

Before Environment Canterbury Regional Council

In the matter of of the Resource Management Act 1991

And

In the matter of the Rangitata Diversion Race Consents

Statement of evidence of Helen Marr for Central South Island Fish and Game Council

12 April 2018

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Qualifications and experience

- 1 My name is Helen Marie Marr. I am a planning consultant at Perception Planning Limited, of which I am also a Director.
- 2 I have a Bachelor of Resource and Environmental Planning (specialising in Environmental Science) with Honours from Massey University. I am also a qualified RMA decision-maker under the 'Making Good Decisions' programme.
- 3 I have over seventeen years' experience in resource management and planning. My particular areas of expertise are in policy and plan development and natural resource management, particularly issues relating to biodiversity and fresh water management.
- 4 Since 2010 I have worked as a planning consultant for Perception Planning Limited, a specialist planning consultancy, of which I am also a Director. My role involves working with a range of clients, including councils, special interest groups, and developers, to assist them in creating or working with council planning documents. For example, I have recently worked with Palmerston North City Council on a review of their district plan relating to wind farms and outstanding landscapes, and with Taupō District Council scoping their district plan review.
- 5 I am currently engaged by the New Zealand Planning Institute to deliver a full day training courses on fresh water management planning under the RMA, including implementation of the National Policy Statement for Freshwater Management (**NPSFM**).
- 6 In 2015 I presented evidence to the environment court on behalf of Ngāti Rangī. My evidence focused on analysis of the relevant plan provisions and NPSFM relating to water takes and discharges for a canal system and hydro-electricity scheme in the central north island.
- 7 In 2014 I presented evidence on behalf of Eastern and Hawkes Bay Fish and Game Councils to the Board of Inquiry into the Ruataniwha Water Storage Scheme and Plan Change 6. My evidence focused on the implementation of the NPSFM and appropriate management of nutrients from farming following implementation of a large water storage and irrigation scheme.
- 8 Prior to joining Perception Planning I worked as One Plan Manager for Horizons Regional Council. I was involved in the final stages of the consultative process prior to notification of the One Plan, managed the One Plan through the formal RMA First Schedule process, and worked with other planners, technical experts, and consultants to assess the One Plan in response to submissions.

- 9 I presented expert planning evidence to the Environment Court on appeals to the One Plan, on the topics of biodiversity and water quality, including on the provisions relating to the control of farming activities.
- 10 I have also worked for the Ministry for the Environment (**MFE**) in the RMA Policy team. In this role I worked on recommendations to the Select Committee on the 2005 RMA Amendments and on the early stages of development of a number of national policy statements and national environmental standards. I have also worked for Greater Wellington Regional Council as the Policy Section Leader for the Wairarapa Division.
- 11 In preparing this evidence I have reviewed:
- (a) The reports and statements of evidence of other experts giving evidence relevant to my area of expertise, including:
 - (i) The applications and assessments of environmental effect;
 - (ii) Mr David Greaves, Planner for the applicant; and
 - (iii) Ms Natalia Ford, Planner for the Canterbury Regional Council;
 - (b) Where I have relied on the statements of technical experts in forming my conclusions I have stated that in my evidence, and in particular I have relied on the evidence of technical evidence of:
 - (i) Mr Mark Webb;
 - (ii) Mr Martin Bonnett;
 - (iii) Dr Darryl Murray Hicks;
 - (iv) Mr Alasdair Keene; and
 - (v) Dr Adrian Meredith.
- 12 I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note. This evidence has been prepared in accordance with it and I agree to comply with it. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

Scope of evidence

- 13 I have been asked by Central South Island Fish and Game Council to prepare evidence in relation to Rangitata Diversion Race Consents. This includes:

- (a) A review and analysis of the policy environment in which these consents are being considered, including relevant objectives and policies in the:
 - (i) Canterbury Land and Water Regional Plan (**CLWRP**);
 - (ii) Canterbury Regional Policy Statement (**RPS**);
 - (iii) Water Conservation Order for the Rangitata River (**WCO**); and
 - (iv) National Policy Statement for Freshwater Management (**NPSFM**);
- (b) I then analyse the water take and discharge aspects of the proposal against those policies. I do not address the construction aspects of the proposal, and as such do not form a conclusion on the overall appropriateness of the proposal *as a whole* and whether it achieves the sustainable management purpose of the Act, but I do form opinions on the 10m³/s take and the discharge of water and contaminants via the emergency and test discharges.

Executive summary

- 14 Because of the links between the WCO, the RMA and the RPS the primary policy driver for this consent is to:
- 15 Protect the significant or outstanding characteristics, features and values identified in the WCO for the Rangitata River, being:
 - (a) Amenity and intrinsic values;
 - (b) Habitat for terrestrial and aquatic organisms;
 - (c) Fishery values;
 - (d) Wild, scenic and other natural characteristics;
 - (e) Scientific and ecological values;
 - (f) Recreational, historical, spiritual or cultural characteristics; and
 - (g) Significance in accordance with tikanga Maori.
- 16 Where there are specific 'instructions' for doing this in the WCO then these must be followed. For example, the restrictions on abstraction of water. Where there is no specific instruction in the WCO, then policy in the CLWRP, RPS or NPSFM is relevant and should be considered, taking into account the formal recognition in the WCO of specific values that are nationally outstanding.

- 17 In my opinion this policy direction to protect the significant values of the Rangitata River is a clear and directive one in both the WCO and the RPS.

Other general policy direction

- 18 The RPS puts in place a policy¹ requiring the precautionary principle to be followed where the effects are unknown or uncertain.

- 19 The CLWRP sets out a number of overall objectives relevant to the proposal including:

The quality and quantity of water in fresh water bodies and their catchments is managed to safeguard the life-supporting capacity of ecosystems and ecosystem processes, including ensuring sufficient flow and quality of water to support the habitat and feeding, breeding, migratory and other behavioural requirements of indigenous species, nesting birds and, where appropriate, trout and salmon.²

Freshwater bodies and their catchments are maintained in a healthy state, including through hydrological and geomorphic processes such as flushing and opening hāpua and river mouths, flushing algal and weed growth, and transporting sediment.³

The significant indigenous biodiversity values of rivers, wetlands and hāpua are protected.⁴

Natural character values of freshwater bodies, including braided rivers and their margins, wetlands, hāpua and coastal lagoons, are protected.⁵

Fish passage

- 20 The WCO requires that the passage of salmon shall not be adversely affected⁶ - this restriction would apply to takes and discharges as well as structures, in my opinion. Intake sites must provide for fish exclusion or fish bypass to prevent fish from being lost from the waters⁷.

- 21 The current BAFF fish screen is contrary to the WCO. Mr Webb's evidence is that between 38,300 and 191,600 juvenile salmon have been diverted into the

¹ RPS Policy 7.3.12

² LWRP Objective 3.8

³ LWRP Objective 3.16

⁴ LWRP Objective 3.17

⁵ LWRP Objective 3.19

⁶ WCO cl10(1)

⁷ WCO cl10(2)

RDR canals and lost to the river each year since 2008⁸. The current BAFF fish screen is not preventing fish from being lost from the protected waters of the Rangitata.

- 22 There appears to be agreement among the experts that the rotary fish screen application if appropriately designed, installed and operated, including the maintenance of appropriate water velocities will achieve the required level of fish exclusion. The experts recommend amended consent conditions to ensure that the fish screen operates as anticipated.

Natural character

- 23 Natural character of rivers includes natural elements, processes and patterns (including, biophysical, ecological, geological, geomorphological and morphological aspects), and the natural movement of water and sediment including hydrological and fluvial processes⁹. Natural character may be adversely affected by both reductions in quantity and reductions in quality.
- 24 Natural character should be preserved where natural character values are high and maintained where natural character values are modified but highly valued¹⁰. Rangitata is not identified as a river of 'high naturalness' in Section 12 of the CLWRP. The Rangitata is however identified as an outstanding waterbody, by virtue of the WCO which recognises its outstanding values, characteristics and features, including its scientific value as a braided river.
- 25 Evidence from Dr Hicks shows that the current level of water abstraction is already adversely affecting the gravel carrying capacity and morphological characteristics of the river. In his opinion the proposed 10m³/s take will exacerbate and continue this effect. In my opinion this does not maintain the highly valued values of the Rangitata which contribute to its natural character. Dr Hicks and others also raise concerns about the increase in deposited sediment resulting from reduced sediment carrying capacity as a consequence of the proposed 10m³/s take. This will impact natural ecological processes, reducing life supporting capacity of the river.

Water allocation

- 26 The WCO sets out specific restrictions on abstraction of water – these must be met. The WCO order does not set out an 'upper limit' for extraction above a

⁸ Mr Webb evidence in chief paragraph 88

⁹ Natural character is not defined in the RMA or any of the CRC policy documents, but it is set out in the NPSFM National Values tables under 'natural form and character'.

¹⁰ RPS Policy 7.3.1

flow of 110m³/s ¹¹. Extraction above 110m³/s should be assessed as to whether it will negatively impact on the values identified in the WCO.

- 27 In addition to the overall goals for water quantity in the objectives of the CLWRP set out above, the CLWRP focuses on allocating efficiently, within the limits set in the Plan. In the case of the Rangitata the Plan refers to the WCO to provide the limits.
- 28 The RPS also provides guidance on appropriate setting of abstraction limits. This includes:
- (a) Protect the flows, freshes and flow variability required to safeguard the life-supporting capacity, mauri, ecosystem processes and indigenous species including their associated ecosystems and protect the natural character values of fresh water bodies in the catchment, including any flows required to transport sediment, to open the river mouth, or to flush coastal lagoons¹²; and
 - (b) Support any flow requirements needed to maintain water quality in the catchment¹³.
- 29 The proposed 10m³/s take will have impacts that are inconsistent with the freshwater objectives set in the CLWRP and the directions set in the WCO. These effects include morphological changes, changes in natural character, and effects on ecosystem processes. This amounts to over-allocation of the waterbody, which the NPSFM directs is to be avoided in every decision of the Regional Council¹⁴.
- 30 Policies in the NPSFM, RPS and CLWRP also require the use and reticulation of water to be efficient – however it is not possible to assess this for the additional take as no information about the proposed use of the additional water over and above that required for existing consented uses has been provided.

Water quality

- 31 The proposal includes discharge of water and entrained sediment from emergency discharges and testing the emergency discharge infrastructure. There are also concerns that taking of water at high flows will reduce velocity and lead to more deposition of sediment in the bed of the Rangitata.

¹¹ Abstraction 'may' be allowed up to a maximum of all the water in the river above 110m³/s

¹² RPS Policy 7.3.4(c)

¹³ 7.3.4(f)

¹⁴ NPSFM Policy B5

- 32 The WCO includes standards on water quality relating to discharges setting standards for; maximum temperature, pH standards, undesirable plant growth, E. coli and dissolved oxygen.
- 33 RPS guidance on water quality requires water quality standards to be set with a goal to (amongst other things) “maintaining life supporting capacity, ecosystem processes and indigenous species including their associated ecosystems, and natural character of the water body”¹⁵.
- 34 Where water quality is below those standards, then additional allocation of water for abstraction and additional discharge of contaminants that might further adversely affect the water quality should be avoided¹⁶.
- 35 The relevant standards for discharges into the Rangitata are contained in the CLWRP Schedule 5 (and apply after reasonable mixing). Relevant standards for sediment are:
- (a) Visual Clarity % change shall not exceed 20%; and
 - (b) Colour % change shall not exceed 5 Munsell units.
- 36 The current proposal for the ‘test’ emergency discharges contains a discharge regime aimed at reducing the visibility of sediment discharges, however there is no provision in the current proposal for testing of water quality of the discharged water prior to it being released, or to monitor the receiving waters of the Rangitata to ensure the WCO, RPS and CLWRP standards are being met. In the absence of a measuring, monitoring and adaptive management regime it is not possible to be confident that the planned testing discharges are appropriate.

Evidence

The Rangitata River is an outstanding water body which is to be protected

- 37 The Water Conservation (Rangitata River) Order 2006 (**WCO**) recognises the outstanding characteristics, features and values of the Rangitata River and its headwaters (the Clyde River and the Havelock River) as the following:
- (a) Amenity and intrinsic values;
 - (b) Habitat for terrestrial and aquatic organisms;
 - (c) Fishery values;

¹⁵ RPS Policy 7.3.6(1)(a)

¹⁶ RPS Policy 7.3.6(3)

- (d) Wild, scenic and other natural characteristics;
 - (e) Scientific and ecological values;
 - (f) Recreational, historical, spiritual or cultural characteristics; and
 - (g) Significance in accordance with tikanga Maori.
- 38 In particular, of relevance to this proposal, the Rangitata River potentially affected by this proposal is recognised in Schedule 2 of the WCO as 'protected waters'. The area downstream of the Klondyke water level recorder is recognised in Schedule 2 (items 4 and 5) for the following outstanding characteristics or features:
- (a) Salmon fishing;
 - (b) Salmon passage;
 - (c) Water based recreation;
 - (d) Significance for Ngai Tahu;
 - (e) Aquatic Macroinvertebrates;
 - (f) Scientific – braided River;
 - (g) Aquatic bird habitat (Arundel to coast); and
 - (h) Spiritual and cultural values (Arundel to coast).
- 39 The WCO contains specific conditions and restrictions to protect these outstanding characteristics, features and values, and I discuss these in more detail in sections on natural character, water quality and water quantity later in this evidence.
- 40 The NPSFM directs that the significant values of outstanding freshwater bodies are to be protected¹⁷. The NPSFM defines outstanding freshwater body as water bodies identified in a RPS or Regional Plan (**RP**) as having outstanding values.
- 41 Consistent with the policy directive in the NPSFM, the Canterbury RPS¹⁸ contains Policy 7.3.3 to:

¹⁷ Objective A2(a) and B4

¹⁸ The Canterbury RPS became Operative in January 2013, which pre-dates the NPSFM 2014. However the NPSFM 2011 contained a similar objective, to protect the quality of outstanding freshwater bodies

... identify and protect areas of significant indigenous vegetation and significant habitats, sites of significant cultural value, wetlands, lakes and lagoons/hapua, and other outstanding water bodies; ...

- 42 The RPS does not contain a definition of outstanding water bodies.
- 43 The CLWRP no longer¹⁹ identifies or defines 'outstanding water body' or includes any specific provisions to identify or protect outstanding waterbodies. Because of this, in my opinion the CLWRP does not give effect to the requirements in the RPS, and the NPSFM to identify and protect outstanding waterbodies.
- 44 Given this 'incomplete coverage' in the CLWRP I rely on the provisions of the 'higher order' documents – in this case the RPS and the WCO with respect to outstanding waterbodies. The RPS directs the protection of outstanding waterbodies, and the WCO defines the Rangitata as an outstanding waterbody and sets out its outstanding characteristics and values for direction on the protection of the Rangitata as an outstanding waterbody.
- 45 Section 104(3)(c)(i) and section 217(2) of the Act state that a resource consent may not be granted contrary to a WCO.
- 46 In my opinion, based on my analysis of the Act, the Rangitata WCO, and the Canterbury RPS, the primary policy directive for the Rangitata River is to protect the significant or outstanding characteristics, features and values identified in the WCO for the Rangitata River. Where specific directions are given in the WCO these must be followed. Where no specific directions are given, management of the resource should result in the identified outstanding values being protected.
- 47 Evidence on some of the outstanding angling values of the Rangitata is given by Mr Mark Webb. He outlines the particular conditions, flows and times that are particularly valued for salmon angling, and passage of juvenile salmon, in particular. Mr Webb's evidence sets out some of the particular management parameters that must be provided for, for the outstanding angling and salmon passage values of the Rangitata to be protected. Mr Webb identifies that 89% of the salmon angling on the Rangitata takes place below the RDR intake. Mr Webb identifies both flow and water clarity as key factors in the success of salmon fishing in this area. Mr Webb identifies that preferred flows for fishing

¹⁹ Prior to Plan Change 4 becoming operative the CLWRP did include a definition of outstanding waterbody, which included all waterbodies subject to water conservation orders. It also included in Objective 3.14 the requirement to maintain and improve outstanding waterbodies. Plan Change 4 removed the definition of outstanding waterbody, and replaced reference to outstanding waterbodies in Objective 3.14 with reference to 'high naturalness waterbodies'. The Rangitata is not defined as a 'high naturalness' waterbody.

the Rangitata downstream of the RDR intake²⁰ are those that correspond with flows recorded at Klondyke of between 70 and 110m³/s²¹ and that anglers show a strong preference for water with turbidity between 10 NTU and 30NTU²².

- 48 Mr Webb raises concern that the application over estimates the benefit for angling amenity of the proposed take based on flows. In Mr Webb's opinion any impact or benefit of the take on salmon fishing needs to consider the impact of flows, reduced clarity and reduced flow variability overall.
- 49 Mr Webb identifies that increased turbidity will occur in the otherwise optimum fishing flow range because the river is actually in 'flood' at this time (although actual water levels are lower below the RDR intake, because of the volume of water extracted), and naturally carrying extra sediment, and so the river will be too turbid for good angling²³. Therefore, any increased time the river will be at optimum flow ranges for angling will not actually increase the angling amenity of the river, because the water will be too 'dirty' for good angling.
- 50 Mr Webb identifies changes to the flow variability, where the river will be held at flows of approximately 77m³/s for extended periods. This reduces the flow variability. The effect on flow variability is shown in the evidence of Mr Keane, who demonstrates both the reductions in 'freshes' and the increased length of time the river is held at 77 m³/s²⁴. Flow variability is important for salmon passage, because it is the flow peaking and then receding that triggers both the movement of fish up the river²⁵. Dr Meredith also identifies this effect of reduced flow variability on cues to migration of both sports fish and native fish, in particular he identifies that lower flows may cause the river temperature to increase, and that frequent small 'freshes' reduce temperature, triggering upstream migrations²⁶.
- 51 The Rangitata WCO recognises the outstanding characteristics and features of the Rangitata, as including amenity, water-based recreation, salmon fishing and salmon passage. Mr Webb and Dr Meredith have identified potential for adverse effects on the salmon passage and no benefit for salmon fishing values.

²⁰ Mr Webb evidence in chief paragraph 59

²¹ Although actual flows in the river will be lower than this, because of the abstraction at the RDR intake

²² Mr Webb evidence in chief paragraph 64

²³ Mr Mr Webb evidence in chief paragraph 66

²⁴ Mr Keane evidence in chief graphs in figure 1

²⁵ Mr Webb evidence in chief paragraph 67

²⁶ Dr Meredith s42A memo 13 April 2017 and 22 February 2018 page 6

52 I also discuss below, from paragraph 69, the effects of changes in sediment carrying capacity and the resulting effects of increased deposited sediment and ongoing cumulative changes to the morphology and character of the river. In my opinion, the types of effects described by Mr Webb, Dr Hicks, Mr Keane and Dr Meredith on the outstanding values of the Rangitata is not consistent with the requirement in the RPS to protect outstanding waterbodies. In my opinion, it is also contrary to the purpose of the WCO to recognise and sustain the values of the waters which are considered outstanding, including in particular the amenity, scientific – braided river, and water-based recreation values of the river.

Natural character

53 The natural character of rivers includes natural elements, processes and patterns (including, biophysical, ecological, geological, geomorphological and morphological aspects), and the natural movement of water and sediment including hydrological and fluvial processes and the colour and clarity of the water²⁷. Natural character may be adversely affected by both reductions in quantity and reductions in quality.

54 The Act requires that all decisions recognise and provide for the preservation of the natural character of rivers and their margins²⁸ and the protection of them from inappropriate subdivision, use and development as a matter of national importance. The RPS requires that natural character should be preserved where natural character values are high and maintained where natural character values are modified but highly valued²⁹. The CLWRP directs that the 'natural character values of freshwater bodies, including braided rivers...are protected.'³⁰ This objective also forms one of the 'freshwater objectives' that I discuss more in the following section of my evidence. The Rangitata River is recognised in the CLWRP as an 'Alpine River' and the CLWRP recognises alpine rivers as 'ecologically unique having very high natural character, recreation or wilderness values³¹. I recognise the Rangitata is not identified as a river of 'high naturalness' in Section 12 of the CLWRP, but I don't believe this should exclude it from the provisions requiring natural character to be protected or preserved. This is because, in particular, naturalness is not the same thing as natural character. Natural character is made of many factors in addition to

²⁷ Natural character is not defined in the RMA or any of the CRC policy documents, but it is set out in the NPSFM National Values tables under 'natural form and character'.

²⁸ RMA s6(a)

²⁹ RPS Policy 7.3.1

³⁰ CLWRP Objective 3.19

³¹ CLWRP section 1.2.1 page 10

things being simply in their 'natural state' and natural character is to be preserved and protected no matter where on the continuum of naturalness it exists. The Rangitata is identified as an outstanding waterbody, by virtue of the WCO which recognises its outstanding values, characteristics and features, including its scientific value as a braided river.

- 55 Dr Meredith identifies that the Rangitata is already subject to a high degree of hydrological alteration, compared to its natural state³². Evidence from Dr Hicks shows that the current level of water abstraction is already adversely affecting the gravel carrying capacity and morphological characteristics of the river. In his opinion the proposed 10m³/s take will exacerbate and continue this effect. This is set out in more detail in later sections of my evidence. In my opinion this does not maintain the highly valued values, including the outstanding scientific value of the braided river bed, and its significance to water-based recreation users of the river. Dr Hicks and others also raise concerns about the increase in deposited sediment resulting from reduced sediment carrying capacity as a consequence of the proposed 10m³/s take. This will impact natural ecological processes, reducing life supporting capacity of the river. This is set out in more detail in later sections of my evidence.
- 56 These morphological and ecological characteristics and movement of water and sediment including hydrological and fluvial processes, along with the other values of the Rangitata all contribute to the natural character of the of the Rangitata. In my opinion, as a result of the identified changes to morphological and sediment carrying capacity identified above, including ongoing and exacerbated effects, and consequential effects on the ecological, fishery and water-based recreation uses of the river, the natural character of the Rangitata will not be preserved or protected by the additional 10m³/s take being sought by the applicant.

Management within limits and avoiding over allocation

- 57 The Rangitata River is in the Alpine River sub-region as set out in the CLWRP. This is not identified in the Council's NPSFM Implementation Programme as a sub-region for which a plan change to give effect to the NPSFM is pending. I assume from this that the council considers it has already given effect to the NPSFM for this sub-region. As stated earlier, I disagree with that assessment in relation to the requirement to protect outstanding waterbodies. In my opinion the CLWRP does not give effect to this requirement in the NPSFM (or that same requirement in the RPS).

³² Dr Meredith s42A memo page 3

- 58 However, setting that aside, and focusing on freshwater objectives and limits, this means, in terms of the NPSFM, that the CLWRP contains water quality and quantity freshwater objectives and limits. The NPSFM directs³³ that resource use (both takes and discharges) must be managed within these limits. Over-allocation is to be avoided³⁴.
- 59 Over-allocation occurs when either limits are exceeded or where freshwater objectives are not being achieved³⁵. The freshwater objectives for the Canterbury Region are set out in the objectives³⁶ and Policies 4-1 to 4-6 of the CLWRP³⁷. I have included a complete set of these relevant provisions in Appendix 1. I have highlighted those that I consider to be most relevant to this proposal in the sections below relating to the CLWRP provisions. Collectively these state 'the intended environmental outcome' for the relevant areas. These objectives and policies (which form the fresh water objectives for the region) must be achieved in order to avoid over-allocation, as required by the NPSFM.

Management within limits and avoiding over allocation – water quantity

- 60 Specific water quantity limits are set in the sub-region chapters of the CLWRP. The relevant chapter for the Rangitata is Chapter 12 – Canterbury Alpine. This chapter states that the Environmental Flows and Allocation Limits for the Rangitata are those in the WCO.
- 61 The WCO sets specific flow regimes for flows less than 110m³/s. Above 110m³/s the WCO states that the maximum take may be extended to 33m³/s plus any naturally occurring flow in excess of 110m³/s³⁸. I disagree with the statement by Mr Greaves in his evidence³⁹ that the proposed 10m³/s take complies with the WCO because it does not breach the specific numeric flow regime. In my opinion while there is no specific flow regime guidance in the WCO for how much water should be allocated above 110m³/s, there are other directives in the WCO (and the RPS and CLWRP as I discuss later) which do place an upper 'limit' on how much water could be allocated. The WCO contains direction relevant to the allocation of flows, to ensure that:

³³ Policy A3(a) in relation to water quality and Objective B2 and Policy B5 in relation to water quantity

³⁴ Objective B2

³⁵ Definition of 'over-allocation' in NPSFM, which is restated in CLWRP section 2.5

³⁶ In section 3 LWRP

³⁷ LWRP Section 2.4

³⁸ WCO clause 9(3)(d)

³⁹ Mr Greaves evidence in chief para 6.55

- (a) There is no material alteration of the channel cross-section, meandering pattern or braided river channel characteristics of the river⁴⁰; and
 - (b) The activity does not adversely affect the passage of salmon⁴¹.
- 62 The purpose of the WCO is to protect the identified values. In my opinion this means that when deciding whether or not to allow taking of flows above 110m³/s the decision maker should ensure that the identified outstanding characteristics and values are protected.
- 63 In my opinion these directives in the WCO form a type of 'limit' in that the amount of water taken above 110m³/s must be restricted to that which:
- (a) Provides for the protection of the identified outstanding values and characteristics;
 - (b) Does not affect the passage of salmon; and
 - (c) Does not materially alter the channel form of the river.
- 64 In order to avoid over allocation, these 'limits' I describe above must be complied with.
- 65 The second arm of the definition of over-allocation in the NPSFM is that the relevant 'fresh water objectives' of the CLWRP must also be achieved in order to avoid over-allocation. Achievement of these freshwater objectives will assist in defining the maximum amount of water that can be taken out of the Rangitata above flows of 110m³/s. The fresh water objectives in the CLWRP are set in the objectives in Section 3 and Policies 4.1 – 4.6⁴². All the freshwater objectives are set out in Appendix 1, however of particular relevance to identifying maximum rates of water abstraction from the Rangitata are the following⁴³:
- (a) Regionally significant infrastructure is enabled and resilient and positively contributes to economic, cultural and social wellbeing through efficient and effective operation... and upgrading⁴⁴;

⁴⁰ WCO clause 9(1)

⁴¹ WCO clause 10(1)

⁴² Section 2.4 CLWRP

⁴³ All the freshwater objectives must be achieved, in this smaller list I have only identified the freshwater objectives that are most useful in determining what the appropriate amount of water to allocate above flows of 110m³/s is.

⁴⁴ LWRP Objective 3.3

- (b) A regional network of water storage and distribution facilities provides for sustainable, efficient and multiple uses of water⁴⁵;
- (c) The quality and quantity of water is managed to safeguard the life supporting capacity of ecosystems and ecosystem process, including ensuring sufficient flow and quality of water to support the habitat and feeding, breeding, migratory and other behaviour requirements of indigenous species, nesting birds and where appropriate, trout and salmon⁴⁶;
- (d) Freshwater bodies and their catchments are maintained in a healthy state, including through hydrological and geomorphic processes such as flushing and opening hāpua and river mouths, flushing algal and weed growth, and transporting sediment⁴⁷;
- (e) Natural character values of freshwater bodies, including braided rivers and their margins, wetlands, hāpua and coastal lagoons, are protected⁴⁸;
- (f) Surface water bodies are managed so that... (e) the passage for migratory fish species is maintained unless restrictions are required to protect populations of native fish; and ... (g) variability of flow, including floods and freshes, is maintained to avoid prolonged “flat-lining” of rivers; to facilitate fish passage; and to mobilise bed material⁴⁹; and
- (g) The harvest and storage of water for new irrigation or new hydro-electricity generation schemes contribute to or do not frustrate the attainment of the regional concept for water harvest, storage and distribution set out in Schedule 16 or a water quantity limit set in sections 6 to 15⁵⁰.

66 Several freshwater objectives also require water takes to be efficient, necessary and reasonable, and require efficient distribution and use of abstracted water⁵¹. The issue of efficiency is discussed in more detail from paragraph 90 below.

⁴⁵ LWRP Objective 3.4

⁴⁶ LWRP Objective 3.8

⁴⁷ LWRP Objective 3.16

⁴⁸ LWRP Objective 3.19

⁴⁹ Policy 4.3

⁵⁰ 4.8

⁵¹ See for example Objectives 3.9 3.10

- 67 In my opinion, the freshwater objectives I have identified above both encourage efficient sustainable irrigation schemes, and set what I consider to be 'environmental bottom lines' that must be achieved when providing for water takes for irrigation schemes. Those environmental freshwater objectives that must be achieved in my view may be summarised as follows:
- (a) Safeguarding life supporting capacity of ecosystems and ecosystem process;
 - (b) Ensuring sufficient flow for habitat of fish and birds; and
 - (c) Maintaining a healthy state of the river, including hydrological and geomorphic processes such as flushing and transporting sediment and bed material and maintaining flow variability.
- 68 Mr Webb and Mr Keane note that there will be a 'flat lining' effect of the proposed 10m³/s take, keeping the river at 77m³/s for extended periods of time. This not only affects the outstanding salmon angling passage values identified in the WCO, but also does not achieve the freshwater objective to 'maintain flow variability, including floods and freshes to facilitate fish passage'⁵².
- 69 Dr Hicks and Dr Meredith⁵³ identify that the proposed 10m³/s take will reduce the sediment carrying capacity of the river, and that this will likely result in increased deposition of fine sediment in slow flowing areas of the river⁵⁴, particularly between flushing flows⁵⁵. Dr Meredith describes the effects that this deposited sediment may have on smothering river bed biota and potentially providing a supply of phosphorus which may contribute to periphyton growth, particularly the growth of toxic phormidium algal blooms⁵⁶. Dr Meredith also explains the effect the growth of periphyton, particularly didymo and cyanobacteria such as phormidium can have on sports fisheries and mahinga kai, potentially making fish inedible⁵⁷.
- 70 Based on this evidence, I am of the opinion that the increased deposition of sediment will have adverse effects on the life supporting capacity of ecosystems and ecosystems processes, and will not achieve the freshwater objectives of

⁵² Policy 4.3(g)

⁵³ Dr Hicks evidence in chief para 29 and Dr Meredith s42A memo page 5

⁵⁴ Described by Dr Hicks as 'dead zones' in his evidence

⁵⁵ Dr Hicks evidence para 29

⁵⁶ Dr Meredith s42A page 5

⁵⁷ Dr Meredith s42A page 5 and 6

the LWRP⁵⁸ or the objectives of the NPSFM associated with that. Dr Hicks does identify some potential ways to mitigate the risk of increases in deposited sediment, including by only taking the 10m³/s on a rising stage of a flood (not on the receding stages), but that this would need to be carefully monitored and part of what I consider to be an 'adaptive management regime' to monitor effects and adjust practice to avoid particular effects. I also note that this particular measure may not address effects of the reduced flow on other outstanding values in the river, such as angling, water-based recreation and the passage of fish.

- 71 Dr Hicks also discusses the impact of the proposed 10m³/s take on the bedload transport and channel morphology of the Rangitata. He expects that the currently consented takes would already be significantly reducing the river's gravel transport capacity, leading to changes in the morphology of the river⁵⁹. In particular an increase in aggradation and decrease in variability in channel elevations. He notes this effect has already been observed by river users, with adverse effects on white water paddling amenity. He concludes that the additional take will contribute to the current morphological change⁶⁰ – which I interpret as meaning it will contribute to a cumulative adverse effect on river morphology, with resulting adverse effects on river use and amenity.
- 72 In my opinion this type of ongoing and potentially exacerbated change in river morphology and character is inconsistent with the freshwater objectives of the CLWRP to protect the natural character of river, including braided rivers⁶¹, and with the requirement of section 6(a) of the Act to preserve the natural character of rivers. This change is also inconsistent with the WCO direction to protect the water-based recreation and scientific – braided river values of the Rangitata.
- 73 I acknowledge that some of the freshwater objectives will be met; for example in relation to providing for irrigation and storage. However, in my opinion, it would not be appropriate to refer to some objectives being met and other environmental bottom line type objectives not being met and to say 'on balance' the freshwater objectives are achieved. In my opinion the definition of over-allocation in the NPSFM requires that all the freshwater objectives are achieved (not just some) to be able to conclude that over-allocation has been avoided as required by Policy B5.

⁵⁸ I discuss the numeric freshwater objectives for deposited sediment in paragraph 84 of this evidence

⁵⁹ Dr Hicks evidence in chief paragraph 63

⁶⁰ Dr Hicks evidence in chief paragraph 63

⁶¹ LWRP Objective 3.19

- 74 In my opinion that means that abstracting an additional 10m³/s as sought in the current proposal:
- (a) Would not be consistent with the WCO; and
 - (b) Would not achieve the freshwater objectives of the CLWRP, particularly the ones setting 'environmental bottom lines'; and so
 - (c) Would amount to 'over-allocation' of the Rangitata River; and as a result
 - (d) Would not achieve the requirement of the NPSFM to avoid over-allocation.

Managing within limits – water quantity – cumulative effects

- 75 The AEE states that the flood flow take of 10m³/s will reduce the number and frequency of flushing flows, and increase the mean accrual time (for algal growth)⁶². The AEE draws conclusions on the nature and severity of these effects by comparing the take with flood flows to the 'existing environment', the river with other consented takes already taken out. On this basis the AEE and Dr Ryder⁶³ concludes that the changes in flushing flows are 'minor'. I understand that this is the correct way to assess *individual effects* of the individual take – that is to compare them to the existing impacted environment. However, I do not consider that this approach appropriately considers *cumulative effects*. In my opinion relying solely on an assessment of *individual effects* ignores the combined effect of multiple takes.
- 76 If a cumulative effects assessment is not undertaken, consecutive takes of water will be assessed individually, and the 'big picture' of the overall impact of all the takes may never be assessed. This is in my view why the NPSFM requires regional councils to set overall allocation limits, and to manage takes within those limits; to address cumulative adverse effects and avoid significant effects occurring through 'a thousand cuts'. Unfortunately, in this case the regional council has not set specific numeric limits for takes above 110m³ (the maximum addressed specifically in the WCO).
- 77 Dr Meredith has identified the issue of cumulative effects of takes in his evidence⁶⁴. In particular he identifies a combination of nutrient inputs, lower flows and sediment deposition together adversely affecting the health of the river. Mr Webb also raises similar concerns, that current impacts on the river

⁶² Dr Ryder evidence in chief paragraph 32

⁶³ Dr Ryder evidence in chief from paragraph 31

⁶⁴ Dr Meredith s42A memo page 4

make the river less resilient to other, new, influences⁶⁵. I agree with Dr Meredith that the cumulative effects of the additional 10m³/s take in addition to the current effects on the river, and the combination of different effects on life supporting capacity, flushing flows and the accumulation of sediment and algae needs to be assessed and understood in order to analyse whether or not the freshwater objectives of the plan in relation to these matters are achieved or not. In the presence of uncertainty on this topic, I am of the opinion that RPS Policy 7.3.12 becomes relevant, that is, if the effects are unknown or uncertain (in this case the cumulative effects) a precautionary approach ought to be taken.

Management within limits – water quality

- 78 I understand that the applicants no longer seek consent to discharge water and sediment when the pond is cleaned, or 'sluiced'. However, in addition to construction based discharges, I also understand that they still intend to discharge water from the storage pond, to the Rangitata River in either emergency conditions (the dam over tops or is at risk of failure), or to test the emergency discharge and gates at regular intervals⁶⁶ and that these scenarios are all intended to be captured under the resource consent for emergency discharges (CRC182541).
- 79 The WCO includes restrictions on the granting of any consent for a discharge if it will breach the standards set in the WCO. The WCO includes standards for;
- (a) Temperature (both seasonal maximums and maximum change);
 - (b) pH;
 - (c) Undesirable plant growth (including bacteria and/or fungal slime and periphyton;
 - (d) E coli (and other contaminants that make the water unsuitable for contact recreation); and
 - (e) Dissolved oxygen.
- 80 Standards for other contaminants, such as sediment, are not included in the WCO, so in my view it is appropriate to turn to the other policy documents for direction on appropriate standards to manage those contaminants.

⁶⁵ Mr Webb evidence in chief, paragraph 78

⁶⁶ The discharge scenarios are set out in Dr Ryders evidence page 38

- 81 The RPS requires water quality standards to be set with a goal to (amongst other things) “maintaining life supporting capacity, ecosystem processes and indigenous species including their associated ecosystems, and natural character of the water body”⁶⁷.
- 82 Where water quality is below those standards, then additional allocation of water for abstraction and additional discharge of contaminants that might further adversely affect the water quality should be avoided⁶⁸. The RPS does not contain numeric standards.
- 83 The CLWRP sets a number of narrative freshwater objectives relating to water quality. Of particular relevance is objective 3.8 which requires that:
- The quality and quantity of water in fresh water bodies and their catchments is managed to safeguard the life-supporting capacity of ecosystems and ecosystem processes, including ensuring sufficient flow and quality of water to support the habitat and feeding, breeding, migratory and other behavioural requirements of indigenous species, nesting birds and, where appropriate, trout and salmon.
- 84 The CLWRP also sets numeric water quality freshwater objectives in Table 1. These numeric outcomes must be met by 2030⁶⁹. In my opinion that also means that the standard should not be exceeded if it is not already, and that it should not be further exceeded if it is already. To do so would be inconsistent with the other freshwater objectives of the CLWRP and the RPS, and amount to over-allocation as defined in the NPSFM, as I have set out above. The numeric freshwater objectives are:
- (a) Minimum QMCI score of 6;
 - (b) Minimum dissolved oxygen 90%;
 - (c) Maximum temperature 20 degrees;
 - (d) Periphyton measurements;
 - (e) Maximum deposited sediment cover of bed 10%; and
 - (f) Good suitability for contact recreation.

⁶⁷ RPS Policy 7.3.6(1)(a)

⁶⁸ RPS Policy 7.3.6(3)

⁶⁹ CLWRP Strategic Policy 4.1 which is also freshwater objective as required by the NPSFM

- 85 The CLWRP also sets some numeric standards, that apply to discharges into the Rangitata, in the CLWRP Schedule 5 (these apply after reasonable mixing). Schedule 5 contains relevant standards for sediment which are:
- (a) Visual Clarity % change shall not exceed 20%; and
 - (b) Colour % change shall not exceed 5 Munsell units.
- 86 In my opinion where specific numeric standards are set in the WCO or the CLWRP these must not be exceeded. To do so would be contrary to the WCO and would frustrate the achievement of the freshwater objectives of the CLWRP and result in, or continue over-allocation and would not achieve the direction set in the NPSFM⁷⁰.
- 87 I have discussed earlier in this evidence the likelihood of increases in deposited sediment as a result of the increased 10m³/s take. Whether that would also cause the deposited sediment numeric freshwater objective identified above to be breached is unknown. However, as I will discuss, deposited sediment in the river should at a minimum be monitored.
- 88 Water stored in the pond will not be the same quality as that in the river when it is discharged. The AEE identifies⁷¹ potential changes in water quality of the stored water, including deoxygenation, changes in temperature, build-up of E-coli and growth of algae.
- 89 The potential discharge of these contaminants with stored water into the Rangitata must be managed to ensure that the standards set in the WCO are not breached⁷² when that water is discharged into the river. Consent conditions must include a condition that requires these standards to be met for every discharge event, at least the planned 'test' discharges. The current draft of consent conditions in Mr Greaves evidence does not include any conditions requiring monitoring of the emergency or 'test' discharges, of either the source water quality from the dam or the effect of that discharge on the river. This is inappropriate and inconsistent with the WCO in my opinion. Any consent to discharge to the Rangitata should have consent conditions that require the discharge to comply with the water quality standards in the WCO and in the LWRP, and have a management and monitoring regime for each discharge that ensures that those standards are met.

⁷⁰ NPSFM Policy A3

⁷¹ Dr Ryder evidence in chief discusses this from paragraph 85

⁷² A resource consent may not be granted if it is inconsistent with a WCO104(3)(c)(i) and section 217(2)

Efficient use and allocation

- 90 Improving and maximising the efficient allocation and efficient use of water is an objective of the NPSFM⁷³. The NPSFM requires regional councils to provide for efficient allocation and consider this when deciding on policies for the transfer of water permits, and to specifically state methods to encourage the efficient use of water.
- 91 The WCO is silent on the topic of efficiency of allocation.
- 92 The RPS sets out one objective and four policies directing the efficient allocation and efficient use of water. I have set these out in Appendix 2. In summary, these provisions require that:
- (a) The water taken is no more than necessary for the proposed use⁷⁴; and
 - (b) The reticulation and application method is highly or increasingly, efficient⁷⁵.
- 93 The CLWRP gives effect to these policies by identifying efficient use⁷⁶, storage and distribution⁷⁷ of water within allocation limits as among the objectives and freshwater objectives of the plan.
- 94 The CLWRP then includes a specific section containing policies on the efficient use of water⁷⁸. These policies require that:
- (a) The amount of water taken must be reasonable for the intended use⁷⁹; and
 - (b) That a maximum annual volume for water used for irrigation should be defined⁸⁰ using a reasonable use test⁸¹; including

⁷³ NPSFM Objective B3

⁷⁴ RPS policy 7.3.8(3)

⁷⁵ RPS Policy 7.3.8(1) and (2) and 7.3.11(2)

⁷⁶ CLWRP Objective 3.4, 3.9 and 3.10

⁷⁷ CLWRP Objective 3.4 and 3.10

⁷⁸ Section 4 CLWRP

⁷⁹ CLWRP Policy 4.65

⁸⁰ CLWRP Policy 4.66

⁸¹ CLWRP Schedule 10

- (c) That if the water is for irrigation, an application efficiency of 80% must be achieved⁸².

- 95 I also understand that there are two aspects to the 'use' component of the resource consent applications. The first is the application to use water for 'storage'. I understand this seeks to ensure that water taken under the existing water take consents (and the additional 10m³/s being sought) can be stored in the pond, before being used. The second aspect is the 'use' of the additional 10 m³/s water take currently being sought.
- 96 The use consents applied for to allow for the 'storage' before use are largely seen as an administrative issue, and arguably are not technically required. However, the issue of storage of water raises a related issue. The existing take and use is changing from a 'run of river' take and a 'run of river' bundle of uses to a 'take to storage' and a 'use from storage' bundle of consents. The addition of a substantial storage facility into the scheme changes the way water is available for the consented uses. This is acknowledged and seen as a positive outcome by the applicants. It is unclear however, whether their existing bundle of take and use consents anticipates and is able to adequately deal with the effects of more water being taken and made available more often as a result of the storage facility.
- 97 This type of change is anticipated by CLWRP Policy 4.53, which sets out a series of requirements for takes which change from 'run of river' to 'take to storage' in order to deal with the potential adverse effects. Dr Meredith describes these potential adverse effects can arise because abstractions with high volume storage ponds *"have a high capacity to maintain high levels of abstraction sustained continuously over long periods of time. Therefore, they have a higher capacity to 'regulate flows' and maintain flows at minimum flow condition for significant durations of time."* Policy 4.53 sets out ways to mitigate those potential adverse effects, including setting maximum seasonal and annual takes in addition to instantaneous take conditions. This can help address the potential for taking more water more often under the instantaneous limit.
- 98 I understand that the bundle of take and use consents currently held is complex and that makes addressing this issue difficult. It is in my opinion made more difficult by the decision by the applicant to separate the take and storage components of the consent from the (already held) use components, when these two matters are intrinsically linked.

⁸² CLWRP Policy 4.68

- 99 However, despite the complexity and despite the current separation of take and use issues, I do not think it is appropriate to fail to consider the issues of maximum seasonal and annual takes when deciding whether or not to grant these consents. I therefore disagree with Mr Greaves analysis of the relevance of the efficient and reasonable use policies in his evidence⁸³. The direction in the NPSFM, RPS and CLWRP is clear and directive on this matter, and it would in my opinion be inappropriate to not consider and be consistent with that direction.
- 100 The second aspect of the 'use' component of the consents, is the consent to 'use' the 10m³/s take currently being sought. The application seeks to use this water for storage, irrigation, stock water and hydro-electricity generation. The proposed consent conditions only propose one condition related to the use of this water⁸⁴ – which is that it be used for the same purposes specified in the currently held use consents⁸⁵. This does not limit the amount of water taken and used to that able to be used under the current consents, it also allows for replacement consents that potentially could allow for more water to be used. I believe this leaves the actual use of the water somewhat uncertain, and this should be remedied by consent conditions (or review of consent conditions) that address the end use and the efficiency of that end use.
- 101 However, I also understand (and set out below) that the amount of water applied for to be taken and stored, under the existing water take consents and the 10m³/s additional take now sought, is *in excess* of that that could be used under the existing resource consents to use water for irrigation, stock water and hydroelectricity generation.
- 102 A proportion of the 53Mm3 of water proposed to be stored at any one time can be used to irrigate up to 94,486 ha of land, provide stock water and hydroelectric power generation under the consent currently held by Rangitata Diversion Race Management Ltd (**RDRML**)⁸⁶. I refer to this portion of water as 'water with consented use'. The rest of the water proposed to be taken and stored (and in particular, a portion of the additional 10m³/s being sought) cannot be used by the Scheme under the current water use permits. This is up to 20,000,000m³⁸⁷ or as low as 4Mm3 of the potential storage volume depending on which water demand modelling scenario is relied upon. I note that Mr Curry

⁸³ Mr Greaves evidence from para 6.50

⁸⁴ I also the title of this consent in the proposed conditions is incorrect in that it only refers to 'abstraction' of water, not the take and use.

⁸⁵ Proposed condition 4 CRC170654

⁸⁶ Consent CRC121664 which expires in 2019

⁸⁷ Mr Veendrick evidence in chief paragraph 7.15

in his evidence discusses a minimum of 6Mm3 of storage being available for other uses⁸⁸. I refer to this portion of water as the 'extra' water.

- 103 There is no explanation or analysis of how this 'extra' water will be used. There is general description in the applications and in the evidence⁸⁹ about 'future uses', 'future irrigation', 'managed aquifer recharge' (**MAR**), or 'targeted stream augmentation' (**TSA**), and an acknowledgement that resource consent could be sought for these activities in the future.
- 104 There is no analysis of what the 'extra' water will be used for, the efficiency or necessity of that future use. It is impossible to know if the extra water proposed to be taken is reasonable for the intended use and whether it will be used efficiently or not, when the intended use is not known. The applicants state that use of the 'extra water' may be the subject of a future resource consent to use the water in the future. Without knowing the intended use and the efficiency of the intended use, it is not possible to consider whether the take and allocation of the water is efficient or not. This assessment is necessary to achieve the objectives of the NPSFM and to be consistent with the RPS and CLWRP. I do not consider it is appropriate to leave consideration of reasonable and efficient use to another time, when a future permit for the use of water is applied for and considered.
- 105 A related issue is the situation if no specific use permit for the 'extra' water is ever applied for. If the water is allocated to RDR, but not used, or only partially used, then that water is not available to other users who may wish to use it appropriately and efficiently. I consider the allocation in those circumstances to RDR in those circumstances is inefficient.
- 106 This later concern could be ameliorated by appropriate consent conditions, that provide for the take of water beyond what can be used under current water use permits (the 'extra' water) to only commence once a consent for the use of the water has been granted, and for the consent to take the extra water to lapse if a resource consent to use the extra water is not sought and granted within a reasonable period of time, say 5 years. A condition limiting the total take to 'storage' to an annual or seasonal maximum as required by CLWRP Policy 4.53 would also help to address this. This would allow the extra water allocated to RDR to remain in or be returned to the river (and enable a consent to be sought for the take of that water by another person if that is appropriate), if that water is not used by RDR within a reasonable period of time.

⁸⁸ Mr Curry evidence in chief paragraph 6.11

⁸⁹ Mr Curry evidence in chief paragraph 5.15

107 In this regard the lapse period of 15 years sought by the applicant is in my opinion inappropriate. It allows RDR to 'sit' on allocation and not utilise it. This would not amount to efficient allocation of water.

S104D assessment

108 As set out above, I consider that the adverse effects of the activity, in relation to the effects of the take of the 10m³/s and the potential effects of the emergency test discharges via the emergency canal are more than minor.

109 I also set out above, that I consider the effects of the 10m³/s take are contrary to the objectives and policies of the LWRP. The effects of the emergency test discharges may also be, if they are not managed and monitored appropriately.

110 I therefore conclude that the proposed 10m³/s take does not pass the s104D gateway. In this respect I agree with the conclusion of Ms Ford, and disagree with the conclusion of Mr Greaves.

111 For completeness, I also conclude that the proposal to take 10m³/s is inconsistent with the WCO and should not be granted in accordance with 104(3)(c)(i) and section 217(2). The proposed 10m³/s take will not protect the outstanding salmon angling and salmon passage values of the Rangitata. It will contribute to the ongoing change and loss of the scientific - braided river values which in turn will adversely affect other values on the river, including water-based recreation. Increases in deposited sediment will adversely affect the life-supporting capacity of the river and as a result the macroinvertebrate habitat of the Rangitata will not be protected. The test emergency discharges may also be inconsistent with the WCO in their current form, unless water quality standards consistent with the WCO are imposed as consent conditions, along with a suitable monitoring and adaptive management regime.

Helen Marie Marr

Planner

Perception Planning

12 April

Appendix 1

Freshwater Objectives as set out in the Canterbury Land and Water Regional Plan

Provision number	Provision contents	Relevant to these applications?
Objectives		
3.1	Land and water are managed as integrated natural resources to recognise and enable Ngāi Tahu culture, traditions, customary uses and relationships with land and water.	✓
3.2	Water management applies the ethic of ki uta ki tai – from the mountains to the sea – and land and water are managed as integrated natural resources recognising the connectivity between surface water and groundwater, and between fresh water, land and the coast.	✓
3.3	Nationally and regionally significant infrastructure is enabled and is resilient and positively contributes to economic, cultural and social wellbeing through its efficient and effective operation, on-going maintenance, repair, development and upgrading.	✓
3.4	A regional network of water storage and distribution facilities provides for sustainable, efficient and multiple use of water.	✓
3.5	Land uses continue to develop and change in response to socio-economic and community demand.	
3.6	Water is recognised as essential to all life and is respected for its intrinsic values.	✓
3.7	Fresh water is managed prudently as a shared resource with many in-stream and out-ofstream values.	✓
3.8	The quality and quantity of water in fresh water bodies and their catchments is managed to safeguard the life-supporting capacity of ecosystems and ecosystem processes, including ensuring sufficient flow and quality of water to support the habitat and feeding, breeding, migratory and other behavioural requirements of	✓

	indigenous species, nesting birds and, where appropriate, trout and salmon.	
3.8A	High quality fresh water is available to meet actual and reasonably foreseeable needs for community drinking water supplies.	
3.9	Abstracted water is shown to be necessary and reasonable for its intended use and any water that is abstracted is used efficiently.	✓
3.10	Water is available for sustainable abstraction or use to support social and economic activities and social and economic benefits are maximised by the efficient storage, distribution and use of the water made available within the allocation limits or management regimes which are set in this Plan.	✓
3.11	Water is recognised as an enabler of the economic and social wellbeing of the region.	✓
3.12	When setting and managing within limits, regard is had to community outcomes for water quality and quantity.	✓
3.13	Groundwater resources remain a sustainable source of high quality water which is available for abstraction while supporting base flows or levels in surface water bodies, springs and wetlands and avoiding salt-water intrusion.	
3.14	High naturalness fresh water bodies and hāpua and their margins are maintained in a healthy state or are improved where degraded.	✓
3.15	Those parts of lakes and rivers that are valued by the community for recreation are suitable for contact recreation.	✓
3.16	Freshwater bodies and their catchments are maintained in a healthy state, including through hydrological and geomorphic processes such as flushing and opening hāpua and river mouths, flushing algal and weed growth, and transporting sediment.	✓
3.17	The significant indigenous biodiversity values of rivers, wetlands and hāpua are protected.	✓

3.18	Wetlands that contribute to cultural and community values, biodiversity, water quality, mahinga kai, water cleansing and flood mitigation are maintained.	
3.19	Natural character values of freshwater bodies, including braided rivers and their margins, wetlands, hāpua and coastal lagoons, are protected.	✓
3.20	Gravel in riverbeds is extracted to maintain floodway capacity and to provide resources for building and construction and maintenance, while maintaining the natural character of braided rivers and not adversely affecting water quality, ecosystems or their habitats, access to or the quality of mahinga kai or causing or exacerbating erosion.	
3.21	The diversion of water, erection, placement or failure of structures, the removal of gravel or other alteration of the bed of a lake or river or the removal of vegetation or natural defences against water does not exacerbate the risk of flooding or erosion of land or damage to structures.	✓
3.22	The effectiveness of both man-made natural hazard protection infrastructure, and wetlands and hāpua as natural water retention areas, is maintained to reduce the risk of and effects from natural hazards, including those arising from seismic activity and climate change.	
3.23	Soils are healthy and productive, and human-induced erosion and contamination are minimised.	
3.24	All activities operate at good environmental practice or better to optimise efficient resource use and protect the region's fresh water resources from quality and quantity degradation.	✓
Policies		
4.1	Lakes, rivers, wetlands and aquifers will meet the fresh water outcomes set in Sections 6 to 15 within the specified timeframes. If outcomes have not been established for a catchment, then each type of lake, river or aquifer should meet the outcomes set out in Table 1 by 2030.	✓

4.2	The management of lakes, rivers, wetlands and aquifers will take account of the fresh water outcomes, water quantity limits and the individual and cumulative effects of land uses, discharges and abstractions will meet the water quality limits set in Sections 6 to 15 or Schedule 8 and the individual and cumulative effects of abstractions will meet the water quantity limits in Sections 6 to 15.	✓
4.3	Surface water bodies are managed so that:	✓
	(a) toxin producing cyanobacteria do not render rivers or lakes unsuitable for recreation or human and animal drinking-water;	✓
	(b) fish are not rendered unsuitable for human consumption by contaminants;	✓
	(c) the natural colour of the water in a river is not altered;	✓
	(d) the natural frequency of hāpua, coastal lakes, lagoons and river openings is not altered;	✓
	(e) the passage for migratory fish species is maintained unless restrictions are required to protect populations of native fish;	✓
	(f) reaches of rivers are not induced to run dry, thereby maintaining the natural continuity of river flow from source to sea,	✓
	(g) variability of flow, including floods and freshes, is maintained to avoid prolonged “flat-lining” of rivers; to facilitate fish passage; and to mobilise bed material; and	✓
	(h) the exercise of customary uses and values is supported.	✓
4.4	Groundwater is managed so that:	
	(a) groundwater abstractions do not cause a continuing long-term decline in mean annual groundwater levels or artesian pressures;	
	(b) the individual and cumulative rate, duration and volume of water pumped from bores is controlled so as to	

	prevent seawater contamination;	
	(c) the rate and duration of individual abstractions is controlled to ensure that individually or cumulatively, localised pressure reversal does not result in the downward movement of contaminants;	
	(d) in any location where an overall upwards pressure gradient exists, restrict the taking of groundwater so that at all times the overall upward pressure difference is maintained between any one aquifer and the next overlying aquifer;	
	(e) overall water quality in aquifers does not decline; and	
	(f) the exercise of customary uses and values is supported.	
4.5	Water is managed through the setting of limits to safeguard the life-supporting capacity of ecosystems, support customary uses, and provide for group or community drinking-water supplies and stock water, as a first priority and to meet the needs of people and communities for water for irrigation, hydro-electricity generation and other economic activities and to maintain river flows and lake levels needed for recreational activities, as a second priority.	✓
4.6	In high naturalness water bodies listed in Sections 6 to 15, the damming, diverting or taking of water is limited to that for individual or community stock or drinking-water and water for the operation and maintenance of existing infrastructure.	

Appendix 2

RPS efficiency Policies

RPS Objective	7.2.2	<p>Parallel processes for managing fresh water</p> <p>Abstraction of water and the development of water infrastructure in the region occurs in parallel with:</p> <p>(1) improvements in the efficiency with which water is allocated for abstraction, the way it is abstracted and conveyed, and its application or use;</p> <p>(2) the maintenance of water quality where it is of a high standard and the improvement of water quality in catchments where it is degraded; and</p> <p>(3) the restoration or enhancement of degraded fresh water bodies and their surroundings.</p>
Policy	7.3.8	<p>Efficient allocation and use of fresh water</p> <p>To improve efficiency in the allocation and use of fresh water by:</p> <p>(1) ensuring the infrastructure used to reticulate and apply water is highly efficient relative to the nature of the activity, for any new take or use of water;</p> <p>(2) ensuring the infrastructure used to reticulate and apply water is increasingly efficient (where not already highly efficient) for existing takes and uses of water,</p> <p>having regard to:</p> <p>(a) the nature of the activity;</p> <p>(b) the benefits and costs of achieving a higher level of efficiency;</p> <p>(c) practicable options to implement any change required; and</p> <p>(d) the physical environment in which the activity takes place.</p> <p>(3) ensuring the quantities of water allocated, as part of a water allocation regime or by grant of water permit, is no</p>

		<p>more than is necessary for the proposed use for all activities, including urban uses and municipal supplies;</p> <p>(4) recognising the importance of reliability in supply for irrigation;</p> <p>(5) recognising the potential for efficiency in infrastructure through combined uses of water and energy efficient infrastructure; and</p> <p>(6) promoting the integrated management and use of fresh water resources within or across catchments.</p>
Policy	7.3.10	<p>Harvest & storage of fresh water</p> <p>To recognise the potential benefits of harvesting and storing surface water for:</p> <p>(1) improving the reliability of irrigation water and therefore efficiency of use;</p> <p>(2) improving the storage potential and generation output of hydro-electricity generation activities;</p> <p>(3) increasing the irrigated land area in Canterbury;</p> <p>(4) providing resilience to the impacts of climate change on the productivity and economy of Canterbury;</p> <p>(5) reducing pressure on surface water bodies, especially foothill and lowland streams, during periods of low flow;</p> <p>and facilitate the conversion of resource consents to abstract water under 'run of river' conditions to takes to storage, where this can be done under conditions which maintain or enhance the surface water body.</p>
Policy	7.3.11	<p>Existing activities and infrastructure</p> <p>In relation to existing activities and infrastructure:</p> <p>(1) to recognise and provide for the continuation of existing hydro-electricity generation and irrigation schemes, and other activities which involve substantial investment in infrastructure; but</p> <p>(2) require improvements in water use efficiency and</p>

		reductions in adverse environmental effects of these activities, where appropriate.
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