biodiversity over introduced species;
- improve degraded water bodies and freshwater ecosystems as far as is possible through the management to water takes and use (and related activities);
- avoid the loss of values; and
- implement integrated management at a catchment scale.

The applications are predicated on an agreed approach to proposed minimum flow limits for the catchment, as well as residual flows for tributaries and/or take specific residuals. The proposed flow management framework set out in this document and the specific applications are anticipated to be able to achieve the following results:

- Flows that provide for values identified by the community at a catchment, tributary and site-specific scale.
- Residual flows that will reduce existing low flow stress on many sections of the river and streams in the catchment.
- Efficient water use, with the rates and volumes allocated based on actual efficient need.

- Efficient irrigation that will:
    - reduce run-off from irrigation
    - maintain or improve water quality (but reduced recharge)
    - reduce recharge of groundwater.
- Co-ordinated and rationed water access that will be pre-emptive of low flows.
- Water reliability that will be of an appropriate level to allow spray application methods to be viable and investment in infrastructure that improves conveyance and application efficiency.
- Falls Dam will be managed optimally to balance the need of providing flows for abstraction and sustaining minimum flows in the main stem. Ultimately this will mean augmentation of the main stem to Campground through dry periods will occur as long as possible.

It is critical to note that these measures are entirely predicated on the proposal as a whole put forward in this document and the separate applications that all form part of the Manuherikia Catchment Proposal. This includes long term permits, allocation and reliability of supply as proposed. This is because all aspects of the proposal are inter-linked and removing or changing any one part could cause all other parts of the proposal to become non-viable.

This document provides an overview of the permits and applications that are part of the catchment approach. It provides a brief overview of the history of water management in the Manuherikia catchment and the physical setting of the catchment. Section 6 outlines the proposal for water management in the Manuherikia, based on an assessment of hydrology, ecology and water quality within the catchment. This includes the rationale and basis for the flow limits, including the location of the various flow limits. Section 7 explains the approach taken with regard to allocation within the catchment.

Given the scale and complexity of the activities included within the applications, where possible a common approach has been taken with the methodologies and analysis to achieve as much consistency as possible across all the applications. These methodologies are outlined in Section 8. This document also includes an assessment of effects on the environment and a legislative analysis at an over-arching catchment level (Sections 9 and 10). More specific analysis and detail is included in the separate applications where relevant.

1. Development of a catchment proposal

In response to the significant number of deemed permits and water permits expiring on (or before) October 2021 in the Manuherekia catchment, the ORC signalled their intent as far back as 2010 to complete the minimum flow plan change process. This plan change involves a full assessment of values in the catchment and the level of flow required to protect and enhance these values. It also considers the allocation limit for the catchment.

The ORC intended to complete its plan change process (which was latterly called Proposed Plan Change 5C Integrated Water Management: Manuherikia Catchment) in advance of the replacement of large numbers of deemed permits and water permits expiring in 2021 in the catchment. This would have allowed replacement applications to respond to the framework and limits set by the minimum flow plan change process, including any reduction in reliability of supply. This is particularly necessary in catchments such as the Manuherekia, with significant investments across the whole catchment in existing modern infrastructure and a strong horticulture and agriculture economic base. The combination of policy requiring further improvements to efficiency of use with a potential loss in reliability of supply (through a new or higher minimum flow limit or reduction in allocation) can create very real challenges in shifting to more efficient systems and the basic viability of many businesses.

However, no plan change process has been completed for the Manuherekia catchment. The Otago Regional Council (ORC) have instead proposed an interim planning framework with the intention to notify a new plan (the Land and Water Regional Plan) mid 2023. This has left a significant gap in the planning framework for the replacement applications.

In anticipation of this gap, central government has stepped in, and directed that a plan change be developed which delays the full assessment of permit replacements until a full review of the planning framework for Otago can be undertaken and new plans proposed. Unfortunately, this intervention has come too late. Water users are aiming to lodge applications more than 6 months prior to the expiry of their permits, to ensure that their ability to continue operating under Section 124 of the Act is retained. In addition, the ORC's temporary framework for 'roll over' consents (Plan Change 7) until a full plan review takes place, is not yet operative. This has resulted in a situation where applications must address both PC7 and the operative RPW. This has further complicated the application process. Nor does PC7 provide a viable option for applicants, many of whom would arbitrarily lose allocation that they have historically used and would not provide sufficient investment certainty due to the short term of consent.

In response to the gap in the planning framework and the looming expiry of permits in October 2021, the vast majority of permit holders in the Manuherekia catchment have worked together to develop a proposal which considers the FMU process and the values and aspirations that the community have repeatedly expressed to the ORC through consultation. This includes the development of a catchment management framework for managing water quantity and water quality, where impacted by water use. It includes integrated limit setting with residual flows on individual water takes, residual flows

for tributaries and minimum flows for the catchment, included as part of the consent replacement applications.

This approach is unprecedented in New Zealand and is both ambitious and challenging. It presents a significant opportunity to understand and recalibrate water management in a manner that protects and enhances the affected freshwater bodies and ecosystems whilst providing for values including human use.

In the absence of an operative planning framework that gives effect to the National Policy Statement for Freshwater Management, this proposal seeks to give effect to the NPSFM (2020) as far as possible. This has been a critical element of the proposal. It does so by protecting and providing for the health and well-being of water bodies and freshwater ecosystems, within the context of broader factors (outside of the applicants control) affecting the Manuherikia catchment. Specifically, the proposal seeks to:

- Start with 'allocation' for the waterbody and freshwater ecosystem values by setting flow limits.
- Improve degraded water bodies and freshwater ecosystems as far as is possible through the management of water takes and use (and related activities).
- Implement integrated management at a catchment scale.
- Prioritise indigenous biodiversity over introduced species.
- Avoid the loss of values.

The Manuherekia has been identified as a Rohe within the Clutha/Mata-au FMU. This proposal acknowledges the values identified in the consultation undertaken to date by the ORC on this Rohe. These values are listed in the figure below.

Environmental values relate to the health, integrity and extent of the natural environment. People value a clean, clear, healthy river with sufficient and variable flow that supports:

- Ecosystem health, including diverse aquatic life
- Indigenous biodiversity and threatened species
- Natural form and character, and
- Retention or enhancement of remaining wetlands.

Social values are about the health and wellbeing of the community. People value:

- Water bodies that are safe and enjoyable for swimming, playing and kayaking
- A safe and secure supply of drinking water and
- Community wellbeing/hauora, including mental health.

Economic values enable the community's livelihood. A reliable and secure supply of water supports:

- Irrigation for farming, horticulture and viticulture
- Employment and prosperity
- Stock water
- Electricity generation and
- Tourism.

Cultural values are about ways of life and links to the past that people wish to preserve, including:

- Access to water bodies,
- Kāi Tahu values of mahika kai, place names, ara tawhito (trails) and quarry sites,
- Fishing,
- A broad range of other recreation, and
- Heritage sites.

Figure 1. Summary of values identified through consultation by the ORC on the Manuherikia Rohe (Source: ORC Freshwater Management Values and Aspirations for the Manuherekia Rohe, 8 May 2020)

The proposed flow management framework set out in this document and the specific applications are anticipated to be able to achieve the following results:

- Flows that provide for values identified by the community at a catchment, tributary and site-specific scale.
- Residual flows that will reduce existing low flow stress on many sections of the river and streams in the catchment.
- Efficient water use, with the rates and volumes allocation based on actual efficient need.
- Efficient irrigation that will:
    - reduce run-off from irrigation
    - maintain or improve water quality (but reduced recharge)
    - reduce recharge of groundwater
- Co-ordinated and rationed water access that will be pre-emptive of low flows.
- Water reliability that will be of an appropriate level to allow spray application methods to be viable and investment in infrastructure that improves conveyance and application efficiency.

- Falls Dam will be managed optimally to balance the need of providing flows for abstraction and sustaining minimum flows in the main stem. Ultimately this will mean that augmentation of the main stem to Campground through dry periods will occur for as long as possible.

It is critical to note that these measures are entirely predicated on the proposal as a whole put forward in this document and the separate applications that all form part of the Manuherikia Catchment Proposal. This includes long term permits, allocation, and reliability of supply as proposed. This is because all aspects of the proposal are inter-linked, and removing or changing any one part could cause all other parts of the proposal to become non-viable.

2. Proposal Design

This overview document provides the overarching approach to the management of surface water in the Manuherekia catchment.

All of the applicants are members of the Manuherikia Catchment Group Inc and have adopted this document as part of their applications.

This document provides an overview of the catchment, how surface water allocation has been managed in the past and sets out the key flow management proposals for a collaborative catchment management approach.

This approach is structured in the following manner:

Table 2. Layout of applications within catchment proposal

Manuherikia Catchment Group Overview of Proposed Catchment Management Approach			
Management Zone	**Sub-catchment**	**Applications**	**Application Number**
Above Falls Dam Management Zone	-	No applications are part of this proposal – existing permits do not expire until 2037	-
Manuherikia Mainstem Management Zone	Main stem of Manuherekia River	OAIC - Falls Dam	RM21.023
		Blackstone Irrigation Company	RM20.453
		Manuherikia Irrigation Co-operative Society	RM20.454
		Paterson and others	RM20.096
		Barley Station (Glencoe) Trust	RM21.007
		OAIC – Main Stem	RM21.010
		Galloway Irrigation Society Incorporated	TBC
	Dunstan Creek	OAIC – Dunstan Race and Downs	RM21.011
		Cairnhill Limited	RM19.125
		Woolshed Creek - Duncan Family Trust and Hawkdun Pastoral Ltd	RM21.045

	Lauder Creek	Lauder sub-catchment including • OAIC and Private Permit holders	RM21.003
	Becks Creek	Sinclair Trust and Lilybank Co. Ltd	RM20.255
	Thomson Creek	Thomsons sub-catchment including: • OAIC and Private Permit holders • Manchester Dairy Limited and Others	RM21.009 RM20.335
		Knapdale Farms Limited	RM18.458
	Chatto Creek	Trevor Wayne Drake and Catherine Drake	RM19.121
		Matakanui Station Ltd	RM21.006
		OAIC – County	RM21.008
		R Naylor	RM21.012
		Manuherikia Irrigation Co-operative Society	RM20.454
	Dip Creek	Ida Valley Irrigation Company	RM20.448
		Galloway Irrigation Society Incorporated	TBC
	Manor Burn	Little Valley Creek - Mt Campbell Station	RM20.437
		Matangi Station	TBC
		Ida Valley Irrigation Company	RM20.448
		Galloway Irrigation Society Incorporated	TBC
	Scrubby Gully (non - connected tributary)	McArthur	TBC
Ida Valley Management Zone	Pool Burn	Ida Valley Irrigation Company	RM20.448
		Thorndean Farm Limited and Others	RM20.092
	Ida Burn	Thorndean Farm Limited and Others	RM20.092
Waikerikeri sub-catchment	Waipuna Springs	Manuherikia Irrigation Co-operative Society	RM20.454

Management Zones are outlined and described in detail in Section 5. A full list of permits subject to the applications that are part of the MCG proposed catchment management approach are included in Appendix A.

Within the Manuherikia Mainstem Management Zone management is occurring at a mainstem and tributary level. This has resulted in applications being primarily grouped by sub-catchments and means that OAIC, which has takes from the mainstem, Dunstan, Lauder, Thomsons and Chatto Creeks has applied for renewal of permits on a sub-catchment basis via separate applications. This approach recognises the extensive inter-connectedness between the use of OAIC scheme water and water abstracted under privately held permits.

In contrast, only one application has been lodged for IVIC, MICS and GIS, recognising that their water sources are more easily defined (with less interconnectedness with private permit holders).

These applications predominantly seek to replace existing permits, but in some cases also apply for new permits – primarily for existing activities.

These applications generally relate to the damming, taking and use of water, with water use primarily relating to irrigation and stock water. An overview of the location of these activities is provided in the figure below.

This document provides an overview of the permits and applications that are part of the catchment approach. It provides a brief overview of the history of water management in the Manuherikia catchment and the physical setting of the catchment. Section 5 outlines the proposal for water management in the Manuherikia, based on an assessment of hydrology, ecology and water quality within the catchment. This includes the rationale and basis for the flow limits, including the location of the various flow limits. Section 6 explains the approach taken with regard to allocation within the catchment.

Given the scale and complexity of the activities included within the applications, where possible a common approach has been taken with the methodologies and analysis to achieve as much consistency as possible across all the applications. These methodologies are outlined in Section 7. This document also includes an assessment of effects on the environment and a legislative analysis at an over-arching catchment level (Sections 8 and 9). More specific analysis and detail is included in the separate applications.

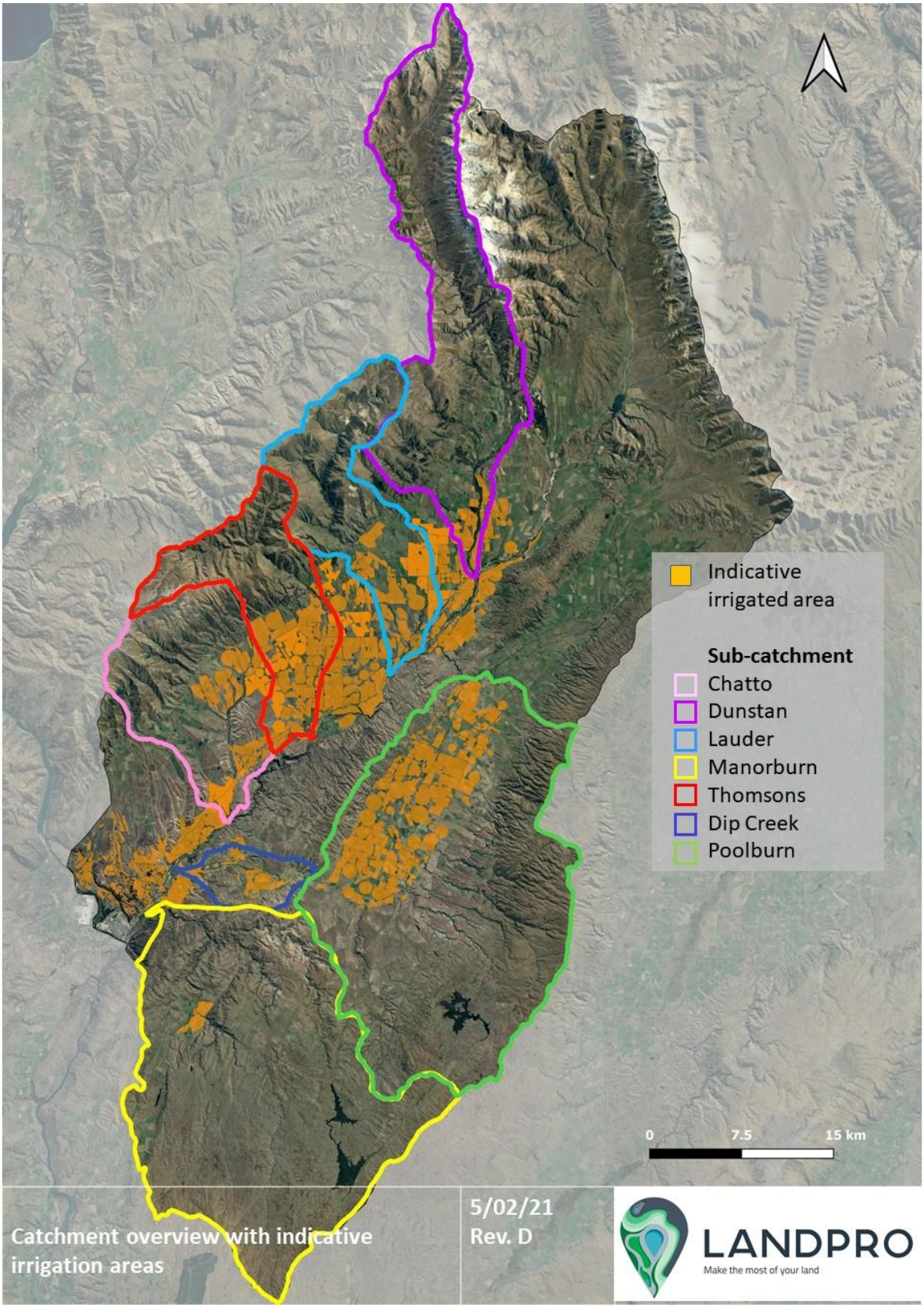

Figure 2. Overview of area affected by MCG related applications - aerial

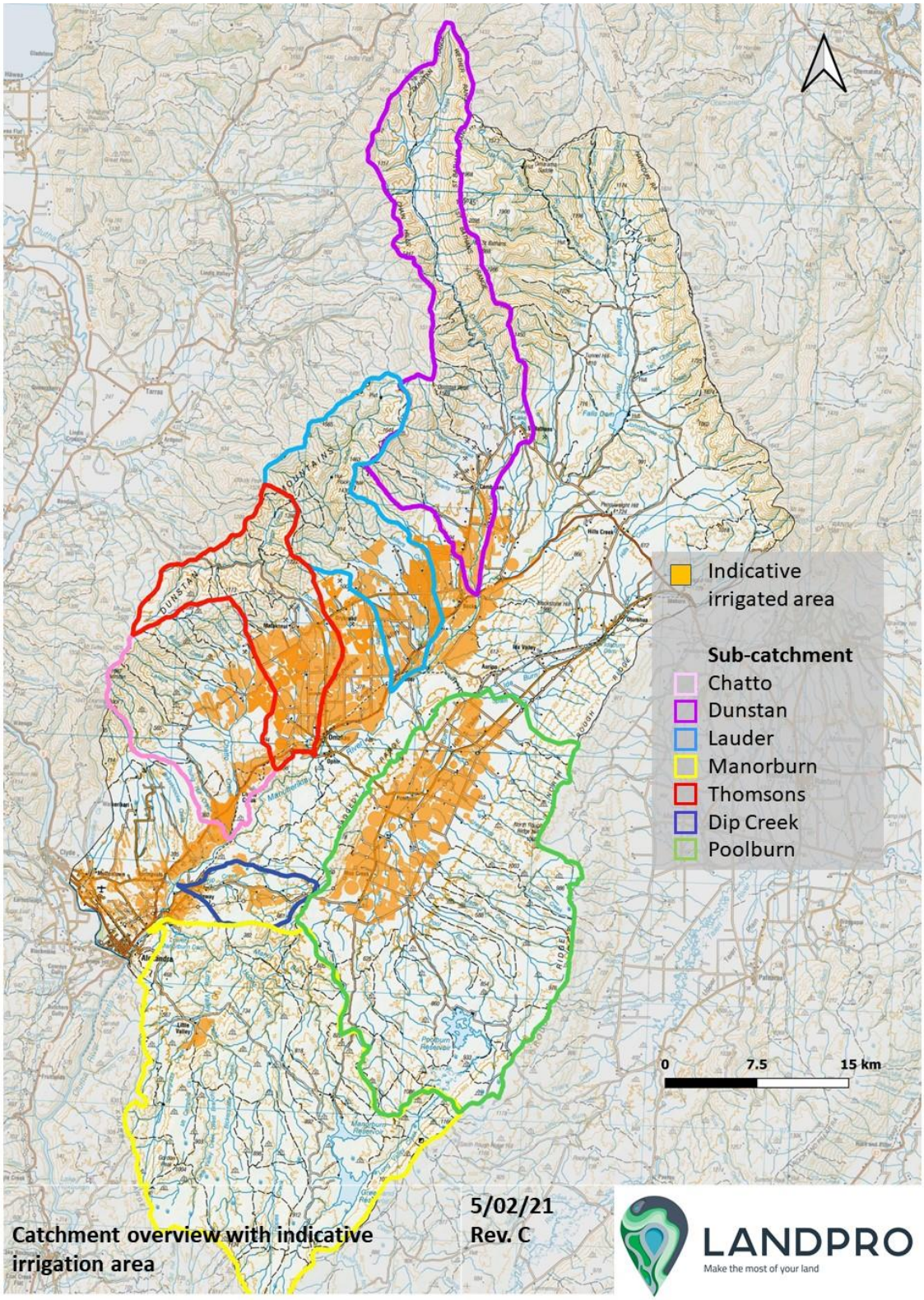

Figure 3. Overview of area affected by MCG related applications - topographic

3. History of Water Management in the Manuherekia Catchment

The first rights to take water from the Manuherekia were issued under mining legislation in the late 1860s for the purpose of gold mining. As gold mining became progressively uneconomic many of the rights to take water and associated conveyance infrastructure were used for irrigation as agriculture and horticulture ventures developed. Early irrigation developments were private ventures in the Fruitlands and Earnscleugh areas.

Around the early 1900's the settlers in the Alexandra and Manuherekia areas lobbied Government to help with investment in larger irrigation schemes. The Government, although reluctant at the time, heeded this request and purchased the assets of the Bonanza Mining Company that had gone into receivership in 1906. The assets of the Mining Company included the Greenland Dam in the Upper Manorburn catchment and a network of water races that conveyed water from the dam to the south end of the Ida Valley and into the Dip Creek catchment at Galloway. The first area to be irrigated from this Scheme was on Galloway station. The infrastructure was later used to develop the first large Irrigation Scheme in Central Otago in the southern area of the Ida Valley.

After this initial purchase and further lobbying from settlers in the area the Government appropriated more funding for the development of Irrigation Schemes in the area. The Ida Valley Scheme was extended further with the construction of the Upper Manorburn dam in 1914 and the Pool burn dam in 1931. The Idaburn dam was also constructed in 1931 in conjunction with the Hawkdun-Idaburn Scheme and supplied water to the northern end of the Ida Valley.

The Galloway Scheme was developed in 1934 with the construction of the Lower Manorburn dam to irrigate the lower half of the Galloway Flat. The upper half of the Galloway Flat was irrigated from the Ida Valley Scheme via the Dip Creek water races network until the 1950s. In response to increased demand for irrigation in the Ida Valley, in 1954 the Government installed pumps in the Manuherikia River to supply the Galloway Scheme and leave more water available from the Upper Manorburn for the Ida Valley Scheme.

The Manuherikia Scheme was designed and constructed by the Public Works Department over the period of 1910 to 1922 and by 1925 was irrigating 2,282 hectares in the Chatto creek, Springvale, Letts gully and Dunstan flat areas.

In the Omakau area, irrigation was first developed from the mining races in the Thomsons creek, Chatto Creek and Lauder Creek catchments in the early 1900s. In the 1930s a larger Scheme was developed by the Public Works Department for the Omakau area with the construction of the main race to take water out of the Manuherekia River, a separate race to take water out of Dunstan Creek in 1931 and the construction of Falls Dam in 1935. Over time, the Public Works Department used Falls dam to supplement water supply to the four Schemes that take water from the Manuherikia River.

Existing Flow Sharing Agreements

The Irrigators in the Manuherikia Catchment have developed flow sharing agreements over the last few decades to more efficiently use the water resource.

The initial flow sharing regime was developed by the Ministry of Works in using the water stored in Falls Dam to supplement the supplies to the four irrigation schemes on the main stem of the Manuherikia. The flow sharing agreements were formalised when the Irrigation Schemes were sold to the irrigators in 1990 and the Falls Dam Company (FDC) was formed to manage the Falls Dam. At that time the agreements were extended to include the other private water right holders in the catchment.

This has enabled a rationing regime where irrigators agree to cut back on water use for irrigation based on the remaining water stored in Falls Dam and the level of flows in the lower Manuherekia.

The flow sharing agreements are based on the priority system of the old mining privilege water rights (now referred to as Deemed permits). Under the mining legislation water rights were granted a priority based on the date that they were issued. Accordingly, an early water right had the right to take water over any other water rights in the catchment that were granted at a later date. As long as the Mining Rights were being used and were renewed before they expired, then they retained their priority.

The four schemes that are shareholders in Falls Dam have water rights with an array of priority dates. The Blackstone Scheme and the Manuherikia Scheme hold the oldest water rights (amongst the 4 schemes) for the mainstem and the Omakau and Galloway Schemes have older water rights on the tributaries.

A water sharing agreement between all the water right holders based on their relative priorities would be very complex and most likely unworkable. It was also critical to have the higher priority takes located lower in the catchment be parties to the agreement so that water was shared the length of the river. However, the existence of the priorities was a critical catalyst and component for the agreement.

During low flow times some of the irrigators abstracting from the sub catchments also reduce their takes along with the four on the mainstem.

The rationing regime developed by the Falls Dam Company is described in the following section.

Falls Dam Company Ltd - Operation and Rationing Regime

When the Crown sold the Irrigation Schemes to the local irrigators in 1990, Falls Dam was included in the assets of the Omakau Scheme, although the Falls Dam Company Limited (FDC) was formed on behalf of the four irrigation schemes in the Manuherekia Valley to operate and maintain the dam. The shareholding in the FDC was generally based on the area irrigated in each scheme and was formed as:

Omakau	53%
Manuherika Scheme	35%
Blackstone Hills	6%
Galloway	6%

The four irrigation schemes all hold their own water permits for taking water from the tributaries and the mainstem of the Manuherekia and these permits include an inherent priority to be able to take water relative to other water permits in the catchment. Part 5 of the FDC constitution sets out how the members are to share water in the event of a water shortage. The first criteria for water sharing is: *"None of the members shall exercise their priorities for water under their water rights" (Clause 25.2).* This is attached as Appendix B.

The Constitution sets out a two stage Water Sharing Agreement. Stage one is, the decision to start using the stored water in Falls Dam, and Stage 2 is, the decision to start rationing abstraction to slow down the release of the remaining water in Falls Dam.

The two-stage decision process which underpins the water sharing agreement, is described below.

Stage 1 – the decision to release stored water in Falls Dam to supplement flows in the Manuherekia River. When the decision is made to use stored water, Clause 25.3 provides a guideline for the allocation for each Scheme. The allocation is described as *'reduced allocation'* as the volumes are around 90% of the consented volumes associated with the water takes authorised by the Deemed permits held by each Scheme.

The triggers for Stage 1 - to start using stored water from the dam are:

1. When the flow downstream of the dam is not sufficient to supply the water required by the Blackstone and Omakau Schemes; and, when the flow from the Upper Manuherekia into the dam is less than the flow that is being released from the dam for power generation; **or**

2. When flows in the lower Manuherekia catchment are decreasing and there is not sufficient water to supply the Manuherikia and Galloway Irrigation Schemes, and the flow in the Manuherekia at Campground is approaching 900 l/s.

Whether Trigger 1 or Trigger 2 occurs first is dependent on the relative flows in Dunstan Creek versus the flow in the Upper Manuherekia upstream of Falls Dam. These flows are different from year to year depending on the amount of snow stored in each sub-catchment at the end of winter and the direction of recent rainstorms. Generally, the flows in Dunstan Creek and the other tributaries downstream on the Manuherekia (i.e., Lauder, Thomsons and Chatto Creeks) are adequate to maintain the flows in the Lower Manuherekia River for longer than the flows in the Upper Manuherekia branch above Falls Dam and Trigger 1 occurs first.

Note that when Stage 1 is triggered and it is necessary to start using stored water from the dam, the stored water is used to supplement the requirements of the four irrigation schemes and the other private water right holders can continue taking water at full allocation until the decision is made to go to Stage 2 for rationing the stored water in Falls Dam.

Stage 2 – the decision to ration the remaining water in the dam. *'Rationing'* occurs sometime after the Stage 1 release of the stored Falls Dam water if it is determined the dry period is set to continue and involves the rationing of the remaining water in the dam. The water is rationed on a pro-rata basis as set out in clause 25.5 of the FDC constitution.

The Trigger for a decision to begin rationing depends on a number of factors:

1. the amount of water left in the dam;
2. the timing of a dry spell within an irrigation season;
3. the severity of the dry spell; and
4. the longer-term weather forecast.

The rationing decisions are usually made with a conservative estimate on how long a dry spell will last and keeping some water in the dam.

Generally, when a decision is required to go to rationing, the release of stored water from the dam will have been happening for a few weeks and the dam level will be reduced. So, the main factor is the amount of water left in Falls Dam. When rationing occurs the schemes reduce takes on a pro-rata basis – this can start with a reduction to 75% of allocation and can reduce down to as little as 20% of allocation in a very dry season.

It is noted too that the over-riding determinant for the flow sharing regime is to keep flows in the lower Manuherekia River above the current voluntary minimum flow of 900 l/s at Campground.

Manuherikia Catchment Water Strategy Group

Water users in the Manuherikia have been preparing for the replacement of deemed permits and water permits for many years, and have been active in seeking a comprehensive, appropriate limit setting plan change for the Manuherikia that is compliant with the National Policy Statement for Freshwater Management (NPSFM). This work includes the formation of Manuherikia Strategy Group in 2011. This group was formed to investigate the best way to use the Manuherikia Valley's available water, to jointly benefit landowners who need water and the environment.

The impetus for the group included:

- the expiry of deemed permits, and the potential impact of a revised minimum flow and allocation limit for the catchment
- options relating to Falls Dam, a large irrigation storage dam in the upper catchment.

This group comprised local landowners, the local irrigation companies, environmental and conservation groups, including Forest and Bird, Fish and Game, the Central Otago Environmental Society and the Department of Conservation, iwi, district and regional councils, and local business-people.

A large body of studies and assessments were commissioned by this group including the development of GoldSim hydrology model for the catchment. The GoldSim hydrology model has since been utilised by the ORC to further understand the hydrology of the catchment.

This highlights that this catchment has been actively working towards a catchment-based solution for at least a decade, including with regard to the replacement of permits.

4. Physical Setting

4.1 Climate

Central Otago is the driest region of New Zealand, receiving less than 400mm of rainfall annually with daily maximum temperatures in summer often exceeding 30°C. The climate of the Manuherekia Catchment is characteristic of the Central Otago climate and is characterised by long hot dry summers, and cold dry winters. Temperature extremes are experienced across the catchment, with a general median summer temperature gradient experienced from the head of valley near St Bathans (13-14°C) to the Ida Valley to the east (13°C to 15°C), and to Alexandra (15 to 17°C).[1] The highest temperature recorded at Alexandra is 38.7°C, and at NIWA's Lauder research station is 35.0°C.[2] Both Alexandra and Lauder experience an average of 3 and 7 days respectively a year where maximum temperatures exceed 30°C, and an average of 33 and 35 days respectively per year where maximum temperatures exceed 25°C. This same temperature gradient is observed in winter, with median winter temperatures ranging 3.6 to 6.5°C across the catchment. The lowest temperature recorded at Alexandra is -11.7°C and at Lauder is -19.7°C, and both Alexandra and Lauder experience an average of 86 days and Lauder 104 days with the minimum temperature below 0°C. [3]

Median annual rainfall totals of below 400 mm are recorded within Central Otago, which is approximately ten times less rainfall than that which falls in high elevation locations in the far-western ranges of Otago. Dry spells of more than two weeks occur relatively frequently in the Manuherikia and Ida Valleys, with an annual median rainfall between 350 and 500 mm in the valley floors and up to 1,000 mm in the surrounding ranges.[4] The relevant Aqualinc rainfall category for the Manuherikia Catchment, including the Ida Valley is the Central & Lakes District with a mean annual rainfall class in the order of 350 to 450 mm/year generally.

Evapotranspiration is the process where water held in the soil is gradually released to the atmosphere through a combination of direct evaporation and transpiration from plants. If the available soil water becomes insufficient to maintain evapotranspiration, then a soil moisture deficit occurs, and irrigation becomes necessary to maintain plant growth. Soil moisture deficit regularly occur thought summer in Central Otago, and the potential evapotranspiration rate for the Manuherikia and Ida Valleys is significant during the growing season (October to April). Potential evapotranspiration is 90 – 115 mm September to October at the beginning of the irrigation season, 210 – 255 mm November to December, 180 – 215 mm January to February, and 76 – 85 mm at the end of the irrigation season March to April. [5] These potential evapotranspiration rates show that water loss to evapotranspiration during the irrigation season are most acute for the period November to February in the Manuherekia

[1] Otago Regional Council: growOtago Maps.
[2] NIWA. (2015). The Climate and Weather of Otago. 2nd Edition. Accessed online: http://docs.niwa.co.nz/library/public/NIWAsts67.pdf
[3] NIWA. (2015). The Climate and Weather of Otago. 2nd Edition. Accessed online: http://docs.niwa.co.nz/library/public/NIWAsts67.pdf
[4] Olsen et al. (2017). *Management flows for aquatic ecosystems in the Manuherikia River and Dunstan Creek. Dunedin: Otago Regional Council.*
[5] Otago Regional Council: growOtago Maps.

and Ida valleys. According to NIWA's (2015)[6] report, the Manuherekia experiences 146 days of soil moisture deficit during the growing season October to April.

4.1.1 Climate Change

Bodeker Scientific prepared a report[7] for the Central Otago District on climate change implications. The report describes the projected changes in key climate indices. In summary, this modelling work for worst case scenario climate change projections shows shifts for some of the key indicators relevant to irrigation and farming:

- **Temperature** - Overall, Central Otago is projected to become warmer over the course of this century with an increase in the annual highest daily maximum temperatures. The area around Omakau is likely to experience 17.8-21.3 more summer days where temperatures exceed 25 degrees Celsius by the end of the century under the worst-case scenario modelling. The highest maximum temperature reached in the district by the middle of this century is projected to be between 1.6 and 2.6 degrees Celsius higher than in 2000-2009 reference period and will likely increase by up to 5.8 degrees Celsius by the end of this century under the worst-case scenario model.

  The projected changes in the annual maximum temperatures are more pronounced than the changes in the annual minima of daily maximum temperatures, as lowest maximum temperature reached by the middle of this century is projected to increase by 0.2 to 0.4 degrees Celsius in the Manuherekia region.

- **Seasonality** – For Alexandra, under the high emissions scenario modelling, the maximum temperature reached in summer and spring increases by about 4-5 degrees Celsius by the end of this century compared to the start of the century, while autumn and winter will reach maximum temperatures that are about 3.8 degrees Celsius higher.

- **Frosts** – 11-13 less frost days per year by the mid-century and 35-40 by the end of the century.

- **Precipitation** – While the largest decreases in precipitation are projected to occur in the east of the Central Otago District by the end of this century, near Ranfurly, the western areas and central around Alexandra and Omakau may experience small increases in total annual precipitation.

  Overall, total annual precipitation is projected to increase by between 42 and 190 mm (on average) for the western areas of the district and the Alexandra/Cromwell areas; with a

[6] NIWA. (2015). The Climate and Weather of Otago. 2nd Edition. Accessed online: http://docs.niwa.co.nz/library/public/NIWAsts67.pdf

[7] Cameron, C., and Kremser, S., Lewis, J., Bodeker, G., and Conway, J. (2019). The past, present and future climate of Central Otago: Implications for the District. Prepared by Bodeker Scientific for the Central Otago District Council.

statistically significant increase in total annual precipitation over the Manuherekia area. An increase in precipitation intensity of between 0.1 and 0.8 mm/day is projected for most of Central Otago for the worst-case model scenario for the end of the century. For Central Otago there is a great deal of spatial variability in daily rainfall across the district.

- **Dry spells** – The model simulations of climate change scenarios do not project statistically significantly changes in the length of the dry and wet spells by the end of the century for all emissions scenarios for Central Otago.

- **Snow cover** - Climate change is likely to have a large impact on mountain snowpack in Central Otago. Very little snowpack and resultant water storage will remain on the top of the mountain ranges within the Central Otago district by the end of this century under the worse-case scenario modelling, with earlier onset of melt by the end of this century. The peak snow-covered area is projected to reduce by approximately 20% across Central Otago under the worst-case scenario modelling. The snow cover duration is likely to reduce but is particularly pronounced towards the east where the Manuherekia Catchment is situated. With warming conditions, snowmelt is expected to occur earlier in the season (mid-July compared to beginning of August). Climate change will lead to substantial increases in streamflow during winter and declines in summer driven by increasing winter precipitation and a reduction in snow storage.

The implications for farmers and irrigation are generally as follows:

- Climate change is expected to quicken the set-in speed and intensity of droughts;
- Increasing temperatures, combined with changes in rainfall patterns and a dwindling snowpack, are more likely than to increase the risk of drought; and
- Change in snowpack affects snow melt that helps to moisten the soil each spring and promote plant growth. A depletion in the total snowpack may contribute to drier landscapes, and higher drought or wildfire risk. Furthermore, climate change will lead to substantial increases in streamflow during winter and declines in summer, driven by increasing winter precipitation and a reduction in snow storage.

4.2 Land Use and Topography

The activities subject to this proposal are located within the Manuherekia Catchment that consists generally of the Manuherekia and Ida Valleys. The northern upper reaches of the Manuherikia River flow from the Hawkdun and St Bathans Ranges through a steep catchment, before flowing out onto flats below the Forks, where the gradient is markedly lower. The Forks is above Falls Dam.

The western tributaries of the Manuherikia River flow out of Dunstan Mountains and are generally steep smaller headwater catchments that flow onto the Manuherekia Valley floor. This transition from the steep valley of the upper catchment to the low gradient of the valley floor coincides with the Dunstan Fault, which runs along the eastern edge of the Dunstan Ranges. The eastern tributaries flow

out of the Raggedy Range with the Poolburn and Ida Burn flowing through the Ida Valley that drain North Rough Ridge.

The Manuherekia Catchment is unique in that its headwaters originate in a way that mean flows are sourced from multiple directions, with flows derived from both the northern, eastern, and southern ranges surrounding the Central Otago area.

The majority of the Manuherikia catchment consists of low producing grassland (122,715 ha; 40%), tall tussock (83,349 ha; 27%), and high producing grassland (63,637 ha; 21%).[8] There are significant areas of bare gravel (such as scree slopes; 8,708 ha; 3%) and alpine grass/herbfield (4,217 ha; 1%) in the upper catchment. Scrub (including gorse, broom, matagouri, grey scrub, manuka/kanuka, mixed exotic shrubland and sub-alpine shrublands) collectively covered 3% of the catchment (9,896 ha). Below Falls Dam, introduced willows, grasses and introduced shrubs dominate.

The area dominated by low producing grassland and high producing grassland is the general area that is utilised for pastoral farming, with irrigation contributing so a portion of the improved pasture areas. Pastoral land uses include sheep, beef, deer, dairy and dairy support land uses. Viticulture and horticultural land uses are located mostly in the lower Manuherikia Valley. Horticultural land uses include stone fruit, pip-fruit, nuts, flowers, and berries. There are many lifestyle/hobby farms throughout the catchment. A small amount of irrigation also supports businesses with amenity areas such as pubs and wedding venues.

A very small portion of land use directly supported by these water sources is urban park land and open spaces such as the Omakau Racecourse and Omakau Golf Club.

According to the New Zealand Land Cover Database (LCDB)[9], the command area is predominantly covered in high producing exotic grassland, which is consistent with the irrigation of these areas. There are pockets of short-rotation cropland within the command area. Short rotation cropland may be areas of Lucerne or other winter feeds. The Omakau Racecourse is classified as urban parkland/open space.

4.3 Hydrology

Overall, the Manuherikia Catchment has a significant degree of hydrological alteration when compared to its natural state. Flows can be both above, and below, what the river's expected natural flow would be due to the effects of augmentation from Falls Dam and the cumulative effects of abstraction.

[8] Hickey, M., and Olsen, D. (2020). Assessment of Environmental Effects for water abstraction from Manuherikia River from the Falls Dam to the confluence with the Clutha/Mata Au

[9] LCDB v5.0 sourced: https://lris.scinfo.org.nz/layer/104400-lcdb-v50-land-cover-database-version-50-mainland-new-zealand/

The Manuherikia catchment has several storage impoundments including Falls Dam at the head of mainstem and the dams in the Pool Burn, Ida Burn and Manor Burn catchments. All of these have altered the natural flow characteristics of the catchments they dam.

There are six irrigation schemes in the Manuherikia which use a network of races to convey water for substantial distances from where it is taken to where it is used. This pattern of water use combined with the overland irrigation methods has meant that there are significant return flows in some creeks and streams that would not occur naturally. This complicates developing naturalised flows in the Manuherikia catchment. As all of the main tributaries to the Manuherikia River have permits that have been exercised for 100 years or more it further complicates the hydrology of this catchment.

Each of the science assessments supporting the specific applications address the specific hydrology at either a sub-catchment level (e.g. Dunstan, Lauder, Thomsons and Chatto Creek) or at the mainstem level (e.g. Falls Dam and the Manuherikia mainstem reports).

4.4 Aquatic Ecology

The Manuherikia River and tributaries has four species of introduced fish, brown trout, rainbow trout, brook char and perch. Brown trout dominate fish survey records for the catchment, though anecdotal information suggests rainbow trout are becoming increasingly common throughout the catchment also. The trout population appears to be healthy and self-sustaining. The presence of trout in the Manuherikia has resulted in the development of a regionally significant fishery both in the mainstem and in two irrigation storage impoundments (Poolburn and Manorburn Dams)[10].

The Manuherikia also contains three species of threatened indigenous fish, Alpine galaxias, Central Otago Roundhead galaxias and Clutha Flathead galaxias. For the most part Clutha Flathead galaxias which are ranked as nationally critical[11] occur in the Pool Burn and Manor Burn catchments upstream of irrigation takes and waterfalls which prevent trout incursions[12]. Central Otago Roundhead galaxias which are ranked as nationally endangered[11] tend to occur in lower gradient streams in the valley floor. This has led to them only occurring where trout are not present or where hydrological conditions are too harsh for trout but tolerable to Roundhead galaxias[12]. Manuherikia Alpine galaxias which are ranked as nationally endangered[11] occur above Falls Dam in the mainstem of the Manuherikia River. For these three species of threatened fish it is likely that some form of active management beyond flow setting will be required to protect and enhance these populations.

The Manuherikia River between Falls Dam and Ophir only has records of one species of indigenous fish, Upland bully. While from Ophir to the Clutha confluence Upland bully and Longfin eel have

[10] Sports Fish and Game Management Plan for Otago Fish and Game Region 2015-2025.
[11] Dunn NR, Allibone RM, Closs GP, Crow SK, David BO, Goodman JM, Griffiths M, Jack DC, Ling N, Waters JM, Rolfe JR (2018). Conservation status of New Zealand freshwater fishes, 2017. New Zealand Threat Classification Series 24. Department of Conservation, Wellington. 11 p.
[12] Trout have extirpated many non-migratory galaxias population in Central Otago.

been recorded more than a few times[13]. The Central Otago Roundhead galaxias would naturally have been expected to inhabit the Manuherikia mainstem but has been extirpated by introduced trout.

In addition to the above threatened fish, there are five species of indigenous fish that have been recorded in the Manuherikia catchment, Common and Upland bully, Longfin eel, Koaro and Lamprey. Lamprey and Koaro have only been recorded a few times in the Manuherikia catchment and Common bully tend to be associated with Poolburn and Manorburn dams. Upland bully are common and widespread in the catchment while longfin eel are uncommon despite significant physical habitat for this species throughout the catchment. The damming of the Clutha River at Roxburgh has resulted in very low densities of longfin eel and Lamprey in the Manuherikia catchment. To address the lack of eel and lamprey in the Manuherikia catchment there will need to be an active effort over many decades to transfer these fish above Roxburgh Dam.

The macroinvertebrate community at all sites in the Manuherikia River have been dominated by the common mayfly *Deleatidium* on most occasions, with the net-spinning caddis fly *Hydropsyche*, the mud snail *Potamopyrgus antipodarum*, riffle beetles *Elmidae* and the cased caddis *Pycnocentrodes* also among the most abundant taxa collected. Similarly, EPT taxa (particularly *Deleatidium*) dominate most sites in Chatto Creek, Lauder Creek and Thomsons Creek. The introduction of residual flows and expected water quality improvements (particularly reductions in fine sediment inputs) are expected to maintain or improve the state of macroinvertebrate communities in tributaries and mainstem of the Manuherikia River.

4.5 Water Quality

Water quality in the upper Manuherikia (upstream of Omakau) is typically good, with low dissolved nutrients and low levels of faecal contamination. However, the invasive diatom Didymo (*Didymosphenia geminata*) is abundant in this section of river, and this is expected to result in high periphyton biomasses throughout the mainstem. This is due to the preference of this species for low nutrient conditions, long daylight hours and warm water temperatures during summer months, and the naturally long accrual periods between flushing flows.

Nutrient concentrations are elevated in the Manuherikia downstream of Ophir, which is likely to result in an increased risk of periphyton proliferation. However, the observed increases in nutrient concentrations (particularly DRP), downstream of Ophir are expected to be less favourable for Didymo proliferation[14], resulting in a periphyton community of more mixed composition and an increased risk of the proliferation of filamentous algae. This is consistent with monitoring data collected since February 2019.

[13] Lamprey, Central Otago Roundhead galaxias and koaro have been recorded on rare occasions.
[14] Bothwell, M.L., Brad, M.L., Taylor, W. & Kilroy, C. (2014): The Didymo story: the role of low dissolved phosphorus in the formation of Didymosphenia geminata blooms, Diatom Research, DOI: 10.1080/0269249X.2014.889041

The water quality observed in a number of tributaries (Chatto, Thomson, Lauder Creek, Ida Burn/Pool Burn) are impacted by overland irrigation methods. The conversion of irrigation from overland to spray methods is expected to result in significant improvements to water quality in these tributaries, with substantial reductions in phosphorus, sediment and microbial contamination anticipated. Whilst such improvements in water quality are expected to be beneficial for instream ecological outcomes, it is possible that a reduction in the concentrations of DRP in these tributary inflows and, consequently, in the mainstem could have undesirable outcomes, particularly with regard to the distribution and biomass of Didymo within the mainstem. Water quality improvements (such as increased water clarity and reduced DRP) may be more favourable for Didymo proliferation[14], meaning that the distribution and abundance of Didymo within the catchment may increase.

5. Proposed Future Management of Water in the Manuherikia Catchment

The Manuherekia River Management Plan includes a number of tools to manage the take and use of the catchment water. These are outlined below.

5.1 Flow Management Zones

The Manuherikia Catchment is the most complicated catchment that supports irrigation in Otago and quite possibly New Zealand. Characteristics of the catchment includes high values for recreational fishing, swimming and boating values in selected reaches, habitat for indigenous species, cultural values and mahika kai, over 600 water users supporting multiple rural businesses and tourism and one central rural town and other smaller rural sectors, a large catchment and all the tributaries, one large instream communal storage dam and augmentation of river flow for downstream abstraction.

To manage this process and ensure the river well-being comes first in accordance with Te Mana o te Wai, the catchment has been divided into management zones based on hydrological characteristics. The catchment upstream of Fall Dam, and the Ida Valley (Pool Burn and Ida Burn catchments) are both hydrologically dissimilar from the Manuherikia River between Falls Dam and the Clutha Confluence. This logically lends itself to dividing the Manuherikia Catchment in to three management zones as shown in the below.

The zones will be referred to as:

- Above Falls Dam Management Zone
- Manuherikia Main Stem Management Zone
- Ida Valley Management Zone

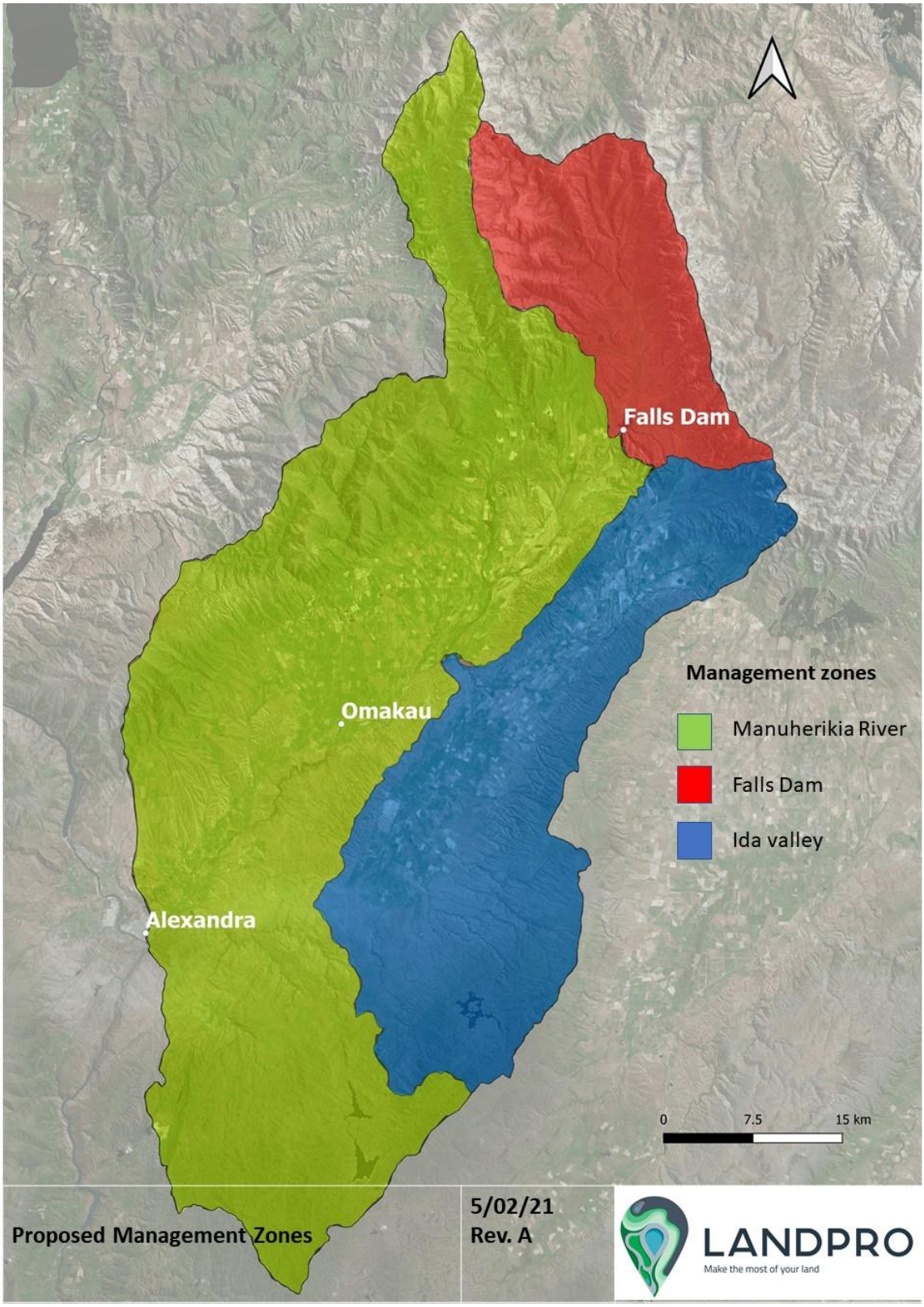

Figure 4. Flow Management Zones - Above Falls Dam, Manuherekia Main Stem and Ida Valley Management Zones

5.2 Regulatory Management Sites and Reference Sites

Flow limits in the form of residual and minimum flows are a key mechanism used to protect the values of waterways. Monitoring flows at strategic sites can also be used as a management tool to guide flow sharing and abstraction restriction in Otago catchments that are routinely short of water during the hot dry summers. The River Management Plan includes flow sites that are used as both consent conditions (Regulatory Management Sites) and/or flow management and water rationing (Reference Sites). Regulatory Management Sites are proposed for the main stem of the Manuherekia River at Ophir and Campground as minimum flows, and at the mouth of each main tributary as residual flows.

This combination of Regulatory Management Sites will provide some of the controls to ensure the flow required to protect values is maintained through the whole catchment to the confluence with the Clutha River Mata Au.

5.2.1 Three Tiered Approach to Flow Limits

All abstraction has been assessed against a three-tiered approach to flow limits. The inclusion of each tier is determined on the values identified, their location and habitat needs against the protection already assured by each tier. For example, if the values at a site will be completely protected by two of the tiers then the third will not be introduced as it will only add unnecessary complexity to compliance assessments and may in fact reduce management flexibility for no environmental gain.

The tiers are:

1. catchment wide minimum flow/s in the main stem (i.e. applied to all relevant permits taking water above any minimum flow site);
2. tributary residual flows – all permits in a tributary would be subject to a residual flow at the tributary mouth; and
3. individual residual flow(s) applying to specific takes, focused on looking after values immediately below the point of take.

It is important to note that the application of all three tiers is not necessary for improved environmental gains. Tier one and two also serve the purpose of anchoring the flow sharing requirements of the sub-catchments and main catchment within the consents.

Key sites for inclusion in this approach are shown in the map below and described in more detail in the following sections.

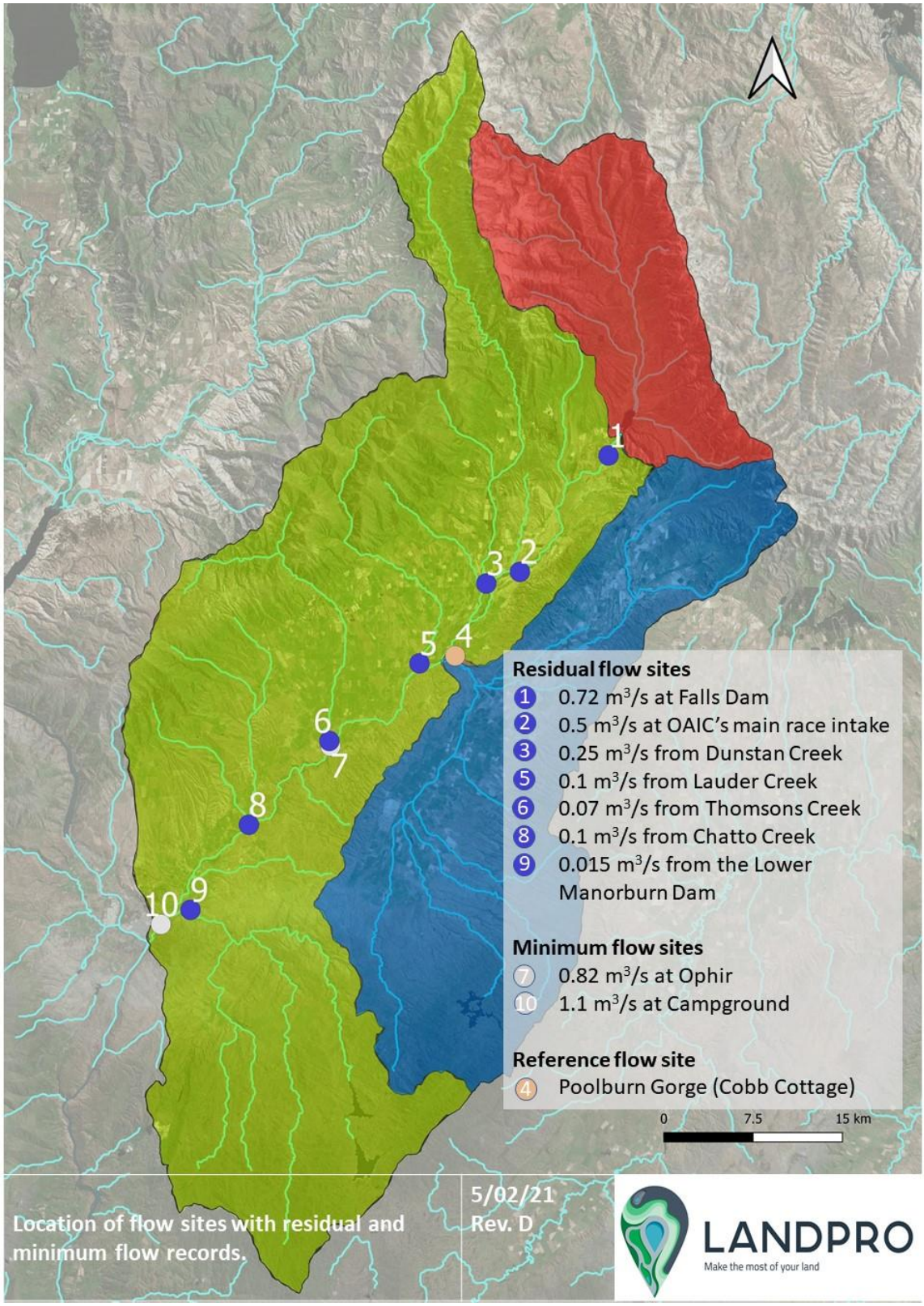

Figure 5. Proposed Flow Limit Management Sites

The proposed minimum flows are intended to be monitored at two established Otago Regional Council flow sites[15], including:

- Manuherekia River at Ophir (MS8) - included in Schedule 2A of the Regional Plan Water.
- Manuherekia at Campground – an existing river flow monitoring site in the Upper Clutha.

The applicant proposes to utilise these flow sites when managing future abstractions and minimum flows.

Unless otherwise specified in the sub-catchment applications, the proposed residual flow sites for the main sub-catchment tributary sites are proposed to be monitored at the following Otago Regional Council flow sites[16], including:

- Dunstan Creek at Beattie Road *(note: abstraction occurs downstream of this site so the residual will be **calculated** from the Beattie Rd site)*
- Pool Burn at Cob Cottage
- Lauder Creek at Rail Trail
- Thomsons Creek at SH85
- Chatto Creek Upstream of Confluence

These sites are all continuous flow sites managed by the ORC, and flows verified by ORC frequently. The Beattie Road site is above some of the abstraction but represents the most accurate site for flow monitoring on this tributary.

With respect to the proposed residual flows for individual permits, where this is not already described in the specific applications, targeted gaugings with staff gauges will provide for appropriate monitoring. It is noted that a recent Joint Witness Statement for the Lindis Environment Court hearing found that physically measuring low flows can be difficult and that alternative observation techniques should be considered as an adequate substitute[17]. This position was supported by ORC's team leader of hydrology[18]. Accordingly, small residual flows such as 5-10 l/sec will be captured in the consent conditions as descriptions such as 'visible surface flow below the point of take'. Such a condition recognises that small residual flows are difficult to measure but are essential in providing for instream life and natural character. In addition, a co-ordinated audit of residuals undertaken by the Manuherekia Catchment Group is proposed to ensure all parties are working to the collective outcomes at the sub-catchment and catchment scale.

[15] *Water Monitoring and Alerts (orc.govt.nz)*
[16] *Water Monitoring and Alerts (orc.govt.nz)*
[17] Joint Witness Statement on hydrology for the Lindis Environment Court Case ENV-2016-CHC-61 & ENV-2018-CHC-155.
[18] Mr Pete Stevenson evidence in chief ENV-2016-CHC-61 & ENV-2018-CHC-155.

5.2.2 Flow Sharing to Support Flow Limits

Initially, it is proposed that water sharing in the Manuherekia Catchment will continue to occur in accordance with the existing agreements described in Section 3. However, as a result of the consenting process the existing arrangements will need to be re-negotiated. Major changes such as flow sharing to achieve the residuals on the main tributaries are likely to be trialled during the next season ahead of the consents decision as it will take some time to understand the hydrological responses to the releasing of extra water when required.

The applicants are committed to formalising flow sharing to ensure flow limits are not breached. This will be carried out as follows:

- Main stem flow sharing will continue to be managed in a similar way as the existing system with the goal of upholding the minimum flow at Ophir and proposed minimum flow at Campground. Legal documents between the parties will be updated.

- Manuherikia Catchment Group Inc (MCG) is likely to become the organisation responsible for the overall management of flows and water sharing amongst the Manuherekia Catchment water users (as opposed to Falls Dam Company).

- The flow sharing regime will be broader than the current regime by including tributary residuals and other mainstem water users.

- Tributary Water Management Groups have been established under the Manuherikia Catchment Group Inc. for the purposes of developing flow sharing regimes for each sub-catchment. Tributary Water Management Groups will be responsible for delivering their respective residuals at the confluence of their tributary with the Manuherekia River. The MCG will oversee the whole catchment flow management.

- Each of the permit holders will become members (most already are members) of the MCG, and members of their relevant sub-catchment group. Members have already determined principles for the water management which underpins the future water sharing. These principles among other things require that the water users share water, water abstraction records and costs incurred in the management of flows. These principles and the proposed management objectives will predicate the legal catchment sharing arrangement which will be drafted subject to granting of consent.

- Flow sharing at the tributary scale will likely be based on an equal percent reduction in takes (e.g. all takes reduce by 20% once a trigger flow is reached), or could be via rostered access, or a combination of both. The trigger flow will be monitored at ORC's flow site on each of the tributaries (and mainstem).

- Each individual application has proposed water management agreement conditions of consent. This ensures accountability to the consent authority and to each other permit holder.

- Members of each Tributary Water Management Group have collectively agreed to the proposed tributary residuals in their respective applications. Each of the Tributary Water Management Groups have also agreed with the other Tributary residuals, minimum flow limits and proposed MCG flow sharing.

The Manuherikia Catchment has a strong history of flow sharing. No other catchment in Otago has successfully co-ordinated all main stem abstractions for decades as the irrigators in the Manuherikia have done (except for the Kakanui Catchment, but that catchment is much smaller). This has enabled ongoing access to some water for all on the main stem, when flows naturally decrease over summer. In short, during most seasons there is simply not enough natural water for irrigators to take their full rate and volume so an agreed reduction in abstraction was implemented when required during summer since the early 1990s. Deemed permits currently legally allow for the full abstraction of all water at a site but the flow sharing agreement that has been in place in this catchment has meant this has not happened. In fact, in recent years irrigation schemes' race managers have voluntarily left extra water at the downstream end and at other locations for recreational and instream values.

The flow sharing has traditionally been governed by the agreement with the operators of Falls Dam (as outlined in Section 3 of this document). This existing agreement will initially form the basis of the new Flow Sharing Agreement. However, this will be re-evaluated and designed in light of replacement consents and a final version will be adopted after the consents are issued. The Flow Sharing Agreements will be approved by the ORC and will be a consent condition on all catchment water permits.

This proposal takes existing flow sharing further by also co-ordinating sharing during the low flow times in the sub-catchment groups to meet a new residual flow at the mouth of each major tributary that contributes to the Manuherikia.

The water permit holders in each sub-catchment group will work together to reduce their abstraction so they collectively deliver the residual flow at the confluence of the tributary and the Manuherikia River. This will be a complicated task that in some cases involves up to 18 irrigators on different farms co-operating.

5.3 Above Falls Dam Management Zone

Identifying the Above Falls Dam Management Zone acknowledges that for practical purposes abstractions from above Falls Dam do not impact on flow management (and thus the values) below Falls Dam. Management of the effects of abstractions above Falls Dam should be achieved by a primary allocation limit and consent conditions, such as residual flows within that zone.

The water taken from within the Above Falls Dam Management Zone is used outside the zone, either in the Ida Valley Management Zone or in the neighbouring Taieri Catchment (as shown in the yellow shaded areas in the figure below). This water is taken by the Hawkdun Idaburn Irrigation Company (HIIC). HIICs permits do not expire until 1 December 2037 and so are not included within the process or these application documents. However, HIIC are members of the Manuherikia Catchment Group.

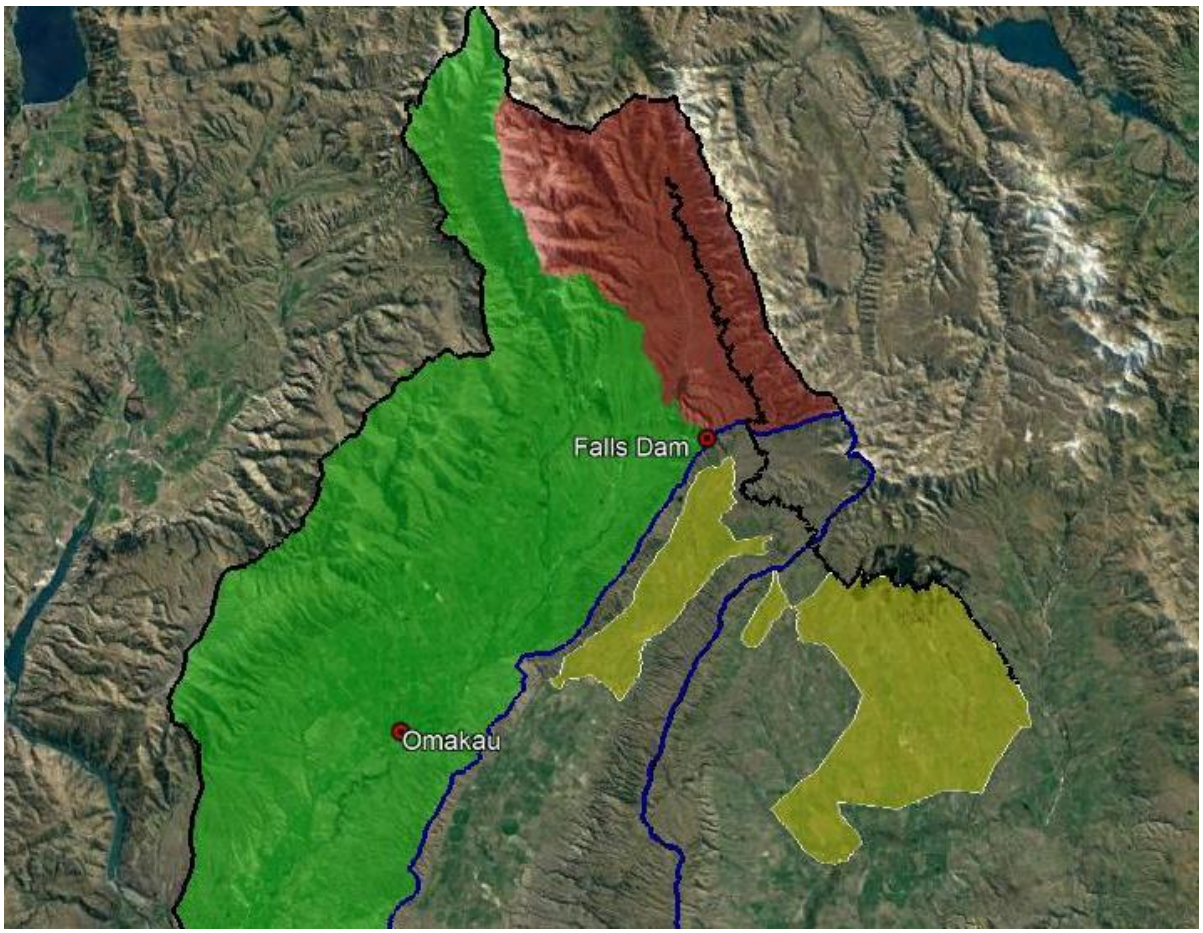

Figure 6 Above Falls Dam Management Zone (shaded red), Hawkdun Ida Burn race (shown in black), Pool Burn Management Zone (blue outline),and area where water taken from Falls Dam Management Zone is used (shaded Yellow).

5.4 Manuherikia Mainstem Management Zone

Downstream of Falls Dam, the mainstem of the Manuherikia River and all of its tributaries are very closely hydrologically connected, with the exclusion of the Ida Valley tributaries (the Ida Burn and Pool Burn). The Pool Burn and Ida Burn contribute very little to the Manuherikia River during low flows (particularly the Pool Burn). The irrigation water applied to land in the Pool Burn sub-catchment during the season is largely reliant on water stored during high flows and snow melt.

Two main stem minimum flow sites are proposed at Ophir and Campground. These two sites will contribute to the protection of the instream, cultural, recreational and ecosystem values of the mainstem and the tributaries of the Manuherikia downstream of Falls Dam.

These minimum flow sites will also be utilised to manage the effects of abstraction on the mainstem from the Manuherikia River Management Zone and direct the flow sharing at times of low flow. All water permits issued in the Main Stem Management Zone above Ophir would include the minimum flow limit condition for both the Ophir and Campground flow sites. As flows are approaching the minimum the irrigators will be rationing water to assist in maintaining the flows. If either of these primary minimum flow levels is not maintained then abstraction for irrigation must cease for all takes above Ophir. The permits for the takes below Ophir will include only the Campground minimum flow. These takes will not include the Ophir minimum flow as turning them off would have no impact on the Ophir flow.

Overview of values identified for the Manuherikia mainstem:

- Contact recreation, particularly swimming near Omakau and from Chatto Creek to the Clutha Confluence. Kayaking in the two gorge sections in the mainstem, downstream of Falls dam and downstream of Ophir, are popular for white-water kayaking, as well as in the lower reaches of the mainstem.
- Cultural values including mahika kai.
- Limited native fish values due to presence of trout and exclusion of longfin eel by Roxburgh Dam.
- Regionally Significant Trout Fishery.
- Native bird values throughout the mainstem from above Falls Dam to Clutha confluence.
- Gamebird values associated with the river and irrigations and stock water ponds.
- Aesthetic and amenity values.
- Abstractive values, supporting a vast number of primary production industries, including surety of supply.

5.4.1.1 Below Falls Dam

Proposed:

- Regulatory Management Site: Residual Flow below Falls Dam of 720 l/s
- Reference Site: for irrigation management.

Rationale:

Falls Dam is a relatively small dam that has the capacity to hold 10 Million m^3 of water. Falls Dam stores winter surpluses to provide this quantum of water in reserve and subsequently some flow manipulation to support irrigation abstraction in dry times. The flow augmentation when the dam is releasing increases the flow in the river to almost the confluence with the Clutha River/Mata Au.

Falls Dam also supports 1.2 MW of hydro electricity generation.

Critical aspects of dam management include:

- Flow augmentation is solely for the purpose of irrigation supply in drier periods.
- When water is being released the irrigators on the main stem will be using irrigation water according to need and in line with their consents. As storage and flows diminish irrigators will start to ration their abstraction so the four main stem companies maintain some access to water at a reduced flow.
- Floods and freshes are managed to protect dam safety.
- Flow augmentation will be combined with the opportunity to generate electricity.
- In the driest years stored water will be exhausted and river flows revert to a very low natural state. Under a higher minimum flow proposal this may occur more frequently than in the past.

These constraints require careful consideration of consent discharge conditions and rely on operator skill and experience to assess short- and medium-term weather forecasts, whole of river flow conditions, and irrigation demand.

Falls Dam is a critical resource point for the Manuherikia Catchment, but with its complex management demands and the complex water distribution and down river tributary stream behaviours, it cannot be a whole of river regulatory management site. Instead, it is a key reference point for resource users with irrigation management.

There is an existing residual flow of 0.500 m^3 in place that currently protects habitat below the dam. This proposal increases this residual flow and so will further enhance this protection.

5.4.1.2 Ophir

Proposed:

- Reference site for irrigation management.
- Regulatory Management Site: Set as a minimum flow site to provide maintenance and protection for values throughout the catchment.

Rationale:

There has been a minimum flow limit set at Ophir since the RPW became operative in January 2004. It has been useful as a reference site for irrigation management and the environmental protection for the river above and below Ophir.

This site has strategic value for water management as the site for all abstractions above and below the site. It has proven useful for water managers and will continue to be used as a reference site to ensure effective water management for upstream uses and values but also to give collective assurance of resource sharing and availability for all downstream users and values.

The minimum flow limit will support and protect identified catchment values.

This site currently has a minimum flow of 820 l/s (set through the environment court) – although this has been subject to scrutiny in recent years as being low relative to natural MALF. However, this logic fails to acknowledge that this site is affected by flow augmentation from Fall Dam delivering water to the Manuherikia and Galloway Schemes below Ophir, as well as the voluntary flow at Campground Flow Site. As a result, an actual flow of 820 l/s at Ophir is very rare and is only likely to occur if Falls Dam has been emptied. At this point natural flows in the Manuherikia are likely to be extremely low, irrigation will likely have ceased with the only water being taken for stock, root stock (horticulture) and domestic supplies.

This site should continue to be utilised as a minimum flow site, to provide assurance to other parties about the protection of water values. We propose that the minimum flow remain at 820 l/sec.

It is proposed that the Ophir primary minimum flow condition of 820 l/sec would be applied to all primary water take permits upstream of Ophir in the Manuherikia Main Stem Management Zone.

5.4.1.3 Campground

Proposed:

- Reference site for irrigation management
- Regulatory management site: a minimum flow site at Campground would maintain and protect values throughout the catchment.

Rationale:

A minimum flow site at Campground gives assurance that water management summed over the entire Manuherikia Catchment is operating effectively.

The Campground primary minimum flow would be included on all the primary water permits in the Manuherikia Main Stem Management Zone and would be the driving force behind flow sharing for the main stem takes. All consent holders would be motivated to uphold the flow at Campground to maintain some access to irrigation water as the flows decrease.

The minimum flow site will protect the values of the main stem, an overview of which are provided below.

Values identified in the Main Stem:

- Cultural values including for mahika kai.
- Presence of indigenous ecosystem values.
- Limited native fish values due to presence of trout and exclusion of longfin eel by Roxburgh Dam.
- Native bird values throughout the mainstem from above Falls Dam to Clutha confluence.

- Contact recreation, particularly swimming near Omakau and from Chatto Creek to the Clutha Confluence. Kayaking, with a focus on the gorges and lower reaches.
- Abstractive values, supporting numerous primary industries, including surety of supply.
- Regionally Significant Trout Fishery.
- Gamebird values associated with the river and irrigations and stock water ponds.
- Aesthetic values.

The primary minimum flow at Campground is proposed to be 1,100 l/sec to provide for the ecological values of the Manuherikia River. It is proposed that all primary water takes in the Manuherikia Main Stem Management Zone will include the 1,100 l/sec minimum flow consent condition. The basis for this flow is set out in Section 8.

5.4.1.4 Residuals on Main Stem takes from the Manuherikia - Blackstone, Omakau, Manuherikia, Galloway schemes

There are four significant abstraction takes held by four irrigation schemes from the Manuherikia River (mainstem), Blackstone Irrigation Company, Omakau Area Irrigation Company, Manuherikia Irrigation Co-operative Society Ltd and Galloway Irrigation Society.

These abstractions are large (424.5 l/s to 2,830 l/s) and subsequently deliver water to 100's of shareholders. These four companies are party to the current legally binding Falls Dam Agreement which details the flow sharing required when the dam is supporting the abstraction. That agreement ultimately protects the ability of all the companies to continue their access to some water. Historically that meant the higher priority take owned by MICS would not be exercised and all would share the water. Relinquishing the priority by MICS many decades ago in favour of a Falls Dam agreement was a progressive move for the catchment. The river benefits from the Falls Dam Agreement as flow is guaranteed to reach the lower stretches of the river. A Flow Sharing Agreement will be developed as a result of this process and will include the Falls Dam Agreement. Only after the replacement consents have been issued will the details of the Falls Dam Agreement be updated to reflect any alterations in rates, new residuals on the tributaries and flow sharing required to achieve the minimum flows. The delivery of water to the lower intakes will remain.

The need to consider maintaining a residual flow (in addition to the minimum flow) for the OAIC Main Race and GIS intakes from the Manuherekia River has been raised by ORC and affected parties. It is proposed that a residual flow of 500 l/sec be introduced on the OAIC Main Race intake (2001.702) to ensure instream habitat protection and provide for natural character between the intake and the confluence of the Manuherekia River with Dunstan Creek. No residual flow is proposed below the GIS intake from the mainstem as the values below this intake will be protected via the minimum flow proposed at the Campground flow site.

5.4.2 Tributary Sub-catchments within the Manuherikia Mainstem Management Zone

Proposed:

- Set residual flows in the following tributaries as the major tributaries in this zone, above their confluence with the Manuherikia River mainstem on:
    - Dunstan Creek
    - Lauder Creek
    - Thomson Creek
    - Chatto Creek
    - Manor Burn

Rationale:

Five secondary management tributaries are proposed and will be managed both for their respective values and contribution flows to the Manuherikia River main stem downstream of Falls Dam (refer to the figure below). Residual flow sites are proposed on these tributaries.

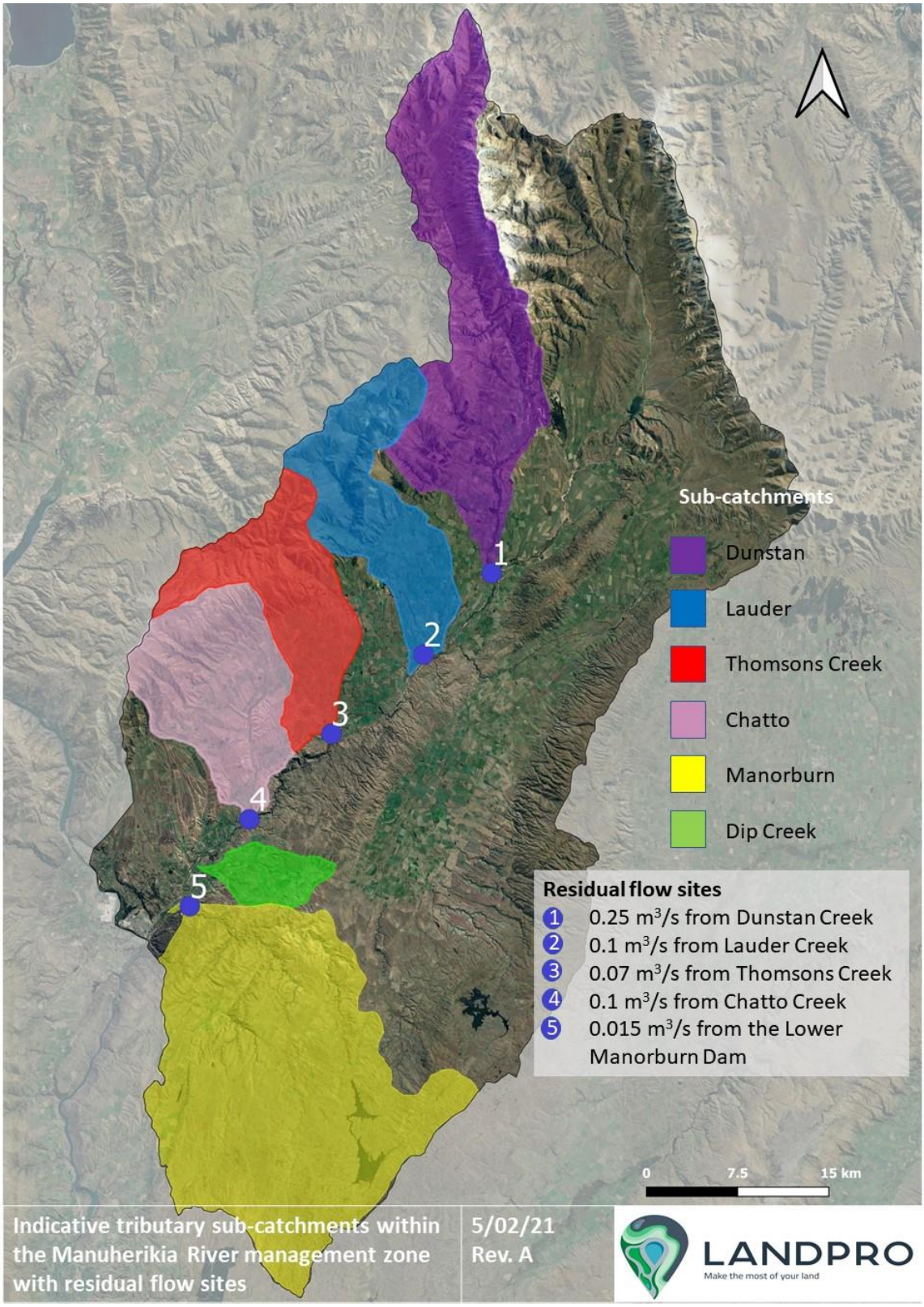

Figure 7. Proposed tributary residual flows

These tributary flow limits recognise that an extra sub-catchment limit is required to further protect specific values in the relevant tributaries. Local water rationing is likely to be required in each tributary sub-catchment to manage available water while providing for instream values. The hydrological characteristics of these sub-catchments may vary in any season from the main stem. The minimum flow in the main stem would work in co-operation with the sub-catchment residual. If either of the Regulatory Management flow (minimum or residual) related to each sub-catchment is breached, then the irrigation abstraction would cease. However, these sub catchments will have a flow sharing regime that will be initiated as flows start to decrease in order to protect the residual flow.
This approach also recognises that under natural conditions these streams would all contribute flow to the main stem, that they all have instream values warranting protection and that they all have a significant amount of water use from them that will require collective management.

A description of the five tributary catchments shown in Figure 6 is provided below.

5.4.2.1 Dunstan Creek

Proposal and rationale:
Dunstan Creek catchment has significant unaffected mountain stream habitat which supports a healthy sports and indigenous fishery. Lower in the sub catchment there are two scheme abstractions servicing a number of properties as well as private water takes. There are a number of smaller takes on the tributaries of the Dunstan Creek. The proposed residual flow at the mouth of the catchment would protect identified values in the Creek. Upstream abstractors will co-operatively work toward maintaining this residual flow. The Beattie Road flow site will be the flow site for management of flows in this catchment. Subtracting all downstream takes (Cairn Hill) from the flow at Beattie Road will ensure compliance with the proposed 250 l/s residual in Dunstan Creek.

Water abstraction and use in the sub catchment is not affected by any water from the main stem of the Manuherikia, unlike the Lauder and Thomson sub-catchments i.e. no water is brought in from the mainstem to farms in this sub-catchment.

Values identified for Dunstan Creek:

- Rare native fish
    - Central Otago Roundhead galaxias.
    - Longfin eel.
- Gamebird values associated with irrigation and stock water ponds.
- Cultural values including for mahika kai.
- Locally significant backcountry trout fishery and spawning stream for Manuherikia River Fishery.
- Abstractive values, supporting primary industries, including surety of supply.

5.4.2.2 Lauder Creek and Thomson Creek

Proposal and rationale:
The hydrology of both Lauder and Thomson sub-catchments are affected by the introduction of water from other sub-catchments. Dunstan Creek and Manuherikia main stem water is utilised on farms in the Lauder sub-catchment and Lauder Creek and Manuherikia main stem water is utilised on farms in the Thomson sub-catchment.

The hydrology of these catchments is made more complicated by the use and reuse of drainage and runoff water via races and irrigation practices, though this has changed dramatically in the last five years with increased use of storage and spray irrigation and is anticipated to change further.

Both the Lauder and Thomson Creeks have a naturally drying stretch at the foot hills of the range onto the flatter country. Both creeks then gain flow from groundwater and smaller tributaries closer to the confluence with the Manuherikia.

The residual flow proposal acknowledges these drying reaches but also provides for instream values between the higher abstraction points and the drying stretch. The residuals on the downstream sections aim to protect values and contribute to the main stem flows.

Effectively the upstream takes will work to one residual flow and the downstream takes will be managed by the second residual flow on both these creeks.

Table 3. Residual flows for Lauder Creek and Thomson Creek

Creek	**Residual flow l/sec**	
	Upstream section (Below OAIC weir)	Downstream section
Lauder	100	100
Thomson	50	70

An overview of values for Lauder and Thomson Creeks is provided below.

Lauder Creek Values

- Rare native fish
    - Central Otago Roundhead galaxias
    - Longfin eel.
- Cultural values including for mahika kai.
- Juvenile trout rearing and spawning stream for Manuherikia River Fishery.
- Abstractive values, supporting primary industries, including surety of supply.
- Gamebird values associated with irrigation and stock water ponds.

Thomson Creek Values

- Rare native fish
    - Central Otago roundhead galaxias

- Longfin eel.
- Cultural values for mahika kai.
- Abstractive values, supporting primary industries, including surety of supply
- Gamebird values associated with irrigation and stock water ponds.

5.4.2.3 Chatto Creek

Proposal and rationale:

Chatto Creek flows are affected by the introduction of water sourced from the main stem of the Manuherikia and Thomson Creek. The introduced water comes from the Manuherikia Irrigation Co-operative Society race that delivers water to shareholders in the lower region of the sub-catchment and the OAIC Main Race and County Race that delivers water to shareholders in the Upper sub-catchment. Water is abstracted from the Chatto creek tributaries for irrigation on the farms in the sub-catchment.

Hydrology assessments demonstrate that lows flows have historically not been a significant issue for Chatto Creek. Observations and data from the longitudinal gaugings indicate that return flows from flood irrigation are likely to significantly affect observed flows in Chatto Creek. It is expected that with a shift to more efficient application methods these returns will reduce in future.

In the 2019/20 season the observed flows were significantly higher than for any other season on record. This is because the Manuherikia Irrigation Company Society (MICS) trialled not taking water from Chatto Creek during 2019/20. The MICS take is consented to take up to 283 l/s and was the largest take in the Chatto Creek catchment but MICS is not seeking to renew this permit.

A residual flow of 100 l/s is proposed at the confluence of Chatto Creek with the Manuherekia main stem. This is expected to provide optimum habitat retention for Central Otago Roundhead Galaxias and greater than >60% habitat retention for large (>300mm) and small eels (<300mm) relative to habitat at the natural 7-day MALF. The Chatto Creek residual is not to be applied to those consents already granted within the Lahey's and Campbells Creek catchments which are to be managed under a separate Galaxias Management Plan (as required by condition of consent on the relevant permits on those tributaries) to protect Central Otago roundhead galaxias from predatory species. Otherwise, the proposed residual applies to all permits in this sub-catchment. The proposed residuals have taken this in to account.

Overview of values identified for Chatto Creek

- Rare native fish including:
  - Central Otago Roundhead galaxias
  - Longfin eel.
- Cultural values including mahika kai.
- Abstractive values, supporting primary industries, including surety of supply
- Gamebird values associated with irrigation and stock water ponds.

- Juvenile trout rearing and spawning stream in lower reaches for Manuherikia river fishery

5.4.2.4 Manor Burn

The Manor Burn hydrology is impacted by the Upper Manorburn dam which stores water higher in the catchment and releases it for use in the Pool Burn and Dip Creek catchments. A smaller portion of this stored water contributes to the lower Manor Burn catchment. There are other tributaries of the Manor Burn such as Little Valley Creek, Hope Creek and Speargrass Creek that feed into the lower Manor Burn. Galloway Irrigation Society manage the Lower Manorburn Dam for use for irrigation. It is also valued and used extensively by the local community for swimming and ice skating. The margins of the lower Manor Burn reservoir are also recognised as a regionally significant wetland.

The Manor Burn catchment has very low rainfall during summer and prolonged dry periods with very little flow from the upper catchment. The Lower Manorburn dam essentially acts as a weir as natural flows in the catchment are passed over the weir except for the portion of water abstracted for irrigation. At times of low flow when there is no flow going over this dam (or weir), a small instream flow downstream of the dam of about 30 - 40 l/sec has been observed. It is anticipated that this is seepage outflow from the Galloway Aquifer. Further downstream the Manor Burn flow is augmented by seepage from the Manuherikia gravels where the Manor Burn flows out to the Manuherikia River flat (i.e. beyond the rail trail bridge). The Manor Burn continues (on the true left of the Manuherikia River flats) as a separate creek for around 1.5 km before it joins the mainstem of the Manuherikia around 500 m upstream of the Campground flow recorder.

Values Identified for Manor Burn

- Significant presence of Clutha flathead galaxias in the Upper Catchment.
- Cultural values including mahika kai.
- Limited presence of longfin eel due to exclusion by Roxburgh Dam and the presence of dams on the Manor Burn.
- Abstractive values, supporting numerous primary industries, including surety of supply.
- Regionally significant trout fishery in Manorburn Dam. Fishing also undertaken at the Lower Manorburn Dam.
- Recreation in the Lower Manor Burn with swimming, picnicking, paddle boarding and ice skating in winter.
- Gamebird values associated with Manorburn Dam irrigation and stock water ponds supplied from the Manor Burn.
- Aesthetic values.

Proposed:

- Lower run of the river takes from the Manor Burn catchment to comply with Campground minimum flow limit (i.e. this does not include IVIC activities or some of the smaller tributaries that are located a long distance from the confluence with the Manuherikia).

- Set residual flows on the Upper Manorburn and Lower Manorburn dams to protect any instream values.
- Manage ecological values in the Manorburn catchment via take specific conditions such as residual flow conditions if required on other tributaries.

The IVIC activities are captured in the Ida Valley Management Zone as described in the next section of this document.

5.5 Ida Valley Management Zone

The Ida Valley has a unique hydrology, historic water management, storage, and water distribution systems. It is a very dry valley and its natural discharge to the Manuherikia during low flow periods is small. ORC has previously found that this hydrology likely means that control sites on the Manuherikia River will not actively protect the values of the Pool Burn and Ida Burn catchments because these streams would dry well in advance of any Manuherikia main stem minimum flow site being triggered to halt abstraction.[19] This has been further supported by the hydrology assessments carried out as part of the IVIC permit replacement application (refer to Appendix M of the IVIC application). This concluded that by the time any minimum flow on the Manuherikia mainstem is triggered the IVIC scheme will be operating solely on water that has previously been stored during high flows or in winter/spring. Furthermore, the Manorburn and Poolburn Dams are multi-year storage schemes meaning that the water used in one season could have been captured two or three years earlier. *Please note: The Manorburn Dam is the Upper Manorburn dam.*

Values identified in the Ida Valley catchment:

- Presence of both Central Otago roundhead and Clutha flathead galaxias.
- Cultural values including for mahika kai.
- Gamebird values associated with irrigation and stock water ponds.
- Limited presence of longfin eel due to exclusion by Roxburgh Dam.
- Aesthetic and amenity values.
- Abstractive values, supporting numerous primary industries, including surety of supply.
- Regionally significant trout fishery in Poolburn Dam. Trout fishing also undertaken at Moa Creek and Pool Burn weirs as well as the Ida Burn Dam.

Proposed:

- Exclude the Pool Burn and Ida Burn catchments from any minimum flow limit set in the Manuherikia Management Zone
- Set a reference flow site in the Pool Burn near the Manuherikia confluence, with the purpose of isolating the Ida and Pool Burn Catchments from the Manuherikia Catchment for flow management, water rationing and water augmentation.

[19] Dale, M. 2012. Instream values and water resource management options for the Ida Burn. Otago Regional Council Publication. ISBN: 978-0-478-37654-8

- Manage ecological values in the Ida and Pool Burn catchments via take specific conditions such as residual flow conditions.

Rationale:

The Ida Valley Management Zone (which includes the Ida Burn and Pool Burn) can be differentiated from the Manuherikia River Management Zone at the existing flow site at Cob Cottage.

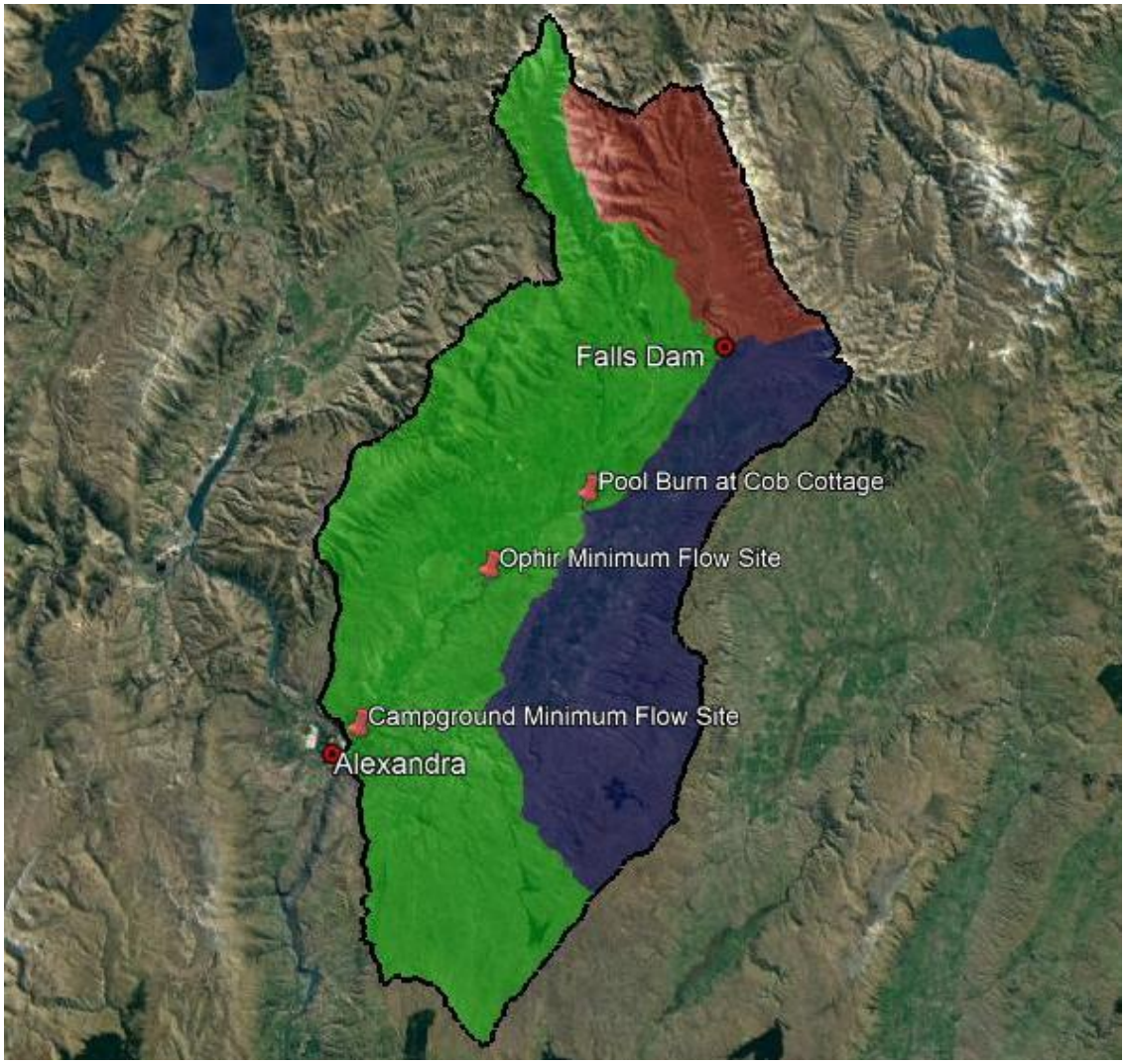

Figure 8. Location of Ida Valley Management Zone and Cob Cottage (potential reference site) in relation to the Manuherikia Mainstem Management Zone.

One reference site at Cobb Cottage is proposed for this zone – this would effectively separate the Pool Burn Catchment from the Manuherikia mainstem for water management purposes. This would mean that takes upstream of the Cob Cottage Flow Site would not be subject to the minimum flows at Ophir and Campground on the Manuherikia River.

This approach would recognise the distinct hydrological characteristics of this zone, including that it is very dry and would contribute very little to the Manuherikia during low flow periods. Recent analysis of the Pool Burn catchment has shown that takes from tributaries of the Pool Burn only operate when flows exceed 1.8 m^3/s at Ophir[20]. Essentially during times of low flow the Pool Burn end of the Ida Valley is operating almost entirely on stored water released for taking from either the Poolburn or Manorburn Dams, while the Hawkdun Ida Burn Scheme is relying heavily on water taken from the Falls Dam Management Zone or water from storage in the Ida Dam.

Therefore, it is logical to have a river reference site in the Pool Burn gorge[21] but to have no minimum flow conditions on permits located upstream of the Pool Burn reference site. The Pool Burn reference site would have the sole purpose of isolating the Ida and Pool Burn Catchments from the Manuherikia Catchment for flow management, water rationing and water augmentation.

Managing ecological values in the Ida and Pool Burn catchments is best achieved via site specific residual flow conditions as described in the sub sections below.

5.6 Residuals on individual takes.

Residual flows are proposed for individual takes by considering the hydrology and values within the waterway that can be affected by the abstraction, and the conditions that are required for protection of these values.

These take specific residual flows are most likely for intakes in the sub-catchments where the water permit has both a take specific residual flow and the sub-catchment tributary flow. It is also likely for smaller tributary catchments that do not have sub-catchment residual flows such as the users on Becks Creek and in Little Valley. These have been proposed to protect relevant values and recognise that a sub-catchment residual flow does not add value in terms of water management.

Proposed:

- Residual flow conditions specific to individual abstractions

5.7 Summary of Proposed Flow Limits During the Irrigation Season

The Manuherikia water users as a group have committed to maintain the following flows throughout the Manuherikia catchment during the irrigation season:

1. 0.720 m^3/s residual flow at Falls Dam.
2. 0.5 m^3/s residual flow at OAIC's intake.

[20] WRM Ltd. 2019. Assessment of Effects on Instream Ecology due to Water Takes from the Five tributaries of the Pool Burn Draining Rough Ridge.

[21] Pool Burn at Cob Cottage Flow Site available at https://www.orc.govt.nz/managing-our-environment/water/water-monitoring-and-alerts/upper-clutha/poolburn-at-cob-cottage

3. 0.250 m^3/s residual flow from Dunstan Creek
4. 0.1 m^3/s residual flow from Lauder Creek
5. 0.07 m^3/s residual flow from Thomsons Creek
6. 0.1 m^3/s residual flow from Chatto Creek
7. 0.015 m^3/s residual flow from the Lower Manorburn Dam
8. 0.820 m^3/s minimum flow at Ophir
9. 1.1 m^3/s minimum flow at Campground
10. Residual flows for individual takes as appropriate, particularly for takes in the Poolburn catchment and takes from other tributaries of the Manuherikia River.

5.8 Proposed Winter Regime

The proposed flow limits during the irrigation season will result in reduced surety of supply or access to water by permit holders during the irrigation season. This is anticipated to result in a greater focus on accessing water for on-farm storage. An increase in on-farm storage will mean that water users wish to be able to fill that storage as quickly as possible when flows allow, therefore it is anticipated that there will be an increased demand for supplementary taking in the Manuherikia.

As a result of this potential shift in accessing water it is important to have winter flow controls on takes. This will address the potential effects of increased taking of water during winter of water.

As a group the Manuherikia water users have committed to maintain the following residual and minimum flows throughout the Manuherikia catchment for primary takes during winter (May – September):

1. 0.720 m^3/s residual flow at Falls Dam
2. 0.5 m^3/s residual flow at OAIC's intake
3. 1.0 m^3/s residual flow from Dunstan Creek
4. 0.360 m^3/s residual flow from Lauder Creek
5. 0.180 m^3/s residual flow from Thomsons Creek
6. 0.250 m^3/s residual flow from Chatto Creek
7. 3.2 m^3/s minimum flow at Ophir
8. 0.05 m^3/s residual flow from Manor Burn
9. 4.0 m^3/s minimum flow at Campground

These flows will provide for adult trout passage which will also ensure passage for all indigenous species present in the lower Manuherikia mainstem.[22]

[22] All indigenous fish comfortably pass riffles at the depths that large trout require.

6. Irrigation and Allocation in the Manuherikia Catchment

Over-allocation is defined in the NPSFM (2020) as a situation where resource use exceeds a limit or if limits have not been set, an FMU or part of an FMU is degraded or degrading. This proposal addresses historic degradation by proposing an allocation limit and flow regime which will provide appropriate flows within the context of what natural flows within these catchments would be.

Allocation in Otago has been viewed through the lens of Policy 6.4.2 and Schedule 2A of the RPW and the division of water into two allocation bands:

Primary allocation water: this water is allowed to be taken at any time above the primary allocation minimum flow or a relevant residual flow limit. Historically, in simple terms, all permits originally granted prior to 1998 (surface water) or 2010 automatically fall within the primary allocation band.

In catchments deemed to be fully allocated, water takes with primary allocation status are protected from competition by new water takes, as no new permits of primary allocation water can be issued (via prohibited activity rules in 12.0.1).

Supplementary allocation water: this water is allowed to be taken only when flows in the river are above the supplementary minimum flow – this is a higher minimum flow than the primary allocation minimum flow (the default is that at least 50% of the natural flow remains instream, Policy 6.4.9 of the operative RPW). Consequently, this water has much lower surety or reliability of supply (as this level of flow in the river is less frequently achieved and these flows are often reached when irrigation is not needed).

Policy 6.4.2 has been the key policy determining the primary allocation limit in Otago.

Policy 6.4.2 defines the primary allocation limit as the *greater* of 3 possible amounts. In simplistic terms, the 3 possible amounts are:

a) An amount specified in Schedule 2A for that catchment as the primary allocation limit;
For the Manuherikia this amount is 3,200 l/s

b) where there is no amount specified in Schedule 2A, 50% of the 7-day mean annual low flow (often referred to as the 'default limit')
This is not relevant as an amount is specified in Schedule 2A.

c) The sum of consented maximum instantaneous rates of take of all permits that were originally granted before set cut off dates - this includes all deemed permits (this is referred to here as the consented sum).
In the Manuherikia the ORC is calculating this as 29,000 l/s[23].

[23] Evidence in Chief of Tom De Pelsemaeker on behalf of the Otago Regional Council, ENV-2020-CHC-127, in the matter of Water Permits Plan Change – Plan Change 7, 7 December 2020, Table 1

This means that under Policy 6.4.2 primary allocation for the Manuherikia catchment is 29,000 l/s, and that the figure in Schedule 2A becomes a nominal sum. This also means that under Policy 6.4.2 the catchment is considered fully allocated and will remain so until the consented sum reduces below the Schedule 2A amount.

Because the primary allocation figure is so much larger than the nominal Schedule 2A amount, the catchment is also commonly referred to as 'over-allocated' and drives a perception that the river must be degraded due to abstraction. This makes it important to consider allocation in the Manuherikia more clearly.

The Schedule 2A amount was included in the RPW as a result of an Environment Court decision on appeals on minimum flow setting under the proposed Water Plan (2003). The Environment Court Decision (see Decision C71/2002 and Decision C88/2003) does not include any explanation or discussion around the criteria that were used to determine an appropriate allocation limit of 3,200 l/s for the Manuherikia catchment.

The existing current primary allocation of 29,000 l/s is based on a simple approach of adding up the 'face value' of consents. Simply adding up the 'face value' of existing permits is flawed for a number of reasons:

a) Many permits to take water in the Manuherikia catchment are re-takes of water that has been delivered via a race and into a waterway (either crossing a waterway, or using the waterway as a means of conveyance).
b) Many permits are a re-take of water that has been stored. The capture of this water occurs when flows are higher, and is actually supplementary allocation water that has been stored and then released from a dam and delivered for irrigation during the irrigation season.
c) Many permits have a proportion of what is known in Otago as 'paper water'. This is water that is authorised to be taken but is not actually abstracted in reality, due to lack of availability of the water resource (i.e. the flow doesn't actually exist in the waterway), and also due to limitations in infrastructure (e.g. the race isn't big enough).

Factoring in these matters results in a significant drop in the 'consented sum' for the Manuherikia catchment. By way of example: the face value of all permits held by IVIC is 11,065.30 l/s. However, this amount is likely to be closer to 3,750 l/s, if only the 'core' takes (i.e. the first takes below weirs out of waterways and not re-takes) are counted.

In addition, it is important to recognise that in the Manuherikia catchment the volume apportioned to primary allocation is over inflated as a proportion of the volume taken each year within the catchment is actually a re-take of stored water, that was actually first 'taken' by capturing the water in Falls Dam, Poolburn Dam and Manorburn Dam during higher flow periods. It is not possible to re-categorise this water as supplementary allocation as the taking of this water occurs when flows are at primary allocation levels.

This proposal will result in a new 'consented sum' that will be much lower than the estimated 29,000 l/s. This is because:

a) paper water will be eliminated;
b) consents that have not been utilised or are not being replaced by consent holders will no longer exist;
c) re-takes will be recognised;
d) supplementary allocation will be better recognised;
e) efficiency parameters will be applied to the permits.

This will result in a new, much reduced total 'consented sum'.

However, there still remains other issue with the 'consented sum' approach. This is that it assumes (or only presents) maximum abstraction from a waterway at all times. This approach fails to recognise that as flows drop, the rate of abstraction also drops. This is a simple and unavoidable response to a decrease in supply. In all waterways affected by this application, the revised consented sum (i.e. total of all maximum rates of take) will not be available to be taken during low flow periods.

This approach fails recognise that the adverse effects of abstraction on waterways are of key concern when flows are lower. Generally speaking, when flows are higher, there is sufficient water to satisfy all values – ecological, natural character, amenity, cultural, and out of river use.

Thus the 'consented sum' approach is not particularly helpful in actually understanding the effects of abstraction on waterways when it matters most – when flows are lower.

The collective 'consented sum" approach also doesn't match reality or the true impact on the waterways. As although theoretically this collective consented total could be abstracted, in reality the total consented maximum is never abstracted at the same time. There are simply too many variables for that to happen in the broader catchment, including the number of intakes, the high-tech equipment, farming types and people. Even if all the water was available for abstraction at every site and the farmers wanted the water there is always some equipment that is being serviced or is awaiting repairs, people are off farm for any number of things funerals, boarding school pick-up, etc, crop types that do or do need water or other farm activities take precedent. To understand the actual impact the abstraction at any point in time would need to be plotted.

Allocation must be managed to ensure that the values identified for an FMU are maintained or protected in accordance with the objectives set for those values.

It is critical to highlight that several factors work together to achieve objectives (or protect values), of which allocation is only one. These include:

- Flow limits such as those proposed in this document, including minimum and residual flows
- Water rationing/flow sharing as flows drop
- Water harvesting and storage
- Augmentation of flows

A minimum flow acts as the key driver in managing both environmental outcomes and allocation, as a minimum flow it essentially allocates water to the waterbody (and associated values) first. Water that is most reliable is protected from any abstraction, and retained in-stream. Only if there is more water than the minimum or residual flow can any abstraction for irrigation occur.

It is critical to irrigators to retain some access to water in dry periods and so they are motivated to avoid flows from reaching the minimum flow. As flows in the river or stream decline irrigators progressively reduce their rate of abstraction so that they can abstract a small amount of water for as long as possible, and consequently the time that the river is at or below minimum flow is minimised.

This is why farmers in Central Otago have frequently expressed that allocation can be viewed primarily as a risk for the farmers not the river or creeks. The minimum and residual flow will protect the river from abstraction during times of low flows. The level of allocation in a catchment will determine the level of rationing that will need to occur – rationing of water impacts irrigators to the benefit of the river.

Flow sharing or rationing of abstraction already occurs between farmers as river flows drop. Farmers reduce their abstraction rates so that downstream irrigators can continue to access some water as well. In the past flow sharing has been driven by the historic system of priorities that are attached to deemed permits. This was a blunt instrument based on the date the permit was issued. It gave some abstractors priority to access water and depending on the location of the higher priority resulted in flows left in the river for downstream users. In many catchments land-owners have applied the priority system in their own way, and this has evolved over time with different land uses and irrigation practices.

In the future flow sharing will be via an agreed collective flow sharing agreement, with an agreed approach to rationing of water. In some cases, this will reflect the existing priority system (as this has dictated access to water in the past and has influenced on farm developments and the water metering data (the 'history of use'). The proposed residual and minimum flows will create a framework within which this flow sharing will occur.

As flows begin to drop, the 'consented sum' approach to allocation is primarily an indicator of the potential duration and frequency of both water rationing, and the potential duration and frequency at which flows in a river might reach a minimum flow. In a river with natural low flow characteristics in summer, high levels of allocation may increase the duration and frequency of low flows, including flows approaching the minimum flow.

6.1 Adaptation and development suited to lower summer flows

Farmers in the dry Central Otago region are accustomed to dry hot summers and a reduction of instream flows. This has been accounted for in farm developments with many farmers retaining lower cost irrigation methods on a few paddocks. When water availability decreases those paddocks are the first to be dropped from being irrigated. This lower reliability water is still valuable to farming

production as it may provide an extra cut of lucerne for winter feed or maintain a few paddocks with stock feed for another month or two.

The lower reliability water is generally applied via the cheaper application methods such as border dykes or contour flooding. Those methods use infrequent applications of a large volume of water (compared with spray methods) to provide for a greater application depth to heavier soils which in turn encourages the deeper rooted species such as lucerne to chase the soil moisture.

The more reliable portion of the water supply is used to keep the higher investment application methods such as pivots operational for all of the season.

Spray application methods such as pivots and k-lines are designed to apply a low rate of water regularly to the paddock to maintain the soil moisture of the root zone between field capacity and wilting point.

This approach of applying "just enough water" reduces the chances of wastage via losses below the rootzone but also leaves the crop or pasture vulnerable if water is not applied regularly as per schedule.

If the pivot is unable to operate due to water shortage then the crop or pasture will very quickly wilt and suffer production loss. This risk is the inevitable consequence of applying "just enough water" efficiently. This loss potential is most marked in the heat of summer when the evapotranspiration rate regularly exceeds or matches the application rate. This means that spray irrigation can only be effective and efficient (in terms of plant growth for a given volume of water applied) if the water application is consistent and reliable.

6.2 What does this mean for allocation in the Manuherikia Catchment under the NPSFM (2020)

The applications forming part of this proposal will provide a much clearer and accurate understanding of actual allocation within the Manuherikia Catchment. These applications highlight the extent of stored water relied upon for abstraction and the extent of re-takes. They also eliminate a significant proportion of 'paper water'. In some cases, existing (utilised) allocation is also not being replaced by permit holders.

As a result, these applications will provide a much clearer starting point for understanding allocation within the catchment. In addition, based on existing irrigated area identified for each permit holder and land use type, efficient water requirements have been assessed and applied to reduce (where necessary) the allocation for that permit holder.

Based on the understanding that flow limits are the primary means of protection for waterways, this proposal then applies the following key measures to manage the effects of abstraction:

- Flow limits (minimum and residual flows). Flow limits ensure that the waterbodies and freshwater ecosystems are 'allocated' appropriate flows to protect and provide for values.

- Flow sharing. Flow sharing ensures flow limits are met by progressive reduction of abstraction, ensuring elevated flows between intakes is sustained for the maximum amount of time and minimises the time that in-stream flows are at or near these flow limits.

6.3 Irrigation Scheme management of water use

Generally, the Schemes represented in the Manuherekia Catchment applications have no legal ability to require shareholders to utilise water in a certain way, as this is not included within existing water supply agreements. A change to scheme constitutions and/or water supply agreements would be necessary to enable this.

All of the Schemes encourage their shareholders to address any adverse effects. The Schemes have been communicating with shareholders about water use in relation to efficiency improvements and water quality through emails, meetings (including AGMs), and direct communications from respective race operation managers – for example, if race operation managers observe irrigation run-off, leaking irrigation pipes or stock in a race, then the race manager contacts the property owner/farm manager directly and requests that the problem be fixed. IVIC have commenced water quality monitoring - this represents an acknowledgment of the need to understand the effects of the use of water at a scheme level. MICS have actively promoted and facilitated (including through undertaking physical works) efficiency improvements.

Generally, if consent replacements require a more formal involvement in the use of water by shareholders, each Scheme will need to change its constitution and/or water supply agreements.

7. Methods Underpinning applications

This section provides an overview of the methods underpinning key calculations and assessments in the applications.

7.1 Water Demand

One of the key assessments for water permits to take and use surface water is determining how much water is needed for the proposed use.

Within the Manuherikia catchment, permits to take and use water are primarily used for irrigation of pasture, horticulture and viticulture. Additional uses supporting these key activities include frost-fighting, fruit cooling, dairy shed use, domestic supply and stock drinking water. Pasture is the dominant water use within the Manuherikia catchment in terms of irrigated land use type.

This section outlines the methods and assumptions used in calculating how much water is reasonably required for the purpose of use.

7.2 Water required for irrigation

The Otago Regional Council assesses reasonable irrigation water requirements using a desk top approach based on a report prepared by Aqualinc for the Otago Regional Council - referred to as the "Aqualinc approach" or Aqualinc (2017)[24]. Aqualinc carried out water-balance modelling for 42 irrigation seasons (1972 to 2014) using NIWA climate data (including virtual climate data) and five soil plant available water classes for pasture, grapes, stone fruit and market garden crops. This modelling provided guidelines for reasonable water allocation limits in Otago. Aqualinc note that the guideline values will be suitable for most water users but that there will be exceptions and water users can provide site-specific information to justify different rates. The report states that the guidelines were developed generally to achieve the following:

- For pasture, to ensure average annual pasture production loss due to soil moisture deficits was less than 0.5%.
- For crops, to maintain soil moisture above 50% of PAW for at least 90% of the time.

Aqualinc (2017) specifically notes that the use of water for frost-fighting is not included in any of Aqualinc's estimates for irrigation water requirements. Other non-irrigation water uses are also not included.

[24] Aqualinc, "*Irrigation Report: Guidelines for reasonable irrigation water requirements in the Otago Region.*" Report prepared for the Otago Regional Council, 2017

To determine a reasonable allocation, Aqualinc (2017) looks at the location of the activity (Central Otago), the type of activity (e.g. irrigation of pasture), and the mean annual rainfall and profile available water applying to the irrigation area.

In order to apply Aqualinc (2017), the applicants have identified their irrigated areas through mapping. The approach taken in identifying and mapping irrigated areas is outlined below.

7.2.1 Irrigated Area

For the purpose of these applications, irrigated area is defined as follows:
Irrigated Area: the area that has historically been irrigated. This includes paddocks or areas that may be 'dropped off' in a dry year to better conserve lower water supplies.

This differs from the 'command area' which is defined as follows:
Command Area: the area which could physically be irrigated from a scheme.

The irrigated areas presented in the applications are shown in each application, with overview maps contained within Section 2 of this document. The irrigated areas are used as the basis for the Aqualinc (2017) calculation discussed in the following section.

The irrigation areas are identified by method. The following irrigation methods are presented in the maps.

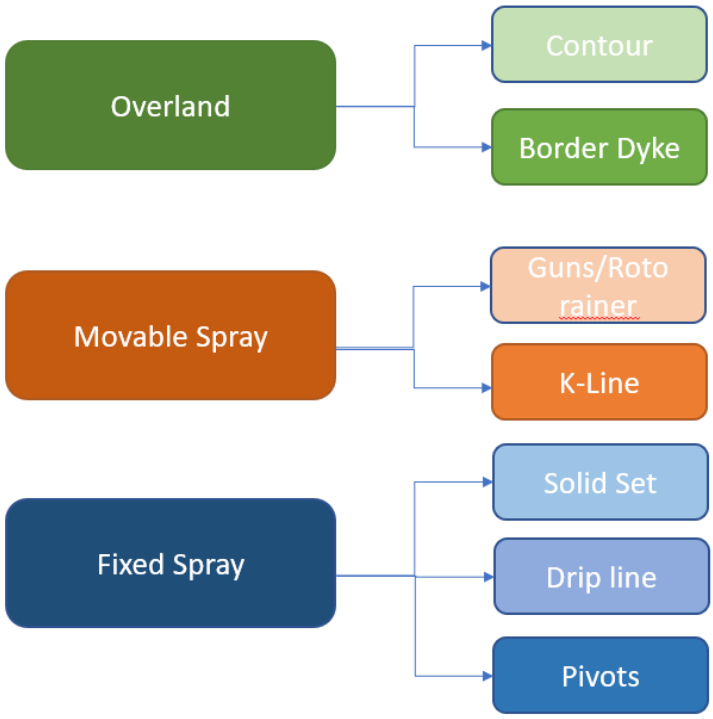

Figure 9. Categorisation of irrigation methods in application maps

The images below contain examples of these irrigation methods in the Manuherikia catchment.

Figure 10: Example of Border dyke irrigation (overland method), Cairn Hill, Becks. September 2016

Figure 11: Example of gun irrigation (Moveable spray), Lilybank, Lauder November 2020

Figure 12: Example of Pivot irrigation (Fixed Spray), Cairn Hill, Becks. September 2016

7.2.2 Aqualinc (2017) and Reasonable Irrigation Demand

An assessment of reasonable irrigation demand has been undertaken for irrigated areas presented within each sub-catchment and company application in accordance with Aqualinc 2017[25] guidelines.

As noted in earlier in this section, the approach utilised in Aqualinc (2017) combines geographic information, rainfall and soil (profile available water) information to inform its soil water balance modelling of reasonable irrigation demand for irrigated areas.

Plant available water (PAW) reflects the soil water reservoir that is available for the crop to use (mm). It is the soil moisture available between the field capacity and wilting point.

Applications have either utilised the Manaaki Whenua/Landcare Research recent SMaps[26] or the Fundamental Soils Layer to determine the soil type and PAW within the irrigation area – each application specifies the information used. NIWA's Mean Annual Rainfall (MAR) map layer was used, unless it was not considered to be accurate, in which case alternative rainfall information has been provided and used. The soils, PAW, MAR, irrigated area and land use type were mapped using a geographic information system. Where MAR or PAW were unknown, either the nearest PAW or MAR were assumed for these areas or the Fundamental Soils Layer information on soils was applied.

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

[26] See for example https://smap.landcareresearch.co.nz/

Land use types utilised crop types as defined by Aqualinc (2017). For the Manuherikia catchment these included pasture, horticulture ('Cherries and Apricots' in Aqualinc) and viticulture.

Crop types were identified based on information from the shareholders/permit holders. Life-style properties make up a small proportion of the catchment's irrigated area and do not always fit easily into one category, as these properties can be characterised by the variety of activities occurring on them. Based on shareholder information these properties have been attributed primarily to either pasture or horticulture.

The mapping of this information resulted in the calculation, using Aqualinc (2017), of the reasonable water requirements to irrigate specified areas. Aqualinc presents an average, 80th percentile, 90th percentile and maximum annual demand for pasture, but provides no direction as to which of these should be applied to determine a reasonable irrigation demand: "The annual (i.e. seasonal) demands are presented for average, 80th percentile (i.e. two-in-ten year drought), 90th percentile (one-in-ten year drought) and maximum situations. These values are calculated based on irrigation water requirements for the 1972-2014 irrigation seasons." (Aqualinc, 2017, p18).

Each application has utilised the maximum annual demand as identified by Aqualinc (2017). This recognises that when water is most needed, i.e. in a drought event with a lower likelihood of occurring that a 1 in 10-year event (as per the Aqualinc 90th percentile), it would not make sense to restrict a water user's access to this water when they most need it, if it were available to them e.g. through the use of stored water.

7.2.3 Water required for frost-fighting

The use of water from frost-fighting is well established and is typically by overhead sprinkler systems. For horticulture frost-fighting occurs in spring (to protect buds) while for viticulture frost-fighting is critical in spring (bud protection) and autumn (crop protection) due to the late harvest period for grapes compared to horticultural crops.

To be successful the rate of application must be adequate (e.g. to fully enclose buds in a layer of ice) otherwise the damage incurred will be more severe than if no protection had been provided. For this reason, it is critical not to under-estimate the amount of water required for frost fighting with water.

ORC guidance material has referred to the use of Environment Bay of Plenty recommendations for protection. This is not considered appropriate given the difference in climate and the severity and frequency of frosts that can be experienced in Central Otago.

Information collected from water users who utilise water for frost-fighting in the catchment has indicated the amounts set out in the table below.

Table 4. Water needed for frost-fighting

Amount and time	**Used in applications**
Maximum usage (mm/hour)	5 mm/hour (range of 4 to 6 mm/hour)
Maximum usage on an hourly basis	50 m^3/hour/hectare
Hours per event (average)	7 hours
Volume required	350 m^3/hectare/event

Due to the high flow and surety required for a frost-fighting event, and the likelihood of multiple events occurring over several consecutive nights land-owners utilise storage ponds as buffers to ensure water is available when needed. It is important to note however that the predominant demand for frost fighting typically overlaps with the shoulders of the irrigation season i.e. during spring or autumn.

ORC guidance material has indicated that Environment Bay of Plenty guidelines will be applied to frost-fighting in Otago.

The excerpt below shows frost occurrence and grass minimum temperatures at Alexandra (top) as compared to sites in the Bay of Plenty.

Below: Excerpt from Table 18, NIWA The Climate and Weather of Otago, 2nd Edition, G. R. Macara

Location		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alexandra	a	7.5	7.2	4.9	1.3	-1.9	-3.9	-4.6	-3.5	-1.2	1.2	3.7	6.6
	b	-4.3	-7.5	-7.8	-11.9	-13.9	-13.9	-14.4	-15.0	-11.9	-10.6	-7.8	-5.2
	c	1	1	4	11	19	25	27	24	17	11	5	1
	d	0	0	0.3	3	12	20	24	19	7	2	0.5	0

Below: Table 13, NIWA The Climate and Weather of Bay of Plenty, 3rd Edition, P.R. Chappell

Location		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Tauranga Aero	a	10.5	11.0	9.4	6.3	3.9	1.9	0.8	2.0	3.4	5.0	7.1	9.3	5.9
	b	0.3	-2.0	-1.8	-2.6	-5.7	-7.0	-9.4	-8.1	-5.0	-5.7	-3.2	-1.7	
	c	0.1	0.1	0.3	1.4	6.4	10.9	13.4	10.5	6.4	3.6	1.3	0.3	54.6
	d	0.0	0.0	0.0	0.0	0.1	1.2	1.9	0.5	0.2	0.0	0.0	0.0	3.9
Rotorua Aero 2	a	10.1	10.4	9.1	5.7	2.9	1.2	0.1	1.6	3.0	4.8	6.8	8.9	5.4
	b	-0.2	-1.0	-3.1	-4.4	-6.8	-8.0	-9.0	-7.9	-6.4	-4.1	-4.5	-2.1	
	c	0.0	0.0	0.3	1.8	7.9	11.9	14.0	10.5	6.4	3.1	1.1	0.1	57.3
	d	0.0	0.0	0.0	0.1	1.7	6.0	7.3	3.7	0.9	0.2	0.1	0.0	19.9
Waiotapu Forest	a	8.0	8.4	6.7	3.6	1.0	-0.8	-1.8	-0.8	0.9	3.0	4.9	7.1	3.4
	b	-2.4	-2.0	-6.0	-8.7	-9.8	-12.5	-10.5	-11.6	-9.1	-8.9	-7.6	-3.2	
	c	0.6	0.4	2.1	5.7	12.6	15.3	18.4	16.3	12.2	7.5	3.1	0.9	95.0
	d	0.0	0.0	0.7	2.0	7.6	12.5	15.1	11.2	5.8	2.4	0.7	0.1	58.1
Whakatane Aero	a	11.6	11.7	10.5	6.2	2.9	1.7	0.5	1.7	3.3	5.5	7.7	10.2	6.1
	b	0.3	0.3	-1.3	-2.3	-5.5	-7.2	-7.3	-6.1	-4.9	-4.4	-3.6	-0.1	
	c	0.0	0.0	0.2	0.7	5.9	11.1	13.1	9.9	6.6	2.5	0.8	0.0	50.8
	d	0.0	0.0	0.0	0.0	1.1	5.1	7.6	4.3	0.8	0.1	0.0	0.0	19.0

a: mean daily grass minimum (°C)
b: lowest grass minimum recorded (°C)
c: average number of ground frosts per month
d: average number of air frosts per month

Figure 13. Frost occurrence and grass minimum temperatures at Alexandra (top) as compared to sites in the Bay of Plenty

NIWA's climate overviews from the Bay of Plenty and Otago highlight that Alexandra gets more severe and frequent frosts than the Bay of Plenty. For this reason, it is not considered appropriate to simply utilise Bay of Plenty recommendations on water needs for frost-fighting.

7.2.4 Water required for fruit-cooling

Commercial apple growers within the Manuherikia catchment utilise water for fruit-cooling during hot, sunny conditions. This protects apples from 'sunburn' and retains the ability of these growers to obtain a high market value for their apples on the market. This is in addition to irrigation of horticultural crops.

Water use for fruit-cooling depends on the application rate of the system used – as this is via spray this is likely to utilises 4.5 to 5 mm per hour and occurs for up to 7 hours per event. Up to a maximum of 12 of these events could occur in one irrigation season.

7.2.5 Water required for stock drinking water

Other water uses include stock drinking water needs and domestic supplies. Each water source provides for stock drinking and domestic supplies to varying degrees. Some of these domestic supplies are to be relinquished and sourced elsewhere in future.

To calculate the reasonable stock drinking needs for a property, either:

1. The peak stock numbers have been provided from the property owner; or
2. Each stock farming category has been classified as deer, sheep and beef, or dairy/dairy support. An average stocking rate consistent with industry best practice has then been assumed for that farming category.

Where stock numbers have been provided by landowners this is made more complex by the different approaches used by various landowners – in some cases landowners may have provided stock units which is based on the Livestock Units (LSU) which utilises a specific class of ewe against which all other classes of stock can be compared. In other cases, landowners provided actual numbers for each type of stock (or classes of stock). Stock numbers can also vary from season to season depending on farm management decisions, seasonal variations, or market factors. For this reason, stock numbers should be treated as indicative.

ANZECC 2000 guidelines[27] have then been used for assessing the reasonable stock drinking water requirements and ensuring consistency with Policy 6.4.0A of the RPW. The full assessment of stock drinking water in the guidelines is set out in the table below, however, to reduce complexity the following values have been applied in the applications:

Sheep:	5 litres per head per day (as approx. average of average daily consumption across types of sheep)
Beef cattle:	45 litres per head per day
Dairy cattle:	70 litres per head per day
Horses:	35 litres per head per day
Deer:	15 litres per head per day (taken from ORC's Form 4)

This is likely to be an underestimate for the Central Otago climate and may need to be adjusted.

[27] Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), 2000 Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3, Primary Industries — Rationale and Background Information

Table 5. ANZECC Guidelines on stock drinking water requirements (Table 9.3.1, p9.3-1, Volume 3)

Type of livestock		Average daily consumption	Peak daily consumption
Sheep		(litres/head)	(litres/head)
	Nursing ewes on dry feed	9	11.5
	Mature sheep on dry pastures	7	8.5
	Mature sheep on green pastures	3.5	4.5
	Fattening lambs on dry pasture	2.2	3
	Fattening lambs on green pasture	1.1	
Cattle			
	Dairy cows in milk	70	85
	Dairy cows, dry	45	60
	Beef cattle	45	60
	Calves	22	30
Horses			
	Working	55	70
	Grazing	35	45
Pigs			
	Brood sows	22	30
	Mature pigs	11	15
Poultry		(litres/100 birds)	(litres/100 birds)
	Laying hens	32	40
	Non-laying hens	18	23
	Turkeys	55	70

a From Burton (1965)

7.2.6 Water required for domestic use

The applications identify any situations where water is taken for domestic use.

Domestic needs are calculated based on Ministry of Health reasonable domestic needs. Within the Central Otago District domestic drinking water supply of 1,500 l/day per household is reasonable.

7.2.7 Distribution losses

Distribution losses are anticipated to occur with the conveyance of water via open races. The generally accepted rate of loss from distribution via open channel races is 10% or lower. Distribution losses are discussed in each of the applications where relevant. Distribution losses include losses caused by evaporation as well as losses to ground.

Water users are inherently motivated to reduce losses to ensure that when water is least available in-stream, they are able to maximise their usage of any water taken, rather than simply lose it on the way to using it. This motivation is increased through the imposition of volume limits (noting that many deemed permits had no real volume limit) and minimum flow limits. These restrictions increase the need to minimise distribution losses so that any water taken is actually able to be put to good use.

7.3 Analysis of Metering Data

The abstraction records presented within each sub-catchment or company application have been sourced from the Otago Regional Council directly, or the data service provider. The source of data and reason for that source is outlined where appropriate.

Metering data for water takes have been graphed or presented in table format within each sub-catchment or company application. The instantaneous rate of take has been presented. The maximum recorded annual volume is also identified. As many of the existing permits do not have monthly allocation volume limits, data has not always been analysed on the basis of monthly limits.

Maximums are identified so that applicants can demonstrate that their recorded instantaneous rate of take is consistent with the maximum instantaneous rate applied for on their replacement permits. This is consistent with the ORC's Form 4 requirements which require maximum rates to be provided and is also considered consistent with Policy 6.4.2A which directs the grant of 'no more water than has been taken under an existing consent'.

Where an application has poor or nil water records, the applicant has then followed the explanation in Policy 6.4.2A of the operative RPW to substantiate the volumes and rate of take applied for on that permit. This includes the presentation of supporting evidence such as the description of existing circumstances and use, the infrastructure present or photos showing irrigated land.

Raw Data

In some applications the raw data has been provided. This is the metering data with no data filtering, or exclusion of outliers, or spikes in the data. Incorrect readings, exceedances or zeros can often be the result of flood or weather events or monitoring malfunctions. Where exceedances are significant the applications discuss or identify the likely cause of the exceedances.

Filtered Data

The filtered data (Filtered) is the raw abstraction record filtered in the following way:

- Where the instantaneous rate contains exceedances, the maximum recorded rate of take has been capped at the maximum consented rate, and these exceedances are acknowledged. If there have been no exceedances, the maximum recorded rate is the maximum of the raw instantaneous record.
- Further analysis of the data to calculate historical monthly and seasonal or annual water use is based on data that has been filtered in the following way:
    - Data is capped at 5% or 10% over the maximum consented rate (10% is consistent with the margin of error associated to an open channel flow meter and accounts somewhat for metering outliers, or errors; for piped meter this margin of error is 5%)
    - All zero or negative values have been removed from the data. The approach is consistent with recent hearing decisions (see: Long Gully Race Society RM17.176; and Queensbury Ridges Ltd (pending appeal) RM19.312).

Using the Plan Change 7 Methodology for Analysing Data:

These applications are not made on the basis of the controlled activity rule (10A.3.1.1) in PC7. This rule is the only mechanism in PC7 requiring the application of the methods for data analysis contained in Schedule 10A.4.

The applicants also have a number of significant concerns with the methods contained in Schedule 10A.4, as expressed in submission by OWRUG on PC7. As these applications are not made under Rule 10A.3.1.1 the data analysis methods contained in PC7 Schedule10A.4 have not been applied in these applications.

7.4 Allocation Sought in Applications

Rate of take:

Unless otherwise stated, the instantaneous rate of take sought is the lesser of the maximum rate historically accessed (as demonstrated by the record of abstraction) and the rate currently authorised on the permit.

Annual Volumes:

Unless otherwise stated, the volume sought is based on:

a) the lesser of the maximum volume historically accessed (as demonstrated by the record of abstraction) and maximum reasonable irrigation demand (Aqualinc, 2017),

plus

b) water requirements for any other use sought such as:

i. stock-drinking water
ii. frost-fighting
iii. fruit-cooling
iv. distribution needs
v. domestic supply

Each permit also seeks a year-round abstraction if that this is in accordance with existing permits or unless otherwise specified. This allows for some flexibility in taking water for factors such as frost-fighting or the supply of stock drinking-water.

Monthly allocation limits have typically not been applied to the proposed permits. This is because monthly volume limits tend not to achieve anything in managing effects on the environment and have often been simply an extrapolation of the instantaneous limit – and so add nothing as a mechanism of controlling the activity.

7.5 Value of Existing Investment

Placing a value on existing investment is difficult, particularly with so many permit holders and water users. The value of existing investment by permit holders, including shareholders is significant, and is anticipated to be in the hundreds of millions.

The investment in scheme infrastructure is detailed in the specific applications.

In the case of the larger schemes, it is challenging to obtain information from shareholders about the value of existing investment, including due to changes in land ownership. Where farm specific information has not been utilised, the following estimates have been applied:

- The average cost for installing a pivot scheme in Otago is $6,000/ha, on the basis that costs approximately $4,000/ha for full circle machines and smaller part circle machines can be $8,000/ha.
- The average cost for installing a k-line system would be $3,500/ha.
- A low estimate of storage construction would be $4/m^3

These costs are at the low end, as they do not consider all on-farm investments that are made in reliance of irrigation.

Additional costs face this catchment, with a significant spending on existing dams with respect to remedial and upgrade work required so that they can continue to operate in the current state. An estimate provided to the Manuherikia Catchment Water Strategy Group for this work for Falls Dam was $17.5 million.

8. Catchment Level Assessment of Effects on the Environment

8.1 Existing Environment

The environment against which the effects of a proposed activity should be assessed depends on the particular facts and context of the case. Where an activity has been authorised by a consent, the activities subject to those consents should not form part of the existing environment.

However case law has established that this does not require an assessment against some imaginary natural and unmodified environment, and that the 'environment' depends on the context and facts of the application.[28]

The Court in *Lindis Catchment Group v. Otago Regional Council*[29] noted the difference in 'environment' under section 104(1)(a) and section 104(1)(b). The environment to be considered under the latter will be based on the policy direction taken in relevant planning instruments. The importance of the environment under section 104(1)(a) may be qualified by the policy direction in those documents and the nature of the environment being considered:

> *"the importance of that (section 104(1)(a) assessment)[30] may be later qualified in the sense that a regional or district plan can contemplate a different reasonably foreseeable future – indeed, regional and district plans routinely do so. The section 104(1)(b) "environment" contemplated by the objectives and policies of the statutory documents may be more important in many cases than the section 104(1)(a) environment. The answers always depend on context. If the "environment" assessed under section 104(1)(a) contains a critically threatened endemic species, then the section 104(1)(a) environment may be the most important consideration in the case (depending on the strength of the policies considered under section 104(1)(b) RMA). But where the adverse effect to be considered in section 104(1)(a) are on an environment that is substantially modified with few or no remaining indigenous biodiversity factors, then the environment may be less important (but the opposite might also be true if the modified ecosystem is rare). Each situation depends almost totally on its own facts and predictions".*

In this case key policy instruments are largely forward looking – as they are focused on maintaining or enhancing the values that are present. For example, Policy 5 of the NPSFM (2020) is about improving degraded water bodies and freshwater ecosystems and maintaining the health of other water bodies and freshwater ecosystems; Policy 11 includes a focus on 'phasing out' existing over-allocation. The Court in *Lindis* noted that Section 6(a), 7(c), 7(f) of the RMA are forward looking. The RPW Objectives include a focus on "maintaining life-supporting capacity", although Objective 5.4.8 includes consideration of a naturalised environment as well as the status quo.

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[28] See for example *Contact Energy Limited v. Waikato Regional Council* Decision A04/2000 and *Alexandra Flood Action Society Inc v. Otago Regional Council* Decision C102/05

[29] Decision No [2019] NZEnv 179

[30] The Court concluded that the 'environment' under section 104(1)(a) is the reasonably foreseeable future environment without the deemed permits which are being replaced and without regard to the policies of the RPW (refer [56]).

In addition, the environment affected by the activities that are subject to these applications are largely within a modified environment, with introduced species present. Where threatened indigenous species are present and are not threatened by introduced species, a primary focus has been given to effects on the indigenous species.

While these policy factors are noted here within the context of what constitutes the 'existing environment', this section is focused on a section 104(1)(a) assessment of 'environment.'

8.1.1 Dams and Weirs

The dams and weirs subject to these applications were constructed by the government in the early 1900s. The use of these structures are permitted activities pursuant to Rule 13.1.1.1 of the RPW – as long as they are maintained in good repair. If a structure is not maintained in good repair it becomes a restricted discretionary activity under Rule 13.1.2.1.

The repair or maintenance and extension, alteration, replacement or reconstruction of the structure is also permitted pursuant 13.3.1.1 and 13.3.1.2 of the RPW (subject to compliance with some standards set out in 13.3.1.5). Consent is required to remove these structures under the RPW.

This indicates that the presence of these structures forms part of the permitted activity baseline, but the storage of water behind them requires a consent.

The dam and weir structures subject to these applications are considered to be part of the existing and foreseeable future environment because they lawfully exist and are permitted activities in the RPW. Therefore, the effects of these structures (regardless of the impoundment of water) are part of the environment.

When assessing the effects of the impoundment of the water within the dam the starting point is that the environment does not include the impoundment of water behind the dam itself. This is because renewed consents are required for this.

The impoundment of water has existed lawfully. These applications seek to continue this activity. One of the logical comparators is the effects of continuing to do so, rather than only a fanciful imagining of the effects of impounding this water for the first time.

In the context of the dams and weirs subject to these applications the 'environment' must include the various ecosystems that now exist as a consequence of the establishment and operation of these dams and weirs. Their formation has given rise to freshwater ecosystems that are now part of the 'environment'. A failure to renew the permits that enable the storage of water will destroy the habitat, natural character and amenity values that now exist in these reservoirs. Such an outcome would not maintain and enhance those values.

If the consents to dam water are not replaced, one of the real world scenarios is that consent would need to be obtained to remove these structures, and the effects of this would need to be considered if this was applied for. Another real-world scenario is that some or all of these structures will remain in place for many years (without any impoundment of water within them). The environment in that case includes the presence of trout and introduced plants and a significantly altered bed and surrounds.

8.1.2 Water takes

The same considerations apply to the water takes. Naturalised flows are assessed in the science assessments supporting the applications. In the absence of water takes occurring, the 'existing environment' is the modified environment including pastoral farming, the presence of trout and introduced species.

8.2 Effects on Hydrology

Our assessment of effects has shown that relative to natural flows the Manuherikia River has a high degree of hydrological alteration due to the effects of water storage, augmentation and abstraction. We have shown that the reaches of river with the greatest departure from its natural flow pattern at times of low flow is from Falls Dam to the OAIC intake (augmented) and the MICS intake to the Clutha confluence (reduced) (refer to figure belowFigure 14).

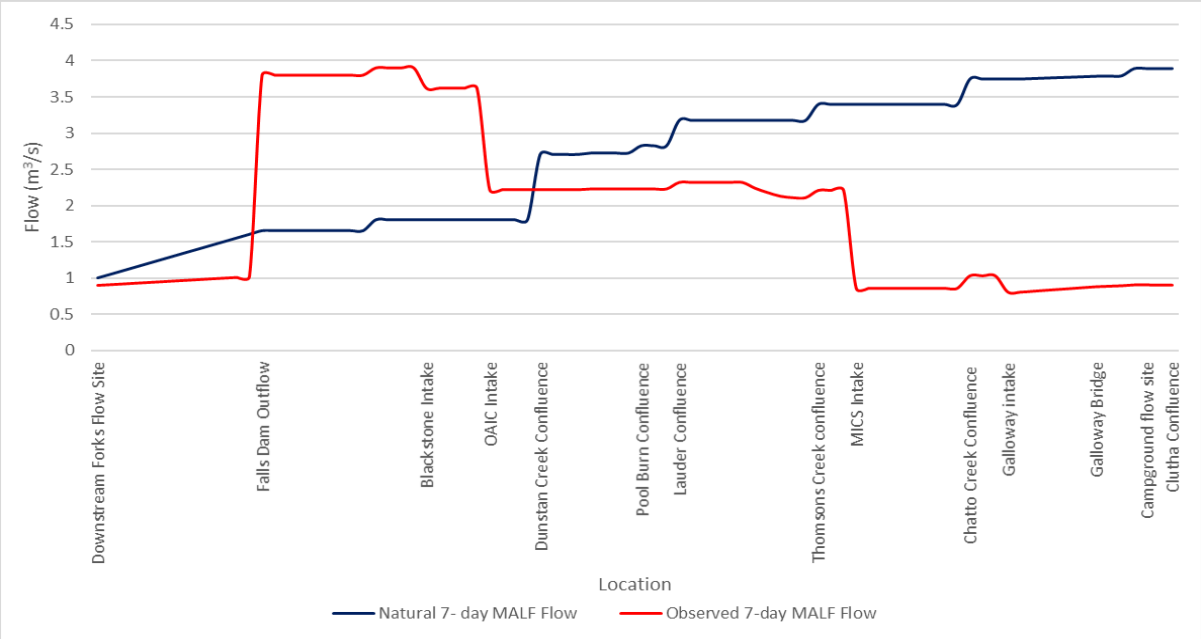


Figure 14. Longitudinal Flows expected under the natural 7-day MALF and observed 7-day MALF at the Downstream Forks, Ophir and Campground flow sites. It is 83 km from the Forks Flow Site to the Clutha Confluence.

Where flow information is available observed 7-day MALF's and daily average minimum flows have historically been significantly less than would be expected under natural flows[31] as would be expected with a catchment with a high demand for water and little to no regulatory controls to cease the taking of water.

Table 6 Observed and natural flows for key site across the Manuherikia.

Site	Natural 7-day MALF (m^3/s)	Observed 7-day MALF (m^3/s)
Manuherikia Downstream of the Folks	1.009	0.880
Manuherikia at Falls Dam	1.666	1.101
Dunstan Creek at Beattie Road	0.900	0.293
Lauder Creek at Rail Trail	~0.350	0.090
Thomsons Creek at SH85	~0.220	0.098
Manuherikia at Ophir	3.200	2.152
Chatto Creek at Confluence	~0.350	0.199
Manuherikia at Campground	3.900	0.911

Accrual time analysis indicates that although there are several storage impoundments in the Manuherikia they do not appear to affect periphyton flushing flows as much as might be expected relative to natural flows. This is because time between flushes in the Manuherikia are naturally long, on average about 3 months.

In conjunction with the naturally long accrual times Falls Dam is relatively small in proportion to the size of Manuherikia River meaning that the dam is often full or close to full when a flush occurs which then allows flows to overtop the dam and carry on downstream. The Poolburn and Manorburn Reservoirs capture only small areas of their respective catchments, meaning that when it does rain the catchment areas not affected by the dams are large enough to still generate significant flows.

The figure below provides observed flows at Campground for the 2017/18 hydrological year compared to a flow of 3x the median flow which is 36 m^3/s. A flow of 3x median is an index flow for what is sufficient to flush periphyton. For context the 2017/18 irrigation season was looking to be one of the driest on record, by the end of January 2018 Falls Dam was all but exhausted but in the first few days of February the Manuherikia received significant rainfall.

Despite Falls Dam being almost empty by the end of January 2018 and both the Poolburn and Manorburn Dams being well below their respective crest levels flushing in the lower river still occurred (refer to the figure below).

[31] By natural flows we mean flows with no abstraction or storage impoundments.

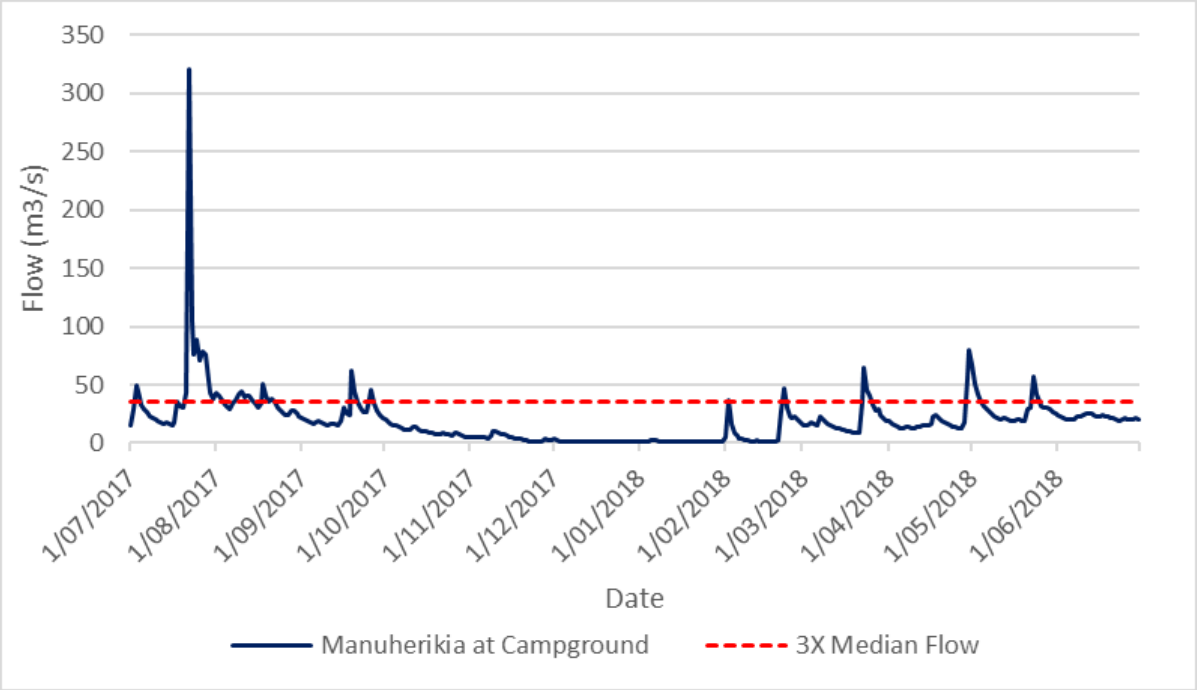


Figure 15. Observed daily average flows at ORC's Campground flow site for the 2017/18 hydrological year (July to June) compared to a flushing flow of 36 m^3/s (3X median flow).

The imposition of an increased residual flow from Falls Dam, a residual flow on the OAIC main race intake, residual flows on all takes from perennial tributary streams and two minimum flows in the mainstem will ensure hydrological connection throughout the catchment and prevent the extreme low flows observed in the past (Table 6).

Table 7 below shows the observed minimum flows recorded across the Manuherikia compared to the proposed residual and minimum flows proposed at those locations in document and the associated applications.

Table 7. Observed daily average minimum flows at key location relative to the proposed residual and minimum flows in this application at those same locations.

Site	Observed daily minimum flow (m^3/s)	Proposed instantaneous residual or minimum flow (m^3/s)
Manuherikia at Falls Dam	0.500	0.720
Manuherikia at OAIC Race intake	0.300	0.500
Dunstan Creek at Confluence	0.011	0.250
Lauder Creek at Rail Trail	0	0.100
Thomsons Creek at SH85	0	0.070
Manuherikia at Ophir	0.457	0.820
Chatto Creek at Confluence	0.069	0.100
Manuherikia at Campground	0.406	1.100

Table 7 highlights the significant increase the residual and minimum flows proposed in the application provide relative to what has been observed at different locations throughout the catchment.

8.3 Effects on Water Quality

Water quality in the upper Manuherikia (upstream of Omakau) is typically good, with low dissolved nutrients and low levels of faecal contamination. Nutrient concentrations are elevated in the Manuherikia downstream of Ophir due to a number of sources including the Omakau wastewater treatment plant and runoff from overland flow irrigation. Interestingly turbidity increases the most in the upper river between Loop Road and Blackstone Hill and is linked to runoff following rain from historic gold mining areas.

E.coli levels are highest at Ophir, which is immediately below the Omakau waste water treatment plant discharge and Thomsons Creek inflows. While spikes in *E.coli* can occur downstream of Ophir it is not clear what the source of these are[32]. The most likely source associated with water use is return flows from irrigation run-off which can be addressed through conversions to spray and changes to on farm management practices.

Water quality observed in the mid to upper reaches of Manuherikia tributary streams is generally good, however a number of streams in their lower reaches (Chatto, Thomson, Lauder Creek, Pool Burn) can be impacted by stock access and overland irrigation methods with elevated turbidity, *E.coli* and phosphorus. In general Dunstan Creek is less impacted and has good water quality throughout its length.

Currently Thomsons Creek has the lowest quality water at its confluence with the Manuherikia and a significant wetland development and fencing project is underway to help improve the water quality in this stream[33]. A working, conceptual draft of this wetland project is attached as Appendix C. The NPSFM (2020) has specific requirements for stream fencing which will also contribute to reducing contamination of tributary streams.

Residual flows set on takes in the upper reaches of tributaries will also allow more water of good quality to flow downstream and in combination with a reduction in return flow from overland irrigation methods should see a subsequent improvement in water quality.

The combination of residual flows, reduced stock access, conversion to spray irrigation and targeted remedial work such as the Thomsons Creek wetland project are expected to provide improvement in tributary and mainstem water quality in the Manuherekia River.

[32] For example, sources could be the waste water treatment plant, overland flow returns, birds loafing on the river, septic tanks, stock access etc.
[33] Funding for this was provided by the Minister for the Environment.

8.4 Effects on Ecology

In assessing the ecological effects of water takes from the Manuherikia catchment it was important to understand what effects can be attributed to abstractions and which effects are the result of an unrelated activity or factor. Our assessment as part of this application tries to tease this out by assessing flow, take, water quality and biomonitoring data.

Our assessment based on observed flows and habitat modelling has found that over abstraction at times has had significant adverse effects on the ecological values locally or at a reach scale in Dunstan Creek, Lauder Creek, Thomsons Creek, Chatto Creek and the lower Manuherikia River. The key reason for this is the lack of residual or minimum flows in place to protect ecological values.

Overall, the most severe ecological impacts on indigenous species observed in the Manuherikia appear not to be because of abstraction[34]. For example, the lack of longfin eel, lamprey and koaro[35] is due to the Roxburgh Dam on the Clutha River. The lack of galaxias where they would naturally occur is due to the presence of trout as recently expressed in evidence on behalf of the ORC to the Environment Court[36] made the point that a key factor to recognise is that halting water abstraction will not change the threat status of the threatened non-migratory galaxias but removing salmonids from Otago would improve the state of nearly all the non-migratory galaxias. Finally, reduced macroinvertebrate scores in the upper river despite good water quality is due to the presence of invasive diatom Didymo (Didymosphenia geminata).

In assessing and recommending residual flows we have tried to apply the NPSFM (2020) priorities with regard to the compulsory values of threatened fish, indigenous ecosystems, and mahika kai. We have taken a river first approach as the application of residual and minimum flows ensures the flow required to protect habitat for indigenous species, threatened fish and mahika kai species is safeguarded and that no abstraction can occur unless the flow required for the compulsory values is present.

In principle, for the tributaries we took the approach that where non-migratory galaxias are present, that based on instream habitat modelling the taking of water will not result in flows less than identified as optimum for this species. That is, based on the best science available, physical habitat for non-migratory galaxias will not be compromised by abstraction.

With respect to indigenous ecosystems for the tributaries from a habitat perspective flows that provide optimum habitat for galaxias were assessed for their outcomes for macroinvertebrate habitat, upland bully and longfin eel habitat. From this we are comfortable that once all other influences[37] that affect indigenous species and their presence in the tributaries of the Manuherikia are accounted

[34] This does not mean abstraction does not have effects, but the effects of abstraction tend to be localised.
[35] Trout predation will also be a significant factor for koaro.
[36] Para 45. Evidence in Chief of Dr Richard Allibone in the matter of the Water Permits Plan Change - Plan Change 7, being part of a proposal of national significance directed by the Minister for the Environment to be referred to the Environment Court under section 142(2)(b) of the RMA
[37] For example, the Roxburgh Dam, impacts of trout on galaxias and macroinvertebrates.

for that abstraction effects on ecological values are not anticipated to be more than minor with the proposed residual flows in this document and the associated applications.

With respect to mahika kai we have used longfin eel as the key species to assess this value in the Manuherikia[38] and what we have found is that based on habitat modelling, flow is not constraining this species. The prevention of recruitment from the sea with the construction of Roxburgh Dam on the Clutha has meant that longfin eel is now uncommon in the catchment and that even if a significant increase in manual trap and transfer was to occur past the Roxburgh Dam from 2021, obtaining a population that is plentiful with multiple age cohorts that can be sustainably harvested [39] is likely to be decades away.

Our approach has been to ensure based on habitat modelling that there are good levels of physical habitat throughout the catchment for longfin eel so that once recruitment is reinstated this species will be able to re-establish throughout the Manuherikia.

For the mainstem, habitat modelling has shown that the flow regime provided for by the minimum flow at Campground, the existing take layout and active management of storage releases will ensure greater than 90% habitat protection relative to the natural 7-day MALF for upland bully and longfin eel throughout the river. The same flow regime provides more than 80% habitat relative to the natural 7-day MALF for adult brown trout throughout the river.

The implementation of fish screens where appropriate will protect migratory fish as they travel downstream to fulfil their lifecycle[40], prevent the loss of adult and juvenile galaxias from streams, ensure juvenile trout recruitment to the mainstem can occur unimpeded and in some cases will protect galaxias populations from trout.

Fish passage has been assessed for all structures and that has shown that migratory indigenous fish are likely able to pass many of the smaller weirs in the catchment. No passage is possible past any of the large dams for any fish species however this has been assessed as not necessary both due to the locations of the dams in the catchment[41] and because for the most part the only species affected are trout which have significant self-sustaining populations both above and below the dams.

Our assessment has found that the invasive diatom Didymo (*Didymosphenia geminata*) is abundant in the Manuherikia above Omakau, and this is expected to result in high periphyton biomasses

[38] We understand koura are important for mahika kai also but they are less widespread and tend to be associated with dams such as the Manorburn and Poolburn.

[39] Page 37 of the NPSFM (2020) Compulsory Value mahika kai; "*FMUs that are used for providing mahinga kai, the desired species are plentiful enough for long-term harvest and the range of desired species is present across all life stages".*

[40] It is important to recognise that for longfin eel until safe passage past the Roxburgh Dam turbines is provided screens in the Manuherikia will not deliver the desired outcome.

[41] For example, both Poolburn and Manorburn dams are in the headwaters at very high elevation above natural waterfalls which suggests they would have been at the upper limit for migratory fish to reach.

throughout the mainstem due to the preference of this species for low nutrient conditions, long daylight hours and warm water temperatures during summer months, and the naturally long accrual periods between flushing flows.

Current grading of macroinvertebrate monitoring results using the NOF in the NPSFM (2020) shows that depending on the metric used, invertebrate grades range from A to C band in the mainstem. Interestingly, the lowest scores occur where dissolved nutrients are lowest most likely due to the presence of Didymo.

Our expectation is that the implementation of residual and minimum flows, water sharing, the management of Falls Dam storage and fish screens as proposed in these applications will ensure that abstraction effects on ecological values will not be more than minor.

8.5 Effects on Natural Character and Amenity

Natural character is influenced by the extent to which the natural elements, patterns and processes occur; and the nature and extent of modification to the ecosystems and landscape.

Amenity values are defined as those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes. Visual amenity provides an attractive visual setting or backdrop for people living, working, recreating, visiting or travelling through the area.

The mountains defining the boundaries of the Manuherikia catchment (Hawkdun and Saint Bathans Ranges, the Dunstan Mountain Range and Rough Ridge), and running within the catchment (Raggedy Range) have a high degree of natural character, being the least developed parts of the catchment. The Central Otago District Council maps identifies the mountains surrounding the catchment as Outstanding Natural Landscapes, whilst the Raggedy Ranges, which divide the Manuherikia River valley and the Ida Valley are identified as a Significant Amenity Landscape.

These mountains and ranges form part of the quintessential high-country landscape for which Canterbury and Otago are renowned. The upper catchment is characterised by large areas of tall tussock grasslands, with rock tors.

The slopes and foothills of these ranges tend to be utilised for dryland pastoral farming, with grazing for sheep and beef operations. The upper valley of the Manuherikia and the whole of the Ida Valley are dominated by an open pastoral landscape with sheep and beef still the dominant farming systems, with a small number of dairy or dairy support properties, and a scattering of small settlements such as Becks and Chatto Creek – often identifiable through a picturesque pub. Omakau is the largest of these, with a clearly defined residential area and surrounded by small holdings. The variety of land uses increases further down the Manuherikia valley with orchards, vineyards and small holdings

evident. Development increases in the vicinity of Alexandra and extends north west towards Clyde along the Dunstan Flats. Vineyards extend above Springvale Road and up McArthur Ridge.

The key reaches of waterways affected by this proposal that are identified on the CODC maps as landscape features include:

- Falls Dams - Significant Amenity Landscape
- Upper Manor Burn and Pool Burn - Outstanding Natural Landscape
- The Manuherikia River within the Ophir Gorge – Outstanding Natural Feature
- Poolburn Gorge – Outstanding Natural Feature
- The Manuherikia River from below Ophir Gorge until just below the confluence of Chatto Creek the Manuherikia River - Significant Amenity Landscape

Some of these features are shown on the CODC planning map below.

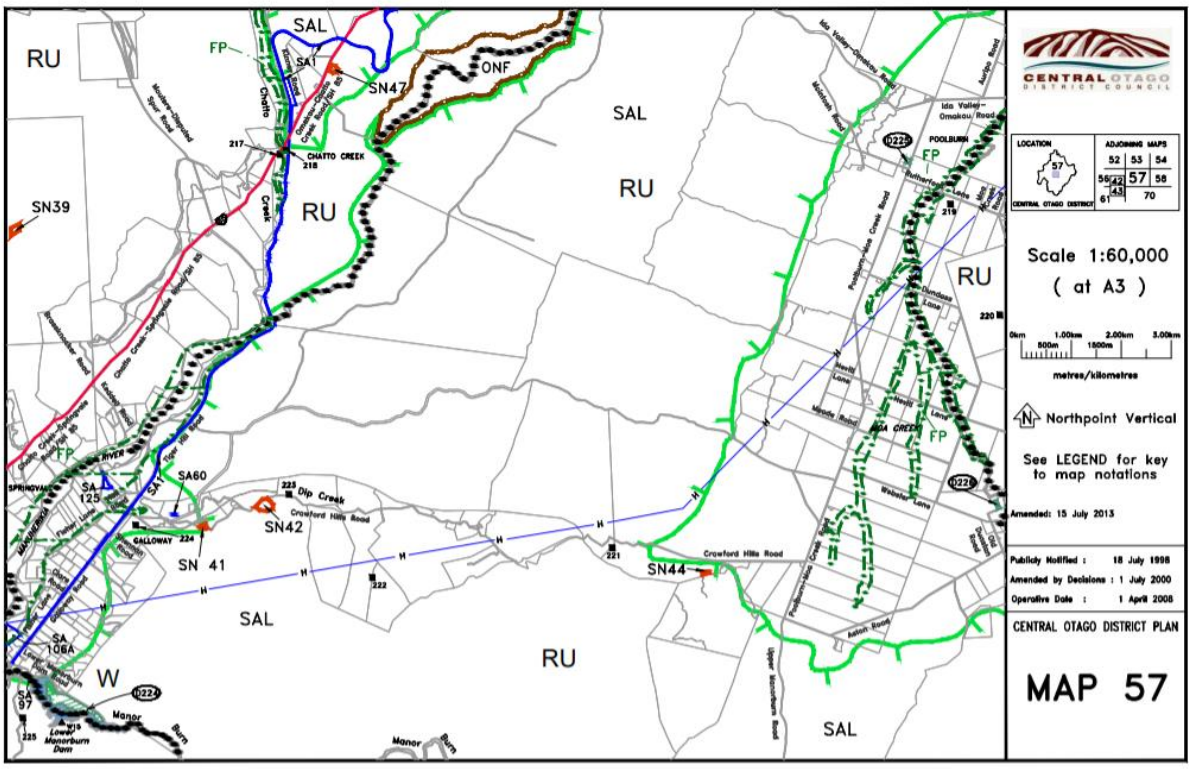


Figure 16. CODC Plan Map 57 showing classification of landscapes

The classification of these landscapes has occurred with the irrigation infrastructure in place and the activities associated with it occurring, including the damming and taking of surface water and the use of it for irrigation.

The contribution of irrigation infrastructure to the landscape is acknowledged by the District Plan, including the sense of history provided by water races and small dams, and the oasis character provided by irrigated pasture within the predominantly dry landscape. (Section 2.3.1 of District Plan).

The dams and weirs and races associated with irrigation have been in place for many decades and now form an integral part of the landscape as do the farms where water from the Manuherikia catchment is used. The dams and weirs associated with this proposal actively compliment or provide respite from the otherwise dry, almost barren appearance of the landscape. These dams increase the amenity of the area both visually and from a visitor perspective. The Lower Manorburn dam, being close to Alexandra, is valued for swimming, while the Poolburn dam has a number of small, rustic cribs or holiday homes situated on the shores of the dam, as well as caravans or motorhomes. These cribs are often used by anglers from spring to autumn, who come to the dam for the good fishing that it offers.

Espie (2015) characterised the existing Falls Dam and reservoir from a landscape character perspective, noting that in a general sense the character of the Falls Dam area is a remote, farmed high country area with a degree of wilderness associated with it. Espie recognises the existing dam is an obvious and striking man-made element. While perhaps less obviously so to many observers, the reservoir is also the result of human modification of the landscape.

Natural character and amenity within the valleys affected by this proposal are integrally linked to this open pastoral farming landscape. Within the rural context and existing pattern of development of the valley the natural character and amenity of the landscape is moderate, while the upper catchment areas affected by this proposal are considered to have high natural character.

Interestingly, the push for more efficient forms of irrigation has resulted in changes to the pastoral landscape with the development of pivot irrigation and resultant losses in trees and increased visibility of irrigation infrastructure within both the Manuherikia and Ida valley. This higher visibility often leads to a perception of intensification or expansion or irrigation.

The natural character of a waterway is influenced by a range of factors including flow characteristics, abstraction, structures within the bed, riparian management, and water quality (including colour and clarity), and the ecology of the river and its margins. Greenaway (2020) notes that previous studies have not identified the Manuherikia River as nationally significant wild or scenic river. Espie (2015) notes that from a purely landscape character or visual perspective, the course of the Manuherekia lacks natural character. He goes on to note that the river certainly provides an often-picturesque amenity, but natural character is relatively low.

Along with landscape values, the waterways affected by this proposal have higher degrees of natural character in their upper reaches, when situated within undeveloped areas. The dams subject to this application are an exception to this, disrupting the natural flow and introducing a built element within the river channel. Conversely, as noted already, the dams also add to the amenity and landscape values.

The natural character of the waterways affected by this proposal decreases somewhat once they flow into the more developed foothills and valleys. Abstraction from waterways can affect natural character through a reduction in flow and the introduction of built elements into the waterways, including weirs and gravel bunds.

With the exception of the Poolburn (and waterways feeding into this dam) and Upper Manorburn, the upper reaches of waterways within this catchment are largely unaffected by abstraction. All waterways are anticipated to have high levels of water quality and be less choked with exotic species such as willows along their margins.

The Manuherikia River has higher levels of natural character in its more confined reaches where it passes through gorges. In its more open, lower gradient reaches riparian margins are dominated by willows and other exotic species. In these open reaches the bed is characterised by river gravels, which are accessed by vehicles in a number of places along the valley including at the Omakau-Ophir Bridge and the Galloway Bridge. Lower flows in these open reaches can result in larger areas of exposed river-bed, and hot summer temperatures can lead to exposed areas of algae on rocks which can detract from the amenity of the river.

While the gorges and upper reaches have the highest level of natural character and visual amenity, the lower more open reaches of the river offer amenity values in summer through easily accessible pools and gentle flowing shallow water ideal for swimming and paddling, especially for children.

Abstraction from the Manuherikia has affected the amenity and natural character of the lower reaches of the river, by reducing flows and reducing channel width and the depth of pools, and increasing the extent of exposed bed (and potential for exposed algae). Land-use supported by abstraction may also affect the natural character and amenity of the waterway by affecting water quality.

Large gravel bunds associated with intakes such as the MICS intake from Chatto Creek and the GIS take in the lower reaches of the Manuherikia River also adversely affect natural character by directing all, or the majority of flow away from the river-bed and towards the intake at times of low flow.

Historically, abstraction from a number of the tributaries has resulted in dry reaches of river bed, particularly in the lower reaches of Chatto Creek (due to the gravel bund at the MICS intake) and in Thomsons Creek and Lauder Creek.

In other places losing reaches of waterways would naturally result in a dry river-bed during summer. While abstraction can extend the extent and duration of this drying, this is still the natural character of the waterway. This occurs in Sailor Jacks Creek (a tributary of Thomsons Creek), Brassknocker Creek, Waipuna Springs and the tributaries draining the western slopes of the Rough Ridge Range into the Poolburn area (Dovedale Creek, Maori Creek) as well as in the middle reaches of Thomsons and Lauder Creeks and in several Chatto Creek tributaries.

For much of its length along the valley floor the Pool Burn has been straightened and is modified, with a drain like appearance. This reflects the history of farming in the area and was done decades ago. Given the low natural flows, low gradient (and correspondingly low flow velocities) and high summer temperatures it if often overgrown with weeds and in places can have a growth of aquatic plants on the surface of the water.

The proposed residual and minimum flow limits for the Manuherikia catchment and proposed changes to intake structures are anticipated to result in flows that will ensure that abstraction does not cause drying reaches within riverbeds where this would not occur naturally, and that flow is maintained within the natural channel. The flow limits are also anticipated to effectively reduce the area of exposed gravel beds. Dis-establishment of the gravel bund in Chatto Creek will also retain flows within the natural channel. GIS are proposing to continue to refine the design of its intake in the main stem to minimise the by-wash required at the pump station. This is anticipated to retain more flows within the natural channel.

The applicants are also committed to a range of measures to improve water quality in the catchment, including riparian fencing and plantings (underway before national regulations requiring this), wetland projects and changes to farm management practices.

In combination, the level of abstraction and the measures proposed by the applicants are anticipated to enhance and protect the natural character and amenity of the affected waterways so that effects on natural character are minor. While large dams do impact the natural character of the waterway, this impact is considered to be balanced by the positive effect that these dams have on both natural character and amenity of the area.

It is also noted that some activities affecting natural character are outside of the applicants' control including wastewater discharges at Omakau, the dominance of exotic species along the banks of waterways, the presence of Didymo, vehicle access to the bed of the Manuherikia River and sediment inputs that are not associated with the applicant's land use.

8.6 Effects on Recreational Values

The ORC commissioned report "Manuherikia River and Dunstan Creek Recreation Values Assessment" (Greenaway and Associates, June 2020, Draft Version 2) concludes that:

> *"The Manuherekia River has regionally significant angling, swimming, kayaking and jet boating values, and in reaches near settlements – such as Alexandra, Omakau and Becks – is popular for walking and picnicking. The River presents a scenic setting and is of a moderate scale, and so is accessible to a wide range of skill levels for all activities."*

Below Falls Dam the Manuherekia River can be described as regionally significant for recreation, while above Falls Dam recreational values appear to be confined largely to angling, with some walking and cycling in the valley generally. The upper River is most likely of only local significance for recreation. Greenaway (2020) concluded that the Manuherekia River is not nationally significant or outstanding for recreation.

Walking and swimming were the key recreational activities in terms of a proportion of respondents surveyed. A much smaller proportion engaged in other activities including kayaking and fishing.

Important white-water kayaking values are present throughout the River, but particularly in the Ophir Gorge and for teaching in the lower part of the Gorge and downstream. Angling activity was dispersed throughout the River.

Many respondents to the survey undertaken for the report thought the Manuherikia River had deteriorated (53%), but gave a variety of reasons including low flows, water quality, algae and slime, an increase in mud and removal of willows. Other reasons for a perceived deterioration in experience included the impact of farming, an increase in tourism including due to fishing guides (one example was an increase from 2 guides to 20). Improvements to water quality was a key focus of respondents by a wide margin, along with toxic algae, while water quantity was afforded a much lower priority.

Low flow did not appear a determinant of recreation value by itself. Many respondents considered low and gentle flows a reason to describe the Manuherekia River as 'safe' and 'family friendly', although there were also many respondents who wanted deeper swimming holes. Concerns with flow may also be associated with the presence of algae and silt, which were frequently described as problems for recreational use. (Greenaway, 2020, p18-19).

Respondents preferred flows higher than 2 m^3/sec in the main stem of the river, although it is not clear how this question was framed or how flows were presented to respondents, as this can be very difficult to judge correctly for many laypeople. Kayakers expressed a preference for flows above 15 m^3/sec with freshes playing an important part in their enjoyment of the Ophir Gorge, although lower flows were used for kayak training below the Gorge. Kayakers are well informed about flow, and will check flow information before heading out.

The report notes that *"National angler survey data indicate that the Manuherekia catchment contributed 5.5% of all angler days in Otago in the 2014/15 season (the most recent data available), and the Manuherekia River contributed 21% of the angler activity in the catchment (2,100 ± 830 angler days)."*[42] Anglers described a range of preferred flows with the lowest being 1.5 m^3/sec but others preferring between 3 and 8 m^3/sec. The study does note that flow is only one aspect affecting their anglers experience, others include water temperature, maintenance of habitat, and water quality.

Significant recreation values on Dunstan Creek are confined to angling, and these do not appear to be regionally significant in the reach below St Bathans, considering its low level of use and good accessibility (noting the increasing influence of willow and other weeds impeding access). The reaches above St Bathans have poor accessibility, but commercial guides and regional visitors are willing to invest effort to experience the remote setting with its high quality scenic and natural values, angling challenge, clear water and the chance of catching a trophy fish. This upper section of Dunstan Creek is of at least regional significance for angling. There is also some local swimming and walking in Dunstan Creek where access allows, particularly around Cambrians (Greenaway, 2020, p66-67).

[42] Greenaway, executive summary, p7

Flow preferences for Jet boating and Kayaking appear to align with naturally higher flow periods during winter and spring (i.e. above 15 m^3/second). Median flow at the Campground flow site is ~12 m^3/s and flows above this level are unlikely to be affected by abstraction.

Many of the recreational values have existed based on the status quo, with damming, augmentation of flow and abstraction in place. The flow limits proposed for the catchment will ensure higher levels of instream flow are retained. Water quality enhancements will occur from further conversion to spray irrigation (on the basis of long-term permits), riparian management and targeted projects (such as the Thomsons Creek wetland project). This will be further supported through compliance with national standards and regulations focused on water quality, and the use of FEPs by landowners within the catchment. These measures will protect and enhance trout fishing, swimming and other recreational and amenity values.

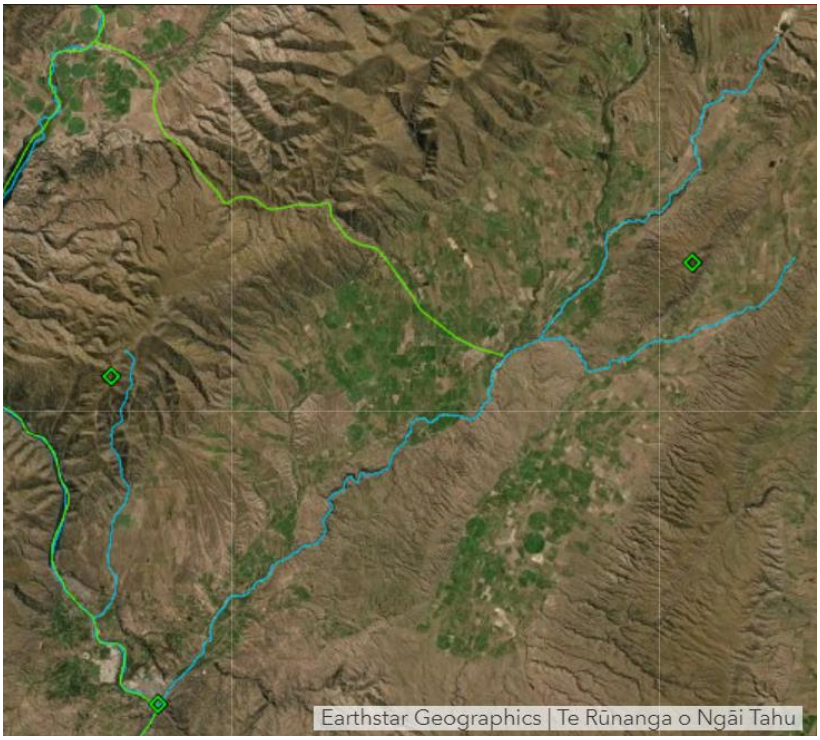
8.7 Effects on Cultural Values

For the purposes of the Te Rūnanga o Ngāi Tahu Act 1996, Papatipu rūnaka represent the individual beneficial rights of Kāi Tahu members. In the Central Otago takiwā these are Kāti Huirapa Rūnaka ki Puketeraki, Te Rūnanga o Moeraki, Te Rūnanga o Ōtākou and Hokonui Rūnanga, described in the First Schedule of this Act. However, rūnaka downstream of the Manuherikia area are acknowledged by Ngā Rūnaka as being affected by activities in the upper Clutha catchment including Hokonui Rūnanga, Awarua Rūnanga, Ōraka Aparima and Waihōpai Rūnanga.

The "Cultural Values Report for the Manuherekia Catchment Proposed Plan Change 5C to the Regional Plan: Water for Otago" KTKO (2017) identifies and provide information about cultural values associated with the Manuherekia.

These include ara tawhito (old pathways), mahika kai, tauranga waka and nohoanga (boat landings and campsites).

Ara tawhito linked the Manuherikia Valley near Ophir and Omakau to the Lindis and the lakes beyond through Thompsons Gorge. The Manuherikia Valley was also linked to the Taieri Scroll Plain using a trail over the terrain of the Old Dunstan Road.



Source: https://www.kahurumanu.co.nz/atlas Green shows kā ara tawhito (traditional travel routes), while blue shows awa (waterways)

Sites of importance may be identified through place names and site descriptions. The lower Manuherikia area near Alexandra consisted of wetlands that attracted seasonal inland migration during the summer months and for this reason is of particular importance to Kāi Tahu whānau. The nohoanga was around the Manor Burn area.

Mahika kai (literally "food works") is an integral aspect of Kāi Tahu culture and it is important to keep mahika kai intact including in terms of cultural practices, productivity and diversity of species. Mahika kai is more than just the food itself, it also encompasses cultural practices including seasonal migrations, access to the resource, the act of gathering and using resources and ensuring the future health of these resources. A range of flora and fauna have been identified as mahika kia species present in the Manuherikia valley and ranges including bracken roots, koara and Clutha Flathead galaxias, bull rush, tuna (eels), kakahi (freshwater mussels), lamprey and a number of bird species. Tuna are identified as the principle seasonal lure to Kāi Tahu, but are noted as functionally extinct above the Roxburgh dam, and are heavily commercially fished below the dam.[43] However instream flows to provide optimum habitat for long fin eel is sought by Kāi Tahu in the event that passage is provided past this dam.

A number of galaxias species were previously utilised as mahika kai. KTKO (2017) notes that Kāi Tahu seek improvement to the status of threatened galaxias species and the prioritisation of indigenous

[43] KTKO Ltd, *Cultural Values Report for the Manuherekia Catchment Proposed Plan Change 5C to the Regional Plan: Water for Otago,* 2017, p29

biodiversity. Maintaining flows for koara (freshwater cray) habitat is also identified as important, although predation by salmonid species was noted. Kanakana (lamprey) may have also been present in the Manuherekia. Kakahi (freshwater mussels) is a declining species which may be linked to the reduction in native fish in the catchment as they are dependent on fish for spreading their early parasitic larval stage and adhere to benthic native fish better than to salmonids.

Riparian and instream habitat can be adversely affected by stock access, although this is noted in KTKO (2017) in relation to the area above Falls Dam, which is outside of the scope of these applications. This report also notes the high value of remnant wetlands and the importance of restoring and enhancing these.

Another issue identified is the mixing of water between different catchments. In terms of these applications this occurs with the IVIC take from Totara Creek. Above Falls Dam (and outside of the scope of these applications) water is taken and conveyed to the east into the northern extent of the Taieri Catchment, however this activity is not addressed within these applications due to the later expiry of associated permits in 2037.

The large dams and weirs are noted for the habitat they provide including in their naturalised margins (for waterfowl), although they also impede fish passage. KTKO (2017) also notes that there may be biodiversity concerns with conveyance of water down natural waterways, and that water races can offer some habitat for in-stream fauna albeit in a suboptimal way to augment the loss of instream habitat caused by the taking of water.

This proposal seeks to retain the large dams and weirs in the catchment. This will result in the retention of the habitat provided by these reservoirs, including the wetland margins. This does however mean that the large dams and weirs will continue to prevent fish passage. However, the effect of this is considered to be relatively limited due to the location of these structures in (or towards) the upper reaches of the catchment which means they are at or beyond the upper extent of migration pathways for eels. In addition, the barrier created by the Roxburgh dam to migration by long fin eels would remain the primary barrier to migration by long fin eels into and out of the catchment.

Water quality issues were also noted with the waiora (health) of the waterbody being diminished. This includes sedimentation, including sedimentation that could result from construction or extension of existing structures. This would apply equally to demolition of existing structures. The management of both sedimentation and diffuse pollution including nutrient losses resulting from irrigation was considered necessary. Support is expressed for fish screens, fish passage and efficient irrigation systems (KTKO, 2017, p66).

The assessment of water quality has noted that run-off from historic gold mining areas is likely to be a key contributor to sediment in the Manuherikia River. Ongoing improvements to farm management practices (including through Farm Environmental Plans and compliance with national regulations) will reduce the risk of sediment inputs from farming. This proposal includes a long term of consent for

replacement permits, this will allow for conversion to contour irrigation which will reduce the potential for nutrient losses and is anticipated to result in improvements to water quality.

Whanua interviews were undertaken as part of the KTKO (2017) assessment and these highlighted the following aims: continuity of access to swimming locations; an attractive river to visit; flows over summer than provide good safe swimming; and appropriate flows for mahika kai species.

This proposal will not adversely affect access to swimming locations and will result in the continued provision of swimming sites (e.g. Lower Manorburn Dam), and improvement at some swimming sites (through the flow limit protecting flow in the lower reaches of the Manuherikia River). The Manuherikia River will remain an attractive river to visit and will be enhanced in this regard through the flow limits and water quality improvements that are anticipated as a result of long term permits and water quality enhancement projects. The river may still be affected by other factors outside of the scope of these applications however, including the presence of exotic species. As discussed below, flow limits have been developed by prioritising indigenous freshwater fish species, including mahika species such as eels.

An iwi presentation (no author or presenter is referenced within the powerpoint) to the Manuherikia Reference Group (8 August 2019) identified whānau issues that they had observed with the Manuherikia River (slide 21):

> More recent than 2005, whānau have observed the following issues in the Manuherekia River Catchment;
>
> a) *Over allocation of water*
> b) *Sedimentation*
> c) *Reduction in habitat*
> d) *River modification*
> e) *Water deterioration and eutrophication*
> f) *Harvest and removal of vegetation and shelter*
> g) *Barriers for fish passage*
>
> To this list can be added issues of flow, surface and ground water interaction, remnant wetlands, loss of braids, habitat (availability, diversity, quality), temperature, oxygen levels, success of feeding for indigenous species, population structures of taoka species, growth rates, reproduction and behaviour of species.
>
> All of which have impacts that include alienation, loss of relationships, inability to manaaki and loss of access and mātauraka. Above the importance of assessing effects in a cumulative manner.

Figure 17. Iwi presentation (no author or presenter is referenced within the powerpoint) to the Manuherikia Reference Group (8 August 2019)

With respect to the concern about over-allocation as referred to in the figure above, the flow limits set out in this proposal are the key mechanisms to manage allocation within the catchment as outlined in Section 5 and 6. The implementation of residual and minimum flow limits as set out in those sections, along with non-replacement of allocation that does not have a 'history of use' or has not

been used efficiently, and the implementation of flow sharing on a catchment wide basis are anticipated to effectively manage allocation within the catchment.

This proposal does not include reduction in habitat or further river modification (identified as an issue by iwi – refer to figure above) – the residual and minimum flows have been proposed based on optimum levels of habitat retention for indigenous freshwater fish species. Sedimentation, water quality and barriers to fish passage have been discussed earlier in this section.

Two other critical Kāi Tahu values are identified in Kāi Tahu planning documents and highlighted in detail in recent submissions by Aukaha (consultancy representing the Papatipu rūnaka affected by this proposal) on deemed permit applications. This is the mauri of waterways and the concept of ki uta ki tai.

Mauri can be tangibly represented in terms of elements of the physical health of the land, a river, or surrounding biodiversity. Physical aspects used to reflect the status of mauri include:

- Aesthetic qualities e.g. natural character and indigenous flora and fauna;
- Life supporting capacity and ecosystem robustness;
- Fitness for cultural usage.

Mauri also includes intangible qualities associated with spiritual aspects, and these can also be affected by activities affecting the freshwater resource. The mauri of a resource is desecrated if it no longer supports traditional uses and values.

The assessment in this proposal is focused on physical aspects of mauri which may be used to inform potential effects on spiritual aspects. Aesthetic qualities are addressed in the section on Effects on Natural Character and Amenity (Section 8.5).

Retention of flow variability is also seen as important to mauri, so that a waterbody can behave as it naturally would, as in the retention of connectivity along the length of a waterway and between connected water bodies.

This links to the concept of ki uta ki tai, with a narrow interpretation referring to the flow from the mountains to the sea and considering effects (including cumulative effects) along the whole length of a waterway. However, a more holistic perspective of ki uta ki tai requires an understanding and assessment of the effects (both positive and negative) in every direction.

In terms of hydrology, three key aspects can begin to inform effects on the mauri of a waterway:

1. Amount of water abstracted compared to natural flow
2. Connectivity
3. Flow variability

The abstraction of water may always be considered to have a level of adverse effect on the mauri of a waterway, as the very nature of abstraction is to remove some of a resource. Recently Aukaha, on behalf of local Runaka, has indicated in submissions and evidence for deemed permit replacements

that abstraction should result in at least 50% of the natural flow remaining in the waterway. The rationale for this appears to be that taking more than half of the resource is inequitable with nature and will deplete the resource. However ecological assessments (including habitat modelling) provide a useful perspective on the degree to which a resource is depleted as a result of the proportion of water abstracted or retained.

The three factors identified above in relation to hydrology and the mauri of a waterway are inherently linked to ecological aspects – for example connectivity should allow fish passage and migration to occur, and flow variability is important for ecological processes including flushing flows which can reduce periphyton.

The minimum and residual flows set out in this proposal have been identified through the ecological assessment (including habitat modelling) to provide and protect optimum habitat for indigenous freshwater fish species, including mahika kai species. This supports the view that abstraction can occur while flow is above these limits without depleting the resource to an inappropriate extent.

The proposal will ensure that abstraction does not result in a loss of connectivity of flow (except past dams) where it does not naturally occur within the catchment. Connectivity and fish passage is impacted by the dams and large IVIC weirs in the catchment, however, little is likely to be gained by providing fish passage past these structures given their location in the upper reaches of the catchment and the barrier created by the Roxburgh dam to long fin eels. As noted in the section above relating to Effects on Hydrology, flow variability still occurs below Falls Dam, the Poolburn Dam and the Upper Manorburn dam.

This proposal has tried to take a holistic perspective of ki uta ki tai by looking at the effects of damming and abstraction, but also the effects of using water. The effects of using water includes a range of positive effects, including supporting economic and social well-being. It has also resulted in some adverse effects on water quality in the catchment, as discussed in Section 8.3. As noted in that Section, the combination of residual flows, reduced stock access, conversion to spray irrigation and targeted remedial work such as the Thomsons Creek wetland project are expected to provide improvement in tributary and mainstem water quality in the Manuherekia River.

This will be further supported through compliance with national standards and regulations focused on water quality, including the use of Freshwater Farm Plans by landowners within the catchment.

Papatipu rūnaka and Kāi Tahu values are wide ranging in relation to the Manuherikia catchment. This proposal seeks to provide for these values, including through habitat retention for indigenous mahika kai species, retaining connectivity of flow throughout the catchment where it would naturally occur (except where structures create a barrier to fish passage), retaining habitat provided by the large dams and weirs, and enabling and supporting improvements to water quality. The catchment approach taken with this proposal attempts to address the cumulative effects of damming, taking and use of water in the catchment, through a cohesive set of flow limits and flow sharing within the catchment. While any abstraction or damming is anticipated to result in adverse effects on the mauri of waterway, these factors are anticipated to manage these effects to appropriately.

8.8 Effects related to Climate Change

A report prepared for the Central Otago District Council in 2017[44] identifies a decrease in snowpack by the end of the century as one of the key effects relevant to agriculture and instream flows in Central Otago, including mountain ranges relevant to this proposal.

By the end of the century more winter precipitation is anticipated to fall as rain, resulting in less accumulated snow and therefore reduced contributions of snowmelt to river flows in spring. This is expected to lead to substantial increases in streamflow during winter and declines in summer, driven by increasing winter precipitation and a reduction in snow storage. Temperatures and extreme rainfall events are also expected to increase.

The report notes that "projections of climate changes over the next 10-30 years are more likely to be sensitive to influences on climate that do not result from accumulation of greenhouse gases in Earth's atmosphere; there are long-term processes active in the climate system that can drive climate trends over periods of a decade or more" (p10). An example of this is the Interdecadal Pacific Oscillation, a long-term oscillation of sea-surface temperatures in the Pacific Ocean that can last from 20 to 30 years, which is known to affect flows in many catchments in the lower South Island, including the Clutha catchment.[45]

Droughts are predicated to be more likely than not in Central Otago. The report also notes (at p25) that water users will seek continued expansion of irrigation activities but does not explain this rationale or qualify this. This is not the approach taken in areas currently exposed to drought in which farms already incorporate drought mitigation measures including building storage to act as a buffer, running lower levels of stock, selling animals before they reach their prime weight, protecting dryland pastures from over-grazing, focusing irrigation on most responsive soils. In addition, there has been an increased use of Lucerne and other such plants which are highly efficient in terms of water use due to rooting depth.

Changes in land use are also possible, including different crop types, the ability to sow crops earlier in the season and reach maturity faster, and there may be changes in the distribution of pest species, and a decrease in frosts. Changes in land use are also likely to be driven by climate change impacts. These predictions, while falling outside of the term sought for these consents, highlight the importance of the large dams within this catchment (such as Falls Dam) in enabling productive use of land. Many of the applicants utilise stored water, either from large dams associated with irrigation schemes or on-farm. The irrigation schemes and dams will continue to play a vital role in supporting a wide range of businesses, many of which support food production, and the storage of winter water will become even more important in terms of avoiding the effects on abstraction when flows are lower in summer.

[44] Bodeker Scientific, August 2017, *The Past, Present and Future Climate of Central Otago: Implications for the District* prepared for Central Otago District Council

[45] McKerchar, A.I., Henderson, R.D. (2003) Shifts in flood and low-flow regimes in New Zealand due to interdecadal climate variations. *Hydrological Sciences Journal*, 48 (4): 637-654

The use of water from hydro-electricity generation is also an important component of reducing carbon emissions. This also links back to the proposed activities as irrigation becomes increasingly reliant on electricity through conversion to spray irrigation.

Given the time scale for the predictions and the term of consent sought, the proposed activities are more likely to be vulnerable to long-term climatic processes that drive trends which can last for years or decades. An example of this is the Interdecadal Pacific Oscillation, a long-term oscillation of sea-surface temperatures in the Pacific Ocean that can last from 20 to 30 years, which is known to affect flows in many catchments in the lower South Island.[46]

The continued use of storage dams within the Manuherekia catchment, the minimum and residual flow limits and flow sharing arrangement between all abstractors proposed from the wider Manuherekia catchment are anticipated to protect the Manuherekia River from any reduction in instream flows due to climate change, whilst also enabling and protecting productive land use.

8.9 Effects of Dams

The effects caused by the large dams and weirs within the catchment are both positive and adverse.

Falls, Poolburn, the Upper and Lower Manorburn Dams, along with the Totara Creek, Pool Burn, Bonanza, and Moa Creek weirs resulted in reservoirs which flooded areas which may have contained wetlands, bogs (particularly the Poolburn and upper Manorburn Dams) and gorges as well as small creeks feeding into them. This completely changed the habitat in the immediate vicinity of these dams.

The introduction of trout at the time of construction further altered the ecology of these waterways. The dams and large weirs now provide stable habitat for a self-sustaining population of trout as well as a number of other species including koura and common bully and upland bully.

The dams restrict fish passage and prevent flow connectivity and as a result have adverse effects on cultural values as described in Section 8.7. However, the provision of fish passage is unlikely to be beneficial, either because it would provide trout with improved access to galaxias populations, or because some of the dams lie beyond or near the upper most extent of migration routes. Finally, the key limitation for migration by tuna, one of the key migratory species that would be present in the catchment, is prevented by the Roxburgh dam.

The IVIC dams are considered to have limited effect on low flows downstream given the low natural flows that would otherwise be present without the dams. The supply of water from Falls Dam to takes downstream augments instream flows in the main stem of the Manuherikia. Falls Dam has a very

[46] McKerchar, A.I., Henderson, R.D. (2003) Shifts in flood and low-flow regimes in New Zealand due to interdecadal climate variations. *Hydrological Sciences Journal*,

limited impact on flow variability in the Manuherikia, as the dam is relatively small which results in spilling of water during higher flow events. This is supported by the assessment of flushing flows which showed that an ~3 month accrual period for periphyton is extended by ~ 2 weeks due to the presence of the dam. Retention of flow variability lessens the potential effects on ecological processes reliant on this variability.

Overall, the dams would have had a significant localised effect on instream ecology at the time of construction and filling, some 90 years ago. The Poolburn and Manorburn dams now provide important habitat for a regionally significant trout fishery are also highly valued for the mahika kai species koura. The margins of the lower Manorburn dam are recognised as a regionally significant wetland and provides habitat for a number of native birds. In this respect the dams themselves can be considered to have a positive ecological effect.

If damming behind these structures no longer took place the bed where the reservoirs were would be likely to be covered in a layer of silt and mud. Over time this would be colonised by plant species adjacent the dam including any exotic species. Sediment would be washed downstream, where it is likely to have an adverse effects on water quality. Habitat for a range of species present in the dam would be significantly decreased or destroyed and wetland areas around the margins of the reservoirs would be destroyed. Currently flooded waterways within the reservoir may be buried in sediment and may become boggy areas or may revert to small mountain streams.

Cessation of damming activities in the catchment would have a significant adverse effect on the existing land uses that are reliant on the supply of water associated with these dams. The reliability of supply during the irrigation season would decrease dramatically in the Manuherikia valley, while in the Pool Burn valley the farming that currently exists would become non-viable as there would be insufficient supply. Conversely, the continuation of these dams supports the many businesses that utilise water from the dams and the vibrant local economy.

8.10 Economic and Social Effects

These applications directly represent over 550 businesses or landowners. Many of these businesses support multiple generations or families and collectively employ hundreds of people. Many service providers and contractors work for these businesses including scheme management, monitoring service providers, irrigation and farm consultants, engineers, earthwork contractors, shearers, vets, mechanics and agricultural contractors. Water has enabled diversification away from pastoral land-use to high value horticulture and viticulture. Life-style opportunities supported by access to this water have attracted many highly skilled and qualified professionals to the district. The value of diversification has been highlighted with the shocks caused by Covid-19.

Irrigation brings increases in productivity, increased resilience to climatic extremes and the ability to carry out a range of land uses. It results in economic benefits for those utilising the water and the wider community.

The value of existing investment at both the scheme and farm level is significant. Much of the current infrastructure would be well beyond the reach of the shareholders to build today. This means any 'value of existing investment' vastly under-represents the inherent value of this infrastructure as it is essentially irreplaceable on today's terms.

There would be significant adverse economic effects on both the landowners directly affected by these applications and the local community if permit holders were no longer able to store, take and deliver water either because permits are not replaced or are replaced with an insufficient term to facilitate the necessary investment in scheme infrastructure, or are replaced with insufficient allocation to enable farms within the scheme to be productive and profitable. In contrast, replacement permits as proposed by this application would result in on-going positive economic effects for shareholders and the local community.

Positive economic effects are closely linked to a range of positive social effects, including the maintenance of a stable population and associated services including schools, hospitals, doctors and retirement homes as well as a wide range of community groups. Social connections are also able to be maintained, as people can find and retain jobs within the area. As noted already, many highly skilled and experienced professionals have been attracted to the life-style opportunities, many of which own small-holdings supplied with water from the MICS scheme. This increases diversity and resilience in the community, with positive social effects.

The taking and use of water does have the potential to create adverse effects on waterways, including if flows are lowered inappropriately, or water quality is degraded. This can result in adverse social effects, including adverse effects on human health or the enjoyment of the natural environment. The proposal includes measures proposed to protect and enhance flows and instream ecology through the setting of flow limits throughout the catchment in an integrated manner (including through flow sharing agreements), projects to improve and protect water quality where most needed. These measures are anticipated to minimise any potential for adverse effects on social well-being.

8.11 Cumulative Effects

Cumulatively, the taking and use of water from the Manuherekia catchment has had a significant effect on the catchment, particularly when dams and irrigation schemes are considered. These uses were lawfully established, and the large schemes were primarily undertaken by or facilitated by central government. The dams and schemes within the catchment have enabled the use and development of the catchment for productive land uses and have supported the local community for generations. This has resulted in significant positive social and economic effects for the district and region. Flows and instream values have undoubtedly been affected by these uses and developments, including through changes to flow characteristics from the damming of waterways, and blocking of fish passage.

The cumulative effect of water use within the catchment is being addressed by the catchment management approach undertaken by the vast majority of permit holders within the catchment and the catchment-based approach being utilised. This has resulted in the formation of MCG which all of the applicants are a member of. This is a collective application approach to renew water permits for the storage and taking and use of water for over 550 landowners.

This catchment-based approach has tried to account for the interactions of the vast bulk of water takes and use within the catchment. This has resulted in the development of residual flow and minimum flow limits that have been developed to work in an integrated manner, and a catchment wide understanding and management of allocation which aims to address the cumulative effects of abstraction on instream values and associated values, as embodied in Te Mana o Te Wai. This process has led to a significantly improved understanding of the level of primary allocation, and how water is moved around the catchment and the corresponding potential effects of these activities. Management of allocation will occur through flow sharing agreements between relevant permit holders to maintain residual and minimum flows.

Water quality enhancements will occur from further conversion to spray irrigation (on the basis of long-term permits), riparian management and targeted projects (such as the Thomsons Creek wetland project). Compliance with national standards and regulations focused on water quality, use of FEPs by landowners within the catchment and a range of enhancement measures will work to maintain and enhance water quality within the catchment.

Overall, at a cumulative level, the proposal will result in both positive and adverse effects. The cumulative effects of storing, taking and use of water will be effectively managed through the proposed residual and minimum flow limits. These are the key management mechanisms proposed. Additional measures, such as the dis-establishment of some take points, changes to intakes, and fish screens will further mitigate or avoid potential adverse effects. Given the scale of the proposal and the degree of alteration that exists as a result of the activities, it is difficult to conclude that the adverse effects are no more than minor, yet effects are considered to be managed to an appropriate level, particularly within the context of the positive effects that would result from the proposal.

9. Catchment Level Legislative Analysis

Where specific provisions are only relevant to particular activities they are addressed within the separate applications.

9.1 Activities

9.1.1 Taking and Use of Water

Under Section 14 of the Resource Management Act (RMA) water cannot be taken, used, dammed or diverted in a manner that contravenes a national environmental standard or regional rule unless the activity is expressly allowed by a resource consents or is an existing lawful activity under Section 20A.

Water is defined in the RMA as:
"Water -

a) *means water in all its physical forms whether flowing or not and whether over or under the ground:*
b) *includes fresh water, coastal water, and geothermal water:*
c) *does not include water in any form while in any pipe, tank, or cistern"*

Relevant rules in the operative RPW and PC7 address the activity of 'taking and use' of surface water. These provisions intend that the 'taking and use' of water extends from the original points of take through to the end points of use. This means that conveyance to facilitate this use (including off-takes from an open race or a farm/irrigation scheme dam) are covered by the 'taking and use' of water. In a practical sense, the off-takes represented in the applications do not represent 're-takes' but are simply the conveyance of water so that it can be used.

Given the above, it is considered that everything between the original take of water and the end use of the water for irrigation are inherently considered to be part of the 'taking and use' activity. The exception is where the re-taking of water is specifically addressed via a rule in the operative RPW in the case of Rule 12.1.4.1 which specifies that re-takes of 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.

While we agree that the scope of the water take consent(s) should allow for the taking of water from races, we disagree that an additional consent is required under s14 of the RMA. This approach has been supported in recent ORC decisions, including RM17.176[47] where the Commissioner agreed that off-takes from races (or off-stream dams) did not require additional consents and that these activities fall within the scope of 'taking and use' of water. Similarly, other recently issued ORC decisions did not require separate consents for applicants to take water from races (or off-stream dams), including Criffel Water Limited, Luggate Irrigation Company Ltd, and Lake McKay Station Ltd.

[47] *Long Gully Race Society Decision Report RM17.176 dated 23 July 2020*

The alternative is nonsensical. Treating every offtake from an open race as an activity requiring an additional consent would then require water metering of each of these off-takes. Monitoring requirements would increase dramatically (for example, 300 new meters for the MICS scheme and another 300 for the IVIC scheme) for no environmental gain. Each off-take would also need to be considered for a residual flow limit, with corresponding in-race ecology and natural character assessments for the race.

It is our view that requiring an additional consent for the taking of water from races is a departure from existing ORC practice, creates additional complexity for no apparent resource management benefit, and is not consistent with the intent of the RMA or the RPW provisions.

Unless otherwise specified in the sub-catchment applications, these applications are therefore premised on the basis that the scope of the water take consents under the relevant planning framework already provides for the 'taking' of water from races and therefore no additional consents under s91 or s14 of the RMA are required.

9.1.2 Dams

Recently the ORC has revised its own approach to applying rules managing the damming of water. This has resulted in a contradiction in earlier advice to landowners. Earlier advice from the ORC was that any dam not situated in a waterway was a permitted activity and did not require an RMA permit. Many dams were built on farms on the basis of this interpretation by the ORC.

The recent change in interpretation and application of this rule by the ORC has resulted in dams that were constructed as permitted activities (on the advice of ORC) now being considered as a discretionary activity. This has resulted in some dam owners being required to apply for retrospective consent for any dams situated outside of a waterway which are over the size threshold in the permitted activity rule (greater than 20,000 m^3 in capacity and also greater than 3 m deep). It was not the intention of the RPW to require RMA permits for dams outside waterways but to cover the activity with a permitted activity.

In general, these applications do not seek consent for the construction of any dams. Any dams that are proposed to be constructed on farm will be assessed for compliance with ORC rules and the Building Act and consent will be sought separately if required by the individual landowners.

The existing dams supplied with water from these permits were constructed in compliance with ORC advice and guidance at the time they were developed. Recent changes to interpretation by the ORC of its own rules relating to the damming of water and the potential implications that this has for existing dams is a significant issue that needs to be addressed at a regional scale in a consistent manner. Previous advice from the ORC has been that this issue would be addressed through a plan

change process by the addition of a permitted activity rule. There was no intention to address existing dams caught by this change in approach.

It is also noted that a retrospective consent application for existing dams is very challenging – engineers are unwilling to provide an engineering assessment for a structure that they have not designed or supervised.

Accordingly, these applications do not seek consent for the construction of any dams. This will be addressed, where necessary, through separate applications.

9.1.3 Diversion

'Divert' is defined in the operative RPW as "in relation to the diversion of water, is the process of redirecting the flow of water from its existing course to another."

Arguably the taking of water is also a diversion, however it is sensible not to require a consent for both activities when addressing them simply as a take will allow the activity to be managed appropriately.

Water in Otago is frequently taken from a waterway via an open race system, particularly for smaller takes (as opposed to the big scheme intakes).

An open race intake often consists of several parts, all of which are essential to the successful operation of the take. The intake can include one or all of the following:

- Use of bund directing flow towards the race or gate. Bunds are made of river gravels.
- Use of a rock wall within the bed of the waterway which can back up flow and direct flow towards, the race or gate. The rock wall often uses river boulders and rocks. Alternatively, a concrete weir or a submerged wooden board might be used to create this effect.
- An initial length of race (this is referred to as the 'headworks').
- A gated intake or pipe which controls the amount of water entering into the race.
- A by-wash to take excess water back to the waterway.

All parts of this are considered to form the intake structure. The by-wash is an essential part of the intake as it ensures open channel intakes are not washed-out during floods and the right amount of water is taken into the race.

The only exception to this is if the by-wash is not in close proximity to the headworks where this results in the diversion of water for a significant distance, and there is potential for adverse effects on instream flow and values between the take and return points. This is considered to be the case the GIS and OAIC mainstem intakes – diversion consents have been sought for both of these takes.

For the above reasons, unless otherwise specified in the sub-catchment applications, we do not consider that diversion consents are necessarily required. The activity of diverting water is inherent

in the proposed activity of taking water and thus within the scope of the current applications already filed. However, for clarity on jurisdictional scope the applicants are applying for diversion consents for these applications on the basis that there will be further opportunity to work through any interpretation differences during the consenting process.

This means that a diversion consent is sought for BICL RM20.453, MICS RM20.454, OAIC County RM21.008, OAIC Thomsons RM21.009, OAIC Main RM21.010 under Rule 12.3.4 (1) (i) as a Discretionary Activity. A description of each 'diversion activity' is provided in each application as submitted (i.e. the nature of each intake structure and key components of the intake system, variously including bunds, weirs, races, control gates, by-washes) and a corresponding assessment of effects of the 'diversions' is also provided in each application (i.e. in the context of the various intake structures and component features) on hydrology, aquatic ecology, effects on other lawfully established takes, natural character and amenity. There are no known regionally significant wetlands in the vicinity of the diversions that may be affected by the proposals.

All diversion activities represented across the applications are existing and facilitate the applicants' take and use of water and have been in place for significant periods of time. No changes to the existing diversions are proposed (unless specified in the applications), and they will continue to be appropriately maintained to ensure connectivity with the respective main stem River/Creeks and to avoid negative impact on fish passage. The diversions are not known to cause flooding, land instability, sedimentation or property damage.

9.2 Otago Regional Council: Regional Plan: Water for Otago

The Regional Plan: Water for Otago (RPW) became operative on 1 January 2004 and contains objectives, policies and rules managing activities associated with water in Otago, including rules which require a resource consent for the damming, taking and use of water and discharges to water. Since it became operative it has been subject to several amendments, some relevant to the whole region, and others focused on specific catchments (including minimum flow plan changes). One amendment was to ensure compliance with the provisions of the original NPS-FM 2011.

The RPW is also subject to the Proposed Water Permits Plan Change (Plan Change 7, referred to here as PC7) which includes an additional objective, as well as policies and rules relevant to water permit applications that would override, or limit the relevance of some of the existing provisions in the RPW. PC7 seeks the creation of an interim regulatory framework for the replacement of deemed permits, and any other water permits expiring prior to 31 December 2025 to allow time for the development of a new Land and Water Regional Plan that is consistent with national policy. This interim framework is a significant departure from the framework in the operative RPW.

The ORC has also notified Proposed Plan Change 8 – Discharge Management (PC8). The weighting to be given to this plan change does not have direct bearing on the applications that form this proposal

and so the weighting to be given to PC8 is not considered here, although similar assessments would be likely to apply to any consideration of the weight to afford that plan change.

9.3 Weighting to be applied to Operative RPW and PC7

The rules in PC7 relate to water and therefore have legal effect in terms of determining activity status. However, the ORC is applying a number of principles derived from case law when determining the appropriate level of weight to be applied to proposed provisions. These are considered below:

1. *The extent that it has progressed through the plan-making process:*

   PC7 was notified on 18 March 2020 and the submission period closed on 4 May 2020, however the plan change was 'called in' by the Minister for the Environment and PC7 was re-notified for submissions by the Environmental Protection Authority on Monday 6 July 2020, with that submission period closing on 17 August 2020. A total of 290 submissions and 16 further submissions were made on PC7. The Plan Change was opposed by 208 submitters and supported by approximately 20 submitters. Sixty-two submitters did not state their position.[48] The environment court hearing is scheduled to begin on 8 March 2021 and end sometime in May 2021. The submissions highlight the substantial opposition to the plan change, and the potential for changes to it.

2. *The extent that the proposed measure has been subject to independent testing or decision making:*

   PC7 has not yet been the subject of decisions on submissions. At the time of writing, there has been no independent testing or decision-making on PC7.

4. *Circumstances of injustice:*

   A key stated principle of PC7 (p5, Council Agenda, 22 January 2020) is that there must 'be consideration of potential impacts on existing water abstractors and existing priorities in deemed permits.'

   It is considered that the economic effects of a short-term permit will result in significant and adverse effects on the applicants, for the following reasons:

   a) The applicants began preparatory work supporting the replacement of water permits almost 10 years ago (through their involvement in the Manuherikia Catchment Water Strategy Group) to develop a comprehensive proposal to support replacement of their permits.

[48] Statement of evidence by Tom De Pelsemaeker on behalf of the Otago Regional Council, 7 December 2020

- The nature and timing of notification of PC7 has introduced further complexity to the process, with applications now required to consider both the operative and proposed provisions of the RPW. Given the expiry dates on permits and the need to lodge at least 6 months prior to the expiry date (s124 of the RMA), applicants had no choice but to continue to develop comprehensive applications, at very significant cost. As no NPSFM compliant planning framework has been put in place for this catchment by the ORC, the applications have also had to address far broader matters than would normally be required. This is in direct contrast to the 'simple' process promoted by the ORC and the "relatively low cost, and fast issuing of new consents" requested by the Minister.

b) The ORC began work on a limit setting plan change for the Manuherikia in 2016 and proposed to notify this plan change in 2018. The applicants engaged and assisted the ORC with this work. In 2018 the ORC indicated that the plan change was no longer proposed to fully implement the NPSFM, as it would not address allocation. OWRUG requested that any plan change for the Manuherikia give full effect to the NPSFM, so that permits could be replaced within this framework. The date for notification has continued to slip and now the applicants must lodge an application without this planning framework in place, due to the expiry date of the permits being replaced.

c) The applicants have invested in professional advice so their applications would be acceptable to affected parties and decision makers based on existing operative planning requirements.

d) In direct response to the operative provisions of the RPW, and in preparation of the renewal process, many of the applicants or their shareholders actively invested in infrastructure and efficient application methods, with significant total investment costs to date.

e) Many of the applicants rely in part or in whole on large dams or weirs, some of which are authorised by deemed permits, while all other dams and weirs are authorised by water permits. These weirs are large, aging structures which will require maintenance work. The costs associated with this may be substantial but will be very difficult to finance with short term consents.

Given the above, the circumstances of injustice to the applicants are significant. The financial implications of a shorter consent term under PC7 is a key matter to be considered.

4. *The extent to which a new measure, or the absence of one, might implement a coherent pattern of objectives and policies in a plan:*

The extent to which PC7 might implement a coherent pattern of objectives and policies has not yet been determined via the plan change process or any independent testing or decision-

making. PC7 is not considered to be a coherent pattern of objectives and policies including because:

- it fails to give effect to existing objectives in the RPW, or to link with them in a cohesive manner.
- it does not protect a range of values, including ecological values or economic or social-well-being, and is likely to result in worse outcomes than the existing plan.
- it fails to achieve sustainable management as required by Part 2 of the RMA.

This assessment is clearly outlined in the submissions on PC7 by OWRUG and MCG.

5. *Whether there has been a significant change in Council policy and the new provisions are in accordance with Part 2 of the RMA.*

Given the current progression of PC7 through the plan change process, there is no determination yet as to whether the proposed provisions in PC7 are in accordance with Part 2 of the RMA. Our assessment of PC7 is that it will result in inferior environmental outcomes and fail to achieve the purpose of the Act, including because there is no requirement to:

- protect significant habitats of indigenous fauna
- protect trout or salmon habitat
- share water
- take into account effects on affected parties
- take into account how the existing deemed permit priority system influences the observed flow regime or ecological values present in the waterway

This is detailed in the OWRUG and MCG submission on PC7.

It is also noted that the proposed plan change itself does not purport to give effect to Part 2 of the RMA, or to give effect to any other relevant statutory planning instrument such as the NPSFM. The plan change is effectively a holding pattern to delay proper assessment of replacement permits until a new Land and Water Regional Plan is operative.

For the above reasons, little weight should be placed on the provisions of the proposed plan. In any case, pursuant to s88 of the Act. It is the operative provisions that have been tested and debated through a public plan change process and therefore the operative RPW is considered to be the dominant planning instrument.

9.4 Objectives and Policies in PC7

The objectives and policies of PC7 are only relevant to some of the activities carried out by the applicants, namely all water takes (including re-takes) as well as any discharges or dams that are authorised by deemed permits.

This means that only the damming activities authorised by a deemed permit are to be considered against PC7 provisions. All of the other dams and weirs being replaced by these applications do not come within the ambit of PC7.

The following objectives and policies of PC7 are applicable to water takes, dams and discharges authorised by a deemed permit:

> *1. Objective 10A.1.1 Transition toward the long-term sustainable management of surface water resources in the Otago region by establishing an interim planning framework to manage new water permits, and the replacement of deemed permits and water permits to take and use surface water (including groundwater considered as surface water) where those water permits expire prior to 31 December 2025, until the new Land and Water Regional Plan is made operative.*

The aim of the objective is stated to be a transition toward long-term sustainable management of surface water resources. The objective sets up a process to do this via an interim planning framework, which includes the non-complying activity status relevant to this application.

However, PC7 does not attempt to achieve long-term sustainable management itself – instead, it relies on a future Land and Water Regional Plan, to be notified by 31 December 2023[49] to achieve this.

In contrast, these applications will result in the long-term sustainable management of the surface water resources affected by the applicants' activities, as is discussed in the Assessment of Effects on the Environment in this section, in each of the applications, and in the analysis of Part 5 of RMA and the NPSFM. Within the context of the priorities set out for Te Mana o Te Wai in the NPSFM, sustainable management also includes enabling people to provide for their economic and social well-being. The only way in which this can occur for these applicants is through a long term of consent. This is necessary to enable the investment required in infrastructure including large aging scheme dams, and the development and upgrade of on-farm infrastructure. This in turn will enable water users to shift towards irrigation methods which will enhance water quality.

Accordingly, these applications are not considered to be contrary with Objective 10A.1.1 in that they will achieve long-term sustainable management.

In any case, little weight should be placed on this objective for the reasons stated above.

> *Policy 10A.2.1 Irrespective of any other policies in this Plan, avoid granting resource consents that replace deemed permits, or water permits to take and use surface water (including groundwater considered as surface water under policy 6.4.1A (a), (b) and (c) of this Plan) where those water permits expire prior to 31 December 2025, except where:*
>
> *(a) The deemed permit or water permit that is being replaced is a valid permit; and*

[49] Recommendation of Minister for the Environment, Hon David Parker to the Otago Regional Council (undated letter with file date 18 November 2019).

(b) There is no increase in the area under irrigation, if the abstracted water is used for irrigation; and

(c) There is no increase in the instantaneous rate of abstraction; and

(d) Any existing residual flow, minimum flow or take cessation condition is applied to the new permit; and

(e) There is a reduction in the volume of water allocated for abstraction.

Policy 10A.2.1 provides a direction to 'avoid' granting consent except where the provisions in (a)-(e) are met.

The use of the word 'avoid' in a policy has been interpreted by the Courts as a policy that is intended to be directive and indicates that the policy is intended to be binding.[50] The use of the word 'avoid' signals that an activity is inappropriate and should be prevented and is normally coupled with more restrictive rules such as non-complying or prohibited. In the case of PC7, granting of replacement permits is to be avoided, except where several exceptions can be met. These exceptions are considered in turn here:

a) All water permits being replaced are 'valid', as they were authorised and issued by the ORC or a previous relevant authority.

b) The total irrigation area subject to this application does not represent an increase in the irrigated area. There will be changes as on farm developments occur but overall, this will not result in an increase in total irrigation area.

c) These applications do not propose any increase to instantaneous rates of abstraction.

d) A small proportion of existing permits had residual flows or minimum flows applied to them. These applications go much further than simply replacing existing flow limit conditions, instead they are based on a comprehensive assessment of values across the whole catchment from Falls Dam downstream and propose a scheme of flow limits that protect values at the site-specific scale but are interlinked at a catchment scale to ensure that the health of the catchment is protected and enhanced.

e) This application, if granted, would result in a reduction in the volume of water allocated for abstraction.

As such, this application is not considered to be contrary to this policy, particularly as the proposal in this document goes further than required by this policy, particularly with respect to residual or minimum flow conditions.

In any case, little weight should be placed on this policy for the reasons stated above.

[50] *Environmental Defence Society Inc v The New Zealand King Salmon Co Ltd* [2014] NZSC 38

Policy 10A.2.2 Irrespective of any other policies in this Plan concerning consent duration, only grant new resource consents for the take and use of water for duration of no more than six years.

This proposal is primarily concerned with the replacement of existing permits, and any new permits sought for the taking and use of water are only for supplementary allocation. This proposal seeks a long term of consent for all permits to take water and to dam water. This is a critical component of the proposal in enabling the applicants to achieve sustainable management.

Policy 10A.2.3 Irrespective of any other policies in this Plan concerning consent duration, only grant new resource consents that replace deemed permits, or resource consents that replace water permits to take and use surface water (including groundwater considered as surface water under policy 6.4.1A (a), (b) and (c) of this Plan) where those water permits expire prior to 31 December 2025, for a duration of no more than six years, except where Rule 10A.3.2.1 applies and:

(a) The activity will have no more than minor adverse effects (including no more than minor cumulative effects) on the ecology and the hydrology of the surface water body (and any connected water body) from which the abstraction is to occur; and

(b) The resource consent granted will expire before 31 December 2035.

Paragraph (a) of this policy is somewhat unclear as it is concerned with the adverse effects of 'activities' but then refers only to 'abstraction'. All of the irrigation schemes covered by this application are reliant in part on existing large dams and weirs, not all of which are subject to PC7 as they are not all authorised by deemed permits. This policy only applies to existing water takes (whether authorised by a water permit or a deemed permit) and discharges, dams or weirs authorised by deemed permits. With respect to dams and weirs the following are authorised by deemed permits:

- Falls Dam (FDC)
- Poolburn Weir (IVIC)
- Moa Creek Weir (IVIC)
- Lower Manorburn Dam (GIS)

At least two discharges in the Manuherikia catchment are also potentially authorised by a deemed permit, as the discharge of water associated with conveyance is included within the deemed permit. These discharges comply with permitted activity rules in the operative RPW but appear to be caught by PC7 simply because they have been described in a deemed permit.

Dams and weirs authorised by deemed permits within waterways have resulted in significant positive effects including on economic and social well-being and on ecological and recreation values. However, they are likely to be viewed by Kāi Tahu as having more than minor adverse effects on the mauri of the waterway through loss of connectivity and interference with natural flow characteristics – although Policy 10A.2.3(a) is not concerned with effects on cultural values.

In addition, the applicants are seeking a term of 35 years for all permits. This means that these applications are not consistent with this policy.

The use of the words 'only allow' in this policy as opposed to the use of the word 'avoid' in Policy 10A.2.1 creates some confusion and may imply a lesser standard than 'avoid', although the Environment Court in the King Salmon case likened the two.

However, regardless of the directiveness of this policy, little weight should be placed on this policy for the reasons stated above.

9.4.1 Relevant Objectives and Policies in the Operative Plan

Chapters 4, 5, 6 and 8 are the most relevant to this proposal, and key provisions from these Chapters are assessed here.

Chapter 4 of the RPW discusses the Kāi Tahu Ki Otago perspective on water management. It is largely descriptive, recognising for instance Kāi Tahu values in fresh water (such as the cultural importance of fresh water, mauri and the presence of mahika kai) and discussing the desire of Kāi Tahu to be involved in both the development of planning instruments for water management, and participation in the use, development and protection of water resources.

There are no specific objectives or policies in Chapter 4 of the RPW. Instead, the Chapter includes nine issues which are cross referenced to objectives and issues in other chapters of the RPW, or simply to the other chapters of the RPW.

Chapter 5 of the RPW is entitled 'Natural and Human Use Values of Lakes and Rivers'. Chapter 6 of the RPW focuses on Water Quantity and is directly relevant to this proposal. Chapter 8 focuses on the Beds and Margins of Lakes and Rivers, and is relevant to the dams, weirs and structures associated with this proposal.

No objectives in the operative RPW have specific priority over any other.

Key provisions in the RPW that are of relevance to this application are discussed at a high level below. Each application contains a specific assessment of these provisions in relation to the particular activities proposed.

9.4.2 Chapter 5 Natural and Human Use Values

Schedule 1 Values

Objective 5.3.1 To maintain or enhance the natural and human use values, identified in Schedules 1A, 1B and 1C, that are supported by Otago's lakes and rivers.

Schedule 1A of the RPW identifies natural values for specific water bodies in Otago. This Schedule is now considered to be out of date, as it was based on information at the time the RPW was notified in 1998. However, it does provide a helpful starting point for understanding the characteristics and values that may be present. Notably, these values were scheduled within the RPW with the existing activities (as proposed in this application) in place.

Commonly identified values for the Manuherikia mainstem and tributaries within the Manuherikia Valley include the presence of trout and eels(tuna), spawning and juvenile rearing areas for trout, riparian vegetation, being weed free, and in some tributaries, habitat for Otago Roundhead galaxias. Values identified for the Ida Burn and Pool Burn are the presence of trout and eels(tuna), spawning and juvenile rearing areas for trout.

The scheduled values relating to specific waterways are identified in the relevant sections of the applications accompanying this overview, along with assessments of how these values will be affected.

> *Objective 5.3.2 To maintain or enhance the spiritual and cultural beliefs, values and uses of significance to Kai Tahu, identified in Schedule 1D, as these relate to Otago's lakes and rivers.*

Schedule 1D of the RPW identifies spiritual or cultural beliefs, values or uses associated with water bodies of significance to Kāi Tahu. These values were identified with the existing activities in place. Manuherikia River and Other Manuherikia Tributaries (excluding Moa Creek) are identified as having the following values:

- Kaitiakitanga - the exercise of guardianship by Kāi Tahu in accordance with tikanga Maori in relation to Otago's natural and physical resources; and includes the ethic of stewardship.
- Mauri – life force; for example, the mauri of a river is most recognisable when there is abundance of water flow and the associated ecosystems are healthy and plentiful; a most important element in the relationship that Kāi Tahu have with the water bodies of Otago.
- Waahi tapu and/or Waiwhakaheke - sacred places; sites, areas and values associated with water bodies that hold spiritual values of importance to Kāi Tahu. (Note: Kāi Tahu should be consulted regarding the location of these places, sites areas and values for a river identified as MA3).
- Waahi taoka - treasured resource; values, sites and resources that are valued and reinforce the special relationship Kāi Tahu have with Otago's water resources.
- Mahika kai - places where food is procured or produced. Examples in the case of waterborne mahika kai include eels, whitebait, kanakana (lamprey), kokopu (galaxias species), koura (freshwater crayfish), freshwater mussels, indigenous waterfowl, watercress and raupo
- Kohanga – important nursery/spawning areas for native fisheries and/or breeding grounds for birds.
- Trails – sites and water bodies which formed part of traditional routes, including tauraka waka (landing place for canoes).
- Cultural Materials – water bodies that are sources of traditional weaving materials (such as raupo and paru) and rongoā (medicines).

Moa Creek and Little Bremner Creek are each only identified as having Waahi taoka values. Moa Creek is affected by the IVIC application. Little Bremner is not subject to any proposals addressed in these applications.

The values relating to specific waterways are identified in the relevant sections of the applications accompanying this overview, along with assessments of how these values will be affected.

Natural Character

> ***Objective 5.3.3*** *To protect the natural character of Otago's lakes and rivers and their margins from inappropriate subdivision, use or development.*
>
> ***Policy 5.4.8*** *To have particular regard to the following features of lakes and rivers, and their margins, when considering adverse effects on their natural character:*
>
> *(a) The topography, including the setting and bed form of the lake or river;*
>
> *(b) The natural flow characteristics of the river;*
>
> *(c) The natural water level of the lake and its fluctuation;*
>
> *(d) The natural water colour and clarity in the lake or river;*
>
> *(e) The ecology of the lake or river and its margins; and*
>
> *(f) The extent of use or development within the catchment, including the extent to which that use and development has influenced matters (a) to (e) above.*

These applications are focused on the damming, diversion, discharging, taking and re-taking of water, primarily for purposes associated with irrigation. These activities occur within the rural environment and primarily support rural activities. Many of the activities enabled by the supply of water are long established.

Identification and assessments of the topography, natural flow characteristics, water colour and clarity and the ecology of these waterways are included in this overview and separate applications. An assessment of natural flow characteristics can be challenging given the scale and complexity of water distribution (including re-takes and re-use of water) and the presence of large dams in the catchment for 90 years or more.

Dams, irrigation, and irrigation infrastructure are recognised for their contribution to the landscape values and natural character of the area. This is evident in the inclusion of Falls Dam and the Upper Manorburn, Lower Manorburn and Poolburn dams in Significant Amenity Landscape and Outstanding Natural Landscape areas in the Central Otago District Council (CODC) District Plan, as can been seen in the specific applications relating to these dams.

The CODC District Plan describes the contribution of water use and irrigation on the landscape in Central Otago as follows:

> *Vegetation at the time of European settlement was dense shrublands and tussock grassland which has been modified by burning, grazing, oversowing and topdressing to produce predominantly exotic grassland. The Upper Manuherikia Valley and Maniototo Plain are*

irrigated to provide grass for pastoral production. In the Clutha and Lower Manuherikia Valleys, irrigation supplies pastoral production, orchards and vineyards.

…

The results of human endeavour are highly visible aspects of the landscape because of the open nature of the country. Most noticeable are the homesteads, accompanied by stands of trees, usually poplar. These trees provide a spectacular display during the autumn months. Water races and small dams formerly used for gold sluicing and now for irrigation and isolated remnants of old stone cottages; and shelter belts of trees, especially in the Upper Clutha and Manuherikia Valleys, also give a sense of history. Remnant structures such as stone walls and associated decaying cottages are small in scale and add to rather than dominate the landscape. Former mining sites are now an integral and distinctive part of the District's landscape, particularly in places such as St Bathans, Bannockburn and the herring bone tailings at Northburn.

…

The irrigated pasture, orchards and vineyards give an oasis character to this predominantly dry landscape, especially in spring when trees are in blossom. Vineyards are increasingly adding variety to the landscape." (P2:6 to 2:7 of Operative CODC District Plan)

From a general perspective, the use and development associated with the activities subject to these applications is not considered inappropriate within this environment. Irrigation and associated activities and land use are anticipated within the rural environment.

However, it is also acknowledged that instream structures such as the existing dams, weirs and intake structures (including larger gravel bunds) can have adverse effects on the natural character of waterways. This proposal includes dis-establishment of the MICS Chatto Creek intake, combination of takes in the Lauder catchments and refinements of the GIS mainstem intake to avoid or mitigate the effects of these intakes on natural character.

As noted in Section 8 of this document, in combination the level of abstraction and the measures proposed by the applicants - particularly the flow limits proposed - are anticipated to enhance and protect the natural character and amenity of the affected waterways so that effects on natural character are minor. While large dams do impact the natural character of the waterway, this impact is considered to be balanced by the positive effect that these dams have on both natural character and amenity of the area.

Amenity Values

Objective 5.3.4 *To maintain or enhance the amenity values associated with Otago's lakes and rivers and their margins.*

Policy 5.4.9 *To have particular regard to the following qualities or characteristics of lakes and rivers, and their margins, when considering adverse effects on amenity values:*

(a) Aesthetic values associated with the lake or river; and

(b) Recreational opportunities provided by the lake or river, or its margins.

As with natural character, the amenity values associated with these activities are influenced by the history of abstraction and the resultant productive land uses which surround it. The affected waterways have a varying degree of amenity. The irrigation schemes, large dams and weirs within waterbodies have a high degree of amenity as they provide an attractive contrast to the arid open landscape within which they sit and can also provide significant recreational values.

Sustained low flows or drying reaches in rivers can adversely affect amenity values, by decreasing opportunities for swimming, fishing and boating, resulting in exposed riverbed, sometimes with exposed areas of algae which can be unattractive and smelly. Intake structures (including large gravel bunds) channelizing or diverting most of the flow can also lower amenity values in specific reaches. The residual and minimum flows proposed have been developed to maintain or enhance (where necessary) amenity values. Intakes are also proposed to be refined (GIS intake) or will not be replaced (MICS Chatto Creek take, two intakes in the upper Lauder creek) to reduce effects on amenity values.

Assessments of the specific effects of the activities on amenity values are contained in the separate applications.

Providing for sustainable use and development

Objective 5.3.6 To provide for the sustainable use and development of Otago's water bodies, and the beds and margins of Otago's lakes and rivers.

The Explanation and Principal reason for adopting this objective make it clear that this objective is focused on ensuring continued access to Otago's water resource for a range of existing and new uses, as long as this use is sustainable.

This proposal aims to enable existing users to continue utilising the water resource, subject to a number of mitigation and control measures to ensure that this continued use is sustainable, particularly with regard to life-supporting capacity and freshwater eco-system values. In addition to natural and cultural values, sustainable use and development includes the ability of communities to provide for their economic and social well-being. This proposal relies on sufficient reliability of supply and long-term permits, which will enable water users to continue to utilise existing infrastructure, and convert to more efficient infrastructure where appropriate.

Accordingly, this proposal is considered to give effect to this objective.

Approach to effects

Policy 5.4.2 *In the management of any activity involving surface water, groundwater or the bed or margin of any lake or river, to give priority to avoiding, in preference to remedying or mitigating:*

(1) Adverse effects on:

(a) Natural values identified in Schedule 1A;

(b) Water supply values identified in Schedule 1B;

(c) Registered historic places identified in Schedule 1C, or archaeological sites in, on, under or over the bed or margin of a lake or river;

(d) Spiritual and cultural beliefs, values and uses of significance to 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.

This policy is somewhat consistent with Clause 3.21 of the NPSFM (2020) in that priority is to be given to avoiding adverse effects where practicable (although that Clause also then prioritises mitigation over remedying). It is difficult to completely avoid adverse effects associated with the taking and use of water, as abstraction affects flows in waterways, and dams significantly alter the characteristics of a waterway.

Where practicable, adverse effects will be avoided by this proposal, including those that result from drying reaches or flows that are too low to sustain ecological values. These effects will be avoided through the reduction in allocation to match efficient use in the catchment and the imposition of residual and minimum flow conditions. Entrainment of fish in races will be avoided through the fish screening conditions where practicable. Changes to intake structures will avoid a number of effects – for example, adverse effects on fish passage, natural character and amenity values will be avoided through the disestablishment of the MICS Chatto Creek take.

Where avoidance is not practicable, the whole of catchment approach taken with these applications, along with site specific responses to effects caused by activities is anticipated to effectively mitigate a range of adverse effects on natural values, spiritual and cultural beliefs and values of significance to Kāi Tahu, natural character and amenity values. These mitigation measures also include residual and minimum flow conditions, fish screens, changes to intakes, surrendering of consents.
The flow sharing in the tributaries to collectively achieve the new residual flows at the confluences with the Manuherikia or in the upper reaches of the tribwill result in higher flows through the stretches where abstraction occurs. Previously in general each irrigator abstracted the water that was available and did not routinely consider the need for a residual. In the proposal each will have to leave a portion of water to contribute to the downstream residual.

On this basis these applications are considered to be consistent with this policy, as adverse effects have been avoided where possible.

Shared management

Policy 5.4.12 *To promote the establishment of, and support, appropriate water user groups to assist in the management of water resources.*

Policy 6.4.0B *To promote and support shared use and management of water that:*

(a) Allows water users the flexibility to work together, with their own supply arrangements; or

(b) Utilises shared water infrastructure which is fit for its purpose.

This proposal is entirely predicated on a shared approach to water management. The management regime outlined for the catchment in this document has been designed to allow self-management that is equitable between permit holders whilst ensuring robust environmental outcomes.

Historically, shared management has occurred within irrigation schemes through water supply agreements, and the shared use of water between schemes with a right to water from Falls Dam. This proposal represents a notable shift by creating an integrated approach throughout the catchment and is the result of significant commitment by all applicants.

The delivery of residual flows at the confluence of each major tributary will require the water users in each tributary to share at low flows. The water users have formed sub catchment groups in the tributaries and are prepared for the transition towards achieving the new residual flows and the catchment minimum flows.

This application gives effect to these policies.

9.4.3 Chapter 6 – Water Quantity

Life-supporting capacity

Objective 6.3.1 *To retain flows in rivers sufficient to maintain their life-supporting capacity for aquatic ecosystems, and their natural character.*

The concept of life-supporting capacity can be challenging and does not necessarily fit neatly within a scientific approach. A recent decision by the Environment Court discussed this issue and noted that "the word used is "capacity" not "ability". The latter is a qualitative word, whereas capacity is both qualitative and quantitative. It is not merely the ability of (in this case) water to support life which is to be protected, but the volume of water in any given factual matrix.[51] Other factors referenced from case law include biological and genetic diversity, ecosystem diversity, form (e.g. topography, climate, natural processes), its functioning (e.g. natural cycles, influence of external processes such as pests, weeds, climate change, resilience.

Life-supporting capacity can vary considerably within a catchment even within a natural state, depending on a range of factors including habitat characteristics, whether a reach is a gaining or losing, natural catchment yields and temperature. Life supporting capacity can be lowest in the highest of flows.

It is also recognised that life-supporting capacity is not to be maintained for pest species including toxic or invasive algae such as didymo. A range of factors not related to the activities contained in this

[51] *Lindis Catchment Group v Otago Regional Council* [2019] NZEnvC 166 [166]

proposal can also impact life-supporting capacity including downstream dams, discharges from septic systems. These factors have been recognised where appropriate in the specific application sections.

The natural character of the Manuherikia catchment was described in relation to Objective 5.3.3 and Policy 5.4.8 above and in Section 8. This proposal does not propose a change to the existing natural character of the broader catchment area and will result in enhancement of natural character including through retention of more flow within waterways, particularly through residual and minimum flows, surrendering of takes and changes to intakes.

The proposal is considered to be consistent with this objective.

User needs

Objective 6.3.2 *To provide for the water needs of Otago's primary and secondary industries, and community domestic water supplies.*

Water is critical in the dry hot Central Otago summers. Most of the water taken as part of this proposal supports agriculture, horticulture and viticulture. Within and additional to these categories a wide range of commercial activities are enabled by this water including:

- sheep and beef farms
- viticulture
- orchards (including organic apples, cherries)
- dairy farms
- dairy support farms
- horticulture (stone fruit, pip fruit, nuts and berries)
- vegetables/market gardens
- flowers e.g. peonies
- nursery plants
- an equestrian centre
- horse breeders
- hospitality businesses such as cafes, B and Bs with outdoor areas

Non-commercial activities include irrigation and stock-water on lifestyle blocks, irrigation of bio-diversity plantings. The activities subject to this proposal are essential to enabling these activities.
This proposal meets this objective.

Minimise conflict between users

Objective 6.3.3 *To minimise conflict among those taking water.*

The shared management of water within the catchment is a key element of the catchment applications and over all proposal. Manuherikia water users have worked together to form a proposal that has considered effects and access to water (including reliability of supply) from an individual water user's needs up to a whole of catchment scale. This level of co-ordination across such a large group of irrigation companies and individual water users is unique in New Zealand. The fact all the water users

are working together is a huge achievement and the effort, time and energy involved should not be underestimated.

This approach is anticipated to minimise conflict amongst those taking water.

This proposal gives effects to this objective.

Adverse downstream effect of managed flows

> *Objective 6.3.6 To minimise any adverse downstream effect of managed flows*
>
> *Policy 6.5.4 In regulating the management of flows, other than in association with a small dam or any dam designed to contain contaminants, to have regard to provision for:*
> *(a) The requirements of:*
> *(i) Natural and human use values identified in Schedule 1;*
> *(ii) The natural character of the water body; and*
> *(iii) Amenity values supported by the water body; and*
> *(b) The periodic release of sufficient quantities of water at appropriate flow rates, where necessary to remove excess algal growth or an accumulation of sediment downstream of the dam; and*
> *(c) The existing needs of consumptive users of water, while taking into account, where appropriate, the extent to which the water body has been modified by resource use and development.*

This objective and policy are relevant in relation to the large dams and the effect that they have on downstream flows and values affected by variations (or lack of variation) in flows. Large dams can impact on flow variability. They reduce downstream flow when they are filling and augment reaches of the downstream sections of a river when flows are typically lower and they are releasing. The large dams associated with this proposal have been shown to have limited impact on flow variability, either due to the small percentage of the catchment affected (e.g Poolburn and Upper Manorburn dams) or the relatively small size of the dam (e.g. Falls Dam). Augmentation of flows in the Manuherikia mainstem during dry summer periods can result in positive effects on a range for values.

The flow variability required for a range of eco-system processes including flushing flows to clear algae that accumulates during higher summer temperatures and lower flows does still occur downstream of the large dams and weirs included in this proposal, as can be seen in the assessment of hydrology in Section 8.2.

The existing needs of consumptive water users has been taken into account in developing this proposal through consideration of reliability of supply, including both the timing of access to water and the amount of water sourced from the dams. These dams play a critical role in reducing the impact of abstraction on lower summer flows, whilst also improving reliability of supply. Existing uses could not occur without the increase in reliability of supply provided by storage.

Any requirement for a significant increase in release of water below the dam (beyond the residual flows proposed) to increase instream flows would ultimately result in greater adverse effects on both water users and instream values. This adverse effect arises as a result of the relatively small volume of water impounded by the existing reservoir at Falls Dam. In the event that greater flows are released, it is anticipated that in dry events the dam would run dry in a matter of weeks, and once all available storage had been utilised then the remaining flow would be very low resulting in a significant adverse effect in terms of water users, but also a significant effect on instream values, when the river returns to very low 'natural' flows, once storage is 'used up'.

Requiring increased discharges of water from the dams (beyond what is proposed) to increase instream flows would result in adverse effects on both users and instream values, as water in the dam would simply be 'used up' earlier in the season and may not be available for either water users or instream values if in-flows continue to be low.

Accordingly, this proposal is considered to be consistent with this this objective.

Lake Levels

Objective 6.3.7 To minimise the adverse effects from fluctuations in the levels of controlled lakes.

Policy 6.5.2 Where lake levels are already controlled, to recognise and provide for the purpose of that control if limits are to be placed on operating levels.

The large dams associated with this proposal have been constructed, maintained and operated with the primary purpose of supplying water for irrigation. Lowering of water levels occurs when necessary to supply water, as required by water supply agreements.

No issues have been raised by the various stakeholders consulted with in relation to water levels within these dams.

This proposal is not inconsistent with this objective and policy.

Hydrological characteristics

Policy 6.4.0 *To recognise the hydrological characteristics of Otago's water resources, including behaviour and trends in:*

(a) The levels and flows of surface water bodies; and

(b) The levels and volumes of groundwater; and

(c) Any interrelationships between adjoining bodies of water, when managing the taking of water.

The hydrological characteristics of the catchment have been given consideration throughout the development of this proposal. An overview of these characteristics are considered in Section 4.3 and Section 8.2.

The application is considered to be consistent with this policy.

Required amount

> ***Policy 6.4.0A*** *- To ensure that the quantity of water granted to take is no more than that required for the purpose of use taking into account:*
> *(a) How local climate, soil, crop or pasture type and water availability affect the quantity of water required; and*
> *(b) The efficiency of the proposed water transport, storage and application system.*

The local climate, soils, crops and pastures have been taken into account by utilising the Aqualinc approach to calculating the volume of water required to efficiently irrigate the command area. Where the Aqualinc approach is based on incomplete or incorrect data (e.g. rainfall data for the Ida Valley) this is noted in the specific applications, and an appropriate alternative data set is used.

The use of dams within the catchment contributes to efficient and effective use of the resource. The dams effectively 'capture' higher winter or spring flows and release them for use when water is most needed but least available. The use of stored water is itself considered to be an efficient method of making the most of a water resource.

The various irrigation schemes that are part of this proposal have over 325 km of races, resulting in the irrigation of land in the range of at least 20,000 ha. In addition to this are the private supply races.

The efficiency of the races was considered in an assessment carried out for the Manuherikia Catchment Water Strategy Group, which is outlined a report by Golder Associates (Golder, 2015).[52] This report is addressed in more detail in relation to the efficiency requirements set out in Objective B2 of the NPSFM, but the key conclusions in relation to efficiency are noted here.

This report concluded that irrigation is very efficient at a catchment level in terms of both scheme distribution and catchment water use. Race leakage was assessed as being within the 10% range considered acceptable for distribution networks based on open races.

The Golder (2015) report identified on-farm irrigation methods as the key area for efficiency improvement in the catchment, which would require conversion to spray irrigation. The report noted however that this requires reliability of supply, and that much of the irrigation above Ophir and in the Ida Valley suffers from poor reliability. This can limit the ability of irrigators to convert to spray irrigation.

Since the Golder report was issued in 2015, there has been ongoing conversion to spray irrigation on-farm. This has further improved the efficiency of water use in the catchment.

[52] Golder Associates, June 2015 *Manuherikia Catchment Water Strategy Group – Irrigation Distribution Report*

Based on the assessment of the Golder (2015) report and the assessment of the applicants' water use using the Aqualinc (2017) methodology, the allocation sought by the applicants is considered to be consistent with this policy.

Nearest practicable source

Policy 6.4.0C To promote and give preference, as between alternative sources, to the take and use of water from the nearest practicable source.

As the Manuherikia catchment is considered fully allocated under the operative RPW, no alternative sources are available to replace the water currently accessed.

Beyond the restrictions created by this planning framework, the practicability of a source is linked to factors such as the reliability of that source, and the cost of utilising that source.

The system of distribution of water that is taken and conveyed for some distance along a race has evolved in this catchment based on the reliability of the source water body, including any increase to reliability gained by access to stored water.

Investigations have taken place about the practicality of sourcing water from the Clutha River/Mata-Au to supply the Dunstan Flats, Alexandra and Galloway areas. This option was considered to be cost prohibitive based on the infrastructure costs and the shareholder numbers and requirements in this area.

Based on these factors, at a catchment scale water is considered to be taken from the nearest practicable source.

Enabling taking within defined allocation and flow limits

Policy 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.*

This policy sets up primary and supplementary allocation. The Explanation to the policy states: *"Primary allocation surface water takes are subject to the lowest minimum flows, supplementary allocation surface water takes are subject to higher minimum flows, and further supplementary allocation may be taken at flows greater than natural mean flow."*

The vast majority of the water authorised to be taken and used by existing permits has had primary allocation status. This means the water is able to be taken until flows within the river reach the primary allocation minimum flow.
This categorisation has failed to recognise that the 'original taking' of a large proportion of water actually occurs when it is collected in a dam, where that dams sits within a waterway, and that this 'original taking' coincides with higher flows during winter and spring. The subsequent delivery of water when flows in the river are lower via a discharge from the dam into the river and a take of water out of the waterbody further downstream has only been treated as primary allocation water with no other context provided.

Recognition of the timing and nature of abstraction provides a clearer understanding of the levels of allocation from run of the river water, and a correspondingly clearer understanding of the potential effects of allocation.

This proposal in consistent with this policy by recognising the timing and manner in which water is stored and taken.

Primary Allocation

Policy 6.4.2 - This policy has been addressed in Section 6.

History of use

> ***Policy 6.4.2A*** *- Where an application is received to take water and Policy 6.4.2(b) applies to the catchment, to grant from within primary allocation no more water than has been taken under the existing consent in at least the preceding five years, except in the case of registered community drinking water supply where an allowance may be made for growth that is reasonably anticipated.*

The rate of abstraction and annual volume sought for each of the replacement consents for primary allocation water within the catchment takes into account and is based on the water meter records of the applicants. This is further supported by maps of the irrigation command areas. The method used in assessing this data is set out in Section 7 of this document.

This proposal represents a reduction in primary allocation water by only replacing water on existing permit that has a history of use as shown in water meter records and other evidence of use as relevant – this includes for example, the use of water for frost-fighting purposes and stock drinking-water supply.

This application is considered to be consistent with this policy.

Supplementary Allocation

> ***Policy 6.4.2AA*** *Where Policy 6.4.2A applies and, under the existing consent, water was usually taken at flows above the minimum flow calculated for the first supplementary allocation block for that catchment, to consider granting the new resource consent to take water as supplementary allocation.*

As noted in relation to Policy 6.4.1 above, this proposal provides a clearer picture of allocation within the catchment. However, it does not attempt to re-categorise primary allocation water as supplementary water. Even though water is captured in the large dams during periods of higher flow, the activity of taking this water (at the intake sites downstream) occurs when flows are below supplementary minimum flow limits.

For this reason the proposal is not inconsistent with this policy.

Primary Allocation Minimum Flow

> ***Policy 6.4.3*** *For catchments identified in Schedule 2A, except as provided for by Policy 6.4.8, minimum flows are set for the purpose of restricting primary allocation takes of water.*
>
> ***Policy 6.4.4*** *For existing takes outside Schedule 2A catchments, minimum flows, for the purpose of restricting primary allocation takes of water, will be determined after investigations have established the appropriate minimum flows in accordance with Method 15.9.1.3. The new minimum flows will be added to Schedule 2A by a plan change and subsequently will be applied to existing takes in accordance with Policy 6.4.5(d).*
>
> *For new takes in a catchment outside Schedule 2A, until the minimum flow has been set by a plan change, the minimum flow conditions of any primary allocation consents will provide for the maintenance of aquatic ecosystems and the natural character of the source water body.*
>
> ***Policy 6.4.5*** *The minimum flows established by Policies 6.4.3, 6.4.4, 6.4.6, 6.4.9 and 6.4.10 will apply to resource consents for the taking of water, as follows:*
>
> *…*
>
> *(c) In the case of any existing resource consent to take water from the Lindis catchment area, Luggate catchment area, Manuherikia catchment area (upstream of Ophir) and the Taieri catchment areas Paerau to Waipiata, Waipiata to Tiroiti and Tiroiti to Sutton, as defined in Schedule 2A, upon collective review of consent conditions within those catchments under Sections 128 to 132 of the Resource Management Act.*

The only operative minimum flow for the Manuherikia catchment is 820 l/s measured at the ORC flow monitoring site at Ophir. This is relevant to all takes upstream of this flow site. This includes takes from the Pool Burn and Ida Burn, as the confluence of these tributaries with the Manuherikia are upstream of Ophir.

This proposal goes considerably further than the requirements set out in these policies as it includes a new more restrictive minimum flow for the Manuherikia catchment. These minimum flows are based on the assessments of a range of matters to give effect to Te Mana o Te Wai and the matters outlined in Schedule 2D.1 of the RPW. Schedule 2D.1 states:

2D.1 When setting minimum flows in Schedule 2A for a catchment, consideration will be given to the following matters:
(a) Any existing or previous minimum flow regime or residual flow;
(b) The 7-day mean annual low flow;
(c) Interaction among water bodies;
(d) Ecological values, including the need for flow variability;
(e) Demand for water, including community water supplies;
(f) Existing water uses and associated infrastructure;
(g) Environmental, social, cultural, recreational and economic costs and benefits of taking and using water before and after the implementation of a minimum flow regime; and
(h) Any other relevant matter in giving effect to Part 2 of the Resource Management Act.

The minimum flows proposed aim to protect and enhance the values associated with the Manuherikia catchment, while also seeking to retain a reliability of supply that will enable effective and efficient use of water for the range of activities reliant on access to this water.

Alternative approach to minimum flow

Policy 6.4.6 To consider granting an application for a resource consent to take water from a Schedule 2A river, within primary allocation, subject to a minimum flow lower than that specified in Schedule 2A, on a case-by case basis, provided:
(a) The take has no measurable effect on the flow at any Schedule 2A monitoring site at flows at or below the minimum flow applying to the primary allocation; and
(b) Any adverse effect on any aquatic ecosystem value or natural character of the source water body is no more than minor; and
(c) There is no adverse effect on any lawful existing take of water.

The ORC has previously recommended that a minimum flow may not be the best management option for the Pool Burn / Ida Burn catchment, and that residual flows may be a more appropriate flow management tool.[53] This is considered appropriate on the basis that the vast majority of water taken by the IVIC scheme is stored winter water. Any release of Pool Burn water to uphold or contribute to the minimum flow at Ophir would require the release of stored winter water, and would require a substantial amount of water to make a difference to flows at Ophir. Given the low level of allocation available to shareholders this would make the scheme non-viable.

This is addressed in detail in the IVIC application. All other applications are premised on the basis of compliance with the minimum flows in this proposal.

Supplementary Minimum Flow

Policy 6.4.9 To provide for supplementary allocation for the taking of water, in blocks of allocation where that is appropriate:

[53] ORC, October 2012, *Instream Values and water resource management options for the Ida Burn*

a) *Such that up to 50% of flow at the catchment main stem, minus the assessed actual take, is available for allocation subject to a minimum flow set to ensure that no less than 50% of the natural flow remains instream; or*
b) *On an alternative basis, provided:*
    i. *The take has no measurable effect on the flow at any Schedule 2 monitoring site, or any site established in terms of Policy 6.4.4, at flows at or below any minimum flow applying to primary allocation; and*
    ii. *Any adverse effect on any aquatic ecosystem value or natural character of the source water body is no more than minor; and*
    iii. *There is no adverse effect on any lawful existing take of water.*
c) *Supplementary allocations and associated minimum flows for some catchments are set in Schedule 2B.*

Policy 6.4.10 In addition to Policy 6.4.9, to provide for further supplementary allocation without any restriction on the volume taken, where the minimum flow applied is equal to the natural mean flow.

These policies set the basis for the development and application of a higher minimum flow to restrict water takes with a supplementary allocation status so that they can only operate when higher flows. Supplementary minimum flows allow for and enable 'harvesting' of water in storage dams during higher flows.

This proposal includes a supplementary minimum flow.

The supplementary minimum flow been developed based on the assessments carried out in support of this proposal.

Residual Flows

Policy 6.4.7 *- The need to maintain a residual flow at the point of take will be considered with respect to any take of water, in order to provide for the aquatic ecosystem and natural character of the source water body.*

Residual flows have been developed for specific water takes where residual flows will provide for the values present in the source water body, including aquatic ecosystems and natural character.

Residual flows have also been developed for the lowest reaches of a number of tributaries. These residual flows go further than the requirements of Policy 6.4.7, as they protect values downstream of these tributaries by supporting the minimum flows in the mainstem of the Manuherikia.

Residual flows have also been developed as part of the framework supporting a collective approach to water management and sharing. They are an essential requirement to ensure this happens in a manner that fairly replaces the system of historic priorities.

In general residual flows have not been proposed for re-takes of water from waterways, as this water is only available to be taken subsequent to delivery by the permit holder. Nor are residual flows proposed for or off-takes from races of dams on the basis that this forms part of the whole activity of 'taking and use of water', in that this activity covers the taking from a waterbody right through to the end use on a property.

The details of the assessments undertaken for specific residual flows are outlined in the applications.

Duration of Resource Consents

> ***Policy 6.4.19*** *When setting the duration of a resource consent to take and use water, to consider: (a) The duration of the purpose of use;*
> *(b) The presence of a catchment minimum flow or aquifer restriction level;*
> *(c) Climatic variability and consequent changes in local demand for water;*
> *(d) The extent to which the risk of potentially significant, adverse effects arising from the activity may be adequately managed through review conditions;*
> *(e) Conditions that allow for adaptive management of the take and use of water;*
> *(f) The value of the investment in infrastructure; and*
> *(g) Use of industry best practice.*

A long term of consent is considered critical and appropriate for these resource consents on the following a basis:

a. All of the permits for the taking and use of water as sought by this application have a purpose of use with a long duration.

b. The value of investment associated with existing activities is very significant, including recent investment in development of land uses on the basis of a reliable supply of water, efficiency upgrades on-farm in response to regional and national policy directives. The value of future investments required for the ongoing operation of large dams and scheme infrastructure and financing of existing on-farm developments is also very significant for this catchment and will exceed 10's of millions of dollars of investment.

c. The inclusion of review conditions as conditions of consent are anticipated by the applicants. The applicants agree to the inclusion of review conditions addressing allocation and flow limits.

d. Any potential or actual adverse effects resulting from the proposal will be appropriately mitigated, where relevant, by measures including fish screens, residual and minimum flows, reconfiguration of intakes, surrendering of consents and reduction in rate of take and allocation where appropriate.

e. A range of measures will protect water quality within the catchment, including continued fencing and planting of riparian areas, the continued development of spray irrigation, the use of farm plans and compliance with national and regional water quality regulations and rules.

f. Water users throughout the Manuherikia catchment have worked collectively to understand and respond to the hydrological connections within the catchment. The applicants propose and accept a condition of consent requiring each permit holder to operate in accordance with a Water Management Group for the catchment.

g. The applications gain support from the relevant policies of the RWP which together aim to recognise existing use of water, reduce over-allocation (where it exists), increase efficiency of use and safeguard the life-supporting capacity and natural character of Otago's water resources.

h. At an irrigation scheme level, the large dams and extensive distribution network and infrastructure associated with this proposal require significant ongoing investment. The term sought is critical to provide surety and confidence for the applicants to make investment decisions and attain any required finance from lending agencies. From a farm or individual user perspective, a longer term is also important to support investment and development including conversion to spray irrigation and construction of on-farm buffer storage. Short term permits do not provide the confidence in water access security looked for by funding bodies and can create a situation where permit holders are unable to obtain the necessary finance to make continual improvements to their farming systems.

i. PC7 creates a holding pattern which does not anticipate comprehensive applications. However, in this case the applicants have been preparing for the replacement of their permits for at least a decade, have engaged a range of experts and have worked together and with other stakeholders to prepare a comprehensive proposal for freshwater management in the Manuherikia catchment.

Water Management Groups

Policy 6.4.12B To manage water rationing amongst water takes, Council may either:
(a) Support establishment of a water management group; or
(b) Establish a water allocation committee.
Council may also instigate its own water rationing regime or issue a water shortage direction.

This proposal is predicated on a water management group approach for the Manuherikia catchment, as outlined in Section 5. Accordingly, it is considered to be consistent with this policy.

Promotion of water storage

Policy 6.6.2 To promote the storage of water at periods of high water availability through: (a) The collection and storage of rainwater; and (b) The use of reservoirs for holding water that has been taken from any lake or river.

This proposal includes reliance on stored water, both at a scheme level and also at an on-farm level with buffer storage. Accordingly, it is consistent with this policy.

9.4.4 Chapter 7 - Water Quality

The ORC is reviewing its approach to water quality, including the objectives and policies within Chapter 7 of the RPW, and has prepared Proposed Plan Change 8 - Discharge Management (PC8) to the RPW. PC8 has been called in by the Minister for the Environment and has been notified by the Environmental Protection Authority.

The objectives and policies below are not affected by PC8.

> *Objective 7.A.1 To maintain water quality in Otago lakes, rivers, wetlands, and groundwater, but enhance water quality where it is degraded.*
>
> *Objective 7.A.2 To enable the discharge of water or contaminants to water or land, in a way that maintains water quality and supports natural and human use values, including Kāi Tahu values.*
>
> *Objective 7.A.3 To have individuals and communities manage their discharges to reduce adverse effects, including cumulative effects, on water quality.*
>
> *Policy 7.B.2 Avoid objectionable discharges of water or contaminants to maintain the natural and human use values, including Kāi Tahu values, of Otago lakes, rivers, wetlands, groundwater and open drains and water races that join them.*
> *Policy 7.B.4 When considering any discharge of water or contaminants to land, have regard to:*
> *(a) The ability of the land to assimilate the water or contaminants; and*
> *(b) Any potential soil contamination; and*
> *(c) Any potential land instability; and*
> *(d) Any potential adverse effects on water quality; and*
> *(e) Any potential adverse effects on use of any proximate coastal marine area for contact recreation and seafood gathering.*
>
> *Policy 7.B.7 Encourage land management practices that reduce the adverse effects of water or contaminants discharged into water.*
>
> *Policy 7.D.2 Schedule 16 discharge thresholds apply to permitted activities, from 1 April 2020, at or below the reference flows set in Schedule 16B based on median flows.* (Note – Plan Change 6AA amended this policy so that the thresholds only apply from 1 April 2026. Plan Change 6AA became operative on 16 May 2020).

This proposal centres on the replacement of permits associated with the storage and the taking and use of water. However, the use of water can affect water quality, particularly when associated with more intensive land use or lack of care in on farm management activities.

This proposal takes a holistic approach to land management and has outlined a range of measures that have been undertaken, and will continue to be undertaken which will protect, maintain, and where necessary, enhance water quality. A comprehensive assessment of the water quality situation for the full catchment has been included in the applications and has driven the focus for the mitigation work required. This includes fencing of waterways, riparian planting, the development and use of Farm Environmental Plans and a reduction in overland flow irrigation. Many of these measures were underway prior to the introduction of the Resource Management Stock Exclusion Regulations (2020). Farm Environmental Plans (or Freshwater Farm Plans) are anticipated to be a requirement for farms in the near future.

> *Policy 7.B.5 When considering any discharge of water from one catchment to water in another catchment, have regard to:*
> *(a) Kāi Tahu values; and*
> *(b) The adverse effects of introducing species that are new to the receiving catchment.*

While water is moved around within the Manuherikia catchment through a series of races, discharges and retakes, the only out of catchment transfer occurs where the IVIC takes water from Totara Creek (in the Taieri Catchment) and transfers it to the Manuherikia Catchment (into the Poolburn dam). This is likely to have resulted in a hybridisation of galaxias. The effects of this are well established and understood as this activity has been occurring for many decades. This is addressed in more detail in the IVIC application.

9.4.5 Chapter 8 - The Beds and Margins of Lakes and Rivers

Stability and function of structures

> *Objective 8.3.1 To maintain:*
> *(a) The stability and function of existing structures located in, on, under or over the bed or margin of any lake or river;*
> *(b) The stability of the bed and bank of any lake or river; and*
> *(c) The flood and sediment carrying capacity of any lake or river.*

The key stability and function issues for structures associated with activities included in this proposal relate to large dams and weirs within waterways, and some of the larger intake structures within waterways.

The stability and function of the large dams are addressed through compliance with the New Zealand Society on Large Dams (NZSOLD) Dam Safety Guidelines, as relevant to the particular structure. Other

existing structures have been assessed as part of this process, including a survey of all OAIC intake weirs and are addressed specifically in the relevant applications.

This proposal is considered to be consistent with this objective.

Remedy effects of failure or overtopping of dams

Policy 8.3.4 To remedy any adverse effect resulting from the failure or overtopping of any dam structure.

Policy 8.5.3 To require the holder of any resource consent for a dam on the bed of a lake or river to remedy any adverse effect attributable to the failure or overtopping of the dam structure, either during or after its construction.

These policies require a response in the event of adverse effects caused by failure or overtopping. There aren't currently any failed dams in the catchment. However the irrigation companies that own dams have engaged Dam Engineers to prepare Operations and Maintenance procedures for their large dams and weirs. Remedial works have been carried out when necessary in response to flood events, and the dam operators have kept records of these works. Where appropriate (in accordance with the NZSOLD Dam Safety Guidelines) the large dams covered by this proposal have an Emergency Action Management Plan in place in the event of failure of overtopping.

The proposed activities, including the approach of the dam owners towards management of dams and weirs is considered consistent with these policies.

Fish migration past structures

Policy 8.5.1 To require, where necessary, desirable and practicable, any structure in or on the bed of any lake or river to provide for fish migration through or past it, or alternative remedial measures where fish migration is not practicable.

The dams and large weirs (Upper Bonanza, Moa Creek and Poolburn weirs) included in this proposal are large old structures. Providing fish migration through or past these dams would be very expensive and would be likely to be ineffective, particularly given the number of large structures situated on these waterways. The presence of the Roxburgh dam downstream of the Manuherikia would negate the potential benefits of providing fish passage past these structures, as this dam prevents passage and connection to the sea.

ORC reports have previously noted that long fin eels are largely excluded from the Manuherikia catchment due to the Roxburgh dam. To our knowledge, at the time of writing this situation had not been remedied. In this context, the provision of fish passage would not result in the environmental benefits intended by this policy.

Trout are the key migrating fish species contained in these dams. In many cases trout are present because they were released into the dams, as a suitable habitat for them and to provide recreational

fishing opportunities. These populations are self-sustaining within these dams, and so the provision of passage past dams is not considered necessary.

Accordingly, it is not considered necessary, desirable or practical, to provide fish migration past the existing large dams and weirs that form part of this proposal.

There are also several smaller weirs and intake structures (including large gravel bunds) associated with this proposal. Fish passage past these structures have been assessed for each of the applications. Based on this assessment the following changes are being proposed:

- MICS Chatto Creek take – this take is not being replaced so that the gravel bund can be dis-established and fish passage can be reinstated through this section of Chatto Creek
- IVIC Totara Creek weir – the provision of fish passage for galaxias is being proposed.
- Thomson, Dunstan, OAIC mainstem and Lauder weirs- passage is possible for key migratory species. However at the time or writing fish barriers in the Thomson were being proposed in the Catchment project to protect the galaxias.

9.4.6 Plan Change 6AA

Plan Change 6AA postpones the date when certain rules controlling discharge contaminant concentration and rules on nitrogen leaching come into force from 1 April 2020 to 1 April 2026. This is noted in relation to Chapter 7 polices above.

Plan Change 6AA became operative from 16 May 2020.

9.4.7 Plan Change 8 – Discharge Management

The ORC is reviewing its approach to water quality, including the objectives and policies within Chapter 7 of the RPW, and has prepared Proposed Plan Change 8 - Discharge Management (PC8) to the RPW. PC8 has been called in by the Minister for the Environment and has been notified by the Environmental Protection Authority.

This plan change includes changes to existing provisions and the addition of new provisions relating to discharges affecting water quality, including consents to discharge nitrogen, the management of animal waste systems and good farming practices.

Provisions relating to good farm practices include stock exclusion, standards for intensive grazing and managing sediment run-off from farming activities and management of critical source areas. Changes to policies are intended to provide additional guidance when assessing consent applications for discharges.

The ORC has since submitted against its own plan change in order to correct mistakes, providing better internal alignment and improving clarity. In addition, where parts of the PC8 are addressed by the

NES for Freshwater or the Stock Exclusion Regulations, the submission asks that the PC8 rules are deleted and the NES and Stock Exclusion Regulations are relied upon instead.

This proposal does not include an application for discharges addressed by this plan change. Stock exclusion and intensive winter grazing are addressed in the Sections below addressing national standards and regulations.

9.4.8 Summary of PC7 and operative RPW policy analysis and weighting

Overall, this application is considered to be generally consistent with the objectives and policies in the operative RPW.

It is also considered generally consistent with Objective 10A.1.1 of PC7 as it will result in a framework and measures to achieve sustainable management of surface water in the Manuherikia catchment. It is also considered to be generally consistent with Policy 10A.2.1 of PC7.

This proposal is not consistent with Policy 10A.2.3 of PC7, because it seeks a long term of consent for all activities, and some activities will cause more than minor adverse effects, as noted in the assessment of effects on the environment in this document and the specific applications. This is particularly the case in relation to the large dams and weirs within rivers. However, many of these structures also result in significant positive effects, including on natural values, recreational values and economic and social well-being.

This proposal is based on an interconnected system of water management. PC7 deals with this interconnected system in a fractured manner – all water takes, a few discharges and some of the dams and weirs are subject to PC7, which seeks the granting of 6 year permits.

However, the Pool Burn and Upper Manor Burn dams, and a number of other weirs as well as discharges from a number of structures are not covered by PC7, and only the provisions of the operative RPW apply to them.

This is an incoherent framework to consider a group of activities which are inextricably linked: operationally; administratively; hydrologically and environmentally. A 6 or even 15 year permit for water takes and structures creates significant challenges for the applicants in financing the works required on the dams, and ensuring ongoing reliability of supply, factoring in the residual and minimum flow limits proposed. This has the potential to make the whole of catchment approach non-viable.

Based on the factors discussed in 10.3, very limited weight should be applied to PC7.

9.5 Otago Regional Council Regional Policy Statement

At the time of writing there are 3 versions of the Otago Regional Policy Statement to consider.

The Regional Policy Statement for Otago became operative on 1 October 1998 (referred to hereafter as the RPS (1998)). The proposed Regional Policy Statement (pRPS) was notified on 23 May 2015 and a decision was released 1 October 2016. The pRPS was made partially operative on the 14 January 2019 (PO-RPS), with the exception of all provisions and explanatory material in *Chapter 3: Otago has high quality natural resources and ecosystems*. This is the key chapter of relevance to this application.

A further review of the RPS is currently underway, with the ORC aiming to notify a proposed plan in June 2021. The RPS, including the partially operative version, is considered out of date with respect to the NPSFM (2020).

9.5.1 Regional Policy Statement (1998)

The RPS (1998) contains a number of objectives and policies that are relevant to this application. Those that are particularly relevant are contained in Chapter 6 (Water), as set out below. It is noted these provisions can be afforded some weight, as they are replaced by proposed policies in the pRPS rather than operative policies in the PO- RPS:

> *Objective 6.4.1 To allocate Otago's water resources in a sustainable manner which meets the present and reasonably foreseeable needs of Otago's people and communities.*
>
> *Objective 6.4.2 To maintain and enhance the quality of Otago's water resources in order to meet the present and reasonably foreseeable needs of Otago's communities.*
>
> *Objective 6.4.3 To safeguard the life-supporting capacity of Otago's water resources through protecting the quantity and quality of those water resources.*
>
> *Objective 6.4.4 To maintain and enhance the ecological, intrinsic, amenity and cultural values of Otago's water resources.*
>
> *Policy 6.5.2 To allocate water in areas of Otago where there is or potentially will be insufficient water supplies through:*
> *(a) Considering the need to protect instream amenity and habitat values; and*
> *(b) Considering the needs of primary and secondary industry; and*
> *(c) Considering Kai Tahu cultural and spiritual values; and*
> *(d) Considering the extent to which adverse effects can be avoided, remedied or mitigated.*
>
> *Policy 6.5.3 To promote efficient consumptive water use through:*
> *(a) Promoting water use practices which minimise losses of water before, during and after application; and*
> *(b) Promoting water use practices which require less water; and (c) Promoting incentives for water users to use less water.*

These matters are addressed throughout this application – particularly in relation to specific objectives and policies of the RPW. Overall, the proposed activities are considered to result in sustainable management which meets the needs of the Manuherikia catchment community. The taking and storage of water when it is most available for use during the irrigation season makes a significant difference to the productivity of this area. This approach reduces the effects of abstraction during lower flow periods.

A number of the dams subject to this proposal have positive effects on amenity and recreation values, habitat values and natural character. Shareholders' current and proposed on farm efficiency improvements (converting to spray irrigation), are considered reasonable and commensurate with the level of allocation received by shareholders.

A range of mitigation measures are being proposed to safeguard life-supporting capacity and to maintain and enhance ecological, intrinsic, amenity and cultural values. These measures are outlined in detail in the AEE in this document and within the specific applications.

Overall, this application is considered to be generally consistent with these provisions.

9.5.2 Partially Operative Regional Policy Statement

The relevant provisions (with amendments as a result of appeals included below) of the PO-RPS include:

- *Use resources sustainably to promote economic, social and cultural well-being for its people and communities (Objective 1.1)*
- *Provide for economic wellbeing by enabling resilient and sustainable use and development (Policy 1.1.1)*
- *Provide for social and cultural wellbeing and health and safety by recognising and providing for a number of matters including Kāi Tahu values, values of other cultures, and diverse needs of communities. (Policy 1.1.2)*
- *Taking the principles of Te Tiriti o Waitangi into account (Objective 2.1)*
- *Kāi Tahu values, interests and customary resources are recognised and provided for (Objective 2.2)*
- *Managing the natural environment to support Kāi Tahu wellbeing (Policy 2.2.1)*
- *Recognise and provide for the protection of sites of cultural significance to Kāi Tahu (Policy 2.2.2)*
- *Enable Kāi Tahu relationships with wāhi tupuna (Policy 2.2.3)*
- *Assess activities for natural hazard risk to people, property and communities (Policy 4.1.4)*
- *Reduce existing natural hazard risk to people and communities (Policy 4.17)*
- *Ensure communities are able to mitigate and adapt to the effects of climate change, including by applying a precautionary approach and by encouraging activities that assist to reduce or mitigate the effects of climate change (Policy 4.2.2)*
- *Recognise and provide for infrastructure including by improving efficiency of natural and physical resource use and minimising adverse effects on existing land use (Policy 4.3.1)*

- *Protecting existing renewable electricity generation (Policy 4.4.3)*
- *Manage activities in rural areas to support the region's economy and communities including by enabling primary production and other rural activities* (Policy 5.3.1)
- *Apply an adaptive management approach (Policy 5.4.2)*
- *Apply a precautionary approach to adverse effects where effects are uncertain, not able to be determined, or a poorly understood but are potential significant or irreversible (Policy 5.4.3)*
- *Control the adverse effects of pest species including to safe-guard the viability of indigenous species and their habitats (Policy 5.4.5)*

This proposal seeks to recognise and provide for Kāi Tahu values, including by managing the natural environment to support Kāi Tahu well-being. It does so particularly through setting flow limits within affected waterways which will ensure abstraction does not cause disconnection of surface flows, and enhancement of habitat for mahika kai species. This proposal also takes a 'whole of catchment' management approach which is consistent conceptually with 'ki uta ki tai'. The impact of large dams within waterways on Kāi Tahu values is acknowledged in the relevant applications, however, many of these dams can also have a positive effect on a range of values, including instream values when flows would normally be low.

This proposal promotes resource use that is sustainable by setting flow limits in waterways. It also supports economic and social well-being by providing sufficient reliability of supply for a range of uses, including use of existing efficient infrastructure.

Risks from natural hazards relating to the large dams with a High Potential Impact Classification will be managed through monitoring of dam infrastructure, a programme of physical works (where necessary), emergency action plans, and dam safety management measures. These are addressed in the specific applications on dams.

The activities that form this proposal are well established, and the associated effects resulting from these activities are well understood. Accordingly, a precautionary approach is not considered necessary, as this proposal seeks to enhance a range of values and mitigate or avoid a number of effects associated with these well-established activities.

The ongoing use of the dams associated with this proposal will assist with mitigation of the potential effects of climate change, although the effects of climate change are likely to be experienced after the expiry of replacement consents sought by this application. The retention of Falls Dam also provides for the continuation of existing renewable electricity generation.

Replacement permits for these structures supports an efficient use of water, as it involves the capture of water when it is more plentiful to support use when natural inflows are lower.

9.5.3 Proposed Regional Policy Statement

Since the pRPS was made partially operative, the mediated version of Chapter 3 (changed by Environment Court order – 15 March 2019) has been incorporated into the latest version of the PO-RPS (but not yet made operative). This includes the following provisions of relevance to this application:

- *Recognise, maintain, and/or enhance (where degraded) the values (including intrinsic values) of ecosystems and natural resources (Objective 3.1)*
- *Safeguard life-supporting capacity of freshwater and manage freshwater to achieve a range of matters including the maintenance or enhancement of aquatic eco-system health, indigenous habitats, indigenous species and their migratory patterns; to maintain and enhance as practicable the natural functioning of waterways, and the habitat of trout and salmon unless detrimental to indigenous biological biodiversity (Policy 3.1.1)*
- *Manage the beds of rivers to achieve a range of matters including safeguard life-supporting capacity of freshwater, maintain or enhance ecosystem health and indigenous biodiversity, and maintain or enhance, as far as practicable their natural functioning, character and amenity values. (Policy 3.1.2)*
- *Manage allocation and use of water by recognising and providing for the social and economic benefits of sustainable water use, avoid over-allocation, phase out existing allocation, ensure efficient allocation including by requiring that water allocated does not exceed what is necessary for efficient use and encouraging the development or upgrade of infrastructure that increases efficiency (Policy 3.1.3).*
- *Manage for water shortage by undertaking all of the following: encouraging land management that improves moisture capture, infiltration, and soil moisture holding capacity; encouraging collective coordination and rationing of the take and use of water when river flows or aquifer levels are lowering, to avoid breaching any minimum flow or aquifer level restriction to optimise use of water available for taking; providing* for *water harvesting and storage, subject to allocation limits and flow management, to reduce demand on water bodies during periods of low flows (Policy 3.1.4)*
- *Maintain or enhance ecosystem health and indigenous biological diversity, maintain or enhance as far as practicable habitats of trout and salmon unless detrimental to indigenous biological diversity (Policy 3.1.9)*
- *Identify and protect or enhance, where degraded Otago's significant natural resources (Objective 3.2)*
- *Protect and enhance areas of significant indigenous vegetation and significant habitats of indigenous fauna (Policy 3.2.2).*

This proposal will result in the enhancement of a range of natural values including habitats of indigenous fauna, indigenous biological diversity, natural character and amenity values. This proposal will also maintain and enhance life-supporting capacity within the Manuherikia catchment, as set out in Section 8 and the Assessments of Effects on the Environment supporting each application.

The dams and large weirs do have an effect on the natural functioning of waterways, with corresponding effects on Kāi Tahu values, as outlined in Section 8.7. However, these structures also result in a range of positive effects, including reducing the effects of abstraction that might otherwise

occur during the summer period when flows are naturally lower and sustaining higher flows for longer as water is delivered downstream.

This proposal seeks to support economic and social well-being by ensuring water users have a sufficient reliability of supply to support a range of uses. It is based on assessment on efficient distribution and use and will result in a reduction in allocation. The harvesting and storage of water is an effective mechanism to avoid over-allocation of water, and in combination with flow limits is also an effective way to protect a range of values.

Accordingly, this application is considered generally consistent with the objectives and policies contained within the various versions of the RPS.

9.6 National Policy Statement on Freshwater Management (2020)

The NPSFM (2020) sets out the objectives and policies for freshwater management under the Resource Management Act 1991. It came into effect on 3 September 2020 and replaces the National Policy Statement for Freshwater Management 2014 (amended 2017).

In the absence of a planning framework which gives effect to the NPSFM (2020), this proposal has been developed in order to give effect to the NPSMF (2020).

Te Mana o te Wai

The fundamental concept underpinning the NPSFM (2020) is Te Mana o te Wai, recognising the fundamental importance of water and the health of water in protecting the health and well-being of the wider environment. Within the context of the NPSFM this encompasses 6 principles relating to the roles of tangata whenua and New Zealand in the management of freshwater and the implementation of the NPSFM.

These principles are (at 1.3(4))

> *"(a) **Mana whakahaere**: the power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater*
> *(b) **Kaitiakitanga:** the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations*
> *(c) **Manaakitanga:** the process by which tangata whenua show respect, generosity, and care for freshwater and for others*
> *(d) **Governance:** the responsibility of those with authority for making decisions about freshwater to do so in a way that prioritises the health and well-being of freshwater now and into the future*
> *(e) **Stewardship:** the obligation of all New Zealanders to manage freshwater in a way that ensures it sustains present and future generations*
> *(f) **Care and respect:** the responsibility of all New Zealanders to care for freshwater in providing for the health of the nation."*

The NPSFM (2020) also sets out (at 1.3(5) and at Objective 2.1) a hierarchy of obligations and an objective for Te Mana o Te Wai that prioritises:

> *"(a) first, the health and well-being of water bodies and freshwater ecosystems*
> *(b) second, the health needs of people (such as drinking water)*
> *(c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future."*

The development of this proposal has been based on these principles and obligations. The starting point has been to gain an understanding of the health of waterbodies and freshwater ecosystems, and then to assess the needs of people (primarily in terms of water quality), before assessing social, economic and cultural well-being related to the allocation of water.

The applicants anticipate that tangata whenua will exercise mana whakahaere, kaitiakitanga and manaakitanga through this process. On behalf of the applicants OWRUG and MCG invited local Runaka to visit the catchment and extended a specific invitation to local Runaka to discuss how best to progress and develop a proposal for the catchment. Several of the applicants also approached Aukaha early in the development of applications, to try and focus science work on values and interests of importance to Kāi Tahu.

A number of the principles set out for Te Mana o te Wai are directly relevant to Councils in giving effect to the NPSFM (for example through plan making processes), as they focus on tangata whenua's authority and responsibility and actions, as well as governance by the council. However, the principles are more difficult for an applicant to give effect to through a resource consent process. The principles that can be achieved by an applicant are stewardship, care and respect. The whole of catchment approach taken in this proposal is premised on these principles, and the range of measures embedded in the applications aim to give effect to these principles, including through a reduction in allocation and the setting of flow limits.

Clause 1.6 of the NPSFM requires the use of the best information available. A hierarchy is set up in terms of 'best information' starting with complete and scientifically robust data (1.6(1)) and then information obtained from modelling, partial data, local knowledge (1.6(2)). The applicants have endeavoured to collect scientifically robust data and to add to information already collected by the Otago Regional Council. Given the complexity of the catchment, particularly the movement of water around the catchment and the influence of existing activities on natural conditions, information has included modelling and local knowledge. With the complexities involved, local knowledge is a vital component to understanding water management within the catchment and the effects of water management. Limitations of information and knowledge are identified where relevant.

Policies for freshwater management to achieve Te Mana o te Wai are listed in 2.2 of the NPSFM (2020).

Policy 1 – Te Mana o te Wai

> *Policy 1: Freshwater is managed in a way that gives effect to Te Mana o te Wai.*

This proposal aims to protect the health of waterways within the Manuherikia catchment and to restore and preserve the balance between water, the wider environment and the community by identifying and considering the values within, or associated with, affected waterways, starting with ecological values. The health of freshwater will be sustained (for present and future generations) through a range of measures including setting of flow limits, reduction in allocation, changes to intake structures and fish screening.

Policy 2 – Tangata whenua

Policy 2: Tangata whenua are actively involved in freshwater management (including decision making processes), and Māori freshwater values are identified and provided for.

Council has taken a number of steps to involve tangata whenua in freshwater management in Otago. OWRUG took steps to create a community reference group in late 2018. By early 2019 the ORC agreed to lead the Manuherikia Reference Group, which was intended to underpin the formulation of a freshwater management approach for the Manuherikia.

Further, OWRUG, MCG and applicants have tried to consult directly with tangata whenua in the process of developing this proposal and preparing consent applications, including by hosting two catchment wide field days in the 2018/19 season to which tangata whenua were invited, discussing key values affected by the IVIC scheme and facilitating visits to IVIC sites in 2019 as well as a field day in the Dunstan Creek sub-catchment in April 2018. This proposal identifies Māori freshwater values, and actively seeks to provide for them by taking a holistic approach to the catchment, retaining sufficient in-stream flows and reducing, where possible, the impact of structures and take infrastructure within waterways.

Policy 3 – Integrated management

Policy 3: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.

This proposal takes a whole-of-catchment approach and considers and manages the effects of the taking of water, as well as the resultant effects of using water where these are of concern. The level of whole catchment integration in this body of applications is significant. This opportunity to plan cohesively across the catchment is only possible because of the hard work and commitment from the water user community. The water user community are also acutely aware that they are only one part of the broader community and up to a decade ago initiated discussions and engagement with other parties.

Policy 4 – Climate Change

Policy 4: Freshwater is managed as part of New Zealand's integrated response to climate

change.

The potential effects of climate change on this catchment have been considered as part of this proposal and is discussed in more detail in Section 8.

Policy 5 – National Objectives Framework

Policy 5: Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.

These applications are made prior to the development of a planning framework under the National Objectives Frameworks set out in the NPSFM (2020), or any earlier NPSFM.

The majority of permits associated with the damming, taking and use of water within this catchment expire on 1 October 2021. Given the whole of catchment approach taken by the applicants, and the resultant scale and complexity of this proposal, the applicants needed to ensure their applications were accepted for processing by council, and that they retained the ability to continue operating under existing permits under s124 of the RMA until a decision is made on these applications. This has resulted in the applications being lodged prior to a plan being developed through the NOF process. The applicants had no ability to do otherwise.

However, the ORC has identified the Manuherikia catchment as a Rohe within the Clutha/Mata-Au Freshwater Management Unit (FMU). This proposal addresses values for this Rohe, based on the work of the ORC in developing a management approach for this Rohe. OWRUG and MCG and many of the applicants have actively been engaged in council processes to develop a management plan for this Rohe, including value identification (starting in 2016) and environmental outcomes and objectives.

This proposal sets out allocation limits and flow levels that are designed to achieve environmental outcomes that will maintain, enhance (where degraded) and protect values associated with freshwater in the catchment.

Policy 6 - Wetlands

Policy 6: There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted.

The applications do not include proposals to destroy or damage wetlands. Wetland restoration is being proposed in the Thomson sub-catchment.

Policy 7 – Loss of extent and values

Policy 7: The loss of river extent and values is avoided to the extent practicable.

Clause 3.21 of the NPSFM (2020) defines 'loss of value' as meaning that a river is less able to provide for any value identified under the NOF process or any of:

i. Ecosystem health
ii. Indigenous biodiversity
iii. Hydrological functioning
iv. Māori freshwater values
v. Amenity

The words "loss" and "less" imply a comparison, but it is not clearly stated what the comparison is with – a common sense reading is that it must 'loss' as opposed to existing state of the values identified, particularly as the compulsory values are expressed in terms of current state i.e. the extent to which a waterway supports a value, not the extent to which a waterway should support a value. As the NOF process must include identification of all compulsory values in Appendix 1A of the NPSFM, there is some overlap with the values identified in Clause 3.21(i) to (v).

This proposal seeks to enhance ecosystem health, indigenous biodiversity, hydrological functioning, Māori freshwater values and amenity and human contact including swimming, boating and fishing. It also seeks to enhance the habitat of trout (unless an area is proposed to be protected for indigenous species).

This proposal may result in some loss of value to irrigation, cultivation and food production through a reduction in reliability of supply through flow limits. While this is inconsistent with this policy, it is consistent with the NPSFM's (2020) overarching hierarchy of obligations in Te Mana o te Wai.

This proposal will not result in loss of the extent of a waterway.

Overall, this proposal is considered to be generally consistent with this policy.

Policy 8 – Outstanding water bodies

Policy 8: The significant values of outstanding water bodies are protected.

No waterbody or part of a waterbody affected by this proposal has been identified or is currently proposed to be identified as an outstanding waterbody in a water conservation order, regional policy statement or regional plan (as defined by the NSPFM (2020)).

Policy 9 – Indigenous species

Policy 9: The habitats of indigenous freshwater species are protected.

Indigenous freshwater species include galaxias, tuna (eels), and koura (freshwater crayfish). Habitat requirements for these species have been assessed as part of the development of this proposal.

The habitats of indigenous freshwater species are protected through this proposal via retention of flows instream, achieved via allocation and flows limits, fish screening and the provision of fish passage

where feasible. They will be further protected through wider catchment initiatives protecting water quality including continued fencing of waterways, and Farm Environmental Plans.

Policy 10 – Trout and Salmon

Policy 10: The habitat of trout and salmon is protected, insofar as this is consistent with Policy 9.

Due to the presence of trout in the mainstem of the Manuherikia River and the large dams, galaxias populations are primarily confined to the upper reaches of tributaries. Due to the lack of passage past the Roxburgh dam and observations of commercial eeling carried out in the 1990s, the presence of tuna is also limited. This means that the mainstem of the Manuherikia, Dunstan Creek, the lower reaches of other tributaries and the large dams are areas where the habitat of trout must be protected under this policy, unless the community decides that these parts of the catchment should also be restored as galaxias habitat. As this scenario is unlikely (given the scale of the area and the measures required to exclude trout), this proposal includes protection of these areas as trout habitat. However that said, at the time of writing, the MFE project team and the Thomsons Catchment group were investigating the exclusion of trout and perch from the lower reaches of Thomsons Creek and sluice channels and connected tributaries.

Trout habitat will be provided in the large dams through their retention and continued use and operation. Trout habitat in the reaches of waterways which are not 'set aside' for indigenous species will be protected through allocation and flow limits, fish screening and improvements to intake structures.

Policy 11 - Allocation and efficiency

Policy 11: Freshwater is allocated and used efficiently, all existing over-allocation is phased out, and future over-allocation is avoided.

Over-allocation is defined in the NPSFM (2020) as a situation where resource use exceeds a limit or if limits have not been set, an FMU or part of an FMU is degraded or degrading. This proposal addresses historic degradation by proposing an allocation limit and flow regime which will avoid and minimise adverse effects caused by the extent and duration of low flows.

Allocation within the Manuherikia catchment has been comprehensively assessed in developing this proposal. This assessment has highlighted that a proportion of water allocated is taken at higher flows and stored for later use and that a proportion of water taken is actually from augmented flows.

Allocation of water taken at higher flows and stored for later use is considered efficient as it supports greater reliability of supply and production capacity. This proposal clarifies the proportion of water that can be taken as primary allocation and results in a significant reduction in the overall allocation of water within the catchment.

With regard to efficiency, water abstraction and use affected by this proposal has been assessed based on the ORC's existing approach to assessing efficiency, as contained in Aqualinc (2017).

Conversion to more efficient irrigation has occurred throughout the catchment and has led to increased productivity. Conversion to efficient irrigation is also linked to a reduction in 'wastage' of water by reducing run-off. However, within the catchment 'excess' water is often picked up and reused on several other properties, as is evident in the Thomson sub-catchment. Historically this has resulted in a minimisation of wastage.

Many water users have plans for further conversions, although for many these plans have been on hold until reliability of supply resulting from limit setting is determined. Conversion to more efficient irrigation is also reliant on sufficient certainty in terms of access to water, particularly with respect to the length of permits. Conversion also requires access to appropriate electricity infrastructure, which is known to be an issue in these rural areas. This can further increase the costs and challenges of converting further infrastructure.

This means that while further improvements to efficiency can occur within the catchment, these will only be able to occur with a longer term of consent and sufficient reliability of supply.

One of the efficiency drivers in the NPSFM is economic efficiency (Clause 3.28), which in simple terms includes maximizing desired outputs given available inputs.

A complex range of factors influence the type of land use that water is used to support in the Manuherikia catchment including market forces, district plan zoning, climate and soil type. Water within the catchment is utilised for a diverse range of uses, some of which may not be the highest value use or produce maximum outputs. However, these diverse uses support a more resilient community, as the community is not reliant on one product or market. These diverse uses also reduce the potential for adverse environmental effects that can result from a monoculture approach. Land uses in the catchment have changed over time, including the development of high value land use such as horticulture and viticulture and dairy as well as profitable small holdings producing flowers, nuts and berries. These land use changes are often a reflection of businesses seeking to maximise outputs based on inputs.

Overall, based on the factors outlined above, the approach taken to allocation and efficiency with this proposal is considered to be consistent with this policy.

Policy 12 – Water Quality

> *Policy 12: The national target (as set out in Appendix 3) for water quality improvement is achieved.*

Water quality within the catchment has been assessed as generally good, but potentially impacted by flood irrigation carrying contaminants into waterways. The grant of long-term permits will support further conversion to spray irrigation and will help to address this. Additional water quality

enhancement measures being undertaken in the catchment include riparian planting, fencing of waterways. These measures in combination with compliance with national regulations are anticipated to address water quality issues caused by the use of water associated with this proposal.

Policy 13 – Monitoring and action

> *Policy 13: The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends.*

Water takes will be monitored by the applicants. Water quality monitoring has been undertaken by a number of the applicants, including IVIC and permit holders within the Thomsons catchment. In addition, the applicants anticipate that the ORC will continue to monitor the condition of water bodies, to ensure consistency of monitoring within the catchment and across Otago, and to allow a clear understanding of trends.

This proposal supports improvements water quality. These measures will be further supported by compliance with the National Environmental Standards for Freshwater (2020) and that Resource Management (Stock Exclusion) Regulations 2020.

Policy 14 – State of the Environment Reporting

> *Policy 14: Information (including monitoring data) about the state of water bodies and freshwater ecosystems, and the challenges to their health and well-being, is regularly reported on and published.*

This policy is considered to be directed at regional councils. Metering data collected by the applicants will support the ORC in meeting this policy.

Policy 15 – Social, economic and cultural wellbeing

> *Policy 15: Communities are enabled to provide for their social, economic, and cultural wellbeing in a way that is consistent with this National Policy Statement.*

This proposal has been developed to enable the affected community to provide for its social, economic and cultural wellbeing whilst prioritising the health and well-being of the wider environment. It does so by first understanding and protecting instream ecology and natural values and by then considering the needs of water users for a reliable supply of water, including to ensure that existing efficient infrastructure remains viable. It also takes into account the diverse range of uses that water supports within this catchment and the wider benefit this brings to the local community. This includes enabling productive land use on small blocks, supporting local contractors and service providers, and maintaining a vibrant local community.

Clause 3.16 - Setting Environmental flows and levels and Clause 3.17 Identifying take limits

Clause 3.16 directs councils to set environmental flow levels that achieve outcomes for values relating to FMUs or parts of FMUs and long-term visions. A phased approach can be taken to achieving these.

Clause 3.17 requires take limits to be set to meet these environmental flow limits, but in addition to achieving the environmental outcomes must also provide for:

- flow variability,
- safeguarding ecosystem health from effects of the take limit on the frequency and duration of lowered flows,
- life cycle needs of aquatic life.

The values identified for this catchment or specific parts of this catchment are set out earlier in this document and in the separate applications. The values are based on the work of the ORC to date in developing environmental limits and take limits for this catchment. The minimum and residual flows proposed and the allocation (or take) limits have been developed to achieve environmental outcomes set out in the NPSFM including the matters listed in Clause 3.17(4). This includes prioritising habitat retention for indigenous species, or where these are not present, then for introduced species.

Clause 3.20 - Responding to degradation

This clause direct councils to take action to halt or reverse degradation. This proposal sets out a number of changes to enhance the health of freshwater and the wider environment of the Manuherikia catchment, including setting residual and minimum flow limits, reducing allocation, fish screen conditions, enhancing fish passage where appropriate. In combination these measures form a cohesive action plan for managing freshwater in the catchment to reverse existing degradation that has occurred historically and prevent any further degradation that might result for changing land use practises.

Fish passage

The NPSFM also sets out a number of policies for regional councils to include in regional plans. Clause 3.24 (loss of river extent and values) and Clause 3.28 (allocation including efficient allocation) have been addressed in the analysis of relevant NPSFM policies above. One of the key policies not addressed already in the analysis of the NPFSM here relates to fish passage. Clause 3.26 requires councils to include the following objective in regional plans:

> *"3.24(1)The passage of fish is maintained, or is improved, by instream structures, except where it is desirable to prevent the passage of some fish species in order to protect desired fish species, their life stages, or their habitat."*

This clause also directs councils to consider the extent to which instream structures provide fish passage, to promote the remediation of existing structures and the provisions of fish passage where

practicable, and to develop a work programme to improve the extent to which existing instream structures achieve the objective in 3.24(1) above.

This proposal includes applications to continue operating a number of existing instream structures. None of the large dams or weirs provide for fish passage. Migration routes are blocked off downstream by the Roxburgh dam. Given the number and scale of the large dams and weirs included in this proposal, it would be very expensive and challenging to provide fish passage, with potentially very little to no benefit to tuna (eels), one of the key migratory species in the catchment if there is no passage past the Roxburgh dam. It is not considered practical to provide fish passage past these structures.
Other weirs in the catchment allow for fish passage as they are constructed. However there are also situations where it may be proposed in the future that trout barriers are installed to protect galaxias such as the Thomson Catchment project.

This application is considered to be consistent with the objective contained in Clause 3.24(1) of the NPSFM (2020).

9.7 National Policy Statement for Renewable Electricity Generation (2011) (NPSREG)

This NPSREG sets out the objective and policies for renewable electricity generation under the Resource Management Act 1991.

The NPSREG sets out an objective and policies to enable the sustainable management of renewable electricity generation. The preamble to this policy statement states that it does not apply to the allocation and prioritisation of freshwater as these are matters for regional councils to address in a catchment or regional context and may be subject to the development of national guidance in the future. However, it is important to note the presence of a hydro-electricity generation plant owned by Pioneer Generation below Falls Dam, and the reliance that this has on Falls Dam. More information is provided about this in the Falls Dam application.

Policy A requires decision makers to recognise and provide for the national significance of renewable electricity generation activities, including a range of benefits that result from these activities.

Policy E2 requires regional policy statements and regional and district plans to include provisions to provide for the development, operation, maintenance, and upgrading of new and existing hydro-electricity generation activities.

The continued operation of Falls Dam will enable the ongoing generation of renewable electricity by Pioneer Generation from its plant below Falls Dam. Accordingly, this proposal is consistent with this NPSREG.

9.8 Resource Management (National Environmental Standards for Freshwater) Regulations 2020

The Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (referred to here as the NESF) regulate activities that pose risk to the health of freshwater and freshwater ecosystems.

The NESF come into force on 3 September 2020, although clauses relating to intensive winter grazing, stocking holding areas other than feedlots and the application of synthetic nitrogen fertiliser to pastoral land come into force in mid-2021.

At the time of lodging these applications, regulations had been very recently released, with some aspects not yet in force. This proposal involves a number of large irrigation schemes, along with a number of private permit holders. With the larger irrigation schemes there is naturally a greater separation between the taking, storage and conveyance of water and the end use of this water, including associated management of activities occurring on individual properties as a result of the supply of this water. The MICS and GIS schemes supply water to a particularly diverse range of activities. Many of these activities will not involve activities subject to these regulations as they do not involve stock and do not have wetlands on site.

Sheep and beef is by the far the dominant pastoral land use in the Manuherikia catchment. All properties represented in the applications are currently working to understand the implications of these regulations on their operations. Many already have farm environmental plans and will be updating these to incorporate a freshwater farm plan component, although at this stage there are no appointed certifiers and no clear certification process, as this is still being developed (refer to the RMA Amendment Bill below). If the FFP process is not in place by the winter of 2021, a number of farms may need to apply for a resource consent.

The key aspects and relevance of these regulations to this proposal are summarised below.

Feedlots

Consent will be required for feedlots if cattle are over 4 months and weigh more than 120kg. (Clauses 9-11). There are no feedlots within the catchment and these regulations are not relevant to these applications.

Stock holding areas

Standards for stock holding areas (feed pads, winter pads, standoff pads, loafing pads) must be met or consent will be required from 1 July 2021 (Clauses 12 -14). The minimum standards to be a permitted activity from this date are:

- Manage the permeability of the base area so that it is sealed to a minimum permeability standard of 10^{-9}m/sec; and
- Collect, store and dispose of effluent in accordance with regional council regulations or a current discharge permit; and

- Situate the stock-holding area at least 50 metres away from waterbodies, water abstraction bores, drains and coastal marine areas; or
- Undertaken in accordance with a certified freshwater farm planned the adverse effects are no greater than those allowed for by the preceding conditions.

These regulations are likely to be of relevance to a number of properties subject to this proposal. As noted above, many of these properties will have to develop and work under a certified freshwater farm plan (once the process for these is established) or will need to obtain consent or change on farm practices.

Intensification of land use

Until a regional plan has been notified that complies with the new National Policy Statement – Freshwater Management (NPS-FM), a resource consent is needed for:

- conversion of farmland to dairy by more than 10ha (Clause 18 and 19)
- increase in irrigated pasture for dairy of more than 10ha (Clause 20 and 21)
- conversion of more than 10ha from plantation forestry to dairy farming (Clause 16)
- increase dairy support activities above the highest annual amount in the previous five years (Clause 22, 23 and 24)

A resource consent will be required for intensification and can only be issued if the council is satisfied the activity will not result in an increase in contaminant load or concentrations of contaminants in the catchment. The obligation for obtaining consents for intensification of land use will sit with the individual land-owners and do not form part of this application.

There is no plantation forestry occurring on properties subject to this proposal, and clauses relating to this activity are not relevant.

Intensification through conversion to dairy or increase to dairy support activities, or an increase of irrigation on dairy properties has not been occurring on a significant scale within this catchment over the last few years. In part this is due to the uncertainty associated with the replacement of permits and the planning framework, including minimum flow setting. Where individual property owners want to undertake intensification, they will need to comply with the permitted activity standards or seek consent to do so.

Winter grazing

A consent for winter grazing is required if the following cannot be met:

- Intensive winter grazing occurs over less than 50ha or 10% of the farm, whichever is the greater.
- The mean slope of the paddock is 10 degrees or less.
- Pugging is no deeper than 20cm at any one point and pugging of any depth must cover less than 50% of the paddock.
- Buffers between crops and waterways are 5m or more.
- Land used for intensive winter grazing must be replanted as soon as practicable after grazing of forage crop is finished, but no later than 1 November in Otago each year

- The area being used for winter grazing cannot be greater than the highest annual amount in the previous five years (until the Regional Council has amended the regional plan to meet the new NPSFM) (Clause 29)

In practice, a large proportion of winter grazing within the catchment is likely to require consent from prior to sowing of crops in late 2021. Individual property owners will need to comply with the permitted activity standards or seek consent to do so.

Synthetic nitrogen fertiliser cap

The regulations place a cap on application of synthetic nitrogen fertiliser of 190kg/ha/year on pastoral land in a contiguous landholding (Clauses 32 to 36). This only applies to the grazing of livestock.

Beef and Lamb advise that this is highly unlikely to affect sheep and beef farmers but may impact on some dairy farms. [54] It does not apply to horticulture or arable land use. Affected properties will need to comply with the synthetic nitrogen cap or seek consent to do so.

Wetland Protection

Part 3, Subpart 1 sets out regulations to manage activities in and around natural wetlands. Natural wetlands do not include wetlands constructed by artificial means; or areas of improved pasture dominated by introduced pasture species and subject to temporary rain derived water pooling.

Given the complexities associated with the definition of a natural wetland, the ORC has indicated recently that it will provide further advice and clarification with respect to what it considers is included within the definition of 'natural wetland' in the Otago Region and how the NES regulations will be applied and how to apply this.

No vegetation clearance, earthworks, drainage or taking, damming or diverting water can occur in and around a natural wetland except in certain circumstances e.g. science research, restoration.

For existing arable or horticultural land use vegetation clearance and earthworks are permitted if outside of the wetland and not within a 10 m setback (clause 50), as long as the activity complies with a number of general conditions including not causing one or more adverse effects on water quality, alter the natural movement of water or involve the taking or discharging of water to or from any natural wetland (clause 55).

Regulation 54 of the NES provides for the taking, use, damming, diversion, or discharge of water within, or within a 100 m setback from, a natural wetland, as a non-complying activity. Based on the current state of knowledge no natural wetlands have been identified within, or within a 100 m setback, of any water take (and associated water use) represented across the Manuherekia Catchment consent applications. With regard to dams, any wetland areas that exist along the margins of dam reservoirs are considered to be artificially constructed and so do not fall within the definition of a natural wetland (as defined by the NPSFM).

[54] https://beeflambnz.com/sites/default/files/Essential%20Freshwater%20FS%20Aug2020.pdf

Unless otherwise addressed in the individual applications, the NES Freshwater regulations are not considered to directly apply to the activities proposed in the Manuherekia Catchment applications.

Fish passage and instream structures

Requirements managing instream structures to deal with the effects of fish passage – this does not apply to this proposal, as these clauses do not apply to existing structures, including alteration and extensions of those structures (Part 3, Subpart 3, Clause 60).

9.9 Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007

The NES for Sources of Human Drinking Water (2007) sets requirements for protecting sources of human drinking water from becoming contaminated.

Clauses 6 to 10 are relevant to any activity that has the potential to affect a registered drinking water supply that supplies at least 501 people for at least 60 days per year. Pursuant to Clauses 7 and 8 applications for water permits or discharge permits located upstream of a drinking water supply must be assessed to ensure they will not cause certain adverse effects on the drinking water supply.

The only registered drinking water supply for at least 500 people is Alexandra. Omakau/Ophir is a registered drinking water supply but only supplies 400 people. Other smaller registered drinking water supplies are for fewer people such as Omakua, Tiger Hill (50 people) and Springvale Hills (30 people).[55] These smaller supplies are from bores (except for Springvale Hills).

Alexandra's water is a groundwater extraction supply, fed by a six-bore borefield sited on the true left bank of the Clutha River about 1750 m upstream from the main bridge. Water is drawn from shallow ground water, typically 12 m deep, is chlorinated and pumped directly into the distribution network. A new water pipeline will take water from bores deep in the gravels at the edge of Lake Dunstan above Clyde township to Alexandra's northern reservoir for distribution to the town.

This proposal does not include an application for a water permit or discharge permit which might adversely affect Alexandra's drinking water supply.

Clause 12 is relevant to smaller drinking water supplies (at least 25 people) and directs consent authorities to consider whether an activity (to which the consent application relates) may have a significant adverse effect on the quality of the water at any abstraction point either as a result of an event caused by the activity, or as a consequence of an event (such as heavy rainfall). If this is the case, then the consent authority must impose a condition requiring the consent holder to notify the registered drinking water supply operators and the consent holder if such an event occurs.

[55] https://www.drinkingwater.org.nz/supplies/SupplyCysForLAForCompliance.asp

This is not considered relevant to any of the activities applied for as part of this proposal given the activities relate to the taking and conveyance of water, and structures within waterbodies. These activities will not, in themselves, cause significant adverse effect on the quality of water abstracted for registered drinking water supplies. The use of this water is also not anticipated to result in such an event.

9.10 Resource Management (Stock Exclusion) Regulations 2020

These regulations set out stock exclusion rules which came into force on 3 September but will be phased in over time as set out below. Stock means beef cattle, dairy cattle, dairy support cattle, deer or pigs. The rules do not apply to sheep. The rules are summarised below:
Regardless of slope:

- From 2023 all dairy cattle must be excluded from lakes and rivers more than 1 metre wide and all dairy support from 2025. We note that all dairy cattle are already required to be excluded as a condition of milk supply with Fonterra under The Dairying and Clean Streams Accord.
- From 2023 all cattle and deer must be excluded from lakes and rivers more than 1 metre wide, where land is used for fodder-cropping, break-feeding or grazing on irrigated pasture.
- Wetlands already identified in a regional or district plan must have cattle, deer and pigs excluded by 1 July 2023. Otherwise, cattle, deer and pigs must be excluded by 1 July 2025.

On land mapped as 'low slope' by MFE (less than 10 degrees slope):

- beef cattle and deer must be excluded from lakes and rivers more than 1 metre wide by 1 July 2025.

If animals have to cross the waterway, they can only do so via a dedicated bridge or culvert or only cross (with supervision) twice within one month. Stock required to be set back from the edge of the lake or river (outlined above) must be setback by 3 metres. Extensively farmed beef and deer on land not mapped as low slope are not required to exclude animals from lakes and rivers.

If there is already a fence in place by 3 September 2020 that excludes animals from the waterway, the existing fence can remain in place (even if it is closer than 3 metres from the edge of the waterway).

These regulations specifically state that people who 'owns or controls stock' to comply with these rules. A number of applicants are irrigation schemes owned and operated by companies or incorporated societies, and as such do not have ownership or control or stock. In other cases, the applicants are private permit holders and do directly own or control stock. In the latter case those applicants will have direct responsibility for compliance with these regulations. Many landowners do already have fences in place along sections of waterways, and some schemes, such as IVIC, have fences along races to protect the races from stock damage and to protect water quality.

Affected landowners within the catchment are already working through what compliance with these regulations means for them and are continuing to fence relevant areas within their properties. The regulations have significant implications for many pastoral farms within the Manuherikia catchment, as many properties extensively fall within the 'low slope' mapping areas identified by the Ministry for

the Environment including large areas of dryland hill country blocks, sometimes in remote areas.[56] Compliance with these regulations will involve considerable effort and cost.

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

These regulations are directly relevant to the applications within this proposal. The regulations impose minimum requirements on the holders of certain water permits to keep and provide records of fresh water taken under the permits. All permits are required to be compliant with these regulations, and conditions of consent are included to this end. Where special circumstances exist, these are noted in the applications.

9.12 Kāi Tahu Policy Documents

9.12.1 Kāi Tahu Ki Otago Natural Resource Management Plan (2005).

The four Papatipu Rūnaka of Otago developed the Kāi Tahu Ki Otago Natural Resource Management Plan (2005). This is the principle planning document for Aukaha (formerly Kāi Tahu Ki Otago), a consultancy acting on behalf of these Rūnaka.

The kaupapa of the plan is "Ki Uta Ki Tai", "Mountains to the Sea". This emphasises holistic management of the interrelated elements within and between catchments, from the air and atmosphere to the land and the coastal environment (p11). The over-arching principles governing this document include that of manawhenua, kaitiakitaka (guardianship, care, and wise management) and the protection of Mauri, or the protection of the life-giving essence of an ecosystem.

This document identifies issues for the Otago Region as a whole, and these include damming, over-allocation of water and inefficient use of water, lack of water harvesting, long duration of water take consents (refer 5.3.2 Wai Māori General Issues). Relevant objectives and policies focus on recognition of cultural and spiritual significance of water to Kāi Tahu, protection and restoration of the mauri of all water, only granting the amount of water necessary for the proposed use of water and the efficient use of water, and to oppose further cross-mixing of waters (refer 5.3.4 Wai Māori).

Relevant policies at 5.3.4 include the following:

Water Extractions:

Policy 22.To require that resource consent applicants seek only the amount of water actually required for the purpose specified in the application.

Policy 23. To require that all water takes are metered and reported on, and information be made available upon request to Käi Tahu ki Otago.

Irrigation

[56] https://data.mfe.govt.nz/layer/104827-stock-exclusion-low-slope-land-2020/

Policy 26. To encourage those that extract water for irrigation to use the most efficient method of application. Flood irrigation, border dyke and contour techniques are less likely to be supported than spray irrigation techniques.
Policy 27.To require that a consent term for water extractions for irrigation be of 5-10 years where Kā Papatipu Rūnaka considers the method of irrigation to be inefficient to allow for an upgrade to a more efficient method

This proposal is based on an assessment of the amount of water required for the purpose of use, including by assessing irrigation needs using Aqualinc (2017). Where irrigation is inefficient, and there is sufficient reliability of supply to support conversion to efficient irrigation, this proposal puts forward conditions requiring this conversion in a manner that is consistent with Policy 27. Water takes are monitored and the data is publicly available from the ORC.

This document also includes a number of issues and associated objectives and policies for the Clutha/Mata-Au catchment, within activities addressed by this proposal are situated, including a number focused on mahika kai and biodiversity.

Particularly relevant issues identified for this catchment include that dams throughout the catchment break the continuity of flow from the mountains to the sea, and that habitats have changed as river flows have been modified (refer 10.2.2 Wai Māori Issues in the Clutha/Mata-au Catchment).

The following policies are particularly relevant to this application:

Policy 10.2.3 Wai Māori Policies in the Clutha/Mata-au Catchment:
Dams

1. *To oppose the creation of new dams within this catchment.*
2. *To require gradual rather than instantaneous ramping to control fluctuations in river flow*
3. *To require flow regimes that mimic natural flows.*
4. *To require effects associated with dam management (e.g. flow issues, changes to waterways upstream downstream, habitat changes, fish passage, inundation of values habitats, health and safety issues, siltation concerns, erosion) are addressed. Where the scale of effects is such that it cannot be addressed to the satisfaction of Kā Papatipu Rūnaka and depending on the legal status of the dam Kā Papatipu Rūnaka may advocate for either the removal of existing dams or decline consent to dam.*

Policy 10.3.3

1. *To require that wāhi tapu sites are protected from further loss or destruction*

Policy 10.4.3 Mahika Kai and Biodiversity Policies in the Clutha/Mata-au Catchment:

1. *To require native fish ingress and egress past all dams and structures.*

Damming activities within waterways included within this proposal adversely affect Kāi Tahu values and beliefs, due to the lack of connectivity in terms of ki uta ki tai, and effects on natural flow variations. However, at the same time this damming is effective in enabling the capture of water

during higher flow periods, with a resultant reduction in effects from abstraction on waterways during lower flow periods. These dams also provide consistent habitat for a range of species.

Disestablishment of the large dams would bring its own adverse effects on these values, including significant disturbance of the beds of these waterways as a result of demolishing the dams and weirs. The disestablishment of large dams may do little to increase flows during summer, given the likelihood of low natural inflows during summer (particularly in the Poolburn). This would result in increased pressure on instream values as a result of abstraction based on 'run of the river' flow, with no augmentation from stored winter water. Disestablishment of the dams would also result in significant adverse economic and social effects on the local community, as a result of a decrease in reliability of supply.

No known wāhi tapu sites are affected by this proposal.

Provision of fish passage past the existing large dams and weirs within this proposal is challenging given their scale and age. It will not be effective in providing connectivity with the sea for migratory species unless passage past the Roxburgh dam is also provided. However, where practicable and appropriate this proposal does include the provision of fish passage past instream intake structures to allow for localised migration of fish species within the catchment, and to provide for aquatic life-cycle needs within the catchment.

The flow limits proposed with this catchment based approach will protect and enhance instream flows, and will in turn provide high levels of habitat retention for indigenous freshwater species, including mahika kai species.

9.12.2 Te Runanga o Te Ngāi Tahu's Freshwater Policy

Kāi Tahu's Freshwater Policy provides an indication of the issues and values relating to freshwater management that are of particular concern to Kāi Tahu and the interested Papatipu Rūnaka.

Values identified in the Freshwater Policy that can be affected by abstraction/diversion include:

- Mauri – life-giving essence of a resource. Maintenance and enhancement of Mauri is identified as the primary management principal for Kāi Tahu. One method of doing so is the establishment of minimum flow levels that afford protection to instream values
- Kaitiakitanga – responsibility for the preservation of the integrity of valued waterways
- Rahui – places where restrictions were placed on an area or resource for a given purpose the prohibits a specific human activity.

Water quantity is one of the key issues identified for freshwater. A number of objectives and policies are included within the Freshwater Policy to ensure values of importance are protected. These emphasise the importance of protecting, maintaining and restoring the Mauri of waterways, and mahika kai, as well as the identification and protection of wahi tapu sites and the support and facilitation of Kaitiakitanga.

These values are considered in detail in the specific applications and within Section 8 of this document above. As noted in those sections, the continuation of the dams and weirs are likely to result in adverse effects on Kāi Tahu values, however, the storage of water for use during the irrigation season is also positive in that decreased reliance is placed on abstraction during summer. A range of adverse effects would also be anticipated to result on Kāi Tahu values from a discontinuation of the scheme, including significant disturbance to the beds of waterways, and also greater abstraction during lower flow periods.

A range of measures are proposed to avoid or mitigate effects, including residual and minimum flows, reduced allocation, fish screens and provision of fish passage past intake structures. These measures are intended to recognise and protect Kāi Tahu values, as outlined in Section 8.

9.13 Resource Management Act

Specific provisions of the RMA are addressed here where they have not already been addressed in early sections of this document.

9.13.1 Section 104D Particular Restrictions for Non-Complying Activities

Section 104D imposes particular restrictions for non-complying activities, as follows:

> *104D Particular restrictions for non-complying activities*
>
> *(1) Despite any decision made for the purpose of notification in relation to adverse effects, a consent authority may grant a resource consent for a non-complying activity only if it is satisfied that either—*
>
> *(a) the adverse effects of the activity on the environment (other than any effect to which section 104(3)(a)(ii) applies) will be minor; or*
>
> *(b) the application is for an activity that will not be contrary to the objectives and policies of—*
>
> *(i) the relevant plan, if there is a plan but no proposed plan in respect of the activity; or*
>
> *(ii) the relevant proposed plan, if there is a proposed plan but no relevant plan in respect of the activity; or*
>
> *(iii) both the relevant plan and the relevant proposed plan, if there is both a plan and a proposed plan in respect of the activity.*

Section 104D of the Act specifies that a resource consent for a non-complying activity must not be granted unless the proposal can meet one of two limbs. The limbs of Section 104D require either that the adverse effects on the environment will be no more than minor, or that the application is for an activity which will not be contrary to the objectives and policies of both the relevant plan and the relevant proposed plan. Only one of the two tests outlined by Section 104D need be met in order for Council to be able to assess the application under Section 104 of the Act.

As discussed in the overview of the assessment of effects, the activities associated with this proposal will have more than minor adverse effects, including because of the cumulative effects of the activities and due to the presence of the large instream dams and weirs, and impacts on connectivity, particularly in relation to Kāi Tahu values. Therefore, the proposal is unlikely to pass the first 'gateway' test of Section 104D.

This means that the applications must past the second 'gateway' test of Section 104D. This gateway test is made more complex by the presence of a both an operative plan (RPW) and a proposed plan (PC7).

This raises a critical question as to whether an application passes the second 'gateway' test if it is *only* contrary to the objectives and policies of *one* of the relevant plans, but not both; or whether it needs to ***not*** be contrary to the objectives and policies of ***both*** of the relevant plans to pass this test.

The drafting of Section 104D (resulting from the Resource Management Amendment Act 2003) introduces considerable uncertainty in this regard. Neither the Select Committee Report nor the Hansard debates identify or explain the change from Section 105(2A), (which contained this gateway test prior to the 2003 amendments) to Section 104D, and nor is there case law directly on this issue. A plain English interpretation of Section 104D is that the proposal cannot be contrary to both of the plans (operative and proposed). This also makes sense in terms of a logical outcome i.e. that parliament would be unlikely to intend that activities be declined based on a significant change in position in an untested policy (except where there are no other plans in place managing activities).

The proposal is assessed as being generally consistent overall with relevant objectives and policies of the RPW. Some of the activities within this proposal – particularly the large instream dams and weirs - are likely to be inconsistent with cultural values, however these same activities also result in positive effects on cultural values by reducing pressure on instream values during periods of low flows from the effects of abstraction.

The proposal is considered consistent with Policy 10A.2.1 of PC7 and inconsistent with Policies 10A.2.2 and 10A.2.3.

The application passes the second 'gateway' test because it is *only* inconsistent with to the objectives and policies of *one* of the relevant plans (PC7) but not both. In addition, the proposal, overall, is not considered contrary to PC7 because it achieves sustainable management and gives effect to Te Mana o Te Wai.

In summary, this proposal passes the second gateway test in Section 104D of the Act. Therefore, consideration can be given to the granting of the consent and a full assessment of the application in accordance with Section 104 can be made.

9.13.2 Section 104

Section 104 sets out those matters the consent authority must have regard to when considering a resource consent application.

> *104 Consideration of applications:*
> *(1) When considering an application for a resource consent and any submissions received, the consent authority must, subject to Part 2, have regard to–*
> *a) any actual and potential effects on the environment of allowing the activity; and*
> *ab) any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity; and*
> *b) any relevant provisions of—*
> *i. a national environmental standard:*
> *ii. other regulations:*
> *iii. a national policy statement:*
> *iv. a New Zealand coastal policy statement:*
> *v. a regional policy statement or proposed regional policy statement:*
> *vi. a plan or proposed plan; and*
> *c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.*
> *…*
> *(2A) When considering an application affected by section 124 or 165ZH(1)(c), the consent authority must have regard to the value of the investment of the existing consent holder.*

With regard to s104(1)(a), the actual and potential effects of allowing the activities proposed are considered in Section 8 of this overview and within the specific applications.

With regard to s104(1)(ab), the proposal does not include any offsets or compensation.

With regard to s104(1)(b)(i) the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 are directly relevant to these applications and are considered in earlier in this section. The Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations (2007) has been considered as part of this proposal but is not considered directly relevant.

In terms of any other regulations under s104 (1)(b)(ii) the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 and the Resource Management (Stock Exclusion) Regulations 2020 are directly relevant to this application. These are addressed as part of this proposal and applications.

With regard to s104(1)(b)(iii), the National Policy Statement on Freshwater Management (2020) is relevant to this application, and so is the National Policy Statement for Renewable Electricity Generation (2011) and have been considered.

Under s104(1)(b)(v) and (vi), the ORC Regional Policy Statement (RPS), the Partially Operative Regional Policy Statement and Proposed Regional Policy Statement (PRPS) are relevant to this application, as is the Regional Plan: Water for Otago (RPW) and the Proposed Water Permits Plan Change – Plan Change 7 (PC7) and Proposed Plan Change 8 (Water Quality) (PC8). These have all been considered in developing and assessing this proposal.

In terms of s104(2A), this application is affected by Section 124, as it involves the replacement of existing consents within the ambit set out by Section 124(1). This means that the value of the investment of the existing consent holders is a matter to which regard must be had in considering this application. This is addressed in the specific applications.

Under Section 104(1)(c) other relevant matters are considered to include Kāi Tahu policy documents relating to freshwater. These are addressed earlier in this section.

9.13.3 Section 124

The ORC has recently sought legal advice on the ability for consent holders to exercise their existing permits while applying for a replacement consent. The advice received was that the s124 right covers activities that are substantially the same as the currently authorised activity.

In essence this allows for discretion by the consent authority. This discretion should take into account the nature of older permits, many of which were brief and simple in nature. These permits would often not be linked to a place of use i.e. where irrigation was to occur, and often did not mention storage even though it may have been clearly anticipated – for example the IVIC permit to take from Upper Maori Creek only mentions 'irrigation' even though the application clearly specified that this take would feed into the Poolburn dam. Also, many of the map references for intakes are incorrect.

A number of the applications provide new map references for intake locations. In the vast majority of cases this is a correction of the original consent, not a change in activity. In other cases this is a change in the 'official' location of the take, but no actual infrastructural changes are required on the ground (refer to Sludge Channel applications). The activity that is being authorised has not been changed, the only change is to the administrative details about this activity.

A decrease in the rate or volume of water accessed is also considered to be the same activity, as permits allow for taking ***up to*** a maximum level. They do not require taking ***at*** this level.

In all of these situations, the activity is the same or substantially the same, and should be afforded the s124 right to continue operating.

9.13.4 Part 2 of RMA

For completeness, consideration is given to the ability of the proposal to meet the purpose of the Act, which is to promote sustainable management of natural and physical resources. The relevant sections are Sections 5, 6, 7 and 8 of the Act.

> ***Section 5*** *Purpose*
> *(1) The purpose of this Act is to promote the sustainable management of natural and physical resources.*
> *(2) In this Act, sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—*
> *(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
> *(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
> *(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.*

With regard to Section 5, this application is considered to achieve sustainable management, as it enables social and economic well-being, whilst meeting the requirements of Section 5(2)(a)-(c). The capture of winter water for use during summer ensures natural and physical resources will meet the needs of future generations.

The proposal safeguards life supporting capacity by providing and protecting habitat for indigenous species (as a priority) and trout and also through the augmentation of flows during summer. It considers and takes into account macro-invertebrates and periphyton and highlights the limited impact of the activities on these.

Adverse effects are avoided or mitigated by capturing water when it is most available, and through the provision of the catchment wide integrated proposals for flow limits and the water sharing agreement that will work to ensure flows stay above these limits. Water quality is anticipated to be enhanced through further conversions to spray irrigation (on the basis of long-term permits), enhancement projects and compliance with national regulations and standards.

While some adverse effects on cultural well-being will result from the continued presence of the dams and weirs within the affected waterways, dis-establishment would also be likely to impact cultural well-being, and would not resolve downstream issues caused by the Roxburgh dam in relation to fish migration.

> ***Section 6*** *Matters of national importance*

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:
(a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:
(b) the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development:
(c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:
(d) the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers:
(e) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga:
(f) the protection of historic heritage from inappropriate subdivision, use, and development:
(g) the protection of protected customary rights:
(h) the management of significant risks from natural hazards.

With regard to s6(a), the proposed activities are existing activities occurring in a catchment with a long history of water abstraction, with the large dams contributing to the natural character of the area. The use of the water on shareholder properties is compatible with the pastoral land use that dominates the area.

Effects on the natural character of rivers resulting from abstraction include the lowering of flows and resultant increases in exposed areas of riverbeds, as well as the visual impacts of intake structures situated within the waterway. These effects will be reduced through the increased retention of instream flows resulting from residual and minimum flows where proposed, and through the proposed changes to intake structures.

With regard to s6(b) the reservoirs and irrigation infrastructure associated with this application that are situated within identified outstanding natural landscapes actively contribute to these landscapes. These features are not considered to be inappropriate within these landscapes.

With regard to s6(c) it is not anticipated that the proposal will be inconsistent with the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna. No areas of significant indigenous vegetation have been identified as affected by this proposal. Significant habitats will be protected through residual flows where appropriate. Fish screens also avoid entrainment of indigenous freshwater species, and so further protect these species.

With regard to s6(d) public access is not adversely affected by this application.

With regard to s6(e), the relationship of Māori with the affected waterways is acknowledged and discussed in this application. Overall, the proposed activities are acknowledged as having adverse

effects on Kāi Tahu values including through large structures on waterways and abstraction from waterways. However, dis-establishment of the dams would also result in adverse effects on Kāi Tahu values.

With regard to s6(f), historic heritage is not affected by this application.

With regard to s6(g), there are no known protected customary rights relevant to this application.

With regard to s6(h), earthquakes or significant flood events create a risk of dam failure or downstream flooding. This has been assessed and dam safety management measures are undertaken by the applicants, and ongoing dam safety measures are proposed as appropriate.

Overall the application is considered to have recognised and provided for these matters.

> *Section 7. Other matters*
> *In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—*
> (a) *kaitiakitanga:*
> (aa) *the ethic of stewardship:*
> (b) *the efficient use and development of natural and physical resources:*
> (ba) *the efficiency of the end use of energy:*
> (c) *the maintenance and enhancement of amenity values:*
> (d) *intrinsic values of ecosystems:*
> (f) *maintenance and enhancement of the quality of the environment:*
> (g) *any finite characteristics of natural and physical resources:*
> (h) *the protection of the habitat of trout and salmon:*
> (i) *the effects of climate change:*
> (j) *the benefits to be derived from the use and development of renewable energy.*

This proposal is consistent with the requirements of Section 7 of the Act.

Kaitiakitanga and stewardship have been considered in Section 9 of this proposal and in the separate applications, and are provided for through the avoidance or mitigation of effects through a range of measures including residual and minimum flows, reduction in allocation and changes to intake set ups and fish screens.

Particular regard has been given to the efficient use and development of natural and physical resources. The capture and storage of water when it is most available, for use when it is least available is considered an efficient and effective use of natural resources. The ongoing use and maintenance of existing structures and existing schemes is also considered to be efficient. These schemes enable a wide variety of productive land uses in an area which would otherwise consist primarily of dry land

farming in area of very little summer rainfall. Conditions have been proposed which will ensure efficient use of this water where this is appropriate, based on the reliability of supply.

Amenity values have been considered in Section 8, with the conclusion that the proposed activity will have minimal adverse effects on amenity values, with positive effects on amenity values resulting from the dams.

The intrinsic values of ecosystems, and the maintenance and enhancement of the quality of the environment have also been given particular regard, as outlined in Section 8. The environment will be maintained as this application will result in the continuation of an existing activity, with known effects. Enhancement will also occur, including to intrinsic values, through the proposed mitigation measures.

The proposed activities will protect trout habitat, through the proposed continued operation and maintenance of the dams and through retention of instream flows where waterways provide habitat for trout.

The effects of climate change may not be fully felt until after the expiry of these permits, if a 35 year permit is granted. This is addressed in Section 8. A report prepared for the Central Otago District Council in 2017[57] identifies a decrease in snowpack by the end of the century as one of the key effects relevant to agriculture and instream flows in Central Otago.

This proposal supports the ongoing generation renewable energy through the retention of Falls Dam.

> *Section 8: Treaty of Waitangi*
> *In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).*

The principles of the Treaty of Waitangi have been taken into account by this proposal by acknowledging and providing for Kāi Tahu values. These values are acknowledged and taken into account in Sections 8 and Section 9.12 of this document and in the specific applications.

9.13.5 Resource Management Act (RMA) Amendment Act 2020

The Resource Management Act (RMA) Amendment Act 2020 was passed on 30 June and has introduced to the RMA a provision for farm plans (Part 9A). This development was signalled as part of the Government's freshwater management announcements in May 2020.

[57] Bodeker Scientific, August 2017, *The Past, Present and Future Climate of Central Otago: Implications for the District* prepared for Central Otago District Council

These provisions do not yet apply. An Order of Council (made by the Governor-General) is needed to state which region, district, or part of New Zealand the new requirements apply to.

Further detail will be added through regulation, including timeframes for certification and audit, criteria for the appointment of certifiers and auditors, any fees payable, and content requirements. Specific provisions of the RMA are addressed here where they have not already been addressed.

10. Consultation and Engagement

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

Most recently a series of specific pre-application meetings was held with ORC staff, ORC consultants, and applicant representatives throughout June – September 2020:

Table 8. Record of pre-application meetings

Pre-application meetings with ORC	**Date**
Manuherikia catchment general	10 June 2020
Dunstan sub-catchment	23 July 2020
Lauder sub-catchment	6 August 2020
Thomsons sub-catchment	6 August 2020
Manuherikia Irrigation Co-operative Society	13 August 2020
Falls Dam	20 August 2020
Galloway, Lower Manorburn & Little Creek	27 August 2020
Poolburn and Ida Valley	17 September 2020
Technical dam	23 September 2020
Chatto sub-catchment	24 September 2020
Catchment site visits by ORC staff and consultants	9 and 10 December 2020

Other engagement with the ORC and other stakeholders includes:

- Formal ORC consultation on limit setting for the Manuherikia catchment began in August 2016 identifying values, issues, concerns.
- ORC options consultation in March 2017, including options for how to divide the catchment up by minimum flow sites.
- Response to 3 options for draft minimum flows (25 June 2018)
- Several presentation to ORC Council committees and full council meetings including 12 September 2018 (requesting that any plan change for the Manuherikia must be fully NPSFM compliant, must include an allocation limit, and must be completed prior to 2021).
- This was further supported by another delegation and presentation to a full Council meeting on 26 September. These presentations resulted in the motion to proceed without an allocation limit failing.
- OWRUG organised and hosted two Manuherikia catchment tours for key stakeholders including the Department of Conservation, Fish and Game Otago Councillors and staff, ORC Councillors and staff, Central Otago Environment Society and iwi representatives. The first of these was held on 4 December 2018, with a subsequent tour held on 14 February 2019.
- Involvement in TAG and MRG

The two OWRUG catchment tours aimed to facilitate a shared understanding of the catchment, and sought to understand all stakeholders the values and special interests of the catchment. These were well attended and were positively received by attendees.

At the second of these tours the attendees requested that the ORC establish a technical advisory group to guide development of the Manuherikia plan change, with a planning/policy group to be established later. This request was taken up by the ORC, with the establishment of the Manuherikia Technical Advisory Group and the Manuherikia Reference Group, the latter of which was made up by representatives from the Manuherikia community and stakeholder groups.

Figure 18. Attendees at catchment tour organised by OWRUG, 4 December 2018

Figure 19. Dr N. Dunn (DOC) talking about indigenous species in Thomsons Creek on tour organised by OWRUG, 4 December 2018

Figure 20. Attendees at catchment tour organised by OWRUG, 14 February 2019

Manuherikia water users have had technical expert representation on the TAG group, and several water users have attended the MRG group. These meetings have taken a lot of time and have involved considerable input from two technical representatives for Manuherikia water users: Matt Hickey and Roger Williams. TAG meetings commenced in May 2019 and these have occurred every 4 to 6 weeks since.

Applicants and MCG have facilitated access for:

- the Department of Conservation to complete non-migratory galaxiid surveys
- Fish and Game, iwi and ORC to conduct invertebrate drift surveys
- the University of Otago to carry out invertebrate studies
- the ORC to access sites for longitudinal flow gaugings.

MCG and applicants have consulted with the Department of Conservation and Aukaha about values of importance to these stakeholders with respect to particular sub-catchments and schemes. A number of site visits with staff from these organisations has occurred.

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Appendix A: Summary of permits subject to applications within the MCG Proposed Catchment Management Approach

Table 9.Summary of all Water Permits to Take and Use Water (Subject to applications by McKeague Consulting Ltd)

Sub Catchment or Scheme	Permit number	Permit holder	Water Body
Becks	99654.V1	James Sinclair Veitch, Lynne Kathleen Fauchelle and Ian Lawerence Britten being trustees of the Sinclair Trust	Becks Creek
Dunstan	4157	James Sinclair Veitch Lynne Kathleen Fauchelle and Ian Lawerence	Woolshed Creek
Lauder	93447.V2	Clive Allen Booth and Elizabeth Claire Booth (½ share)	LauderCreek
	2000.644.V2	David Bruce Naylor and Gillian Christine Naylor	MillersCreek
	2004.788	Geoffrey Clouston	Unnamed tributary of Lauder Creek
	RM19.448.01	Geoffrey Clouston	Lauder Creek
	98122	Geoffrey Clouston	Lauder Creek
	99525	Geoffrey Clouston	Lauder Creek
	98572	George Frederick Tucker, Helen Ruth Tucker and GCA Legal Trustee	Millers Creek
	98488	George Frederick Tucker, Helen Ruth Tucker and Roger Norman Macassey	Millers Creek
	WR432B	Ian Brown and JT Moran and JE Moran	Lauder Creek
	2002.399	James William Alexander Armstrong	Unnamed tributary of Lauder Creek
	3707	James William Alexander Armstrong	Millers Creek

Sub Catchment or Scheme	Permit number	Permit holder	Water Body
	3707B	James William Alexander Armstrong	Millers Creek
	94548	Murray John Heckler	Lauder Creek
	96779	Murray John Heckler and Annette Esther Heckler	Lauder Creek
	RM18.030.02	Phada Industries Limited	Lauder Creek
	WR380B	Anthony William Gordon-Glassford and Karen Lesley Gordon-Glassford and CM Law Trustees (2010) Limited as Trustees of the Dougalston Trust (74% share) Shirley Roylance Gordon-Glassford and Brian James Gordon-Glassford as Trustees of the SR Gordon-Glassford Number 2 Family Trust (26% share)	Lauder Creek
	WR378B.V1	Shirley Roylance Gordon-Glassford and Brian James Gordon-Glassford as Trustees of the SR Gordon-Glassford Number 2 Family Trust (26% share)	Lauder Creek
	WR382B.V1	Shirley Roylance Gordon-Glassford and Brian James Gordon-Glassford as Trustees of the SR Gordon-Glassford Number 2 Family Trust (26% share)	Lauder Creek
	2002.071.V1	Thomas Matthew Moran and Jo Anne Elizabeth Moran	Clear Creek
	2001.710	Omakau Area Irrigation Company Limited	Lauder Creek
Manorburn	96167	Matangi Station Limited	Speargrass Creek

Sub Catchment or Scheme	Permit number	Permit holder	Water Body
	96519	Matangi Station Limited	Speargrass Creek
Blackstone Irrigation Company	2000.516.V1	Blackstone Irrigation Company Limited	Manuherikia River
	2000.517.V1	Blackstone Irrigation Company Limited	Manuherikia River
	RM15.063.01	Blackstone Irrigation Company Limited	Manuherikia River
Thomsons Creek	2001.719.V1	Omakau Area Irrigation Company Limited	Thomsons Creek
	2001.720.V2	Omakau Area Irrigation Company Limited	Thomsons Creek
	2001.706	Omakau Area Irrigation Company Limited	Thomsons Creek
	2000.675	Manchester Dairy Ltd (previously Coolavin Farms Ltd)	Unnamed tributary of Thomsons creek
	2001.136.V1	Kye Farming Limited	Tributary of Thomsons Creek
	2000.607	Kye Farming Limited	Tributaries of Thomsons Creek
		Manchester Dairy Ltd (previously Coolavin Farms Ltd)	Tributaries of Thomsons Creek
		Tiger Hill Farm Limited	Tributaries of Thomsons Creek
	2001.694	Tiger Hill Farm Limited	Tributary of Thomsons Creek
	2000.606	Tiger Hill Farm Limited	Tributary of Thomsons Creek
		Donald MacLean	
	2000.608	Donald MacLean	Tributaries of Thomsons Creek
	2000.688	Richard James Morgan	Two unnamed tributaries of Thomsons Creek
	93385A	Richard James Morgan and Harris Inglis Hunter	Sailor Jack Creek
	93385B	Richard James Morgan and Harris Inglis Hunter	Sailor Jack Creek

Sub Catchment or Scheme	Permit number	Permit holder	Water Body
		being trustees of the R J Morgan Family Trust	
MICS	2001.507.V1	Manuherikia Irrigation Co-operative Society Limited	Chatto Creek
	2001.505.V1	Manuherikia Irrigation Co-operative Society Limited	Manuherekia River
	2001.568.V1	Manuherikia Irrigation Co-operative Society Limited	Scrubby Gully
	2001.569.V1	Manuherikia Irrigation Co-operative Society Limited	Waipuna Springs
	2001.508.V1	Manuherikia Irrigation Co-operative Society Limited	Younghill Creek
IVIC	2001.579.V1	Ida Valley Irrigation Company Limited	Take from Manor Burn Dam (Note – Not being replaced, instead replacement of 2001.606 incorporates this activity)
	2001.606	Ida Valley Irrigation Company Limited	Manor Burn below Bonanza Weir
	2001.606	Ida Valley Irrigation Company Limited	Manor Burn Dam at Bonanza weir
	2001.604.V1	Ida Valley Irrigation Company Limited	Manor Burn
	2001.598.V1	Ida Valley Irrigation Company Limited	Moa Creek
	2001.602.V1	Ida Valley Irrigation Company Limited	Totara Creek
	2001.597	Ida Valley Irrigation Company Limited	Upper Maori Creek
	2001.596.V1	Ida Valley Irrigation Company Limited	Upper Maori Creek
	2001.581.V1	Ida Valley Irrigation Company Limited	Pool Burn
	2001.600.v1	Ida Valley Irrigation Company Limited	Pool Burn Weir

Sub Catchment or Scheme	Permit number	Permit holder	Water Body
	2001.589.v1	Ida Valley Irrigation Company Limited	Maori Creek
	2001.590.v1	Ida Valley Irrigation Company Limited	Dovedale Creek
	2001.591.v1	Ida Valley Irrigation Company Limited	Dovedale Creek
Poolburn	95A04	Almondell Farms Limited	Mainstem of Pool Burn
	2004.651	Thomas and Noeline Arthur	Mainstem of Pool Burn
	2002.585	Mary and Wesley Flannery	Unnamed tributary of Pool Burn
	95371	Brian Kitchener Thurlow, Lynne Mary Thurlow and Cook Allan Gibson Trustee Company Limited	Mainstem of Pool Burn
	2000.437	L&S Rutherford	Tributary of Pool Burn on Valley Floor
	2007.224	McKnight Farming Limited	Turleys Creek
	99460	McKnight Farming Limited	Shepherds Creek
	97116	Nicolson Farms Limited	Mainstem of Pool Burn
	97117	Nicolson Farms Limited	Mainstem of Pool Burn
	2001.941	Shane and Deborah McBreen	Mainstem of Pool Burn
	2000.033	Robert James Stewart Rutherford	Scrubby Gully
	2000.437	Thorndean Farm Ltd	Drain connected to Pool Burn
Ida Burn	95978.V1	Wainui Farming (2018) Limited	Unnamed tributary of Spain Creek
	96062.V1	Wainui Farming (2018) Limited	Unnamed tributary of Spain Creek

Table 10. Summary of all Manuherekia Discharge Permits (Subject to applications by McKeague Consulting Ltd)

Sub catchment / Scheme	Consent number	Consent holder	Water Body
IVIC	2001.621	Ida Valley Irrigation Company Limited	Discharge from Manor Burn dam to Manor Burn
	2001.585	Ida Valley Irrigation Company Limited	Discharge from Bonanza Weir to Manor Burn (excess flows)
	2001.618	Ida Valley Irrigation Company Limited	Discharge from Upper Bonanza Race to tributary of Moa Creek
	2001.583	Ida Valley Irrigation Company Limited	Discharge from Pool Burn weir
	2001.619	Ida Valley Irrigation Company Limited	Discharge from Pool Burn dam to Pool Burn
	2001.602	Ida Valley Irrigation Company Limited	Discharge from Totara creek race to tributary of the pool burn dam
	2001.604.V1	Ida Valley Irrigation Company Limited	Discharge to waterways from Manor Burn associated with conveyance to through to Syndicate Race and Crawford Hills
	New Permits	Ida Valley Irrigation Company Limited	Discharge from monitoring weir
		Ida Valley Irrigation Company Limited	Discharge from Moa Creek Weir
		Ida Valley Irrigation Company Limited	Discharge from Dip Creek Weir
		Ida Valley Irrigation Company Limited	Discharge from Totara creek weir

Table 11. Summary of Manuherekia Water Permits to Dam (Subject to applications by McKeague Consulting Ltd)

Sub catchment / Scheme	Consent number	Consent holder	Water body and structure
IVIC	2001.578	Ida Valley Irrigation Company Limited	Manor Burn Dam
	New permit	Ida Valley Irrigation Company Limited	Monitoring weir below Manor Burn Dam
	2001.584	Ida Valley Irrigation Company Limited	Bonanza Weir
	2001.582	Ida Valley Irrigation Company Limited	Moa Creek Weir
	2001.586	Ida Valley Irrigation Company Limited	Dip Creek weir
	2001.587	Ida Valley Irrigation Company Limited	Totara Creek Weir above Pool Burn dam
	2001.580	Ida Valley Irrigation Company Limited	Pool Burn dam
	2001.583	Ida Valley Irrigation Company Limited	Pool Burn Weir
	New permit	Ida Valley Irrigation Company Limited	Monitoring weir
Lauder	2004.787	Geoffrey Thomas Clouston	An unnamed tributary of Lauder Creek
	2002.387	James William Alexander	An unnamed tributary of Lauder Creek
Poolburn	2002.586	Mary and Wesley Flannery	Unnamed tributary of Pool Burn

McKeague
Consultancy Ltd

Table 12. Summary of all Water Permits for re-takes (Subject to applications by McKeague Consulting Ltd)

Sub catchment / Scheme	Consent number	Consent holder	Water Body
IVIC	2001.599.v1	Ida Valley Irrigation Company Limited	Moa Creek (below Moa Creek Weir)
	2001.604	Ida Valley Irrigation Company Limited	Retakes associated with conveyance from Manorburn to Syndicate Race and Crawford hills)
	2001.593	Ida Valley Irrigation Company Limited	Retake from German Hill Creek (after being discharged from race)
	2001.608	Ida Valley Irrigation Company Limited	Retake from Turleys Creek (after being discharged into Creek from race)
Lauder	2002.768	Central Park Limited	An un−named tributary of Lauder Creek
Manuherikia	2001.510	Manuherikia Irrigation Co-operative Society Limited	Retake from Younghill Creek
	2001.515	Manuherikia Irrigation Co-operative Society Limited	Retake from an unnamed gully
	2001.518	Manuherikia Irrigation Co-operative Society Limited	Retake from an unnamed gully
	New permit	Manuherikia Irrigation Co-operative Society Limited	Divert Brassknocker Creek into the Borough Race.

Table 13. Summary of Permits To Take and Use Water (Subject to applications by Landpro Ltd)

Sub Catchment / Scheme	Permit number	Permit holder	Water Body
Becks	94532	Cairn Hill Limited	Becks Creek
Dunstan Creek	99268	Cairn Hill Limited	Dunstan Creek
	2002.708	Omakau Area Irrigation Company Limited	Dunstan Creek
	WR4892N	Downs Irrigation Scheme (G & R Harrex, P & M Hore, Estate of R Beattie and K & D Menzies)	Dunstan Creek
Chatto Creek	2001.714.V1	Omakau Area Irrigation Company Limited	Coal Creek
	2001.716.V1	Omakau Area Irrigation Company Limited	Devonshire Creek
	2001.717.V2	Omakau Area Irrigation Company Limited	Devonshire Creek
	2001.718.V2	Omakau Area Irrigation Company Limited	Devonshire Creek
	2001.715.V1	Omakau Area Irrigation Company Limited	Scotts Creek
	2001.712.V1	Omakau Area Irrigation Company Limited	Middle Creek
	2001.713.V2	Omakau Area Irrigation Company Limited	Middle Creek
	4006.V1	Matakanui Station Limited	Neds Creek
	RM15.217.01	Matakanui Station Limited	Neds Creek
	93320	Ross William Naylor and Andrea Jane Naylor	Devonshire Creek
	RM15.127.01	Ross William Naylor and David James Gibson being trustees of the Spennymoor Trust	Devonshire Creek

Sub Catchment / Scheme	Permit number	Permit holder	Water Body
	97109	Trustees of the Longslope Farm Trust	Younghill Creek
Manor Burn	97761	Mount Campbell Station Limited	Speargrass Creek
	97762	Mount Campbell Station Limited	Little Valley Creek (West Branch)
	97763	Mount Campbell Station Limited	Bickerstaffe Creek
	97764	Mount Campbell Station Limited	Little Valley Creek West Branch & Mount Campbell Creek
	97765	Mount Campbell Station Limited	Little Valley Creek
	97832	Mount Campbell Station Limited	Tributary of Little Valley Creek
Manuherekia Mainstem	2001.702	Omakau Area Irrigation Company Limited	Manuherekia River
	2002.187	Grant Coutts, Russell Coutts and Stephen Laud Anderson being Trustees of the Barley Station (Glencoe) Trust (7/8th), and Christopher Matthew McNally and Vanessa Jane May (1/8th).	Manuherekia River
	99477	Grant Coutts, Russell Coutts and Stephen Laud Anderson being Trustees of the Barley Station (Glencoe) Trust	Manuherekia River
	2002.026	Cairn Hill Limited	Unnamed Tributary of Manuherekia River
Thomsons	RM16.030.01	Knapdale Farms Limited	Russell Creek
	95585.V1	R & A Naylor and Knapdale Farms Limited	Blackbush Creek

Sub Catchment / Scheme	Permit number	Permit holder	Water Body
	RM15.127.03 (summer)	Ross William Naylor and David James Gibson being being trustees of the Spennymoor Trust	Chandlers Creek
	RM15.127.03 (winter - all rates and volumes combined with RM15.127.02 retake permit)		

Table 14. Summary of Permits to discharge (Subject to applications by Landpro Ltd)

Sub catchment / Scheme	Consent number	Consent holder	Water body and activity
Manuherekia main stem	2002.721	Omakau Area Irrigation Company Limited	To discharge to the Manuherekia River in relation to operating Falls Dam
	2001.722	Omakau Area Irrigation Company Limited	To discharge water from the main race to the Manuherikia River for the purpose of desilting the race
	New permit	Cairn Hill Limited	To discharge water from a dam to a tributary of the Manuherekia River for the purpose of operating the dam
Thomsons Creek	2001.723	Omakau Area Irrigation Company Limited	To discharge water from the main race into Thomsons Creek

Table 15. Summary of Permits to dam (Subject to applications by Landpro Ltd)

Sub catchment / Scheme	Consent number	Consent holder	Water body and activity
Manuherekia main stem	2001.701	Omakau Area Irrigation Company Limited	To dam the Manuherekia River
	2002.025	Cairn Hill Limited	To dam a tributary of the Manuherikia River for the purpose of storage of water for irrigation

Sub catchment / Scheme	Consent number	Consent holder	Water body and activity
	New permit	Grant Coutts, Russell Coutts and Stephen Laud Anderson being Trustees of the Barley Station (Glencoe) Trust	To dam water outside of the bed of a waterbody
Thomsons Creek	New permit	R W Naylor	To dam water within Chandlers Creek (Thomsons catchment), and to dam water outside the bed of a waterbody (Chatto catchment)
Manor Burn	New permit	Mt Campbell Station Ltd	To dam water within unnamed tributaries of Speargrass Creek, and weirs at intakes on Little Valley Creek, Little Valley Creek (West Branch), Mt Campbell Creek, and Speargrass Creek, and at an unamed gully.
Chatto Creek	New permit	Matakanui Station Ltd	To dam water within Chimney Gully, and to dam water outside bed of a waterbody.

Table 16. Summary of Manuherekia Permits to re-take and supplementary takes (Subject to applications by Landpro Ltd)

Sub catchment / Scheme	Consent number	Consent holder	Water Body and Activity
Chatto	2002.681.V1	Barry John Drake	To re-take MICS water from an un-named tributary of Chatto Creek
	2001.717.V1	Omakau Area Irrigation Company Limited	To retake and use water from Devonshire Creek
	New Supplementary	Matakanui Station	To take and use water from Neds Creek as Supplementary allocation
Thomsons	RM15.127.02	Ross William Naylor and David James Gibson being being trustees of the Spennymoor Trust	To retake and use water from Chandlers Creek that was from Devonshire Creek taken under RM15.127.01

Manor Burn	New Supplementary	Mt Campbell Station Ltd	Mt Campbell Creek.

Table 17. Summary of Manuherekia Permits (Subject to applications by WSP)

Sub catchment	Consent number	Consent holder	Water body and activity
Manuherekia main stem	2001.220	Galloway Irrigation Society Incorporated	Take and use water from Manuherikia River
	New permit	Galloway Irrigation Society Incorporated	To divert water for the operation of the pump station intake. Non consumptive take.
	2001.221	Galloway Irrigation Society Incorporated	To disturb the bed of the Manuherikia for maintaining a flow of water to the intake channel for 2001.220
Manor Burn	2001.975	Galloway Irrigation Society Incorporated	Take and use water from Manor Burn
	2001.974	Galloway Irrigation Society Incorporated	Dam Manor Burn (Lower Manor Burn Dam)
	New permit	Galloway Irrigation Society Incorporated	to discharge residual flow and flood flows from the Lower Manor Burn dam
Dip Creek	2001.976	Galloway Irrigation Society Incorporated	Take and use water from Dip Creek
	2001.673	Galloway Irrigation Society Incorporated	Dam Dip Creek

Sub catchment	Consent number	Consent holder	Water body and activity
	New permit	Galloway Irrigation Society Incorporated	To discharge flood flows from the Dip Creek weir

Appendix B - Relevant Excerpt – Falls Dam Constitution

PART V

COMPANY OPERATION

25.1 Shareholders Must Comply
While the Irrigation Schemes are members of the company they shall comply with the following Clauses in this section.

25.2 Non-Exercise of Priorities
None of the members of the company shall exercise their priorities for water under their Water Rights.

25.3 Changes in Water Use

(1) In the event of a shortage of irrigation water requiring the storage from Falls Dam to supplement the water supply, the allocation of the irrigation water to the four Irrigation Schemes shall be reduced to the following water allocation volumes.

IRRIGATION SCHEME	ALLOCATION (IN HEADS)
Omakau	70
Manuherikia	80
Blackstone Hills	10
Galloway	10

(2) (a) If Galloway installs further pumping capacity to take further water from the Manuherikia source (fed by Falls Dam), Galloway may increase its allocation under sub-clause (1) above by the amount of the extra pumping capacity but with a maximum increase of five heads. Thereby giving a maximum total allocation for Galloway of 15 heads.

(b) In the event of Galloway taking this increased allocation, the shareholding of the company shall be adjusted with Galloway receiving an extra 0.6% of the total shares from the other shareholders per head of increased allocation, with that increase being transferred from the remaining shareholders on a pro-rata basis as between themselves.

(c) On a readjustment of the shareholding, the voting percentage of the directors under Clause 22.5 shall also be altered to correspond with the readjusted shareholding.

(3) The directors may by unanimous agreement alter the allocation volumes under subclause (1) but if unanimous agreement cannot be reached then the status quo remains.

25.4 Water Shortage
At a time of irrigation water shortage, the racemen for the said schemes shall oversee the supply of water at the separate scheme headworks/take off points.

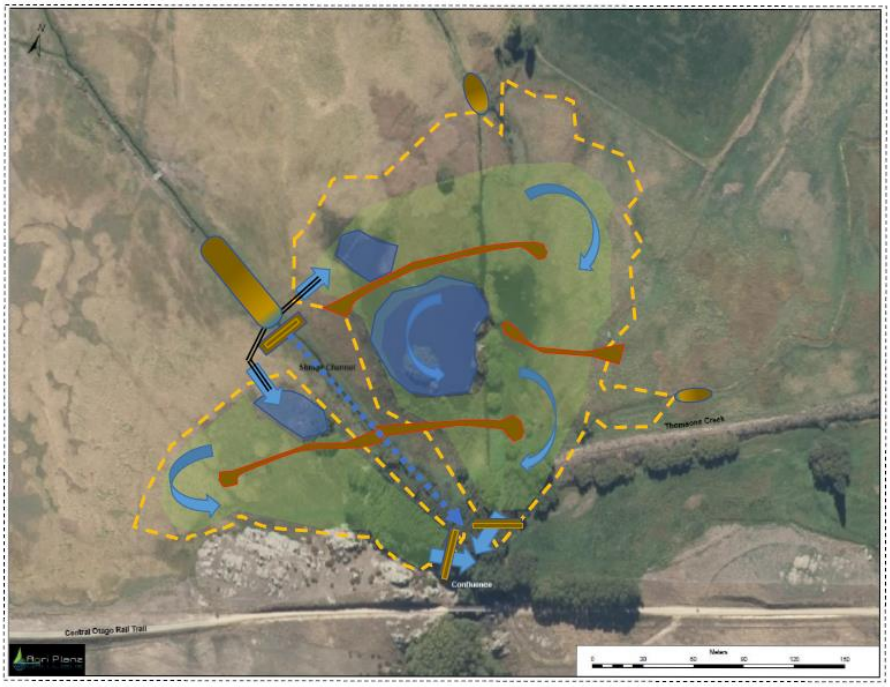
25. Rationing
When irrigation water is required to be rationed below the irrigation volumes recorded in Clause 25.3, rationing to the four irrigation schemes shall be on a pro-rata basis calculated on the allocation volumes in Clause 25.3 however the irrigation water shall be so rationed until the Falls Dam reaches a capacity of only 7 days irrigation water left. The directors, with a unanimous decision, may override this requirement for a particular situation.

Appendix C – Working, Conceptual Draft of Thomsons Creek Wetland Project

Powerpoint Presentation (11 January 2020), presented to wetland project team.

Preliminary wetland concept for Thompson's Creek

To answer initial questions, in particular, feasibility of building earthen bunds to redirect flows and reduce wind/wave fetch



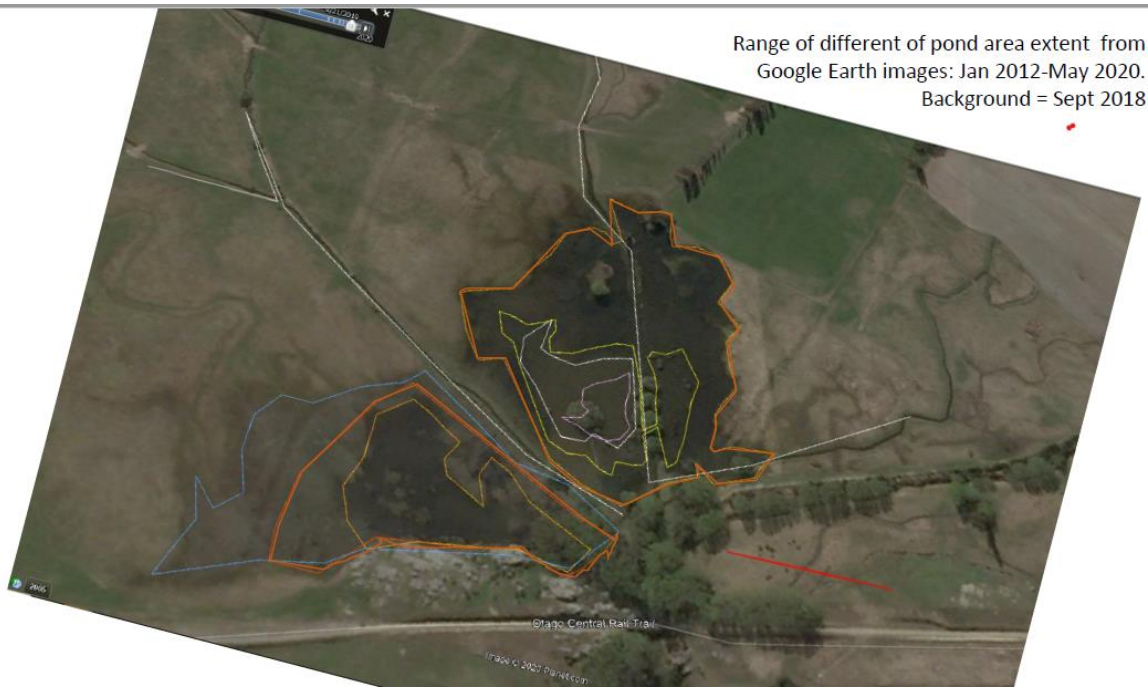
McKeague Consultancy Ltd

Design basics

- Based on generalised level of maximum extent shown (orange dashed line) the northern pond is about 3 ha and the southern one about 1.26 ha, so ~ 4.26 ha in total. Maximum extent based on historical Google Earth images over the last 18 yrs (see next page) looks to have been around 6 ha.
- Based on suggested design flow of 150 L/sec (~13,000 m^3/d) estimated nominal hydraulic residence time ~1-1.5 days when actively flowing. This is about the minimum we should be considering for reasonable treatment performance for sediment. This suggest we need to be looking at a coverage area similar to what the pond was when I visited in early Dec 2020
- Removing the willows constraining outflows from the wetland and using weirs to control the water level at the outflow from the wetland should stabilise water depths and the extent of the wetland.
- Low bunds (~0.4-0.5 m high) will reduce the wind fetch of the basin and direct flows around the wetland. They will provide additional shallow water edge habitat.
- Deeper water areas will provide open-water pond areas and dry weather refuges for aquatic life plus additional sediment storage. Hopefully these areas will become colonised by native submerged plants e.g. Milfoils (*Myriophyllum triphyllum, M. propinqum*) and Potamogeton species (e.g. *Potamogeton cheesmanii, P. ocheratus)*

Wetland planting

- Preliminary suggestions- subject to discussion with local experts. Aim is to provide main structural plantings of resilient taller species that will pre-empt weed invasion - other diverse species (including weeds) will likely colonise amongst these.
- Deeper water (+100 – -300mm)
  - Tall-growing bulrushes and sedges tolerant of flooded conditions
    - Raupō (*Typha orientalis*)
    - *Purei (Carex secta)* likely to be able to colonise these depths eventually with proper acclimatisation, but standard nursery-grown plants unlikely to survive planting direct into water greater than about 50 mm
- Shallow margins (+50 – -100 mm)
  - Medium growing species tolerant of fluctuating inundation
    - Purei (*Carex secta, C. virgata, C. diandra*)
    - *Schoenus pauiflorus*
    - Harakehe (*Phormium tenax*)
    - *Juncus* sp. (*Juncus edgariae*)
- Riparian margins (moist-dry)
  - Locally appropriate plantings for damp to dry conditions) to provide habitat and wind shelter
    - Red tussock (*Chionochloa rubra)*
    - Toetoe (*Austroderia richardii*)
    - Harakehe (*Phormium tenax*)
    - Cabbage tree (*Cordyline australis*)
    - Also see https://www.orc.govt.nz/media/8227/orc-riparian-plant-guide_central_digital.pdf



Range of different of pond area extent from Google Earth images: Jan 2012-May 2020. Background = Sept 2018