BEFORE THE ENVIRONMENT COURT

Decision No. [2010] NZEnvC 403

IN THE MATTER of appeals under Section 120 of the Resource Management Act 1991

BETWEEN

DIRECTOR-GENERAL OF CONSERVATION (NELSON-MARLBOROUGH CONSERVANCY)
(ENV-2007-CHC-000162)
(ENV-2008-000128)

NEW ZEALAND AND NELSON MARLBOROUGH FISH & GAME COUNCILS
(ENV-2007-CHC-000166)

ORMOND AQUACULTURE LIMITED & NEW ZEALAND CLEARWATER CRAYFISH (KOURA) LIMITED
(ENV-2007-CHC-000167)

TRUSTPOWER LIMITED
(ENV-2008-CHC-000217)

SAVE THE WAIRAU INCORPORATED
(ENV-2008-CHC-000222)

JET BOATING NEW ZEALAND INCORPORATED
(ENV-2008-CHC-000223)

Appellants

AND

MARLBOROUGH DISTRICT COUNCIL

Respondent

Hearing at: Blenheim on 2 – 5, 9 – 13, 23 – 26 November 2009, 30 November – 4 December 2009, 7 – 11 December 2009, 8 – 12 February 2010, 10 – 14 May 2010

Court: Environment Judge R G Whiting
Environment Commissioner A J Sutherland
Environment Commissioner J R Mills
Environment Commissioner H M Beaumont

THE SEAL OF THE ENVIRONMENT COURT NEW ZEALAND

Counsel: Mr C N Whata and Ms C N Sheard for TrustPower Limited
Ms M Radich, Mr P Radich and Mr J Maassen for Marlborough District Council
Ms M A Baker for New Zealand and Nelson-Marlborough Fish & Game Councils
Mr M Hardy-Jones for save the Wairau River Incorporated and Jet Boating New Zealand Incorporated
Mr D J Clark for J & J McLauchlan (s 274 party)
Ms A J Parr for self (s 274 party)
Ms P Doyle for self (s 274 party)
Mr S Browning for Green Party Kaikoura Electorate Branch (s 274 party)

Date of Decision:

DECISION OF THE ENVIRONMENT COURT

A. The appeal of TrustPower is allowed to the extent that the decision of the Marlborough District Council is upheld save for the amendments to the conditions of consent as contained in Appendix 2.

B. The remaining appeals are dismissed save for the amendments to the conditions of consent as contained in Appendix 2.

C. Because of the complexities of the conditions of consent the Marlborough District council is given 30 days to apply for the correction of any errors.

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1 BACKGROUND

1.1 Introduction

[1] The Wairau River in Marlborough is the northern-most braided river on the east coast of the South Island. TrustPower Limited (**TrustPower**) presently operates three power stations within tributaries of the Wairau River in Marlborough – one on the Waihopai River, and two (Argyle and Wairau) on the Branch River. TrustPower now has plans to expand its generating capacity in Marlborough with the development of six new small hydro stations within the Wairau Valley. If it proceeds, this development will take place in the lower Wairau Valley, extending along the south-bank of the Wairau River from approximately 1km upstream of the Branch-Wairau River confluence, downstream to just above the Waihopai-Wairau River confluence.

[2] The scheme will involve the extraction of up to $40m^3/s$ of water from the Wairau River, combining this with the water take from the existing Branch Scheme, and directing this flow along a constructed canal (approx 49km in length) built along the true right of the Wairau River. The canal will direct this water through six small power stations, to a final discharge point into the Wairau River. The water not passed through the canal is to be returned to the Wairau River through the existing, but enlarged, Wairau Power Station tailrace.

[3] TrustPower has sought a suite of consents including land use consents, water permit consents, and discharge consents, to do all that is necessary to construct and operate the proposed hydro-electric scheme.

[4] The Marlborough District Council (**the Council**) convened a hearings panel of two independent commissioners, former District Court Judge Anthony Willy and Mr Max Barber, and an elected councillor from the Council, Miss Jill Bunting, to hear and determine the application. The Council Hearing was convened in Blenheim over a number of months between June and December 2006. The Hearing Panel issued an Interim Decision in June 2007 and a Final Decision in July 2008.

[5] The decision granted the suite of over 200 resource consents necessary to construct the proposed hydro-electric scheme, subject to a detailed set of conditions.

[6] From the Council's decisions, a number of appeals were lodged, including one from TrustPower in respect of some of the conditions of consent. A number of s 274 parties joined the proceedings in support of one or other of the appeals. A number of the appellants (including TrustPower) settled their appeals by varying the conditions of consent. During the hearing before us, TrustPower further varied the proposed conditions of consent to address matters raised during the hearing.

1.2 Applications and Council decision

[7] The initial application was lodged with the Council on 14 July 2005. The application was publicly notified on 8 September 2005. Submissions totalling 1,442 were received in response to the notification - 527 submissions were received in support, and 903 received in opposition. This application covered the majority of the consents required for the construction, operation and maintenance of the proposed scheme.

[8] More particularly, the application sought a number of land use consents, water and discharge permits. The land use consents relate to land disturbances, excavation and gravel extraction, location and building of roads, tracks and bridges, the intake structure, pipes, penstocks and associated buildings. It also sought consent to clear and restore existing vegetation, create visitor facilities, and generally to do all that is necessary to construct, operate, and maintain the proposed scheme.

[9] The application also sought consent to take water by means of an intake, divert it to the canal and discharge it back to the Wairau River with the outlet located above its confluence with the Waihopai River, having first utilised it for electricity generation purposes. In addition, the application sought water and discharge permits necessary to construct, operate and maintain the proposed scheme. We set out below some of the various types of consents required:

- To take groundwater from aquifers during construction of the scheme;
- To discharge water and contaminants to land and water during construction of the scheme;
- To discharge water and contaminants to water-bodies during construction of the scheme;

- To take groundwater from aquifers to canals and impoundments during operation of the scheme;
- To use groundwater/water for electricity generation during operation of the scheme;
- To discharge water from the canals and impoundments to land during operation of the scheme;
- To construct and use open channels;
- To construct and use on-ground pipes;
- To install temporary migration barriers and waterbodies;
- To impound water behind the temporary migration barriers;
- To install temporary coffer dams;
- To impound water behind the temporary coffer dams;
- To install temporary bank armouring (if necessary);
- To take water from waterbodies for wetland remediation;
- To discharge water to wetlands for remediation purposes;
- All other consents necessary to enable the scheme.

[10] A second application was lodged with the Council on 20 March 2006. TrustPower considered it necessary to lodge this application as a result of additional information sought by the Council pursuant to s92 of the Act. This relates to groundwater activities including extraction and discharge rates.

[11] The hearing panel issued an interim decision in June 2007 granting consent subject to the final formulation of consent conditions. The interim decision assessed the merits of the scheme and concluded that in light of the proposed mitigation and remedial measures, the scheme would have no more than minor effects on the environment. The decision also assessed the proposal against the relevant objectives and policies of the Wairau Awatere Resource Management Plan (**the Plan**) and it was concluded by the hearings panel that the scheme would not be contrary to the provisions of that Plan.

[12] The key findings recorded in the interim decision are as follows:

[a] The effects individually, collectively and accumulatively, are not more than minor (*Interim Decision, Section Q, at [2]*);

[b] Unanticipated effects which are more than minor can be managed (*Interim Decision, Section D, at [3]*);

[c] The proposal will confer tangible benefits both locally and nationally (*Interim Decision, Section B, at [5]*);

[d] The proposal will not be contrary to the objectives and policies of the Plan (*Interim Decision, Section P, at [91]*);

[e] A grant of consent will not be contrary to the objectives, policies or provisions of the Plan (*Interim Decision, Section Q, at [13]*);

[f] In terms of permitted baseline, although the proposal is not permitted, a number of the effects are contemplated and provided for in the Plan either at a scale predicted by the experts or of a similar nature but smaller in scale (*Interim Decision, Section P, at [43]*).

[13] The Interim Decision released in June 2007 established a process for receiving and considering further submissions on the form and content of the conditions of consent. The submissions on conditions closed in August 2007. TrustPower was then afforded the right of reply to the submissions made regarding conditions. TrustPower's response was provided on 22 November 2007.

[14] In July 2008, the commissioners issued a final decision dealing specifically with matters raised at the conditions hearing, and set out the conditions that were to be imposed.

[15] The decision includes an array of 184 consent conditions. These were organised as follows:

- General conditions
- Pre-construction conditions (largely preparation of management plans)

- Post-construction conditions (largely implementation of the management plans and separate, stand-alone conditions)
- Review conditions

[16] Many of the conditions rely on or refer to management plans as part of what the decision called an adaptive management approach. Some 14 separate management plans are required by way of consent conditions.[1] These are:

1. Construction Management Plan (conditions 14, 15, 16, 38, 39 and 64);
2. Traffic Management Plan (conditions 26 and 85);
3. Landscaping Plan (conditions 27 and 87);
4. Health and Safety Plan (condition 28);
5. Groundwater Management Plan (conditions 46, 47, 106 and 168);
6. Aquatic Ecology Management Plan (conditions 55, 112 and 170);
7. Pre-scheme Black-fronted Tern and Black-billed Gull Research Monitoring and Predator Control Plan (condition 58);
8. Vegetation Management Plan (conditions 61, 117 and 179);
9. Walker's Stream Management Plan (condition 42);
10. Vegetation Protection and Restoration Plan (condition 62);
11. Vegetation Monitoring Plan (condition 63);
12. Dam Safety and Surveillance Management Plan (condition 91);
13. Post-scheme Predator Management Plan (conditions 113 and 173);

[1] Condition numbers quoted as in the Council's decision

14. Post-scheme Black-fronted Tern Monitoring Plan and Black-billed Gull Research, Monitoring and Predator Control Plan (conditions 115 and 175).

[17] Each management plan must be approved by Council and the Vegetation Management Plan requires the approval of the Department of Conservation (**DOC**), the New Zealand Fish & Game Council (**Fish and Game**) and The Royal Forest & Bird Protection Society of New Zealand (**Forest and Bird**). Most management plans also require an expert peer review. Many of the conditions provide specific guidance on the content of management plans. Condition 6 allows for any amendments to any management plans, and condition 7 allows for the review of any management plans. Conditions 5, 6, 7 and 8 provide that the consent authority *shall approve all management plans*. In addition to the specified management plans, condition 5 requires *such management plans as are required to give effect to the decision.*

[18] It is clear from a reading of the decision that underlying the use of the management plans is a form of adaptive management. The decision records adaptive management as being used: [2]

> ... to acknowledge unanticipated adverse consequences which may arise from the grant of a resource consent.

Extensive use of the management plans forms the cornerstone for adaptive management of effects from the proposal.

1.3 The hearing

[19] The appeals extant at the commencement of the hearing before us were:

[a] New Zealand and Nelson-Marlborough Fish & Game Councils; and

[b] Save the Wairau River Incorporated.

[20] Both appellants were generally opposed to the consented scheme because, among other things, of the changes to the flow regime in the diversion reach of the river and downstream of the outfall. These hydrological changes, they said, could have significant

[2] Interim Decision at [35]

effects, including the effects on the natural character and the aquatic ecology of the river to the detriment of the trout, angling amenity, river birds, landscape, and general amenity.

[21] A number of s 274 parties also appeared before us:

[a] Ms Alison Jane Parr on behalf of herself and Mr Ian Rogers. They supported the appeals because of serious and wide-ranging concerns about the scheme;

[b] Mr John and Mrs Joan McLauchlan, the owners and occupiers of Burnside Farm at the eastern-most end of the proposed scheme. They were vehemently opposed to the scheme, they have not, and asserted they will not, consent to TrustPower using their land. They argued that any consent would be futile and should not be granted for that reason;

[c] The Green Party Kaikoura Branch (**the Green Party**) which argued that TrustPower had not adequately advanced alternative methods of energy production; and

[d] Ms Pauline Doyle, a local resident, who was particularly concerned about the effects of this scheme on her property in times of flooding and/or emergency discharges.

[22] The hearing took place in Blenheim over 33 sitting days. During that time we made three site visits which included a helicopter flyover. The site visits helped us to better understand the evidence. We heard or read the evidence-in-chief of 56 witnesses by far the majority of which were expert witnesses. A list of witnesses is attached as Appendix 1. Their evidence-in-chief filled 10 Eastlight folders. Most of those witnesses were cross-examined and re-examined, resulting in 2,787 pages of transcript. In addition, we were referred to numerous graphs, figures, tables and reports. The quantity of evidence was such that it is just not possible to refer in this decision to all that was said, nor is it necessary to refer to all of the witnesses to determine the issues in contention. Accordingly, if specific parts of the evidence are not averred to in this decision, we mean no disrespect to the parties or their witnesses. In coming to our decision we have had regard to the totality of the evidence.

[23] The proposed conditions of consent as determined by the Council have, since the hearing committee's decision, been amended and added to on an iterative basis. This has been to address matters of concern raised by the parties and the Court as the appeals progressed. TrustPower's final draft of proposed conditions was lodged with the Court on 12 May 2010 at the commencement of closing submissions. We have by this decision made some amendments. We attach as Appendix 2 the 12 May 2010 version of the proposed conditions, but as amended by us. Our amendments are shown as track changes.

2 LEGAL MATTERS

2.1 Preliminary legal issue – futility

[24] Counsel for Mr & Mrs McLauchlan lodged with the Court on 13 February 2009 an interlocutory application seeking the following rulings:

[a] Whether the applicant's opposition is a relevant matter to consider under the Act in dealing with TrustPower's applications for resource consent;

[b] Whether or not the applicant's opposition will make the granting of the resource consents, if they are granted under the appeal, futile;

[c] Whether the futility referred to in the preceding paragraph renders the continuation of the proceedings an abuse of process;

[d] The granting of other such relief that consequentially arises from findings in relation to [a] to [c] above.

[25] Affidavits in support of the application were lodged by Mr & Mrs McLauchlan, Ms Doyle, and Ms Parr. They stated that the deponents would not grant access over their lands to TrustPower. Effectively it was submitted in support of the application, that to grant consent would thus be futile, and accordingly to grant the consents would be an abuse of process.

[26] At the preliminary hearing the Court ruled that the question should be deferred to the substantive hearing as the issue involved both questions of law and fact.

2.1.1 The evidence before us

[27] Before us Mr & Mrs McLauchlan and Ms Parr reiterated their stance that they would not grant access over their land to TrustPower. The McLauchlan farm is near the eastern end of the proposed scheme. Power Station 5 is proposed to be on the McLauchlan land as are parts of Canal 8 and Canal 9. Canal 7 would cross the Parr/Rogers land and the head pond for Power Station 4 would also be on their land.

[28] The implacable opposition of these land owners needs to be seen in perspective. It was Mr Lilley's evidence that it was his role to negotiate and liaise with land owners directly affected. He told us[3] that in total there are 58 land holdings crossed by the proposed scheme, currently owned by 51 entities. He provided a breakdown of land owners and status of the stage reached in negotiating agreements in Table 1 of his evidence in chief. We reproduce that table here:

Table 1.1 Landholding Status (On Scheme Alignment)

Landholdings on Alignment	Number	%
Signed Agreement	36	62%
Draft Agreement Sent to Legal Advisor	12	21%
Verbal Agreement	3	5%
Initial Agreement Prepared	2	3%
Awaiting the Grant of Consents	2	3%
Awaiting Financial Compensation Offers	1	2%
Opposed (in principle) to the Scheme	2	3%
	58	

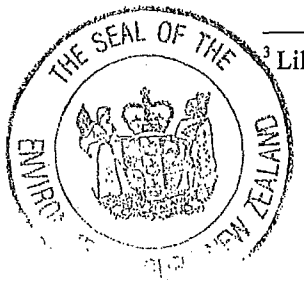
[29] As can be seen from the table, at the time of the hearing agreements had been executed for 36 (62%) of the landholdings. Mr Lilley told us that a further 15 (26%) have agreement very near completion. Of the remaining five (8%), they are divided between:

[a] Land owners waiting for resource consent decision;

[b] Land owners waiting for financial compensation offers; and

[c] Land owners who have lodged submissions against the scheme.

[3] Lilley EIC at [6.1] to [7.7]



[30] According to Mr Lilley, it is TrustPower's intention to continue negotiating with the land owners to seek the necessary agreements. It was his view, that even if some land owners would not agree, the scheme could still proceed as alternative routes or termination points are technically feasible.

[31] Mr Lilley further stated that TrustPower had given consideration to its options should access to the two properties not be secured. One such option could involve piping canal water to avoid one property, in order to complete the scheme. Another could involve diverting the canal back to the river earlier. However, it was quite apparent from Mr Clark's cross examination and questions from the Court, that alternative routes or termination points have not thus far been given more than a cursory consideration. We accept that detailed analysis would be a costly exercise and is not warranted at this stage.

2.1.2 Property rights and the Resource Management Act

[32] It has long been settled law that consent authorities and this Court on appeal are concerned with a proposed activity's effects, not the nature of an applicant's legal rights in respect to the particular land.[4] Disputes about private property rights are outside the Environment Court's jurisdiction and are not generally considered in determining a resource consent application.[5]

[33] Section 88 of the Act enables a person to make an application to a local authority for resource consent. This is not subject to any proviso that the person must have a property interest. In *Coleman v Kingston* Hammond J stated:[6]

> ... the Resource Management Act floats, rather like oil on water, across the top of ownership rights without affecting the underlying substance. The Resource Management Act 1991 and the Property Law Act 1952 have different objectives and do not conflict (*NZ Suncern Construction Ltd v Auckland City Council* [1997] NZRMA 419; and *Haddon v Auckland Regional Council* [1994] NZRMA 49).

[34] Private property rights should only be taken into account where they are relevant to, or reasonably necessary to, determine an issue under the Resource Management Act[7].

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[4] See *MacLaurin v Hexton Holdings Ltd* 2008 [NZCA 570 at [47]]

[5] See *Congreve v Big River Paradise Ltd* HC AK, CIV 2005-404-6809, Fair ACJ, 1 June 2006 at [21], upheld on review, HC AK CIV 2005-404-6809, Lang J, 4 August 2006; *Director General of Conservation v Marlborough DC* C113/04 at [48]; *Degan v Southland Regional Council* C110/98 at [15]; *Saunders v Northland Regional Council* A40/98 at [56 - 57]; *Schmuck v Far North District Council* A26/00 at [33]

[6] HC AK AP103-SW00, Hammond J, 3 April 2001 at [28]

Mr Clark for Mr & Mrs McLauchlan contended that there is a distinction between water take applications and land use consents. The grant of a water permit has an allocative component, as its grant excludes others from applying for it. On the other hand, the resource consent granted in respect of land does not lock the land up, as it cannot be exercised without property rights. At first glance, Mr Clark's argument sounds attractive. But on reflection, it would be inappropriate to make such a distinction without clear legislative intent. In any event, the concern raised by Mr Clark can, if necessary, be addressed by fixing the lapsing period of any consent.

[35] However, in this case, it is not the question of property rights per se that is the issue. It is the futility arising from the lack of the necessary property rights to exercise the consent that is the issue.

2.1.3 Futility

[36] Mr Clark relied on the following passage from the Environment Court decision *Director General of Conservation v The Marlborough District Council*[8]:

> In considering applications for resource consents the RMA does not consider who is applying, it is irrelevant whether the applicant has any legal right to exclude others from the resource, or to be excluded, unless a party can show that it would be futile to grant resource consent because it would be impossible to exercise it. Such matters are outside the Environment Courts jurisdiction; *Whakatipu Environmental Society Incorporated v Queenstown Lakes District Council* (Decision A71/2004 at [22])

[37] It may well be that, as a matter of process, it would be inappropriate to issue a decision granting a resource consent that will be impossible to exercise. But in our view the Court should not lightly make such a determination. To do so would usurp or arrogate the applicant's options.

[38] In this case, the applicant has adduced expert evidence, through Mr Lilley, that alternate routes and/or termination points are technically feasible (albeit little exploratory work has been undertaken to date). Whether such alternatives could proceed by way of a

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[7] See *Congreve v Big River Paradise Ltd* [HC AK CIV 2005-404-6809 Faire ACJ, 1 June 2006 at [21], upheld on a review (HC AK CIV2005-404-6809 Lange J, 4 August 2006 at [30]; *Cornerstone Group Ltd v North Shore* CC A42/07 at [123]

[8] Decision No. NZEnv C113/2004 at [47]

variation to the existing applications is a moot point. In any event the applicant could apply for any new consent deemed necessary.

[39] TrustPower also has other options. Arguably it could request the compulsory acquisition of land under the Public Works Act 1981, as s 186(1) of the RMA enables a network utility operator that is also a requiring authority, to utilize the Public Works Act. Under s 166(d) it could be argued that TrustPower could become a network utility operator for the purposes of the proposed scheme's canal as it involves the distribution of water for supply including irrigation.

[40] A further option is for TrustPower to instigate an amendment to existing legislation, or even to instigate through the proper channels new legislation. These options are of course non-inclusive.

[41] While none of the options can be determined at this stage with certainty, they are nevertheless technically feasible. To arrogate those options that are available to the applicant TrustPower would be untenable. To require an applicant for a large infrastructural consent process such as this, to have all of the necessary property rights in place at the resource consent stage, would be untenable. It would be untenable for one or two land owners out of 58 landholders, as is the case in this instance, to be able to checkmate this opportunity for new renewable energy generation to be enabled. Hence we reject the futility application.

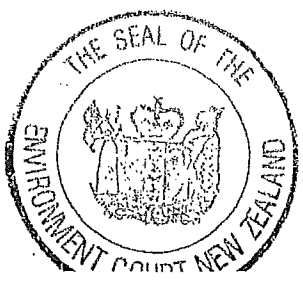
[42] We now focus on, and address the merits of the proposal and whether the proposed scheme will better enable sustainable management.

2.2 Legal basis for decision

2.2.1 The Act

[43] All agreed that the proposed scheme is to be assessed as a non-complying activity. Thus, we are required to assess the proposal under the *threshold tests* of s 104D of the Act. These are commonly referred to as the two gateways. The s 104D tests require that the scheme:

[a] has no more than minor adverse effects; or



[b] not be contrary to the relevant objectives and policies.

[44] Provided that the proposal passes through either of the two gateways, we are then required in terms of the overall discretion inherent in s 104B, to exercise our discretion bearing in mind the relevant matters referred to in s 104(1). These relevantly include:

[a] Any actual and potential effects on the environment;

[b] The provisions of the relevant planning instruments; and

[c] Any other matter we consider relevant and reasonably necessary to determine the application.

Section 290 of the Act provides that we must have regard to the Council's decision that is under appeal.

[45] As a number of consents sought are discharge permits, we must have regard to the matters set out in s 105 of the Act and we are required to apply the provisions of s 107 relating to reasonable mixing.

2.2.2 Part 2 of the Act

[46] Section 5(2)(b) & (c) states that the purpose of the Act is, in part:

> (2) ...
>
> (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.

[47] Much of the evidence we heard was about protecting the capacity of the river and its margins to support particular species of native flora and fauna and provide for trout and salmon. There was also a considerable amount of evidence on the effects of the proposed scheme on natural character, landscape and amenity.

[48] The evidence we heard requires us to consider the directions contained in s 6 & 7. We must recognise and provide for the following matters of national importance:

6. 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:

...

(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:

[49] We are to have particular regard to:

7. Other matters

...

(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.

2.2.3 The relevant plans

[50] The following statutory instruments are relevant:

[a] the Marlborough Regional Policy Statement (**RPS**)

[b] the Transitional Regional Plan for the Nelson-Marlborough Region (**the Transitional Regional Plan**)

[c] the partially operative Wairau/Awatere Resource Management Plan (**the Plan**).

[51] All parties agreed that the Transitional Regional Plan is largely obsolete, it having been superseded by the Plan. The relevant provisions therefore derive from the RPS and the Plan.

2.3 The statutory instruments

2.3.1 Regional Policy Statement

[52] The Regional Policy Statement became operative in 1995. As Mr Delamore said, it is overdue for review. As the Council is a unitary authority, the policy statement foreshadows the objectives, policies and rules for the Plan. The Plan has only recently become operative and the environmental issues are dealt with much more comprehensively than in the RPS. To discuss in detail the provisions of the RPS would not add anything to the decision, as there is nothing contained in it that is not comprehensively addressed in the Plan. We say no more about it.

2.3.2 The Wairau/Awatere Resource Management Plan

[53] It is trite to say that when assessing a proposal against a relevant plan, we should look at the relevant objectives and policies in the round. When assessing the overall application of the objectives, policies and provisions of a plan, the reference should not be to any single objective and policy, but to those relevant to influencing the decision.

[54] In this case, the objectives, policies and provisions of the Plan that are relevant to influencing our decision are those that relate to:

[a] Natural character;

[b] Landscape and amenity (including recreation);

[c] Flora and fauna;

[d] Water quality; and

[e] Water allocation.

We discuss each in turn.

2.3.2.1 Natural Character – Chapter 10

[55] Chapter 10 of the Plan reflects s 6(a) of the Act. It points out, that the preservation of natural character and protection from inappropriate subdivision, use and development, will generally be achieved by a process which addresses identified components of natural character. Relevantly, these include:

[a] Freshwater landforms;

[b] Scenic or landscape values;

[c] Indigenous flora and fauna and their habitat;

[d] Water and water quality, including ecosystems;

[e] Habitat of trout and salmon.

[56] A number of policies seek to support other sections of the Plan, emphasising the need to provide an integrated mechanism for the management of natural character.

[57] Policy 1.1 discourages inappropriate subdivision, use and development in those areas which are predominantly in their natural state and have natural character that has not been compromised.

[58] Policy 1.3 is of importance. It states:

> Policy 1.3 To consider the effects on those qualities, elements and features which contribute to natural character, including:
>
> (a) Coastal and freshwater landforms;
>
> (b) Indigenous flora and fauna, and their habitats;
>
> (c) Water and water quality;
>
> (d) Scenic or landscape values;

(e) Cultural heritage values, including historic places, sites of early settlements and sites of significance to iwi;

(f) Habitat of trout and salmon;

(g) Natural movements of sediments, water, air and biota;

(h) Natural productivity; and

(i) other dynamic processes.

[59] Policy 1.6 seeks to encourage the restoration and rehabilitation of natural character as a part of any proposed development.

[60] Policy 1.7 emphasises the need to adopt a precautionary approach in making decisions where the effects on the natural character are unknown. The explanation in the Plan also recognises that:

> While it is seen as nationally important to preserve the qualities of natural character, it is not intended that this principle should preclude appropriate subdivision, use and development.[9]

[61] Finally Policy 1.8 promotes the concept of rivers and streams as ecological corridors to the coast.

2.3.2.2 Landscape – Chapter 5

[62] Chapter 5 of the Plan addresses landscape issues. The first issue is:

> 5.3 Degradation of natural features and landscapes which have special characteristics

The Plan identifies significant regional and district features. The Wairau River is identified as a significant district feature. The Plan says:

> Although partly modified, the river remains a significantly important multi-recreational landscape.

[63] There is one objective which follows this issue:

> Objective 1 Management of the visual quality of the Wairau/Awatere plan area and protection of outstanding natural features and

[9] Page 10.4 Volume One

> landscapes from inappropriate subdivision, use and development.

[64] Relevantly, Policy 1.2 recognises the Wairau River *"as outstanding in a more localised context"*. There then follows a number of policies which effectively ensure that built structures, land disturbance and earthworks do not compromise the landscape values and avoid, remedy or mitigate long-term effects on the landscape.[10]

[65] The second issue is:

> General degradation and detraction from the landscape and visual amenity values of the district.

Under this issue, the Plan recognises:

> The rivers of the Wairau/Awatere district are other very significant features. The presence of natural water and vegetation is an attraction and the rivers are a focus for recreation. The scenic qualities of these areas are very important and provide opportunities for combining flood management practices with recreational, ecological, heritage and landscape objectives. This is the case in both rural and urban locations.[11]

[66] Objective 2 seeks to protect the scenic quality of the Wairau River and its valley. It says:

> To provide for appropriate development practices within areas not identified as outstanding natural landscapes.

[67] There then follows a number of policies which relevantly seek to:

[a] Maintain an open rural character (Policy 2.3); and

[b] Recognise the significant landscape values of rivers including their aesthetic and intrinsic values (Policy 2.6).

[10] See Policies 1.3, 1.4 and 1.5
[11] Pages 5 - 8 Volume One

2.3.2.3 Flora, Fauna and their Habitat – Chapter 4

[68] Chapter 4 of the Plan implements the requirement of the Plan under s 6(c) of the Act to recognise and provide for the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna. Also, it fulfils the Council's obligations to give particular regard to the intrinsic value of ecosystems and the protection of the habitat of trout and salmon under s 7(d) and s 7(h) of the Act, respectively.

[69] The Plan divides ecosystems into land-based (or terrestrial) and freshwater ecosystems. With regard to terrestrial ecosystems, the Plan's objectives and policies seek to protect and enhance areas of significant indigenous vegetation and habitats.

[70] The Plan notes that lowland ecosystems are the most affected by human activities and lists the forest remnants on the Wairau River as a major value under threat from clearance and stock. Objective 4.2.2.1 seeks to protect areas of significant indigenous vegetation and habitat and is supported by Policies 1.5, 1.11 and 1.12 relating to the protection and restoration of natural wetlands and riparian vegetation.

[71] With regard to water ecosystems, the Plan identifies in Issue 4.3.1, that waterbodies have many ecological, recreational and amenity values. A summary of the values associated with freshwater resources can be found in Appendix A to Volume One.

[72] The Plan identifies a number of activities that can affect water quality and habitat, including:

[a] Water abstraction;

[b] Damming and diversion;

[c] Gravel abstraction; and

[d] Discharges.

[73] There is one overarching objective which says:

The protection and enhancement of freshwater and riparian ecosystems.

There is a range of policies of which the following are relevant:

Policy 1.1	To provide for the protection and natural functioning of aquatic ecosystems by avoiding, remedying and mitigating the adverse effects of water abstraction from all rivers, including the setting of sustainable flow regimes for specified important rivers.
Policy 1.2	To set water quality standards which provide for the protection and natural functioning of aquatic ecosystems and to control point and manage diffuse source contamination to maintain water quality standards.
Policy 1.3	Maintain and enhance wetlands, lakes and rivers as natural corridors where water and riparian margins can act as links along which fauna can move and flora can spread.
Policy 1.4	In the absence of detailed knowledge on the hydrology or ecology of rivers, lakes and wetlands in the plan area, adopt a precautionary approach when considering changes to freshwater ecology and instream values.
Policy 1.5	To recognise and provide for the protection of the habitats of indigenous fish and birds, and trout and salmon in wetlands, lakes and rivers.
Policy 1.6	Avoid, remedy or mitigate any adverse effects of river work activity.
	...
Policy 1.12	To avoid, remedy or mitigate the adverse effects of activities within river and lake beds to protect instream values, including fish passage and recreational values.
Policy 1.13	To promote the use of water storage techniques to achieve the sustainable management of freshwater resources.

[74] The policies recognise that rivers, streams and waterways have many ecological values. They emphasise the need to protect the natural functioning of ecosystems and that such protection is fundamental to the maintenance of the values of these rivers, streams and waterways.

2.3.2.4 Freshwater – Chapter 6

[75] Chapter 6 of the Plan addresses freshwater which includes groundwater and surface water resources. The Plan identifies the freshwater resources of the area as being

among the region's most important natural assets.[12] The significant groundwater resources of the Wairau aquifers supply drinking water and water for irrigation and industrial use. The Wairau River and its tributaries are the key surface water resources in the area, providing important ecological, recreational, cultural, amenity and commercial values, and are the principal source for recharging the Wairau groundwater systems.

[76] The emphasis in the Plan is on maintaining freshwater quality and quantity at levels required to meet ecological, cultural, recreational, social and economic needs. There are a number of relevant issues identified, which give rise to a number of objectives and supporting policies. The first issue is:

> Use of freshwater resources may compromise the life-supporting capacity of the resource.

This issue recognises that the use of freshwater can adversely affect the life-supporting capacity of the resource, through altering the course, quality or quantity of the resource. Uses of freshwater include consumptive and non-consumptive uses, and use of the water as a receiving environment for the direct (or point source) discharge of contaminants. The following objectives and policies are particularly relevant in the context of this case:

Objective 6.2.1.1	To provide for the taking, use, damming and diversion of freshwater in a manner which safeguards the life-supporting capacity of the resource and avoids, remedies or mitigates any adverse effects on the environment.
Policy 1.1	To maintain surface water flows at levels which safeguard the life-supporting capacity of the resource by setting and enforcing Sustainable Flow Regimes (SFRs) in terms of specified river flows.
Policy 1.2	To maintain groundwater levels and flows at levels which safeguard the life-supporting capacity of the resource by setting and enforcing Sustainable Flow Regimes (SFRs) in m^3/year.
	...
Policy 1.5	To set the SFR for fresh surface waters to: • Protect instream habitat and ecology; • Improve fish passage and spawning grounds;

[12] See page 6.1 Volume One

- Protect the natural character of freshwater resources;
- Maintain water quality;
- Protect cultural values;
- Maintain amenity values; and
- Provide for aquifer recharge.

Policy 1.6 To set aside a proportion of the abstraction flow, where appropriate, as additional flow for instream values, over and above the SFR.

[77] The second objective addresses water quality. It says:

> To maintain, and where appropriate, enhance existing freshwater quality.

There then follow some eight policies, two of which are particularly relevant in the context of this case:

Policy 2.1 To apply water classifications to all surface water and groundwater resources which reflect the existing values of each freshwater resource and provides for maintenance and enhancement of existing water quality as appropriate (as outlined in Appendix J, Volume II)

Policy 2.2 To require compliance with the water classification standards, after reasonable mixing, for all new point source discharges to surface water, except where a discharge meets the criteria of exceptional circumstances specified in Section 107(2) of the Act.

[78] The next relevant issue addresses the equitable allocation and use of surface and groundwater resources. It says:

> Competing and increasing demands for freshwater resources may lead to an inequitable allocation.

This issue recognises that with the increase in demand for water there is a potential for increased conflict between different users and increased competition for the total resource available.

[79] The following objectives and policies are designed to achieve equitable allocation. The objective says:

> To achieve equitable allocation and use of surface water and groundwater resources.

[80] Of particular relevance is Policy 1.2 which says:

> Policy 1.2 To establish and apply a triple class permit system for the taking of water and to set and enforce maximum allocations for each class.

The triple class system is a complex system and is explained in the Plan as follows:

> Water will be allocated on a 'first come, first served' basis through the triple class permit system of allocation. This framework allows a certain quantity of water to be allocated to users. This quantity is called a Class and, as successive permits are issued, the allocation available within the class reduces and eventually becomes fully allocated. No further allocations will be made in that class except in the following cases:
>
> - Where the existing full allocation volume is reassessed and is increased, or a resource is assessed as having a larger safe yield, as a result of more information being available;
> - Where part of the existing full allocation volume becomes available following a permit renewal which reduces the volume attached to an existing permit;
> - Where part of the existing full allocation volume becomes available following the revoking of an existing permit.
>
> Three classes of water permit exist for each of the water resources, Class A, Class B and Class C. Allocation moves sequentially through each of the classes, from Class A to Class C (for further explanation of the triple class allocation system refer to the General Rules in Volume Two). Applications for allocations may be made outside of the triple class system but are Non-Complying activities unless they are Prohibited.
>
> The SFRs set shall form the basis of maximum allocation of water. The formula shall be applied as follows:
>
> - The maximum allocation shall be determined on the five year, seven day, low flow of the water body less the SFR of this waterbody if set, otherwise on a case by case basis.

[81] Policy 1.4 provides for water permit volumes to be granted on the basis of allocation guidelines set out in the Plan. Irrigation rates are specified in mm/day and volumes in m^3/week/hectare for a range of crops.[13]

[82] The triple class system and allocation guidelines also address the next issue which relates to the inefficient use of water. This issue states:

[13] Plan page 6-6 Volume One

> The inefficient use of freshwater resources can compromise the sustainability of the resource.

This relates to both the use of water resources and administrative efficiency, and reflects the requirement of the Council under s 7(b) of the Act to have particular regard to the efficient use and development of natural and physical resources.

[83] The objective states:

> Objective 1 To establish an efficient resource use regime and support sustainable management of the freshwater resource.

The objective is followed by some 6 policies, of which Policy 1.1 is the most relevant. It states:

> Policy 1.1 To enable more efficient use of fresh water resources through implementation of a triple class water permit system.

[84] This objective and policy is explained in the Plan as follows:

> A more efficient, flexible triple class water allocation system, which will more closely match water demand and supply, enabling more efficient water allocation use, while still providing an efficient SFR to protect the sustainability of the resource. This will be particularly important for surface water systems, where excess flow during wetter periods is currently lost to the system (for an explanation of the triple class allocation system refer to Volume Two[14]).

[85] There is a further issue identified in the Plan relating to the use of water during periods of low flow. The objective is to achieve sustainable, equitable and efficient allocation of water during periods of low flows. The policies that follow require the setting of flows and levels and the need to include conditions in water permits requiring users to reduce and suspend takes when specified flows or levels are reached.

[86] In summary, Chapter 6 of the Plan identifies the ecological, recreational, social and economic demands on the water resource. Water is considered to be one of the region's most important natural assets. The Plan recognises the need to maintain freshwater quality and quantity at appropriate levels. This is achieved in three ways:

[14] The 'Rules' section of the Plan

[a] By maintaining surface water flows at levels that safeguard the life-supporting capacity of the resource by setting and enforcing minimum flows, the sustainable flow regimes (SFR);

[b] By setting aside a proportion of the abstraction flow (where appropriate), as additional flow for instream values, over and above the SFR; and

[c] Requiring compliance with the water quality standards.

The Plan also recognises a need for the equitable allocation of water. This is achieved, in part, by the establishment and application of a triple class permit system for the taking of water. We say in part because the Plan recognises in its explanation that applications for allocations may be made outside of the triple class system but are non-complying activities unless they are prohibited.

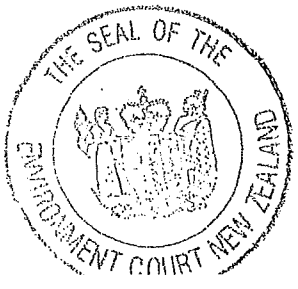
[87] The provisions of the Plan gave rise to two contested issues. The first issue related to the interpretation of the provisions of the Plan and the application of s 69 of the Act with respect to the water standards relating to reasonable mixing. The second issue related to the triple class system and flow-sharing regime. It was submitted by the appellants opposed to the proposed scheme that to allow the proposed scheme would be completely at odds with the comprehensive sustainable flow regime and allocation regime set out in the Plan. We now address both of these issues.

2.3.3 Section 69 of the Act and reasonable mixing

[88] In her final submission, Ms Baker raised a novel legal argument, that any activity not complying with Schedule 3 of the Act (or other standards imposed by the Council) is prohibited by s 69 of the Act. Mr Whata appropriately objected to the late inclusion of this submission. However, as we find, for reasons about to be given, Ms Baker's argument is without merit, we address her submission notwithstanding its lateness.

[89] As we understand Ms Baker's argument:

[a] Compliance must be achieved with the standards in Appendix J of the Plan;



[b] It is likely that sediment flushing discharges will breach turbidity standards;

[c] Section 69 of the Act contains a statutory prohibition on activities which do not comply with Schedule 3 (or the standards imposed in Appendix J).

[90] The argument would have general application if we found any of the standards are likely to be breached.

[91] Section 69 of the Act states:

> **69 Rules relating to water quality**
> (1) Where a regional council—
> (a) provides in a plan that certain waters are to be managed for any purpose described in respect of any of the classes specified in Schedule 3; and
> (b) includes rules in the plan about the quality of water in those waters,—
> the rules shall require the observance of the standards specified in that schedule in respect of the appropriate class or classes unless, in the council's opinion, those standards are not adequate or appropriate in respect of those waters in which case the rules may state standards that are more stringent or specific.
> (2) Where a regional council provides in a plan that certain waters are to be managed for any purpose for which the classes specified in Schedule 3 are not adequate or appropriate, the council may state in the plan new classes and standards about the quality of water in those waters.
> (3) Subject to the need to allow for reasonable mixing of a discharged contaminant or water, a regional council shall not set standards in a plan which result, or may result, in a reduction of the quality of the water in any waters at the time of the public notification of the proposed plan unless it is consistent with the purpose of this Act to do so.

[92] The Plan gives effect to s 69 of the Act by Objective 6.2.1.2 which is *to maintain, and where appropriate enhance, existing freshwater quality.* This is done by applying the water classification standards in Appendix J. For convenience, we repeat Policies 2.1 and 2.2. They respectively state:

> Policy 2.1 To apply water classifications to all surface water and groundwater resources which reflect the existing values of each freshwater resource and provides for maintenance and enhancement of existing water quality as appropriate (as outlined in Appendix J, Volume Two).
>
> Policy 2.2 To require compliance with the water classification standards, after reasonable mixing, for all new point source discharges to surface

water, except where a discharge meets the criteria of exceptional circumstances specified in s107(2) of the Act.

[93] Notably, Policy 2.2 says the standards only apply after reasonable mixing except where the criteria for exceptional circumstances are met as specified in s 107(2) of the Act. Section 107 states:

> **107 Restriction on grant of certain discharge permits**
> (1) Except as provided in subsection (2), a consent authority shall not grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 or section 15A allowing—
> (a) the discharge of a contaminant or water into water; or
> ...
> if, after reasonable mixing, the contaminant or water discharged (either by itself or in combination with the same, similar, or other contaminants or water), is likely to give rise to all or any of the following effects in the receiving waters:
> ...
> (d) any conspicuous change in the colour or visual clarity:
> ...
> (2) A consent authority may grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 or section 15A that may allow any of the effects described in subsection (1) if it is satisfied—
> (a) that exceptional circumstances justify the granting of the permit; or
> (b) that the discharge is of a temporary nature; or
> (c) that the discharge is associated with necessary maintenance work—
> and that it is consistent with the purpose of this Act to do so.
> ...

[94] Reasonable mixing is in turn defined in the Plan as:

> Reasonable Mixing — the maximum zone of reasonable mixing means for any point source discharge the zone of reasonable mixing in the receiving water shall extend from the discharge point as follows:
>
> For rivers and streams, the lesser of:
>
> (a) A distance downstream which equals seven times the width of the river or stream when the flow is at half the median flow; or
>
> (b) 200 metres downstream.
>
> ...

> A larger (or different shaped) reasonable mixing zone will be accepted where the applicant can demonstrate (to the satisfaction of the Council) by physical or numerical modelling, and/or dispersion trials at the discharge point, that
>
> (a) It is not practical to achieve reasonable mixing within the standard zone; and
>
> (b) The objectives of the water quality classification(s) are not frustrated by a larger (or different shaped) zone; and
>
> (c) Adverse effects will not occur.

[95] Also of importance is Rule 27.1.9.2 which relevantly says:

> **27.1.9.2 Standard Conditions Applying to All Discharges to Water**
>
> The following standard conditions apply to all Permitted and Controlled activities. For completeness they are cross referenced at the end of all rules for Permitted and Controlled activities, and are referred to as "the standard conditions"
>
> ...
>
> d) Meets water clarity standards defined in Appendix J, after reasonable mixing.

[96] Quite stringent water quality turbidity standards are provided for in Appendix J for classes F, CR, and FS respectively – the classes that apply to the affected reach. The evidence of Mr Delamore[15] drew to our attention that the standards are unlikely to be achieved.

[97] The Plan sets out a number of permitted activities. If a discharge is not a permitted activity, as is the case here, it is a discretionary activity under Rule 27.1.10.2. One of the assessment criteria under this rule is:

> An assessment of effects on the environment in accordance with the appropriate water classification standard/s listed in Appendix J and the Fourth Schedule of the Act 1991.

[98] The only prohibited activities listed in Rule 27.1.10.3 are the discharge of untreated human sewage, or untreated animal waste into water. Clearly the activities of TrustPower under the discharge provisions of the Plan are to be treated as discretionary

[15] Delamore EIC at [5.14] – [5.15]

activities and the standards listed in Appendix J are one of the assessment criteria against which the application is to be considered.

[99] In our view, s 69 of the Act does not amount to a statutory prohibition. It sets the threshold for the standards to be set in the Plan. If, as here, the standards have been set in accordance with s 69, it is quite open for the Council to consider their breach as part of the overall assessment process to be taken into account when considering an application. That is what the Plan does.

[100] Appendix J is simply one of the matters to be taken into account when considering the application. The standards are plainly relevant considerations, but they should not be elevated by the Plan to immutable requirements to be satisfied before any grant of consent.

[101] Whether or not the sediment flushing regime, or for that matter other activities which may be in breach of one or more of the standards, undermine the objectives of the classifications – safe consumption, contact recreation and spawning[16] – and whether the sediment flushing regime is consistent with the Plan objectives protecting in-stream ecology are all matters that we discuss in other sections of this decision.

[102] Before leaving this matter, we note that Policy 2.2 requires compliance with the water classification standards, after reasonable mixing, except where a discharge meets the criteria of exceptional circumstances specified in s 107(2) of the Act. We are satisfied that the proposed scheme does amount to an exception for the following reasons:

[a] The proposed scheme is a hydro-scheme that can only occur on a river;

[b] The proposed discharges containing suspended sediment would be temporary discharges;

[c] The proposed discharges would occur only during times of reasonably high flow when the clarity of the river would be naturally low.

[103] For the reasons given above, we reject Ms Baker's argument.

[16] Ryder EIC at [11.19] – [11.20]

2.3.4 The triple class system and flow-sharing regime

[104] It was the contention of Save the Wairau and Fish & Game that the Plan required the take of water to be allocated within the triple class system and flow-sharing regime foreshadowed in the objectives and policies contained in Chapter 3 of the Plan. To address this submission it is necessary for us to make an analysis of the rules relating to freshwater allocation set out in Chapter 27 of the Plan.

[105] The planners were agreed that the relevant rules comprise two parts:

[a] An activity classification based on the abstraction volume and the particular water resource (the Plan 27.1.2 Fresh Water Abstractions); and

[b] The management and allocation of water (the Plan 27.1.1 Rules for Abstractions).[17]

2.3.4.1 The activity classification

[106] Small scale abstractions (up to $10m^3$/day/site for domestic and livestock and up to $50m^3$/day/site for construction works) are permitted activities subject to the abstraction rate not exceeding 5% of stream flow and limitations set out elsewhere in the Plan.[18]

[107] Abstractions of Class C water for the purpose of retaining water in storage are a controlled activity with control reserved over the volume and rate of take.[19]

[108] Abstractions between 10 and $500m^3$/day/site from the Wairau River (downstream of the Branch confluence) are a discretionary activity subject to the abstraction rate not exceeding 5% of stream flow and the cumulative take being no greater than 10% of the instantaneous flow. Consent conditions may specify the type of permit as A, B or C Class.[20]

[17] Joint statement of planning witnesses (undated)
[18] Plan 27.1.2.1 Permitted Activities
[19] Plan 27.1.2.2
[20] Plan Rule 27.1.2.3

[109] Abstractions of greater than 500m^3/day/site or any abstraction from the Wairau River upstream of the Branch confluence are non-complying activities.[21]

[110] The proposed diversion clearly requires non-complying resource consents due to both the volume and location of the take. All the planners are agreed on this activity classification.

2.3.4.2 The Sustainable Flow Regime

[111] Rule 27.1.1.1.1 sets minimum flows (the SFR flow) for the Wairau River of 14m^3/s at the Narrows and 8m^3/s at the Tuamarina recorder. The Sustainable Flow Regime (SFR) is defined in the Plan:[22]

> ... means minimum flow levels which have been set for surface and groundwater systems to protect stream environmental values, and to prevent aquifer compaction, and/or prevent saltwater intrusion, while allowing spring discharges to continue unaffected.

[112] The explanation of the SFR flow in Chapter 6 of the Plan notes:[23]

> It is not possible to continually monitor flows along the entire length of a surface water body. For this reason, trigger levels are applied where recorder sites have been established, usually in the upper catchment of the surface water body. The intent of the trigger levels is to achieve the SFR and a corresponding flow relative to the SFR for the remainder of the surface water body.

[113] The SFR flow applies along the whole length of the Wairau River including the diversion reach. That is the minimum residual flow in the diversion reach should be at least the *corresponding flow relative to* 14m^3/s at the Narrows and 8m^3/s at Tuamarina. We address the issue of compliance with the SFR flow when considering the effects of the scheme on the flow regime of the Wairau River in the diversion reach.

2.3.4.3 The triple class system

[114] Rule 27.1.1.2.1 introduces the water permit classes and its interpretation was the subject of considerable evidence and cross-examination. We set it out in full:

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[21] Plan Rule 27.1.2.4
[22] Plan Definitions at 26-16
[23] Plan at 6-3 explanation to 6.2.1 Objectives and Policies for taking, use, damming and diversion of fresh water

> The water allocation system incorporates three classes of resource take – Class A, B and C. Permits for Class A, B and C takes can be made available for all fresh water resources, except those where:
>
> a. Water use is classed as Non-Complying or Prohibited, as these resource systems are considered too vulnerable to support water abstractions; or
>
> b. Steady or static water bodies, such as spring flows, where flows do not exhibit a seasonal variation.

[115] Rules 27.1.1.2.2 – 9 set out how the Class A, B and C permits are to be allocated and exercised. Class A permits allow the holder to take water with a high degree of certainty (likely to be restricted only 1 week every 5 years).

[116] Class B permits enable a moderate degree of certainty with restrictions likely late summer and autumn (fully available 80% of the time, partially available 18% and unavailable 2% of the time). Class C permits are only available at flows above the flow that is exceeded 80% of the time. Class C permits may only be drawn to supply a storage reservoir, recharge groundwater or generate electricity.

[117] Class B and C permits are subject to a 2:1 flow sharing regime.

[118] Rule 27.1.1.2.10 sets out the allocations to Classes A, B and C for the main rivers, including the Wairau River below the Branch confluence:

[a] There is no Class A water allocation for the Wairau River;

[b] The total Class B allocation for the Wairau River from the Branch confluence to Tuamarina is $15m^3/s$ when the flow is above $30m^3/s$ at Tuamarina. The Class B allocation progressively reduces at low flows reaching zero:

[i] For the reach from the Branch to Tuamarina when the flow at Tuamarina is $8m^3/s$;

[ii] For the reach from the Branch to the Waihopai confluence when the flow at The Wash bridge is $9m^3/s$;

[c] Class C water is available at flows above $30m^3/s$ at Tuamarina with no upper limit for the allocation.

[119] Messrs Kyle and Constantine held the view that non-complying activities are not subject to the class permit allocation system. During cross-examination Mr Kyle accepted that the Council had, as a general practice, granted non-complying takes as Class B permits. However he considered that not to be in accordance with a *strict interpretation of the Plan.* While he agreed that the rule used the term *"use"* his interpretation of the rule was that it refers to the *"take"*.[24]

[120] Mr Delamore considered the provision in 27.1.1.2.1(a) that appears to exclude non-complying activities to be ambiguous and not supported by the explanation to the relevant policies (6.3.1) in the Plan.

[121] Mr Hardy-Jones submitted:[25]

> It is the water **use** which determines whether or not an application is able to be made within the Class System. That is where a water **use** is non-complying or prohibited then no consent can be granted within the Class System.

[122] Mr Hardy-Jones considered the Plan to clearly differentiate between a water **take** and a water **use** and quoted a number of plan provisions to illustrate his point. He further submitted that for an application to be granted outside the Class System it must be a true exception and not undermine the allocation framework. He went on to illustrate how an application could be granted using an allocation of both B and C Class water and 2:1 flow sharing.

[123] Ms Baker submitted that any activity contrary to the permit class system and flow share regime would effectively be contrary to the relevant objectives and policies in the Plan[26]. She considered the objectives and policies to be achieved through the setting of minimum flows and the triple class permit system and described this as:[27]

> ... the foundation mechanism the Plan uses to manage water and enable sustainable and equitable abstraction.

[124] Addressing the question of whether the permit regime is mandatory, optional or not applicable at all, Ms Baker described the plan provisions as *contradictory and*

[24] Transcript at 2494 – 2496
[25] Hardy-Jones closing submissions at [26][b]
[26] Baker opening submissions at [125]
[27] Baker supplementary closing submissions at [4]

unclear. She submitted that if the permit system is not applicable then the weight of the Plan provisions indicated more stringent or conservative restrictions to protect the water body deemed to be *too vulnerable*[28] for the permit system to apply.[29]

[125] Mr Whata submitted:[30]

> In any event when the provisions of the Plan are read in their totality, the Triple Class system is enabling, providing a fast track for certain, relatively small abstractions, within specified locations and a mechanism for managing those abstractions on a coordinated basis. While other larger takes or takes in locations not included within this system must be subject to a more thorough assessment of effects.

[126] Mr Whata noted the explanation to the objectives and policies for fresh water resources in the Plan:[31]

> Applications for allocations may be made outside of the triple class system but are Non-Complying activities unless they are Prohibited.

2.3.4.5 Interpretation of Rule 27.1.1.2.1

[127] Rule 27.1.1.2.1 clearly links the Class System to the fresh water resource and that is the key to interpretation rather than focussing on the single word *"use"* as opposed to *"take"*. Sub-clauses (a) and (b) both refer to particular fresh water resources, firstly those considered too vulnerable to support abstractions, as listed in the non-complying and prohibited activity rules (Rules 27.1.2.4 and 27.1.2.5), and, secondly, steady or static water bodies without seasonal flow variation. Given the context of the particular resource, in this case the Wairau River above the Branch confluence, it is clear that this rule puts the non-complying take from (or the use of) the resource outside of the Class System.

[128] It has been the Council practice to issue Class B permits, with the associated 2:1 flow sharing conditions, for non-complying applications. We agree with Mr Kyle that a strict interpretation of the Plan would lead the Council to issue water permits for non-complying water takes outside the Triple Class System. Of course the conditions of such

[28] Quoting Rule 27.1.1.2.1(a)
[29] Baker supplementary closing submissions at [11]
[30] Whata closing submissions at [3.35]
[31] Plan Chapter 6 Explanation to objective 6.3.1 at 6-9

water permits may still include the 2:1 flow sharing and SFR provisions as if they were Class B or C permits. However, Council practice in the past does not preclude an applicant making an application and proposing alternative conditions, controlling the flow regime, to meet the objectives and policies for fresh water resources as set out in the Plan.

[129] We find that the water take from the Wairau River is a non-complying activity and is not subject to the triple class system and the associated 2:1 flow sharing rules in the Plan. We concur with Ms Baker's submission that the reason for this take to be assessed outside of the triple class system is that the water resource (that is the Wairau River above the Branch confluence) is considered to be *too vulnerable* for this standard approach. As such we must carefully consider the effects on the environment subject to the proposed conditions of consent, and their alternative approach to the flow regime, in the diversion reach of the Wairau River. Given the support for the 2:1 flow sharing regime in the policy framework of the Plan it is appropriate to compare the outcomes of the proposed minimum residual flow regime and flow sharing provisions of the scheme to the SFR and 2:1 flow sharing set out in the rules.[32]

3 PHYSICAL CONTEXT, THE EXISTING ENVIRONMENT AND PERMITTED BASELINE

3.1 General Description

[130] We agree with Mr Whata that the Wairau River is a dynamic environment, and that the changing nature of the environment must be considered. He referred us to the following passage from *Lower Waitaki River Management Society v Canterbury Regional Council*:[33]

> We emphasise that the environment should never be regarded as static in any case. At the least the description of the existing environment should be regarded as a snapshot of existing elements and activities with some future activities superimposed on them under the principles set out by the Court of Appeal in *Hawthorne Estates Limited v Queenstown Lakes District Council*. In many cases the description of the environment needs to have regard to the dynamism of many of its elements. That is particularly so in relation to a braided river like the Waitaki as it is a very complex and dynamic hydrological and ecological system.

We agree entirely with this passage which relates equally to the Wairau River.

[32] See Section 6.3.4.4 herein
[33] C80/09 at [10]

[131] As we have said, the Wairau River is the northern-most braided river on the east coast of the South Island. While similar in size to the braided rivers in Canterbury, it has a different hydrological pattern due to limited glacial and natural lake storage. As a result, low flows occur over the summer period (February – April). In this regard the Wairau River is unique compared with other braided east coast South Island rivers, where low flows occur over the winter period.[34]

[132] The proposed scheme is located in the Wairau Valley upstream from Blenheim. The valley is about 4km – 5km wide in the region of the site and the Wairau River flows in a northeast direction. The main stem of the Wairau River is at least 176km long.[35] We refer to the reach of the Wairau River between the intake and the outfall as the diversion reach. This is to distinguish it from the affected reach which extends from the intake to at least Tuamarina where flow fluctuations induced by the scheme will be experienced.

[133] The most significant geological feature in the valley is the Wairau Fault, which runs down the valley and separates greywacke sandstone and mudstone rocks to the south from metamorphic schist to the north. The rock in the base of the valley is covered by silty gravels of both glacial and more recent origin. It is within these silty gravels that the majority of the scheme will be constructed.[36] Tributary rivers flow from the north and the south, discharging to the Wairau River. These tributaries range from large streams to small creeks. The Wairau River falls 253m between the proposed intake site and the proposed outfall over a distance of approximately 48km.

[134] State Highway 63 runs down the valley approximately parallel to the Wairau River with several roads branching off the highway.

3.1.1 River control works

[135] Historically, extensive river works occurred in the Wairau Valley particularly over the lower 36km of the river. Dr Hudson in his evidence-in-chief explained in some detail the extent of the river works.[37]

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[34] Keen EIC,at [3.1]
[35] Wadsworth rebuttal at [11]
[36] Dawson EIC at [5.1] and following
[37] Hudson EIC at [5.6] – [5.11]

[136] Dr Hudson referred to the *River Control and Drainage* chapter of *Water and Soil Resources of the Wairau.* He noted the following from that publication:

[a] Much of the stopbank and erosion control in the Wairau plains (below the Waihopai confluence 36 kilometres upstream from the river mouth (km36)) was completed during the period 1960 – 1975. Numerous other flood and erosion control works were also undertaken on the plains and surrounding hills;

[b] The net result was that the lower river was diverted to the north of the valley, distributory channels were cut off, and the river confined to control the natural tendency of the river to migrate across the flood plains through Blenheim; and

[c] Upgrading and maintenance of the lower river continues today.

[137] In 1974 bank protection on the Wairau River was extended upstream of the Waihopai River confluence (km36) to the Wye River confluence (km72). From the *Wairau River Draft Management Plan (Marlborough District Council 1993)*, Dr Hudson noted the following:

[a] An objective of the river works was to maintain a relatively narrow exposed riverbed fairway;

[b] An objective of the river works was to force the river from an extensive braided pattern to a single channel.

[138] He told us that there are extensive river works in much of the diversion reach and that the Council sought to constrain the river from typically a 1,000m wide riverbed down to one 600m wide. He considered that the Council had succeeded to a large degree with the average width in the diversion reach being 670m. He based his view on the following:

[a] More than 60% of the Waihopai (km36) to Wye (km72) reach of the Wairau River is confined with structures on one or other bank. Other sections are planted for bank protection or have rock outcrops;

[b] Sections of the diversion reach to the Wye River confluence are now approximately half the width prior to river works in the 1970s; and

[c] In the reach from the Wye River (km72) to the intake (km88) the largest structural modification is the almost 1km long stopbank at the Argyle Power Station outfall. There is extensive tree-planting for bank protection (undertaken historically by Council), and natural erosion protection from rock outcrops.

[139] According to Dr Hudson, the roles today have changed somewhat, but extensive channel maintenance and river works continue in the diversion reach:

[a] Council removes vegetation to maintain a relatively narrow cleared fairway and since 1994 landowners have been maintaining and constructing river works;

[b] Construction of stop banks and bank protection planting are on-going with further encroachment into the historic riverbed. Dr Boffa illustrated these changes in his Figures 7.1 – 7.4;

[c] Works are underway to recover land from the breach of the stopbank near Top Valley (above Wairau township) where the Wairau cut a large new channel (4km long and up to 550m wide) in the 1994 flood.

[140] The views of Dr Hudson were reflected by Dr Boffa in his evidence. Dr Boffa considered the reclamations of the riverbed to create unnatural patterns along the river margins and impact on the ecological and visual connectivity of the areas.[38] He noted that the Wairau Valley Flood Control Scheme had been largely discontinued, but the Council continues to carry out limited river control works in the form of tree removal and gravel extraction in the fairway, with adjacent landowners being responsible for initiating flood control works in the form of stopbank construction or remediation works.

[141] Dr Boffa said:[39]

[38] Boffa EIC at [9.2]
[39] Boffa EIC at [5.3]

> While the Wairau River is a significant landscape feature within the valley, it is the least visible and is not readily apparent from most public viewpoints. Notwithstanding this, the Wairau River has also experienced widespread modification in recent years, particularly as a result of river training works and land use change which has resulted in the development of new river margin landscapes. The nature and appearance of river edge landscapes are also changing as a consequence of more extensive and expansive viticulture development within the valley. Being a wide braided river, the river itself is also subject to natural change.

3.1.2 Morphology

[142] The Wairau River has a relatively wide, largely exposed gravel bed, with predominantly braided flow.[40] The river is subject to frequent high flows which can be disruptive to aquatic life.[41] River engineering works have resulted in changes to river character:[42]

[a] the objective to reduce the riverbed width from approximately 1,000m to 600m in the diversion reach was largely successful

[b] there are now fewer channels than historically

[c] the narrower river bed results in more erosion, deposition and channel shifting, and thus more vegetation clearance

[d] the increase in river bed turnover is disruptive to aquatic life

[e] the Council still removes vegetation to maintain a relatively narrow cleared fairway.[43]

[143] There is little relationship between the number of channels and flow in the mean annual low flow (**MALF**) to median flow range.[44] Relatively large freshes are required for small-scale changes of the river channel.[45] Large floods are required to reset the structure of the bed.[46]

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[40] Hudson EIC at [4.1]
[41] Hudson EIC at [4.2]
[42] Hudson EIC at [4.3]
[43] Hudson EIC at [5.10]
[44] Hudson EIC at [44]
[45] Hudson EIC at [5.19]
[46] Hudson EIC at [5.19][c] and Fig 9

[144] Disconnected and spring-fed channels may form in abandoned high flow channels and are fed by sub-surface flows until flood flows occur. Flows in the spring-fed channels are relatively independent of flow in the main channel.[47] There is little change in the proportions of the main habitat types (primary, secondary and tertiary channels, and seepage in pools) over the median to MALF range.[48]

3.1.3 The tributaries

[145] The southbank tributaries surveyed along the diversion reach:

[a] have intermittent flow;[49]

[b] are heavily modified and degraded by existing pastoral activities;[50]

[c] contain poorly represented fish and macro-invertebrate communities;[51] and

[d] are subject to proliferation of periphyton cover in summer flows.[52]

[146] The northbank tributaries are steeper, most are perennial, and some can become disconnected from the main stem by gravel accumulation or as a result of braid migration southward.

3.1.4 Water quality

[147] The Wairau catchment includes alpine streams, a braided river and slow moving lowland reaches providing a diverse range of aquatic habitat. The water quality is generally high with temperature and nutrient concentrations increasing in a downstream direction.[53]

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[47] Hudson EIC at [5.32]
[48] Ryder EIC at [5.19]
[49] Keesing EIC at [4.1]
[50] Keesing EIC at [6.1] – [6.5]
[51] Keesing EIC at [5.17] – [5.20], [5.22] – [5.25]
[52] Keesing EIC at [5.12] – [5.13]
[53] Ryder EIC at [5.18] – [5.22]

[148] The existing temperature range is approximately 5 – 19°C at Dip Flat and 5 – 24°C at Tuamarina. The river is turbid during flood events with sediment levels generally exceeding ANZECC (2000) Guidelines in floods greater than $80m^3/s$.[54]

3.1.5 Aquatic ecology

[149] Extensive quantitative surveying during low to medium flow conditions has been undertaken over several years. This shows:

[a] While didymo has been recorded in the upper Wairau River, it has not spread noticeably since it was first recorded[55]

[b] Invertebrate densities are relatively high on occasions and are comparable to other large east coast South Island rivers[56]

[c] The abundance and distribution of native fish appears relatively high[57]

[d] Brown trout are present throughout the river with high densities in the reach downstream of the scheme.[58]

3.1.6 Avifauna

[150] It is commonly accepted that the Wairau River bed as a whole is an outstanding bird habitat and supports populations of a number of threatened species including the black-fronted tern, the black-billed gull and the banded dotterel. A number of water fowl including game birds are distributed sparsely along the river and associated wetlands.[59]

[151] All of the ecologists agreed that the Wairau River is a significant habitat for indigenous fauna in terms of s 6(c) of the Act, and outstanding in terms of its importance for bird life.

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[54] Levy EIC at [7.10]
[55] Ryder rebuttal at [4.22]
[56] Ryder EIC at [5.3]
[57] Ryder EIC at [5.46]
[58] Ryder EIC at [5.40]
[59] Jolly Rebuttal at [4.1]

3.1.7 Wetlands and the terrestrial environment

[152] The Wairau Valley and river margins support a variety of exotic and native vegetation in both terrestrial (largely dry) and wetland environments.

[153] Areas of native terrestrial vegetation were noted within the potential zone of influence associated with the scheme. A number of willow wetlands were identified along the riverbanks, particularly towards the lower end of the diversion reach. Some of these are subject to on-going clearance and disturbance.[60]

[154] The wetlands associated with the river within the diversion reach provide limited habitat for specialist wetland fauna such as bittern, spotless crake and the marsh crake.[61]

[155] The total area between the permanently vegetated banks is approximately 3,700ha. Of this area, approximately 10% is vegetated.[62] Freshes and small floods in the operational range of the scheme ($10m^3/s - 200m^3/s$) are ineffectual in removing channel vegetation.[63] Many of the existing wetlands within the potential zone of influence of the scheme are open to stock and are grazed.

3.1.8 Landscape and natural character

[156] The Wairau Valley landscape extends from Cloudy Bay to St Arnaud, a distance of approximately 120km. It contains a diverse and distinctive pattern of land use.

[157] The mid-section of the Wairau River, within which the proposed scheme would be developed, is currently experiencing a change from extensive pastoral to viticulture and intensive dairying on both sides of the river. The landscape experts generally considered the mid-Wairau landscape to be an attractive rural working landscape.

[158] Within the Wairau Valley, the three characteristic features are the hills that define the valley, the valley-floor within which most of the intensive rural activities take place, and the Wairau River itself. The proposed scheme would have the most impact on the valley floor and the river.

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[60] Slaven EIC at [5.14]
[61] Jolly EIC at [3.1][b]
[62] Hudson EIC at [5.21]
[63] Hudson EIC at [5.26]

[159] The Wairau River is identified in the Plan as an outstanding natural feature in a local context and a significantly important multi-recreational landscape. The mid and lower sections of the river have experienced modification in recent times, particularly as a result of river control works and land-use changes. Notwithstanding, the river landscape retains a level of natural character, the degree of which was disputed by the expert landscape witnesses.

[160] We note that the Wairau River is affected by the Branch Scheme, a matter we discuss in greater detail elsewhere in this decision.

3.1.9 Recreation

[161] It was accepted that the Wairau River supports a range of recreational activities. Swimming, kayaking and jet-boating occur over the length of the river. According to Mr Greenaway, the majority of the activities occur downstream of the SH6 bridge.[64] It is also clear from the evidence that family picnicking is a popular pastime on the river.

[162] Angling is a key recreational activity which occurs throughout the river. The Wairau River is the most significant salmonid fishery in the Nelson-Marlborough Fish and Game region. Fish and Game provide 47 access points over the entire river with 11 along the diversion reach.[65]

3.2 Existing abstractions from the Wairau River

[163] Abstractions from the river already occur, broadly subject to the sustainable flow regime provisions of the Plan, including:

[a] A minimum flow of $8m^3/s$ at Tuamarina[66]

[b] A minimum flow of $14m^3/s$ at the Narrows[67]

[c] 2:1 flow sharing.[68]

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[64] Greenaway EIC at [2.2]
[65] Hovell EIC at [4.46]
[66] Rule 27.1.1.1.1
[67] Rule 27.1.1.1.1
[68] RMP Rule 27.1.1.2.5

[164] The Plan contemplates a 3-tier classification system under which Class A, B and C permits are issued. We have already discussed the class system and application of the related rules.

[165] On the Wairau River between the Branch confluence and Tuamarina there is no Class A allocation.

[166] The total Class B allocation is $15m^3/s$, of which $9.7m^3/s$ have already been allocated. Mr Wadsworth by way of affidavit dated 29 March 2010 detailed Class B allocation for the diversion reach as : unrestricted $0.0199m^3/s$; Southbank $2.9414m^3/s$; Northbank $0.4023m^3/s$; giving a total of $3.3636m^3/s$.

[167] Class C permits enable water-takes for storage reservoirs, recharge groundwater or electricity generation, when the flow at Tuamarina is above $30m^3/s$, subject to compliance with a 2:1 flow sharing regime. Mr Wadsworth in his affidavit stated that there are $0.0748m^3/s$ allocated Class C takes in the diversion reach.

3.3 The Branch Scheme

[168] There was some argument as to whether the Branch Scheme, given its temporary nature, was part of the existing environment. Ms Baker submitted that circumstances may justify the consideration of the existing environment as it might be without the Branch Scheme consents.[69] The Branch Scheme commenced generation in 1984 and the consents were renewed by the Council in 2001 for a term of 35 years. The operation of the Branch Scheme has impacted on the hydrology and ecology of the Branch and Wairau Rivers for many years and will continue to do so for many years to come. Accordingly we consider that the Branch Scheme should clearly be considered as part of the existing environment.

[169] Given that the Branch Scheme is part of the existing environment any effects cumulative upon the effects of the Branch Scheme must be taken into account. As was said in *Kuku Mara Partnership v Marlborough District Council*:[70]

> ... if an existing activity has adverse effects, and a proposed activity also has an adverse effect even if only minor, which would add to the existing effects, then

[69] Baker closing submissions at [3.5]–[3.8]
[70] [2005] 11ELRNZ466 [EnvC]

> the definition requires a consideration of both. It would be an exception to the permitted baseline concept, but only to the extent that one could have regard to existing adverse effects when, and only when, taken together with the new effect, they produce a synergetic impact on the environment.

[170] Cumulative effects cannot be limited to those arising from the proposed activity, but include the effects of the proposed activity in combination with any existing effects, whether arising from existing uses or consented and probable uses.[71]

[171] In any event, the Branch Scheme would be subsumed into the proposed scheme as the two schemes will work in conjunction with each other. We thus propose when considering adverse effects to look at the combined effects of the two schemes working together, which is effectively having regard to any cumulative adverse effects or any changes to the existing adverse effects arising from the Branch Scheme.

[172] The Branch Scheme, commissioned in 1984, is a cascade diversion scheme whereby water is diverted from the Branch River, passed through two power stations (the cascade) and then returned to the Wairau River. The discharge point is 5.7km downstream of the Branch/Wairau confluence. The Argyle and the Wairau power stations which form the cascade have maximum power outputs of 3.8MW and 7.2MW respectively and a combined average annual energy production of 55GWh (Gigawatt hours).

[173] Appendix 3 is a schematic showing the Branch Scheme to have resource consent to take up to $29m^3/s$ with the requirement to leave $1m^3/s$ (May – December) and $1.5m^3/s$ (January – April) as residual flows in the Branch River. Of the extracted water only $20m^3/s$ can pass through the power stations the other $9m^3/s$ being used in flushing the sedimentation basin adjacent to the intake. Generation flows of $20m^3/s$ occur approximately 25% of the time with the average flow being some $11.3m^3/s$.

[174] An important feature of the scheme is the Argyle pond upstream of the Argyle power station. The pond can store a $20m^3/s$ flow for up to seven hours. This allows regulation of power station inflows and thus matching power generation to demand for approximately 80% of the time. A consequence of this is a variable discharge from the cascade system to the Wairau River and thus the variations in river discharge and river levels.

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[71] ***Outstanding Landscape Protection Society Inc v Hastings District Council*** [2008] NZRMA8

[175] In summary the Branch Scheme:

[a] removes up to $20m^3/s$ from 3.8km of the Branch River and 5.7km of the Wairau River; and

[b] introduces fluctuations in discharge and water level in the Wairau River from the point of discharge downstream to at least Tuamarina for approximately 80% of the time.

[176] We note here that [a] above will not change under the proposed scheme to be described and that the fluctuations in [b] above will not occur in the reach between the Wairau outfall and Marchburn with the proposed scheme. However as discussed later in this decision the proposed scheme will have varying discharges and thus induce flow variations downstream of its discharge point at Marchburn.

3.4 Existing hydrology of the Wairau River

[177] Downstream of The Wash bridge the Wairau River is a wide, braided gravel bed river. Apart from times of flood only some 20 to 30% of the river bed is occupied by water. The gravel bed material ranges in size from 20 to 300mm with sand fractions found amongst the dominant gravels.

[178] At low flows there is sand movement over the bed with gravel movement occurring in flows over $100m^3/s$. For flows ranging up to the order of the mean annual flood of $535m^3/s$ the movement is limited but sufficient to cause small changes in the bed topography. With larger flows gravel movement increases substantially, armouring layers are broken and the braiding pattern can be changed.[72]

[179] The annual suspended sediment discharge is *most likely* to lie in the range 260,000 to 500,000 tonnes per year.[73] The annual bed load discharge will be at least 10% of the value.[74] Dr Davies suggests it may be much more than this particularly at low flows.[75] We find the data on which he bases this suggestion unconvincing as no attempt

[72]Levy EIC at [4.12] – [4.14]
[73]Levy EIC at [4.16]
[74]Levy Rebuttal Evidence Attachment 1 Memorandum at 3
[75]Davies EIC at [4.4]

was made to show the river from which it was derived is similar to the Wairau in terms of slope, sediment size or flow regime.

[180] Mr Levy states that the sediment discharge is supply limited[76] yet he produced a sediment rating curve for the intake site[77] which would indicate the supply is discharge limited for flows greater than approximately 100m^3/s. Dr Davies is of the view that sediment supply is discharge limited.

[181] Long term flow records for the Wairau River are available from the Dip Flat gauging station (Site 60114) in the upper catchment from June 1951 until the present and from sites at Tuamarina[78] (Sites 60108 and 60109) from January 1989 until present.

[182] Concurrent flow gaugings at Dip Flat and the proposed intake site between 2006 and 2009 established a correlation between the flows at these locations. Flow records for the period 1951 to 2008 at the intake were then synthesised with the results shown in the central column in the table below.[79] Figures derived from the Tuamarina records from July 1989 – June 2008 and presented in evidence to the court[80] are shown in the right hand column in the table:

	Flows at Intake	Flows at Tuamarina
Minimum flow on record	6.5 m^3/s	
Seven day five year low (7DQ$_5$)	8.9 m^3/s	
Mean annual low flow (7DMALF)	10 m^3/s	6.0 m^3/s
Median flow	25 m^3/s	54.0 m^3/s
Mean flow	35 m^3/s	90.0 m^3/s*
Mean annual flood	535 m^3/s	2150 m^3/s
10 year flood	820 m^3/s	
100 year flood	1280 m^3/s	
500 year flood	1500 m^3/s	
1000 year flood	1650 m^3/s	

*Mr Wadsworth, Environmental Scientist with the Council gives 99m^3/s for the mean flow at Tuamarina

[76] Levy EIC at [4.18]
[77] Levy EIC Figure 2
[78] Tuamarina is 29km downstream of the proposed outfall at Marchburn and 12.8km from the river mouth
[79] Mitchell EIC at [3.6]
[80] Keane EIC Appendix Table 22(a)

[183] It is the magnitude of the flood events that causes the mean flow to be greater than the median flow which is exceeded, by definition, 50% of the time. In the Wairau River the mean flow is exceeded some 30% of the time.[81] For this reason the median rather than the mean flow is sometimes regarded as a typical flow and used as a reference flow in ecological studies.

[184] Concealed within the above flow statistics is the highly variable nature of the Wairau River flow regime.[82] Between 1951 and 2008 annual mean flows varied by a factor of 2.2 ranging from 22.7m^3/s in 2005 to 49.8m^3/s in 1988. Monthly mean flows show much greater variation from year to year. The November figures show the ratio of the maximum mean monthly flow to the minimum mean monthly flow over the 1951 to 2008 period to be 11.0 with the most stable month being October where the ratio is 5.6. Within any given year the months of February to April are likely to have the smaller monthly means while October to December are likely to have the larger monthly means.

[185] Two common measures of flow variability are the coefficient of variation (CV)[83] and the FRE3 statistic.[84] The former ranges from 1.0 at the intake to 1.3 at Marchburn and 1.5 at Tuamarina.[85] These values suggest the size of the floods varies little from year to year. The FRE3 values range from 10 at the intake to 13 at Marchburn. Thus there are regular freshes within this reach.

[186] In 2008 and 2009 the Council made three gauging runs along the Wairau River measuring at eight sites from The Wash bridge to the Narrows.[86] The other six sites were the intake site, upstream and downstream of the Wairau Power Station, Wairau Valley and upstream and downstream of PS5. The gauging runs were at the low flows of 7.2m^3/s, 9.2m^3/s and 11.4m^3/s. Main north and southbank tributaries were gauged at the same times.

[187] Steady increases in flow were observed from the intake site to Marchburn and then decreases in flow to Tuamarina. The increases matched the measured tributary inflows showing there were little if any losses from the channel between the intake and

[81] Mitchell EIC Appendix 8 Figure 8.1
[82] Mitchell EIC Appendix 9 Table 9.1
[83] The standard deviation divided by the mean
[84] The number of floods in a year equal to or greater than three times the median flow
[85] Mitchell Addendum to Rebuttal Table 10
[86] Mitchell EIC at [6.21] – [6.25]

Marchburn.[87] Declines in flow downstream of Marchburn are likely due to losses to groundwater and to irrigation abstractions.

[188] Flow statistics derived for the six sites for the period 1 January 1989 – 31 December 2008 were presented by Mr Mitchell in the form of flow duration curves and tables showing the number of days annually at each site that flow would be below nominated thresholds for dry, average and wet years. Examples for flow at the intake and at Marchburn (in parentheses) are:[88]

	Days Annually Below			
	80 m^3/s	20 m^3/s	15 m^3/s	10 m^3/s
2005 (dry year)	361 (321)	197 (37)	80 (0)	3.7 (0)
1995 (wet year)	318 (117)	44 (0)	15 (0)	0 (0)
1989 – 2008	343 (245)	131 (18)	66 (0)	7.3[89] (0)

[189] The zero entries for Marchburn reflect the contributions from the northbank tributaries. Derived flow duration curves showed tributary inflows to be between 4 and $5m^3/s$ during extreme low flows, to exceed $5m^3/s$ 95% of the time and $25m^3/s$ 50% of the time.

[190] The number of consecutive days for which flows are below nominated thresholds were presented by Mr Mitchell in tabular form in his evidence to the Council hearing. Ms Baker in her cross examination of Mr Wadsworth produced Mr Mitchell's tables from which the following figures for the intake and for Marchburn (shown in parentheses) are derived.

Return Period (Year)	Probability of Occurrence[90] in 35 yrs (%)	Consecutive Days Annually Below			
		80 m^3/s	20 m^3/s	15 m^3/s	12 m^3/s
10	97.5	160 (82)	59 (29)	38 (0.7)	30 (0)
20	83.4	179 (95)	69 (5.5)	44 (1.0)	36 (0)
100	29.7	222 (126)	90 (24)	58 (3.6)	49 (0)

[87] Mitchell EIC Appendix 4 Figure 4.1
[88] Mitchell EIC Appendix 8 Tables 8.1 and 8.5
[89] We are puzzled as to why this figure exceeds the value given for the dry year
[90] The probability of occurrence in 'n' years of an event with a return period of 'r' years is $[1-(1-(1/n))^r]$

[191] The zero entries for Marchburn result from the sample sizes being too small to be meaningful.

[192] Operation of the Branch Scheme affects flows and levels in the Wairau River. By responding to changes in electricity demand, in particular the morning and evening peaks, the scheme releases discharges ranging from 0 to $20m^3/s$ to the Wairau River via the Wairau tail race. This results in fluctuations in both discharge and water level in the river from the Wairau tail race downstream to at least Tuamarina.

[193] Measurements over the period 15 February to 10 March 2006 show typical fluctuations in discharge at Marchburn to be 10 – $15m^3/s$ and up to $18m^3/s$. Corresponding water level fluctuations are typically 75 – 120mm and up to 160mm. Fluctuations at Tuamarina are smaller being typically 6 – $10m^3/s$ and 50 – 100mm and up to $14m^3/s$ and 120mm.[91] The fluctuations may occur twice a day (morning and evening peaks) or only once a day.

[194] Caucusing of hydrological experts representing the Department of Conservation, Fish and Game, Marlborough Water Augmentation Group and TrustPower in 2006 produced an agreed statement which included:

> It is agreed that the effect of the existing Branch Scheme generation is to cause flow fluctuations in the order of ±20 percent about the rolling 24-hr average flow at Tuamarina.

[195] Groundwater plays an important role in the Wairau Valley. It interacts with surface waters, contributes to the maintenance of wetlands and is a source of water for domestic, agricultural and industrial purposes via wells and infiltration galleries.

[196] On the south bank the groundwater flow is predominantly down the valley and towards the river.[92] Wells in this region thus derive their water from the hills to the south and not from river recharge of the aquifers. On the north bank the flow has a more complex pattern[93] with a series of groundwater zones some of which have flow towards the river and while others have flow from the river. One concludes that groundwater inflow to the river is a small component of the river flow in the affected reach.

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[91] Mitchell EIC Appendix 11 Figures 11.4 and 11.5
[92] Callander EIC at [4.24] and [4.28]
[93] Callander EIC at [4.23] and [4.29]

[197] Groundwater is of good quality within the Wairau Valley with the exception of some saline waters in Walkers Stream and Saltwater Creek. Reasons for the presence of saline water are not fully understood.[94] The groundwater has higher concentrations of nitrite and nitrate nitrogen (NO_x) and dissolved reactive phosphorus (DRP) than surface waters.[95] It is expected that this contributes NO_x and DRP to the smaller tributaries of the Wairau and to wetlands but not to the main river in any significant way.

3.5 The permitted baseline and its relevance

[198] When assessing the effects on the environment of the proposed scheme, we have discretion as to whether or not to use what has become known as the *permitted baseline* as a point of comparison.[96] There was a difference of opinion as to whether we should apply the permitted baseline.

[199] It was TrustPower's submission that it would be unrealistic not to have regard to the permitted baseline when evaluating the overall merits of the proposed scheme. It was the appellants' contention, that we should exercise our discretion and not apply the permitted baseline for the reason that the activities permitted under the Plan are of such a small scale compared with the proposed scheme, that no reasonable comparison can be made.

[200] To determine the permitted activities relevant to considering the proposal, we were referred to the General Rules (Chapter 27) and Rural Zones (Chapter 30) of the Plan. A detailed explanation of the permitted activities was set out in the evidence of Mr Kyle.[97]

[201] Mr Kyle succinctly summarised what he considered any permitted baseline assessment should account for:[98]

> 7.14 Overall, the permitted baseline and future/existing environment assessment should account for:

[94] Callander EIC at [6.10]
[95] Callander EIC at [6.4]
[96] See Sections 104(2) and 104D(2) of the Act
[97] Kyle EIC atat [7.1] and following
[98] Kyle EIC at [7.14]

- Small scale abstractions for domestic use, abstractions for irrigation needs and abstractions associated with construction activities;
- Bores to a depth of 5m;
- Diversion of water for irrigation purposes subject to the volumetric limits that apply to other abstractions;
- River control and drainage channel works where these works are conducted by the River Control Authority (Council);
- Stormwater discharges from earthworks and vegetation clearance subject to adherence to a range of "good practice" protocols and area limitations;
- Application of agrichemicals;
- A range of land uses including farming, viticulture, forestry, irrigation, erection of buildings, cultivation and land disturbance;
- Discharges of dust to the atmosphere;
- Existing consented activity, especially existing lawfully permitted bore usage.

[202] Many of the permitted activities identified, are relatively small in scale when compared to the scale and extent of the proposed scheme. The permitted rules for abstraction and discharges bear no relation to the large scale operation of the scheme. Some of the permitted river works have some relevance to the construction and maintenance phases of the proposed scheme. However, the appeals focus on the changes to the flow regime and the effects on natural character and ecology. Accordingly, we see no need to compare the scheme against what is permitted as of right in the relevant provisions of the Plan.

4 THE PROPOSED SCHEME

[203] Early in the hearing a joint statement of evidence giving an overview of the proposed scheme was presented by Messrs P B Lilley, R M Dawson and G J Levy. The scheme description which follows is based largely on their helpful statement.

4.1 Overview

[204] TrustPower propose to extend the Branch Scheme by taking water from the Wairau River at an intake approximately 2km upstream of the Branch confluence. This water will be combined in the existing Wairau head pond with water from the Branch Scheme. The head pond will supply both the existing Wairau power station and a new

Wairau power station built adjacent to the existing station. The water will then flow via a canal along the south side of the Wairau River through five new power stations to discharge back to the Wairau River at Marchburn some 48km downstream of the intake. The proposal is thus for a cascade diversion scheme which, when in operation, will result in reduced flows in the Wairau River between the intake and Marchburn, the diversion reach.

[205] We will refer to the new Wairau station as the new WPS and the other five new stations as PS1 to PS5.

[206] The scheme will add a maximum power generation of 72.8MW and an annual energy production of 397GWh if a plant factor of 63%, as is obtained in the Branch Scheme, is assumed.

[207] It is important to understand that the Branch Scheme is an integral part of the proposal. Thus the flow regime associated with the proposal and its effects include those of the Branch Scheme.

[208] Appendix 4 is a schematic of the proposal which shows:

[a] the existing Branch abstraction and the Argyle Power Station;

[b] an abstraction of up to $40m^3/s$ from the Wairau with residual flows varying monthly between $10m^3/s$ and $20\ m^3/s$;

[c] a return flow of $5m^3/s$ from the intake for periodic flushing of the associated sedimentation basin and a continuous flow from fish screens at the entry to the canal system;

[d] a flow of up to $55m^3/s$ through the two Wairau power stations;

[e] a return to the river of up to $15m^3/s$ through the existing Wairau Power Station tail race;

[f] a flow of $40m^3/s$ through the proposed canal and five new power stations with discharge back to the river;

[g] maximum flow reductions in the Wairau River of $35m^3/s$ for 2km, $55m^3/s$ for 7.7km and $40m^3/s$ for 38km. These reductions occur for 14%, 11% and 27% of the time respectively.[99]

[209] The mean flow extracted from the Wairau at the intake[100] is $15m^3/s$ which when combined with the $11.3m^3/s$ mean flow extracted from the Branch river gives a mean flow in the canal of $24m^3/s$. Under this condition one finds reductions in the mean flow in the reaches identified in [g] above are of the order of 15, 26.3 and $24m^3/s$ respectively.

[210] Recommendations from TrustPower's ecologists have led to the following suggested minimum residual flows at the intake:

January to July	10 m^3/s
August	12 m^3/s
September	15 m^3/s
October, November	20 m^3/s
December	15 m^3/s

[211] We note that the proposed $10m^3/s$ flow is above the low flows that have been recorded at the intake site.[101]

[212] The above minimum flows plus $5m^3/s$ in each case are proposed for the river upstream of the PS5 discharge at Marchburn. During dry periods when tributary inflows are insufficient to provide the additional $5m^3/s$, water will be released via the Wairau tail race to supplement flows in the diversion reach.

4.2 The intake

4.2.1 Physical description

[213] Immediately upstream of the proposed intake the Wairau River emerges from a narrow reach with one channel and has, historically, split into two channels. Water is to be taken from the southern channel while the northern channel will remain unaffected to

[99] Mitchell Addendum to Rebuttal Evidence Figure 1
[100] Mitchell Rebuttal Evidence Table 1 Page 3
[101] Mitchell EIC Appendix 10

ensure fish passage past the intake. Between 80,000 and 160,000 tonnes per year of mainly suspended sediment is expected to be carried into the intake.[102]

[214] A rock groyne and a gravel bund will provide a ponding area in which gravel and coarse sand will be trapped and subsequently flushed back into the river at the intake site. It is estimated that 24,000 to 48,000 tonnes per year[103] could be trapped in the ponding area.

[215] The gravel bund is sacrificial in that it will wash away in times of flood thus allowing the full river channel to convey the flow. This also means that flood flows are unaffected by the scheme. Reinstatement of the bund will take place as soon as possible on the receding limb of the flood.

[216] From the ponding area the water will pass through intake ports into a short canal and thus to a sediment retention basin. Here most of the remaining sediment (estimated to be between 32,000 and 64,000 tonnes per year)[104] will deposit for later flushing back to the river approximately 900m downstream of the intake. At the outlet from the sediment retention basin into the canal there is a fish screen and a regulation gate which is used to control the abstracted flow and thus the flow to the power stations.

4.2.2 Operation

[217] The intake control structure will be operated to:

[a] ensure residual flow requirements are met;

[b] provide flushing (ecological) flows down the river such as may be required by consent conditions;

[c] cease abstraction when natural flows in the Wairau River are below the residual flows required;

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[102]Levy EIC at [6.2]
[103]Levy EIC at [6.3]
[104]Levy EIC at [6.8]

[d] cease abstraction when river flows exceed 200m^3/s (typically 3 to 4 times annually) which will avoid major influxes of sediment to the system and reduce the amount required to be flushed from the intake pond and the sediment retention basin.

4.2.3 Regulation pond

[218] Together the existing and proposed Wairau power stations will be able to operate with flows up to 55m^3/s which exceeds the capacity of the remaining five power stations, viz 40m^3/s. If the extra 15m^3/s can be stored downstream of the Wairau stations this will allow these stations to provide peaking capacity and thus respond to peaks in energy demand. This storage is to be provided by a regulation pond located between the existing tail race and Saltwater Creek. With a surface area of 15ha it provides some 245,000m^3 of live storage, sufficient to accept 15m^3/s for up to four hours. The water level in the pond may thus rise and fall reflecting the peaks in energy demand.

[219] Discharge from the pond will be controlled to ensure successful operation of the five proposed power stations PS1 to PS5. Control will include being able to shut the flow off completely in times of maintenance shut down or in emergencies. The abstracted water would be returned to the Wairau River via the existing Wairau tail race which will have to be enlarged to cope with the increased flows (from the existing 20m^3/s to the proposed 55m^3/s).

[220] The combined effect of the additional six stations and the regulation pond is to increase the ability of the system to provide peak energy at times of high demand by 4 to 5 times.

[221] The regulation pond will provide a recreational setting. A flooded ecological margin or moat will be established around the pond and isolated from the water level fluctuations in the pond. An indigenous aquatic wetland of approximately 4.3ha is proposed to be created.

4.3 Canals

[222] The 46km of canals is to be formed in cut and/or fill with trapezoidal cross sections. At 40m^3/s the water depth will be 3.2m, the water surface width 22m with top

width ranging from 27m to 33.5m. The canal's footprint width will vary depending on whether the particular section is in cut, fill or cut and fill. Footprint widths up to 70m are expected. As the canals approach power stations they will be widened to form head ponds. These are to provide the storage necessary for start up and shut down of turbines.

[223] Where the canal water level is above that of the adjacent groundwater the canal will be lined to minimise seepage losses. Other sections of the canal will be unlined.

[224] Eighteen lowered sections of the canal embankments (reduced freeboard) will serve as spillways. Twelve of these are emergency spillways and six will serve as both operational and emergency spillways.

[225] Provision will be made for controlled dewatering of the canal. Although this is most unlikely it could become necessary if there is movement on the Wairau fault. Water can be released from the canal through the existing tail race at the Wairau power station, through a tail race to be constructed downstream of PS4 and through a drop shaft into Kiernan Creek. Each power station other than PS5 will have a bypass valve to allow water to pass should the station be unable to operate when dewatering is required.

4.4 Tributary and road crossings

[226] Thirty eight southbank tributaries intersect the line of the proposed canal. Five crossing types are proposed the choice in a particular case depending on the tributary size and the relative water levels in the canal and the tributary. The crossings which are designed for a 100 year flow in the tributaries will be one of the following types:

[a] the tributary in a culvert under the canal, e.g. Wantwood Creek;

[b] the tributary passed into the canal by means of a drop structure, e.g. Centre Valley Stream;

[c] the tributary passed over the canal in a structural flume, e.g. Saltwater Creek;

[d] the canal passed over the tributary in a structural flume, e.g. Branch River;

[e] the canal passed under the tributary in an inverted siphon, e.g. Wye River.

[227] Flows up to the 100 year flows in tributary streams apart from those in [b] above will be unaffected by the scheme as will the recharge they provide to aquifers between the canal line and the river.

[228] Should the 100 year flows be exceeded water from the tributaries may flow into the canal. This water together with that entering the canal through the drop structure ([b] above) will be used to generate power with the scheme abstraction from the river being reduced accordingly. Should this not be possible the operational spillways and possibly the emergency spillways will come into operation.

[229] Twin lane highway bridges will be built at the four locations where the canal passes below SH63 and a single lane bridge built where the canal passes beneath Centre Valley Road. A range of farm crossings is to be provided to maintain access to all affected properties.

4.5 Power stations

[230] The new WPS will receive water from the existing Wairau head pond through a 3.2m diameter concrete penstock. It will discharge into the existing tail race enlarged to accommodate 55m^3/s. The maximum power generation will be 12.1MW.

[231] PS1 to PS4 will each receive water from a head pond through a 3.5 m diameter concrete penstock. Each station will have one turbine and will discharge into the canal leading to the next head pond. The maximum power generation from each of PS1 to PS4 is, respectively, 6.7 MW, 11.0 MW, 8.1 MW and 12.6MW.

[232] PS5 will have two turbines and receive water through twin 2.3 m diameter concrete penstocks. Discharge will be into a tail race leading to the Wairau River. The maximum power generation will be 22.3MW.

4.6 Tail races

[233] The scheme proposes three tail races through which water may be discharged directly back to the Wairau River.

[234] The existing Wairau tail race, enlarged to carry $55m^3/s$, will convey flows from the Wairau power stations to the regulation pond. It will also have a direct connection to the river controlled by an outlet gate. The gate will normally be closed and open if the regulation pond and canal system cannot accept all or any of the flow in the tail race.

[235] A new tail race is to be constructed from a point on the canal 2.3km downstream of PS4 directly to the Wairau River, a distance of 1km. It will have a capacity of $40m^3/s$ and be controlled by an outlet gate approximately 50m from the canal. The downstream section of the tail race will normally be dry and available for grazing. An un-gated weir structure with a drop of 2m will operate as a fish barrier preventing fish from the river entering the canal.

[236] Flows from PS5 will pass along a 1.4km tail race, with a capacity of $40m^3/s$, to the river. Two un-gated weir structures each with a 2 m drop will control the flow and act as fish barriers. It is proposed to incorporate a number of recreational facilities adjacent to the tail race between SH63 and the river. Kayaking, walking, picnicking and boat launching facilities are envisaged.

4.7 Non-engineering works

[237] Recreational facilities as described above are to be provided at the regulation pond and downstream of PS5.

[238] A proposed vegetation package including a vegetation management plan has been agreed with the Department of Conservation. The plan and proposed associated conditions of consent require:

[a] legal protection of 18.7ha of ecologically significant indigenous bush and 15.6ha of exotic forest which provide important ecological corridors

[b] gradual replacement of the exotic components in these corridors

[c] active revegetation of 4.7ha of native forest, 5.3ha of indigenous wetlands and of a 10m riparian strip at the canal intersection with Saltwater Creek

[d] control of weeds and animal pests at nominated sites.

These measures are seen by TrustPower as mitigation and compensation.

5 THE CONTESTED ISSUES

[239] Having set the context of the proposed scheme, we now identify the issues within the statutory framework, within which we must make our decision.

5.1 Positive effects

[240] There were a number of positive effects identified by the TrustPower witnesses. Many of these are acknowledged by those opposed to the proposed scheme. What was contested was:

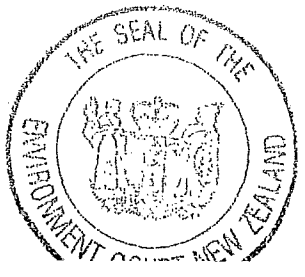
[a] The economic and social benefits.

5.2 Adverse effects

[241] The appellants opposed to the proposed scheme raised a number of adverse effects that they maintained would result. These effects can, for convenience, be grouped as follows: *Group 1 Effects* - those effects resulting (in whole or in part) from the hydrological changes to the flow regime of the river; *Group 2 Effects* - those effects relating to health and safety.

Group 1 effects

1. Hydrological effects including tributary connectivity and groundwater
2. Sediment transport capacity
3. Aquatic Ecology
4. River birds
5. Wetlands and terrestrial ecology
6. Natural character, landscape and amenity (including recreation)



Group 2 effects

1. Well water quality and quantity

2. Dust

3. Seismic Risk

4. Flooding

6 ENVIRONMENTAL EFFECTS

6.1 Undisputed positive effects

[242] The TrustPower witnesses identified a number of positive effects that would result from the construction and operation of the proposed scheme. They included:

[a] Construction of the regulation and sediment retention pond areas which would enhance the amenity of and access to the Wairau River as well as providing recreation opportunities including new walkways and viewing areas;[105]

[b] A boat ramp and kayak play facility that would be provided;[106]

[c] Provision for the canal to carry irrigation waters for the Wairau Valley Water Enhancement Scheme (WVWES);[107] and

[d] Improved access to emergency water supplies for fire fighting along the length of the Wairau Valley.[108]

[243] A number of other mitigating and compensatory initiatives have been proposed for native flora and fauna. We address these specifically when considering actual and potential effects on the ecosystem.

[105] Joint brief at [8.6] exhibit 17
[106] Hovell EIC at [6.12]
[107] McKenzie EIC at [32] – [35]
[108] Bains EIC at [5.89]

6.2 Disputed economic and social benefits

[244] Both Mr Donnelly and Dr Layton identified a number of potential economic and social benefits that would result from the proposed scheme. These included:

[a] Increasing the proportion of New Zealand's electricity produced by renewable resources;[109]

[b] Reducing New Zealand's greenhouse gas emissions;[110] and

[c] Increasing the security of electricity supply in the Nelson/Marlborough region.[111]

[245] The appellants did not call an economist to rebut or contradict the economic evidence of either Mr Donnelly or Dr Layton. Mr Delamore did however enter into the economic sphere. He challenged all three of the above benefits identified by Dr Layton and Mr Donnelly. We thus briefly comment on each.

6.2.1 Supply of renewable electricity generation

[246] Mr Donnelly pointed out[112] that electricity is an essential commodity as it forms the basis of our economic prosperity. Demand is growing, at around 2% or 850 GWh per year. Dr Layton put it at 1.3%. Both Mr Donnelly[113] and Dr Layton[114] considered there would be a benefit by the proposed scheme contributing to the supply of renewable generation. Mr Delamore[115] questioned whether the construction of the proposed scheme is necessary to meet future increases in demand for renewable electricity generation at the national or regional level. He reproduced[116] summary data from a July 2009 Electricity Commission publication. This lists the generation projects that were then under consideration. He pointed out that the renewable energy projects had a combined capacity of 4,189 MW.

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[109] Layton Executive Summary at [2.6]
[110] Layton Executive Summary at [2.6]
[111] Layton Executive Summary at [2.6]
[112] Donnelly EIC at [4.1] and following
[113] Donnelly EIC at [13.1]
[114] Layton EIC at [16.7]
[115] Delamore EIC at [4.11] and following
[116] Delamore EIC at [4.13]

[247] As Dr Layton pointed out, the statistics cited by Mr Delamore are a measure of generation capacity which is measured in megawatts. Electricity output over a period of time (energy) is measured in gigawatt hours. Output does not equate with capacity as no plant can operate at 100% capacity all of the time. The average capacity factor for New Zealand hydro generation plants in 2008 was 46.9%.

[248] We agree with Dr Layton that Mr Delamore has exaggerated the increase in output available from the proposed renewable generators listed in his reproduced table. Further, we agree with both Dr Layton[117] and Mr Donnelly[118] that any proposals need to be put into perspective. Not all of the current proposals will be consented. There is also considerable uncertainty over the commercially viability of some projects.

6.2.2 Impact on carbon emissions

[249] In his evidence-in-chief, Dr Layton concluded that the proposed scheme's generation of an additional 370GWh per year would avoid 140,600 tonnes of CO_2 per year if this electricity were instead generated from a gas-fired plant or 330,000 tonnes per year from a coal-fired plant.[119] He did point out[120] that one could not foretell which plant would be displaced by the proposed scheme's output, as that is the role of the electricity market. But more often than not, fossil fuel-fired thermal plants would be displaced because of their higher short-run marginal costs.

[250] Mr Delamore questioned Dr Layton's conclusion[121] and stated that the proposed scheme's output would only assist in off-setting emissions when South Island power is being used to replace thermal generation in the North Island, or less frequently when thermal generation is being sent to the South Island during periods of low hydro lake levels.

[251] Notwithstanding Mr Delamore's criticism, we find that the commissioning of a new hydro-electricity station would be a net benefit because it would assist in increasing the ratio of hydro generation compared with fossil fuel-fired generation. This would assist in reducing carbon emissions.

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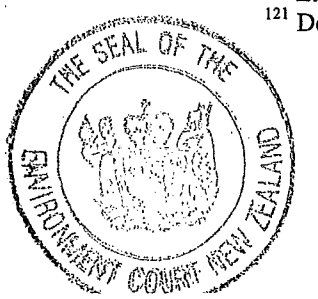
[117] Layton Rebuttal at [3.6]
[118] Donnelly EIC at [13.2] & [13.3]
[119] Layton EIC at [12.2]
[120] Layton EIC at [12.6]
[121] Delamore EIC at [4.19]



6.2.3 Security of electricity supply

[252] Dr Layton concluded,[122] that the proposed scheme would increase security of electricity supply in the Nelson-Marlborough region, by reducing its dependence on the transmission lines into the region from the south. Mr Delamore was critical of Dr Layton's view. He suggested that the key mechanism for establishing security of supply is the transmission network, rather than generation per se,[123] and that the scheme will operate below maximum capacity much of the time.[124]

[253] With regard to the first criticism, Dr Layton pointed out that transmission can improve security of supply in a region by connecting more than one generator to it, so that in the event one generator fails, supply can be provided by the other generator or generators. He did acknowledge that in the event of a transmission fault emerging, the operation of local generation, including the proposed scheme, would be limited by operational constraints.

[254] We acknowledge the limitations raised by Mr Delamore to the effect that the proposed scheme will not be able to fully insulate the local community from transmission faults. However, there would be a net benefit to the local community in terms of a reduction in lost electricity supply that would be equivalent to the energy output of the proposed scheme for the duration of the transmission fault.

6.3 Disputed Group 1 effects
Adverse effects resulting from the hydrological changes to the river

[255] We first discuss the hydrological changes that will result from the construction and operation of the proposed scheme. The river's hydrology and its changes are not in dispute.

6.3.1 Hydrology

[256] The proposed scheme would divert water from the Wairau River into a canal, through a series of turbines and then discharge the water back to the river some 48km

[122] Layton EIC at [15.4]
[123] Delamore EIC at [4.21]
[124] Delamore EIC at [4.22]

downstream. Thus the hydrological effects include the reduced flows in the diversion reach, the discharges at Marchburn, temporary discharges associated with flushing events and potential changes in groundwater levels and tributary connectivity.

6.3.2 Flow management

[257] Flows at the Branch intake are controlled by a gate and limited by the physical size of the intake. Residual flows are removed first by means of a bypass system.

[258] Flows at the Wairau intake are to be controlled by a regulation gate at the exit from the sediment retention pond and are to be measured in the first section of canal. The difference between this flow and the flow at either Dip Flat or The Wash bridge (adjusted to the intake site) will be the residual flow passing the intake in the river. Residual flows will thus be set by adjusting the regulation gate.

[259] A control gate at the exit from the ponding area will be shut preventing abstraction when river flows fall below the required residual flow. It will also close when the river flow exceeds 200m^3/s opening again when the flow drops below 150m^3/s. Reopening will be done gradually taking up to 30 minutes. The gate will also be closed for scheme maintenance typically during low flows when abstraction rates are small. This ensures minimum effect on the river and minimises generation loss.

6.3.3 Discharges from the scheme

[260] For the majority of the time the only discharge from the scheme will occur at Marchburn. Other discharges will occur over the operational and emergency spillways as described above, through the upgraded Wairau tail race when the regulation pond is unable to store the abstracted water which cannot be passed into the canal system, and when flushing of the intake pond and sediment retention basin is undertaken.

6.3.3.1 The discharge from PS5 at Marchburn.

[261] During periods of high river flows when the total abstracted flow from the Branch and the Wairau exceeds 40m^3/s the Wairau tail race will be discharging and PS1 to PS5 will be operating at full capacity with the canal flow being essentially constant. There is

thus little or no variation in discharge from PS5 under this condition which is expected to occur for approximately 25% of the time.

[262] It is inefficient for a station to generate at less than 25% of its capacity. At low flows therefore water will be stored in the regulating pond and released in pulses down through PS1 to PS5. The discharge from PS5 will thus rise and fall. This condition will occur about 10% of the time.

[263] Changes in the discharge will also occur during shut down and start up events (expected to be infrequent) and during conditions between the high and low flow conditions mentioned above. To control such changes in discharge three conditions[125] have been proposed which effectively limit both the magnitude and rate of change of discharge from PS5 to the river.

[264] A maximum ramping rate of $20m^3/s/h$ is proposed by TrustPower. Fish and Game have suggested $5m^3/s/hr$. The purpose of the ramping rate is to limit the rates of change of water depth and wetted width in the receiving waters resulting from changes in discharge to those waters. The maximum anticipated change in discharge is $31m^3/s$.[126] The Wairau River is of the order of one kilometre wide at Marchburn with the flow being in several braids.[127]

[265] Dr Ryder addressed the matter of changes in wetted width by assuming a single channel, 105m wide and carrying $22m^3/s$, receiving an extra $31m^3/s$. The increase in wetted width in this circumstance is 12m.[128] However, the Marchburn discharge will be into one of several braids. Thus the changes in this braid may well be significant but there will be no changes in the remaining braids until they merge with the receiving braid. At this stage any effects will be greatly reduced. Similar comments apply to changes in water depth.

[266] Comparisons are drawn between the existing fluctuations in river levels resulting from the Branch Scheme and those expected from the proposed scheme. These are unhelpful in that the former have had some 48km of river to spread across all braids while the latter will be confined to one braid for some distance.

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[125] Conditions 167 - 170
[126] Mitchell EIC Appendix 11 at [11.10]
[127] Mitchell EIC Appendix 11 at [11.12]
[128] Ryder EIC at [12.8]

[267] This braid will be the closest to the south bank and thus access to other braids may be impeded over the distance required for the braid to merge with others in the cross section. This is likely to occur even when the tail race is discharging at the lower end of its range and ramping rates are thus irrelevant. The braid may provide good fishing as fish which are attracted to it by the larger flow (compared with the other braids) will be unable to move into the tail race because of the 2m high weirs.

[268] Imposing a ramping rate will therefore be for the safety of those who choose to fish in the receiving braid. Many of these will choose to go to there because it is the receiving braid and thus will be aware of the fluctuating flows. Nevertheless, is will be necessary for appropriate signage to be erected along the length of the receiving braid and in particular at any Fish and Game access points in the vicinity. This will be a condition of consent.

[269] No evidence has been supplied to support either TrustPower's or Fish and Game's suggested ramping rate. With TrustPower's $20m^3/s/hr$ maximum rate the $31m^3/s$ change would occur over at least 90 minutes. We favour this rate for the following reasons:

[a] It provides the greater benefit to the production of electricity

[b] It is likely to be limited by the other two conditions on the discharge

[c] The ramping rate does not affect access to the riverbed

[d] There is no effect over the majority of the braids with either ramping rate

[e] Those affected are in the region by choice and many will be well aware of the flow fluctuations

[f] Signage would be adequate to address any safety concerns

[270] A $20m^3/s/hr$ ramping rate is approved and will be included as a condition of consent.

[271] Fish and Game proposed a condition requiring a regulating pond be constructed to reduce the rate of change of discharge from PS5. We consider the impacts of these flow fluctuations on the ecology before considering the need for a regulating pond.

[272] The other two conditions control fluctuations in discharge at Tuamarina in times of low flow and place a limit on the ability of the system to operate as a peaking system.

6.3.3.2 Operational and emergency discharges from canals

[273] Operational discharges will occur over the lowered sections of canal walls acting as spillways. These are to cope with large (of the order of 1% AEP)[129] rainfall events when inflows to the canal from tributary streams and directly from the land cause the capacity of the canal to be exceeded and, if necessary, during maintenance work on the power stations. Emergency spillways will operate in the event of a control system failure, in extreme rainfall events (up to 0.1% AEP events have been considered) and if the stations cannot operate for example in an intense storm which takes out the transmission lines.

[274] In all cases discharge from these spillways will be into tributary streams on the downstream side of the canal. As the scheme does not increase the volume of flood flows, provided the stations are operating, the presence of the scheme will in general reduce flood flows in the tributaries by intercepting flows and discharging them in a controlled manner. If the stations are not operating during a flood event with a 1% AEP in the tributary streams the flood flows in those streams will, with two exceptions, be reduced. Flows in Saltwater Creek and the Wye River will be increased by 18% and 4% respectively.[130] This could result in increased local flooding. The probability of this occurring is much less than that of the flood alone which during the 35-year consent period is 30%.

[275] No issues were raised with respect to discharges from the upgraded Wairau Power station tail race or the proposed PS4 tail race.

[276] Discharges associated with flushing flows are discussed below under the heading Sediment Transport Regime.

[129] AEP is the Annual Exceedance Probability
[130] Levy EIC Table 2

6.3.4 Proposed flow regime

[277] The proposal will significantly change the existing, but modified, flow regime of the Wairau River:

[a] by reducing the mean and the median flows and altering the flow duration curve for the diversion reach i.e. downstream of the intake to the outfall at Marchburn

[b] downstream of Marchburn, by altering the pattern of flow fluctuations presently occurring there as a result of operation of the Branch Scheme

[c] by increasing the possibility of loss of connectivity between northbank tributaries and the Wairau River along the diversion reach.

6.3.4.1 Changes in the diversion reach

[278] Changes from the existing flow regime can be quantified in a number of ways. Those most useful for evaluating amenity and ecological effects are changes in:

[a] Long term mean and median flows and the MALF;

[b] Number of days per annum below specified flows;

[c] Number of consecutive days per annum below specified flows;

[d] Flow variability as measured by the CV and FRE3;

[e] Flow variability between years and monthly variability within a typical year.

[279] Since the intake is to be closed when flows there exceed 200m^3/s the flood regime of the Wairau River will not be altered by the proposal.

[280] By making assumptions about the operation of the proposed scheme and using existing records of past flows, synthetic flow series can be developed.[131] These series represent flows that would have occurred had the scheme been operating for the period covered by the existing records. In this case records from the intake site from 1951-2008 and from Marchburn from 1989-2008 were used. Examples of the statistics derived from the synthetic series[132] are presented in the Table below: (the values are in m^3/s)

	Site*	Existing	Post-Scheme	% Reduction
Mean	1	35	19	46
	2	42	27	38
	3	87	64	26
Median	1	25	10	60
	2	26	13	50
	3	57	31	46
7DMALF	1	10	10	0
	2	11	11	0
	3	19	15	21

*Site 1 is the intake. Site 2 is upstream of the Wairau tail race. Site 3 is Marchburn

[281] The smaller percentage reductions that occur in the mean and median flows as distance downstream from the intake increases result from the tributary inflows which are unaffected by the proposal. The major effects are upstream of the Wairau tail race but those further downstream are still significant.

[282] By using the same synthetic flow series described above flow duration curves can be derived. They show reduced flow variability throughout the reach with a pronounced shift to longer periods at lower flows.[133] These effects can be quantified by examining the number of days and the number of consecutive days per annum for which flows are below nominated thresholds post scheme (existing in parentheses). Examples of these are:[134]

	Number of Days Per Annum Below			
Threshold (m^3/s)	**80 m^3/s**	**20 m^3/s**	**15 m^3/s**	**10 m^3/s**

[131] Mitchell EIC Appendix 7
[132] Mitchell EIC Appendix 7 Tables 1 to 13
[133] Mitchell EIC Appendix 8 Figures 8.1 to 8.6
[134] Mitchell EIC Appendix 8 Tables 8.1, 8.5 and 8.6

Intake	354 (343)	281 (131)	234 (66)	7.3 (7.3)
Above Outfall	296 (245)	88 (18)	15 (0)	0 (0)
Below Outfall	241 (245)	18 (18)	3.7 (0)	0 (0)

[283] For consecutive days below threshold values based on a 20 year return period[135] the values are:[136]

	Number of Consecutive Days Per Annum Below			
Threshold (m^3/s)	**80 m^3/s**	**20 m^3/s**	**15 m^3/s**	**12 m^3/s**
Intake	229 (179)	135 (69)	128 (44)	112 (36)
Above Outfall	129 (95)	46 (5.5)	22 (1.0)	* (*)
Below Outfall	89 (95)	7.1 (5.5)	0.4 (1.0)	* (*)

*The starred values refer to sample sizes too small to fit the distribution

[284] Scheme operation will increase flow variability as measured by the CV in the diversion reach. Values of the CV will move from 1.0 to 1.6 at the intake, 1.3 to 1.9 above the WPS outfall and 1.3 to 1.7 at Marchburn.[137] There will be no change in CV values below Marchburn.

[285] Changes in flow variability were of concern to Fish and Game and Save the Wairau. Dr Hayes believes[138] the best measures of flow variability are the CV and the ratios of MALF and median flow to the mean flow, and the ratio of the MALF to the median flow. Greater values, he opined, of these ratios imply a poorer ecosystem and lower trout abundance. The ratio MALF to mean is increased. The ratio median to mean is decreased. The ratio MALF to median, being the quotient of the previous two ratios, must necessarily increase and thus adds no new information. These tests for ecosystem quality are thus, in this case, inconclusive.

[286] Mr Mitchell provided limited information on monthly flow variability under the proposed scheme. His data are from 2008, a year for which the flow duration curves match closely those of the long term record.[139] Hydrographs for 2008 at the intake and at

[135] A 20-year return period event has a probability of occurrence in 35 years (the consent duration) of 83.4%
[136] Exhibit Wadsworth 1. Mitchell Tables 6.1, 6.5 and 6.6 from his evidence at the Councils' hearing tabled by Ms Baker during her cross-examination of Mr Wadsworth
[137] Mitchell Rebuttal Evidence Table 10
[138] Hayes EIC at [7.28]
[139] Mitchell EIC Appendix 9 Figure 9.1

Marchburn[140] show that for large flows (greater than 40m^3/s) the monthly distribution of the proposed flow regime matches that of 2008. High flows will occur in the periods January to March, July, and September to December.

[287] The hydrographs show clearly that post-scheme the recession phases associated with high flows will be greatly reduced. Dr Hayes' hydrographs for the period July 2001 to June 2002[141] clearly show that under TrustPower's proposal much of the recession portion of the hydrograph is removed. It seems Dr Hayes' hydrographs refer to the intake site and thus show the conditions that would occur within the reach down to the Goulter confluence and WPS outfall (approximately 7.5km). Downstream of the Goulter confluence the effect would be reduced.

[288] The FRE3 statistic will be increased by the scheme partly because the median flow is approximately halved. At the intake it will move from 10 to 14 and at Marchburn from 13 to 17. For ecological purposes it may be more appropriate to reference the FRE3 statistic to the existing median flow. The changes are then from 10 to 7 at the intake and from 17 to 10 at Marchburn.[142] These figures suggest there will be some 7 to 10 freshes each year capable of disturbing the river biota.

6.3.4.2 Changes downstream of Marchburn

[289] There will be an immediate increase in flow and in flow variability just downstream of the outfall. The maximum change in discharge[143] during a day under the proposed operating rules is 31m^3/s. The associated change in river level is 300mm. The corresponding figures for the existing conditions with the Branch Scheme operating are 18m^3/s and 160mm.

[290] The fluctuations will attenuate rapidly in the reach to Tuamarina where proposed condition 167 requires fluctuations in discharge to be less than ±10% about the rolling 24 hour average flow. The Branch Scheme causes fluctuations of ±20% about the 24 hour rolling average at Tuamarina.

[140]Mitchell EIC Appendix 9 Figures 9.2 and 9.4
[141]Hayes EIC Appendix 1
[142]Mitchell Rebuttal Evidence Table 11
[143]Mitchell EIC Appendix 11

6.3.4.3 Connectivity issues

[291] Retaining connectivity between the northbank tributaries and thus access for trout to spawn was seen as important by all parties. Possible effects of the scheme include gravel build up at the confluences and a change in the braiding pattern with braids moving to the south and away from the tributaries. Condition 189 has been proposed to deal with these possibilities. The Court sought clarification as to possible amendments to this condition.[144]

[292] By way of a memo to the Court dated 5 July 2010 counsel for Meridian provided an amended condition, responses from Fish and Game and from Save the Wairau to the amended condition and TrustPower's response to them. The amended condition extends the possible causes to reduced surface flows, provides for increased frequency of monitoring during the period May to August and requires assessment of possible causes by an independent expert before remedial action is undertaken.

[293] TrustPower's evidence is that the likelihood of loss of connectivity is low with Dr Keesing reporting that he could *find no evidence based on stream paths or flows that I have witnessed to suggest that loss of connectivity might occur.*[145] Mr Wadsworth for the MDC expressed a similar view.[146] Given these views it is reasonable to require TrustPower to seek consent from the MDC for the proposed remedial work as soon as a loss of connectivity is detected and thus remedy the loss as soon as is possible without having to wait for an independent expert to investigate and report. We thus reject this section of the amended condition.

[294] Save the Wairau requested the Branch River and Pine Valley Stream should be included in the condition. We note the Branch River problems are being addressed in separate consenting procedures and decline to include the Branch in the amended condition. With respect to Pine Valley Stream, Mr Deans for Fish and Game notes Pine Valley Stream is frequently dry in its lower reaches for many months of the year.[147] It is thus unreasonable to include Pine Valley Stream.

[295] Accordingly the connectivity condition will read:

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[144]Transcript page 2761
[145]Keesing EIC at [8.1]
[146]Transcript at 2248
[147]Deans EIC at [9.25]

[a] The consent holder shall monitor the connection between the Wairau River and Goulter River, Top Valley Stream, Timms Creek/Cat Creek and Fabians/Barnetts Creek to ensure flow connection is maintained and not interrupted by either the formation of a gravel obstruction or reduced surface water flows;

[b] Monitoring shall be carried out at least once per month during May – August (inclusive) in periods of low flow and once every four months for the remainder of the year;

[c] The consent holder shall submit the results of the monitoring to the Consent Authority within seven days of completion of the monitoring;

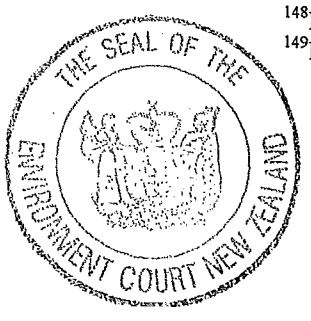
[d] In the event that monitoring shows that connectivity between any of the monitored tributaries and the Wairau River has been lost, the consent holder shall immediately prepare and submit to the Consent Authority for approval a plan for restoring the lost connection and seek any necessary consents for its implementation;

[e] Having obtained the Consent Authority's approval and any necessary resource consents the consent holder shall immediately implement the plan in [d] to the satisfaction of the Consent Authority.

6.3.4.4 Comparison with SFR

[296] Mr Mitchell, using the 1989 – 2005 flow series for the intake derived the corresponding flow series for the residual flows below the intake under three operating scenarios: the proposed flow regime, a regime with flow sharing and a minimum of $8m^3/s$ at the intake (SFR8) and a regime with flow sharing and a minimum of $9m^3/s$ at the intake (SFR9). The SFR8 and SFR9 regimes were subject to the 2 for 1 flow sharing described in the Plan.[148] The results were presented as monthly mean and monthly median flows, as annual mean flows and illustrated by flow duration curves.[149]

[148] Mitchell Rebuttal Evidence at [6.1] to [6.5]
[149] Mitchell Rebuttal Evidence Appendix 1 Figures 4, 5 and 6



[297] There was no significant difference between any of the results for the two SFR scenarios. The monthly means and medians of the residual flows for the proposed regime showed a similar distribution throughout the year to those of the SFR scenarios but values were smaller in the months January to July and greater in the months August to December. The latter is a reflection of the higher minimum residual flows required by the proposed flow regime in this period (12 to $20m^3/s$) than those required by the SFR scenarios (8 and $9m^3/s$). The maximum difference in the monthly means of $3.6m^3/s$ (12%) and monthly medians of $3m^3/s$ (18%) occurred in October.

[298] The mean residual flow over the 1989 -2005 period below the intake was the same for SFR9 and the proposed flow regime at $19.3m^3/s$ while the mean flow for SFR8 was $19m^3/s$ for the same period.

[299] The flow duration curves show a changed distribution of residual flows. The principal change is that the SFR scenarios produce flows of $20m^3/s$ or greater for 18% of the time while for the proposed regime the figure is 24%. The reason for this is again the higher minimum residual flows required by the proposed flow regime.

[300] Condition 179 requires TrustPower to maintain flows above the PS5 outfall of 15 to $25m^3/s$ depending on the time of year unless the natural flows are insufficient to meet the requirement. Flows at the Narrows and Tuamarina will thus not drop to the SFR minimums of 14 and $8m^3/s$ respectively as a result of the scheme operation. Equally flows throughout the diversion reach will not drop to those corresponding to the SFR minimums. In effect condition 179 ensures the minimum residual flows will always (provided there is enough water naturally in the river) exceed the SFR minimums.

[301] We find, in the light of the above results, that the proposed flow regime is not significantly different from that produced by the Plan requirements embodied in the SFR scenario. The principal differences arise from the variable minimum flow regime imposed by the proposal at the intake and upstream of the PS5 outfall which at all times results in higher minimum flows than would occur under the SFR scenario.

[302] TrustPower has agreed to a limited flow sharing regime which sets flows below the Goulter confluence for the period October to January inclusive[150]. This will increase the monthly mean and median flows from those used in the above comparison with SFR

[150] Consent condition 177

scenarios. However during these months the proposed regime monthly flows exceed those of the SFR scenarios. So while the flow sharing may provide more water in the diversion reach it does not improve the comparison with the SFR minimum flows. However like the 2:1 sharing of the Plan it does assist in providing mid range flow variability and for this reason the court supports it.

6.3.5 Sediment transport regime

[303] The proposal will cause changes to the sediment transport regime in the diversion reach by reason of the abstraction of water at the intake and the flushing of sediment from the intake pond and the sediment retention basin. There will also be sedimentation effects during construction of the intake and when works are required in the river bed as part of the scheme operation.

6.3.5.1 Sediment transport in the affected reach

[304] The abstraction of water from the river at the intake will reduce the sediment transport capacity of the river throughout the diversion reach. The principal effect of this is accumulation of bed load material in the vicinity of the intake. Dr Davies presented a formula[151] which in conjunction with the flow duration curves for the existing and the proposed flow regimes allows the reduction in annual bed load sediment transport volume to be estimated. The formula is sensitive to the threshold discharge at which bed load transport begins and assumes the transport is discharge limited. This assumption is conservative and we accept it as being appropriate.

[305] Dr Davies and Mr Levy disagree over the amount of material that will accumulate in the vicinity of the intake and the resultant rise in bed level. Dr Davies uses an accumulation rate of 20,000m^3/yr (without any explanation of why this figure was chosen) and from it estimates bed level rises of 1m in 18 years and 2.5m after 100 years.[152] Mr Levy's estimates based on a threshold discharge of 100m^3/s are 2,100 m^3/yr and a bed level rise of up to 1.3m after 100 years.[153] He opines this is an over estimate given that sediment transport at the smaller flows is supply limited and thus sediment transport rates are unlikely to change appreciably in small to moderate floods as a result

[151]Davies EIC at [4.2]
[152]Davies EIC at [4.5] and [4.6]
[153]Levy Rebuttal Evidence Attachment 2

of the proposed flow regime. He thus expects a rise of considerably less than the calculated value.[154] To support this view he records the experience at other intakes with significant abstractions from braided South Island rivers. Aggradation has not been observed at any of these intakes.[155]

[306] We accept Mr Levy's views on possible aggradation at the intake and thus have no concerns over increased bank erosion or bed form changes in the vicinity of the intake arising from the proposal.

[307] We turn now to consider the effects on sediment transport along the diversion reach. The scheme will shut down when flows at the intake exceed 200m^3/s, a flow expected to be exceeded about twice a year. It is the larger flows which are responsible for the evolution of the braided form of the riverbed and which produce the bulk of the sediment transport volume. Mr Levy quotes Mr Williman, the Council Rivers Engineer, who expressed the view:[156]

> It takes 400 to 500m^3/s of flow before the braids start to move, and 1300m^3/s for significant bed movement.

[308] As these flows are unaffected by the proposed scheme we expect the river to retain its braided form which will respond to each flood as it does presently. The total sediment load transported through the reach (260,000 to 500,000tonnes/yr) will be reduced by the annual volume of deposition in the vicinity of the intake. Estimates of the annual deposition range from 2,100 to 20,000m^3/yr. If the deposit is assumed to increase by 10,000m^3/yr this is less than 7% of the estimated annual sediment load.

[309] The reduction in sediment load may result in local changes in channel slope and cross sectional shape.[157] We accept Mr Levy's observation[158] that presently channel slopes in the diversion reach vary by ±25% which is larger that any change in slope that could reasonably be attributed to the reduction in annual sediment load. Given the channel forming role of the larger flows which will be unaffected by the proposal we do not agree with Dr Davies with respect to possible changes in braid cross section.

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[154] Levy Rebuttal Evidence at [4.25]
[155] Levy Rebuttal Evidence at [4.28] - [4.32]
[156] Levy rebuttal at [4.15]
[157] Davies EIC at [4.9]
[158] Levy rebuttal at [4.19]

[310] Immediately downstream of Marchburn some degradation can be expected. Dr Davies asserts it will occur at approximately the same rate as aggradation does at the intake.[159] This assertion seems to overlook the phenomenon of armouring that will act to limit the depth of degradation but not its downstream extent. We have no information from which to estimate the depth of the degradation. However, we can say it will increase slowly and be limited. Any adverse effects on stop banks or irrigation intakes will thus be minor if any occur at all.

[311] Mr Keane, witness for Fish and Game, was concerned about possible reductions in the number of *optimum* angling days as a result of the proposed flow regime and changed sediment transport regime. It seems the bounds on the optimum range of flows for angling are set by the associated water clarity. He states that at low flows the water is too clear while at flows above the mean flow turbidity increases rapidly and catch rates fall markedly.[160] The optimum range of flows at the Goulter confluence is $20m^3/s$ to $65m^3/s$ and the total range over which anglers may be expected on the river is $10m^3/s$ to $80m^3/s$.[161]

[312] Mr Keane and Mr Levy agree that abstraction of water at the intake will have very little effect on water clarity[162] since this depends on the concentrations of the fine sand and silt fractions in the suspended load which are supply limited and thus not a function of discharge. This is well illustrated in Mr Levy's Figures 7 and 8.

[313] We accept that the turbidity presently experienced at the Goulter confluence at $80m^3/s$ will be unchanged after the scheme has extracted $35m^3/s$ and the flow there reduced to $45m^3/s$. Mr Keane notes that this will become the upper limit of the total fishable range.[163] This flow will be exceeded on approximately the same number of days as the $80m^3/s$ is exceeded presently. Any change in the number of days on which an angler cannot fish as a result of high turbidity will thus be small.

[314] Similarly with the scheme operating at capacity and extracting up to $35m^3/s$ all flows below 35 to $45m^3/s$, depending on the time of year, will be reduced to the relevant minimum flow with the water clarity essentially unchanged. The flows will remain

[159] Davies EIC at [4.12]
[160] Keane EIC at [12.4] and [12.5]
[161] Keane EICTable 8
[162] Keane EIC at [12.9] and Levy Rebuttal Evidence at [8.9] and [8.12]
[163] Keane EICTable 9

turbid enough for them to be fishable and the number of days of angling opportunity will not change appreciably.

[315] We agree with Mr Keane that the range of optimum flows for angling will be reduced but accept Mr Levy's view that the number of days when the river is within that range will not change appreciably.

6.3.5.2 Flushing regime and effects

[316] Sediment will accumulate in the intake pond and the sedimentation retention basin necessitating periodic flushing by sluicing into a major braid of the river. TrustPower suggests that this may occur for at least two hours between 12 and 20 times per year from the intake pond and 12 to 20 times per year from the sediment retention basin. Flushing from the pond and the basin will not be done concurrently but may occur sequentially on the same flood. Flushing will only be done at times when the river flow is in excess of $80m^3/s$ and the turbidity at The Wash bridge recorder site is greater than 5.6NTU.[164] Flushing will be avoided as far as possible during the brown trout spawning season.[165]

[317] ANZECC and MfE[166] have published water quality guidelines for aquatic ecosystems and recreational use which set trigger levels of 4.1NTU for turbidity and 1.6m for water clarity. For a natural flow of $80m^3/s$ at the intake, these trigger levels are exceeded at Dip Flat and at Tuamarina. Thus flushing when flows are greater than $80m^3/s$ as proposed will not of itself result in these trigger levels being exceeded.[167]

[318] TrustPower and Fish and Game disagree as to where the $80m^3/s$ trigger level is to be measured. TrustPower has suggested a condition whereby the $80m^3/s$ is measured at The Wash bridge recorder site. Fish and Game's preference is for there to be at least 80 m^3/s immediately downstream of the intake.[168]

[319] Flushing from the intake pond and the sediment retention basin will cause temporary increases in suspended sediment concentration over that occurring naturally in the receiving water. The peak expected concentration in the river at the flushing outfalls

[164]Levy EIC at [6.10] and [7.11]
[165]Levy EIC at [6.13]
[166]Australia and New Zealand Environment Conservation Council and Ministry for the Environment
[167]Levy EIC Figures 7 and 8
[168]Consent condition 175

is 3000 to 4000g/m^3 a value normally expected with a 100 year flood.[169] This will reduce on mixing with the flow in the river, with time as flushing continues and with distance downstream.[170] At 80m^3/s the natural concentration is 200 to 300g/m^3.

[320] There is disagreement over the extent of a mixing zone with TrustPower suggesting the reach between the outfalls and the Branch confluence while Fish and Game want the mixing zone to be 200 metres. Mr Levy used a length of approximately 1km (from the outfall to the Branch confluence) to model the likely effects of sediment. He considered that to be a reasonable distance in which it could be expected that the braids had rejoined and the river would be fully mixed. While he had looked at possible changes in water clarity and turbidity he did not consider it possible to make predictions and said that would require field trials.[171]

[321] We have found that the proposed scheme is an exception in terms of s 107 of the Act. Bearing this in mind we accept Mr Levy's estimate of 1km to be a reasonable distance for mixing and the flushing condition 198 reflects this.

[322] Sediment capture and its subsequent release to the river is an integral part of any scheme in which significant quantities of water are abstracted from a river. The effects of this cannot be avoided but they can be mitigated. The trigger level of 80m^3/s is not disputed. To maximise the effect of the trigger level we accept Fish and Game's proposal that it refer to the flow just downstream of the intake. This to be computed by differencing the flow as recorded at The Wash bridge site and the intake flow to the scheme.

[323] The proposed flushing condition 194, as in Appendix 2, refers to *the sediment pond adjacent to the intake*. It should also apply to flushing from the sediment retention basin. Thus, the flushing condition will read:

> 194 The consent holder shall ensure that sediment flushing from the sediment ponding area immediately in front of the intake ports and/or the sediment retention basin downstream of the intake into the Wairau River only occurs if the following requirements are met:

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[169] Levy EIC at [6.10] and [7.4]
[170] Levy EIC Figure 6
[171] Transcript at 1212 – 1213

[324] Proposed condition 196 will require a similar amendment.

[325] Proposed condition 200 refers to monitoring of the flushing flows. Condition 200(a) would be of greater utility if the turbidity record was determined at The Wash bridge recorder site (the control site for turbidity during flushing) rather than in the scheme intake channel. Further, we see condition 200(b) as onerous and unnecessary. An amended condition has thus been included.

6.3.6 In-river works

[326] Periodically works will be required in the river bed. Such works will require a bulldozer or large hydraulic excavator to move bed material and may occur over a two kilometre stretch of the river centred on the intake structure.[172] At times it will be necessary to do these works in flowing water.

[327] Circumstances requiring work in the river include:

[a] during initial construction of the intake;

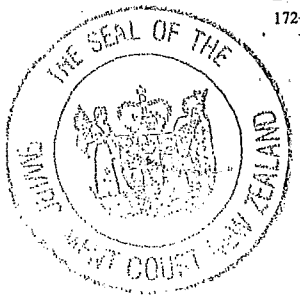
[b] during an extended dry period if insufficient flow is reaching the intake;

[c] after freshes and minor floods if the channel has moved away from the intake or from the sediment flushing outlets;

[d] after major floods when the gravel bund needs to be reinstated.

[328] These works are all of a temporary nature and each will occur infrequently. Consent conditions have been proposed to ensure adverse effects of the works are minimised. These include the requirement to work outside the flowing water as far as practicable, to do reinstatement works during the recession phase of the flood when the river is still turbid and to ensure any black-fronted tern and black-billed gull nesting sites in the vicinity are not affected. With these conditions we have no concerns regarding possible adverse effects from in river works.

[172] Levy EIC Figure 4



6.3.7 Interaction with groundwater

[329] The scheme will affect the groundwater system both during construction and operation. The proposed conditions detail requirements for a Groundwater Management Plan and require a comprehensive pre-construction groundwater monitoring programme. Should the proposal be approved we see these conditions as appropriate and endorse them.

6.3.7.1 During construction

[330] Excavations for power house foundations and for sections of the canal below adjacent groundwater levels will need to be dewatered. This will result in local groundwater lowering which may affect wells in the vicinity and inflows to wetlands and tributary streams.

[331] The extent of the lowering has been estimated and presented by Mr Callander in tabular and graphical form. The maximum lowering resulting from power house excavations of up to 18m is expected at PS5. Canal excavations may result in lowering of up to 14m. The areas affected by lowering extend from the canal almost to the Wairau River and up to 2km along the canal in each direction from the power house locations. Lowering initially reduces rapidly as one moves away from the excavation and more slowly as the distance from the excavation increases.

[332] Dewatering of the excavations is to be by pumping with stipulated maximum pumped flow rates. Should these not be sufficient to control groundwater inflows alternative methods such as sheet piling are available. These will not increase groundwater lowering. The pumped water has to be discharged which raises the possibility that it could be directed to areas of significant lowering or be used to supplement inflows to affected wells, wetlands and spring fed streams.

6.3.7.2 During operation

[333] Changes in groundwater levels during operation of the scheme will be much less than those experienced during construction. This is because differences in water levels between groundwater and the water in the canal will be much less than those resulting from the excavations during construction.

[334] Levels will be lowered locally near those sections of the canal in which the water surface is below adjacent groundwater levels. Any associated adverse effects will be much less than those encountered during construction and be mitigated by the same methods.

[335] Levels will be raised (mounding) along those sections of the canal in which canal water levels are above adjacent groundwater levels and seepage from the canal is expected. Such loss of water from the canal is undesirable from an operational perspective and will raise adjacent groundwater levels. This mounding could have the adverse effect of impeding land drainage which may lead to water logging of soils and reduction in their structural strength. It may also raise the level of the saline groundwater with consequent effects on plant life.

[336] To limit seepage losses it is intended to line the canal with low permeability material in those sections from which seepage is predicted. Even so outflows from the canal are expected to exceed inflows with an average loss of some 10*l*/s/km. Should this result in mounding being a problem it can be controlled by means of cut-off drains with the collected water being returned to the canal downstream, directed to areas in which lowering is occurring, to wetlands or to the headwaters of the spring fed streams.

[337] Many of the southbank streams are ephemeral ceasing to flow in drier periods. It is likely that some of these streams and also some wetlands will benefit either directly from the seepage from the canal or as a result of these flows being diverted to them. This together with the relationship between TrustPower and the Wairau Valley Enhancement Scheme led Mr Callander to the conclusion

> ... it is most likely the water supply situation within the Wairau Valley can be enhanced as a result of this scheme going ahead ...

6.3.7.3 Maintenance of water supplies

[338] During both construction and operation the key issue is maintenance of domestic and stockwater supplies that are affected by the scheme. Mr Callander notes there are potentially up to 60 wells, galleries or springs within the zones of predicted drawdown. These abstraction systems will be affected to differing degrees and will thus have to be assessed individually so that measures appropriate to each can be devised and implemented. This is required by the Groundwater Management Plan. TrustPower has

given an undertaking to provide an alternative water supply to any affected property that is equivalent to, or better than, the supply currently utilised. Available methods include improving well construction and/or the pumping system or providing a new supply by tanker in the short term or in the longer term a new well.

6.3.7.4 Effect of reduced river flows

[339] Reduced flows in the diversion reach of the river would have an effect on the groundwater levels in the gravels adjacent to the river. Mr Mitchell's evidence is that there will be prolonged periods when the river level is 0.3m below existing levels and for short periods in some locations the drop may be up to 0.6m. Similar drops will be experienced in groundwater levels near the river. The drop in levels will decrease with distance from the river. Groundwater flows towards the river will increase as levels drop and exert a moderating effect. Monitoring of wells near the river suggests that the effects of reduced flows in the Wairau will be limited to 300m from the river.

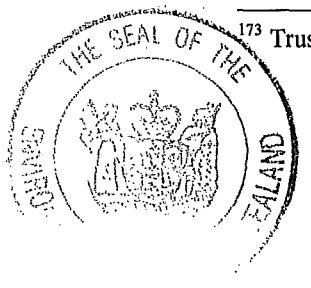
[340] The minimum flow requirements will ensure that groundwater levels will fall no more than they do presently. The duration of the lowered levels will however be increased.

6.3.8 Overall findings on hydrology

[341] The most obvious change to the hydrology is the reduction in flows and reduced mid-range flow variability within the diversion reach. At the intake the median flow is reduced by 60%, a significant effect in itself and one that may have consequential and related effects on the ecosystem and natural character values of the river.

[342] Mr Whata submitted that the abstraction of water could not in itself be considered an adverse effect and that it was the consequential effects that must be considered. He contended that regarding an abstraction as an adverse effect would be an impossible hurdle for any application to take or divert water.[173] We agree that for most applications for water permits a simple abstraction would not be considered to be an adverse effect on the environment. However, that must be assessed on the facts in each case. Most water takes are for a small fraction of the total flow and do not impact on the natural

[173] TrustPower introductory submissions at [10.17]



functioning of the water body. In this case the water take is a large proportion of the median flow and very large in comparison to the MALF.

[343] Mr Whata has already referred us to the Lower Waitaki decision and we note the finding in that decision on the water take:[174]

> There is one significant adverse effect of the NBTC which cannot be avoided – substantially reduced flows over 30 kilometres of the Waitaki River by (on average) 211m^3/s.

In the Waitaki scheme the 211m^3/s take was a 57 % reduction in the median flow. This is very similar to the 48 to 60% reduction in the median flow along the diversion reach as a result of the proposed scheme. However, there the comparison ends as the Waitaki River is quite different to the Wairau River and the related and consequential effects of the water take and operation of the proposed power schemes are also different. We must now consider the related and consequential effects of the changes to the flow regime on the ecosystem, natural character and amenity values of the Wairau River.

6.4 Water Quality

6.4.1 Temperature

[344] Dr Hudson considered the water temperature in the Wairau River to be related to cloud cover and solar radiation, more than to stream-flow.

[345] He predicted the maximum increases in mean daily water temperature as a result of the proposed scheme to be less than 0.7°C and maximum daily temperature to be up to 1.7°C higher in the lower river.[175] Dr Ryder observed that warm temperatures often occur in the Wairau River over the summer and these may be sufficient to cause sub-lethal effects on macro-invertebrates and trout. Brown trout will cease feeding above 19°C and seek refuge in cooler waters. Dr Ryder recommended monitoring to determine the relationship between temperature, river flow and the scheme operation. If shown to be necessary a temperature management plan would be developed.[176] Mr Dungey considered that it might be beneficial to avoid or alleviate temperature stresses on fish following a long dry spell by allowing part or all of a fresh to pass down the river.[177]

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[174] C80/09 at [376]
[175] Hudson EIC at [4.7] – [4.8]
[176] Ryder EIC at [10.4] – [10.9]
[177] Dungey rebuttal at [29]

[346] We will return to the issue of water temperature after we have considered the habitat modelling and monitoring information for periphyton, macro-invertebrates and trout.

6.4.2 Turbidity and sediment

[347] Mr Deanes was concerned that the increased suspended sediment levels from flushing operations will breach the turbidity and water clarity requirements of the Plan and impact upon invertebrates and fish, including salmonid spawning.[178] Dr Olsen was particularly concerned about local effects from fine sediments on the abundance and diversity of invertebrates. He predicted a possible reduction in sensitive invertebrates – *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies), *Tricoptera* (caddis flies) together the EPT taxa – affecting the availability of prey species for adult trout and aerial feeding river birds.[179]

[348] Mr Levy analysed sediment transport in the river at suitable depth and flow for spawning and concluded that the river was able to transport the sediment load. He acknowledged that some smaller braids may well receive and deposit sandy sediment from flushing, much as they do on the recession from natural freshes and floods.[180]

[349] Dr Ryder agreed with Dr Olsen that fine sediments can adversely affect invertebrates and fish but considered the short duration of the flushing events to render any such effects acceptable. He recommended monitoring as a precautionary measure.[181]

[350] As discussed earlier in this decision flushing from the intake pond and sediment retention basin will increase turbidity and reduce clarity although no numerical predictions have been made. There will be increased sediment deposition downstream immediately following flushing. We have already found that the mixing zone should extend from the outfall to the Branch confluence and that the flow in the river should be at least $80m^3/s$ below the intake before flushing is commenced.

[351] The increased turbidity, reduced clarity and increased sediment deposition as a result of flushing may have localised and temporary effects on both invertebrates and

[178]Deans EIC at [12.109] – [12.115]
[179]Olsen EIC at [5.13] – [5.14]
[180]Levy rebuttal at [3.4] – [3.8]
[181]Ryder rebuttal at [4.9] – [4.14]

fish. We accept that numerical predictions are not possible without more detailed field work. Therefore we agree with Dr Ryder that monitoring of the invertebrate community should be undertaken as a precautionary measure.

6.5 Aquatic ecology

6.5.1 Position of the parties

[352] Ms Baker, for Fish and Game, submitted[182] that the proposed changes to the flow regime *could significantly affect the aquatic ecology of the river in respect of the trout food producing habitat, fish migration and water quality.* She noted the uncertainty as to the extent of adverse effects on fish habitat and food production and considered the adaptive management regime to be inadequate.[183]

[353] Mr Whata, for TrustPower, submitted that, on average, overall 90% of habitat is predicted to be maintained[184] and noted that different parts of the diversion reach, particularly the Argyle reach, would be affected more than others.[185]

[354] Mr Hardy-Jones, for Save the Wairau, submitted that there would be consequential adverse effects on river birds and higher flows should be maintained from late July through to February or March.[186]

6.5.2 Habitat modelling to assess ecological effects

[355] Assessment of in-channel ecological effects that may result from the proposed scheme relied upon the habitat modelling used to predict potential physical habitat for a number of species under different flow regimes. It is important to note that this modelling does not set minimum flows, but allows an assessment of potential effects and a comparison of the effects associated with various levels of minimum flow. Nor does the model indicate how much habitat is used or required.

[356] We first give a general description of habitat modelling and then consider in detail how it was applied in this case.

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[182]Baker opening submissions at [7]
[183]Baker opening submissions at [11]
[184]Whata opening submissions – water at [1.5]
[185]Transcript at 608
[186]Hardy-Jones closing submissions at [61]

[357] The first step is hydraulic modelling of the river channels which allows estimates to be made of changes in water velocity and depth and in wetted area associated with anticipated changes in flow rate. Next habitat suitability criteria which define the preferences of each species at their different life stages for particular depth, velocity and substrate conditions are developed. Such criteria are based upon field observations of the behaviour of the species under consideration. Values range from 0 (unsuitable) to 1 (ideal). The criteria are then used in conjunction with the hydraulic model to predict the potential physical habitat for the species of interest and a range of flows.

[358] The habitat available for each species is expressed as an index referred to as weighted usable area (**WUA**) in units of square metres (m^2) for a particular reach or square metres per metre of river length (m^2/m).

[359] Dr H R Hudson, an engineer specialising in river systems, carried out the hydraulic modelling for TrustPower. Prior to doing so Dr Hudson met with experts representing key stakeholders.[187] It was agreed by these experts that the model *River2D* be used to simulate how the river hydraulics and habitat change with flow and the location of three modelling reaches.[188] It was also agreed that the mean annual low flow (**MALF**) be used as the benchmark for assessing habitat retention levels.[189]

[360] Dr Hudson claimed[190] that the accuracy of the hydraulic modelling has been shown by others to be of lesser importance than the details of the habitat suitability criteria for 2D modelling of habitat changes. However, the volume of evidence, rebuttals, second rebuttals and the extent of the cross examination by the appellants devoted to perceived inadequacies in the hydraulic modelling suggests strongly that they do not accept this claim. We observe that the habitat suitability criteria used by Dr Hudson[191] exhibit sharp drop offs in habitat suitability in the ranges of water depths and velocities of interest to this decision. The validity of the hydraulic modelling is thus, in our view, of importance.

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[187]The stakeholder expert panel represented TrustPower, Fish and Game, DOC and Marlborough District Council.
[188]Argyle, Hillersden, and Marchburn located 4km, 23km and 46 km downstream of the intake respectively.
[189]Hudson EIC at [3.2]
[190]Hudson EIC at [7.33]
[191]Hudson EIC Appendix 4

[361] To assist in evaluating the modelling the Court asked that Mr Jowett, a professional engineer with acknowledged expertise in modelling the habitat and flow requirements of benthic invertebrates, brown trout and native fish, prepare evidence evaluating Dr Hudson's model and its application to the Wairau river. The Council offered to and presented Mr Jowett as their witness.

6.5.2.1 The hydraulic model

[362] Hydraulic modelling of a river channel requires a detailed topographical survey of the channel bed and an estimate of its roughness characteristics. A computational mesh is then established over the channel bed. The model must then be calibrated and verified. The former involves comparing model outputs of velocity, depth and flow patterns with measured values for a particular flow rate. The channel roughness and the computational mesh are adjusted until the best agreement is attained. Verification then requires good agreement to be obtained for different measured flows without further change to the model parameters.

[363] An original version of the hydraulic model was presented at the Council hearing. Subsequent to that a revised version with a denser computation mesh was developed by Dr Hudson. This enabled a better description of the bed topography and in particular the edges of channels.[192] The effects of assuming different values for the bed roughness were investigated and found to be small.[193]

[364] It is the revised model that is of interest in this case.

6.5.2.2 Model design and calibration

[365] Dr Hudson, Dr Hayes and Mr Jowett agreed that with respect to the revised model the survey procedures were appropriate and the raw survey data, over some 80% of the reach areas, was adequate for the modelling exercise.[194]

[366] Computational mesh design (often referred to as the black art of hydraulic modelling) provides, by means of a digital representation of the surveyed river channel

[192]Jowett EIC at [20]
[193]Hudson Second Rebuttal at [3.13]
[194]Hudson Executive Summary at [5.9][b]

the framework on which the hydraulic equations that govern the flow are evaluated. Dr Hudson developed his initial mesh using his considerable field experience of river behaviour and hydraulic modelling. The refinement of this mesh and the adjustment of channel roughness during development of the revised model may be considered as a calibration process.

[367] Dr Hayes was particularly critical of what he saw as inadequate calibration.[195] In his view calibration involves adjusting model parameters until differences in observed and predicted water levels are minimised.[196] As a result of bed level changes between the time of his topographic surveys and the collection of water level data Dr Hudson was unable to do this. Instead he relied on flow distributions between different channels, comparison of flow depths (as opposed to water levels) at critical locations and a comparison of inflow to various reaches with the out flow from these reaches. In Dr Hudson's view[197] there were reasonable matches for both flow distributions and flow depths.

[368] Mr Jowett expressed reservations about the original model including that it was not calibrated directly and that it relied on the observation that changes in roughness had little effect on the outputs. The revised model with its improved definition of bed topography and mesh design and changed roughness characteristics partly alleviated Mr Jowett's concerns.[198] However, he retained concerns over Dr Hudson's determination of water levels. Mr Jowett felt they should have been done with constant flow in the river (i.e. with the Branch Scheme switched off) and to greater levels of accuracy.[199]

[369] We share the concerns expressed by Dr Hayes and Mr Jowett with respect to the model calibration.

6.5.2.3 Verification

[370] Dr Hudson employed several means to verify his model including comparison of model predictions with aerial photographs to assess flow distributions, with observed

[195]Hayes EIC at [6.11] – [6.19]
[196]Hayes EIC at [6.12]
[197]Hudson Executive Summary at [7.1][b]
[198]Jowett EIC at [23]
[199]Jowett Transcript at 1993

water levels and with measured hydraulic geometry and flow distributions. He also carefully considered the internal consistency of hydraulic relations for different flows.

[371] The above taken together and supplemented by his extensive field experience of over 100 days on the river led Dr Hudson to be confident that the hydraulic model provides a realistic representation of the hydraulic relations for a complex, evolving, braided river.[200] He thus believed it has been adequately verified and that *collectively the verification processes have shown the model to be sound.*[201]

[372] Dr Hayes was critical of each of the individual verification methods and did not agree that evaluating them as a whole as Dr Hudson did constitutes adequate verification. Indeed, Dr Hayes claimed that in total the data falls far short of that which could be described as a convincing, robust validation data set.[202]

[373] For his assessment of model verification Mr Jowett conducted a detailed study of the model outputs and observed values. In his view the test of a model is whether it correctly predicts water levels and flow distributions throughout the reach for a range of flows.[203] Dr Hayes agreed that this is the appropriate test.[204]

[374] By considering measured and predicted flows and wetted widths in different braids for a range of total flows Mr Jowett found that:

[a] in the Argyle reach model performance was poor with water levels and thus flows and wetted widths being generally over predicted;[205]

[b] in the Hillersden reach the model similarly overestimated water levels;[206] and

[c] in the Marchburn reach over and under predictions of levels and flows in the braids occurred with no systematic bias and in approximately equal numbers.[207]

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[200]Hudson EIC at [7.54]
[201]Hudson Rebuttal Evidence at [3.6]
[202]Hayes Second Rebuttal Statement at [5.6]
[203]Jowett EIC at [24]
[204]Hayes Executive Summary at [1.38]
[205]Jowett EIC at [31]
[206]Jowett Addendum at [11]

[375] Thus Mr Jowett could not conclude from this analysis that model performance was inaccurate nor that it was accurate and considered there to be possible errors of up to $3m^3/s$ in the main channel.[208]

[376] Throughout his evidence and rebuttal statements Dr Hayes emphasised the need for the model to be calibrated and subsequently validated to acceptable scientific standards. We agree with Dr Hayes that calibration and verification of the model was not done in the rigorous way that might have been expected. However, we are conscious of the difficulties of working in a gravel bed river such as the Wairau which has fluctuating flows and multiple channels. In such circumstances one must rely to a certain extent on the experience and judgement of those involved. In this regard we choose to rely more on the experience and judgement of Dr Hudson and Mr Jowett.

6.5.2.4 Habitat modelling

[377] Habitat suitability criteria must be selected for use with the outputs from the hydraulic model. Those used by Dr Hudson are presented in his Appendix 4. These criteria were selected by an expert panel which included Dr Hayes and Fish and Game staff.[209] We therefore accept them as appropriate for use in making predictions of habitat changes in the Wairau River.

[378] Dr Hudson was confident that the hydraulic habitat model provides a reliable representation of the habitat availability for target species in the Wairau River.[210]

[379] Mr Jowett carried out an independent habitat modelling exercise by using measured cross sections at a range of flows and using his preferred 1D model (RHYHABSIM) to estimate flows which would produce maximum trout habitat and maximum food production.

[380] His results for maximum trout habitat[211] were 10, 17 and $23m^3/s$ for the Argyle, Hillersden and Marchburn reaches respectively. These agreed very well with the

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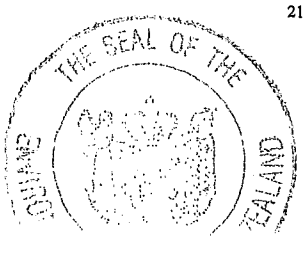
[207] Jowett EIC at [35]
[208] Jowett EIC at [35]
[209] Hudson EIC at [3.21]
[210] Hudson EIC at [7.59]
[211] Jowett Executive Summary at [18]



corresponding values from Dr Hudson's analysis,[212] namely 10, 15-20 and 20m^3/s. For maximum food producing habitat Mr Jowett's values for the three reaches[213] were 15, 28 and 35 m^3/s while Dr Hudson's were,[214] gradually increasing with flow at Argyle, 40m^3/s at Hillersden and 50m^3/s at Marchburn. Mr Jowett considered his flow values to be lower because he had not included food producing habitat in the minor braids.[215]

[381] Mr Jowett compared the shape of the average habitat suitability index (HSI) (calculated by dividing the WUA expressed as m^2/m by the water surface width) against flow for each of the three reaches as calculated using the original and revised models.[216] Mr Jowett explained that the HSI indicates the quality of habitat and the WUA the quantity of habitat.[217] He considered the shapes of the HSI/flow relationships to be more plausible with the revised model. Flows of 15-25m^3/s provided the maximum value of HSI for food production and just under 10m^3/s the maximum value for adult brown trout habitat.

[382] From his investigation and with the benefit of 30 years research into factors influencing the distribution and abundance of trout[218] Mr Jowett concluded that there is sufficient information to make an assessment of flow requirements.[219]

[383] We agree with Mr Jowett[220] that no flow habitat survey is perfect and no flow assessment is precise implying that the flow values obtained are only estimates and may be plus or minus 5m^3/s. To assume otherwise introduces a spurious impression of precision with respect to habitat retention levels. Dr Hayes also acknowledged the uncertainties inherent in ecological modelling of the type just described. But, it seems, attributed them to lack of calibration and verification of the hydraulic model rather than to the nature of the Wairau River and to an imperfect knowledge of the preferences and behaviour of trout.[221]

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[212]Hudson Second Rebuttal Evidence at [2.1][e]
[213]Jowett Executive Summary at [18]
[214]Hudson Second Rebuttal Evidence at [2.1][f]
[215]Jowett EIC at[36]
[216]Jowett EIC at[40] – [41] and Fig 8
[217]Transcript at 2039
[218]Jowett EIC at [4]
[219]Jowett Executive Summary at [18]
[220]Jowett Executive Summary at [18]
[221]Hayes Executive Summary at [1.47] and [1.49]

6.5.2.5 Findings on the habitat modelling

[384] We find:

[a] it unreasonable to expect complete agreement between predicted and measured values in a river such as the Wairau;

[b] calibration of the model has been justifiably criticised; and

[c] Mr Jowett's review demonstrated that verification of the model was sufficient to allow the ecological effects of the changed flow regime, including those associated with the proposed minimum flows, to be assessed with a degree of confidence.

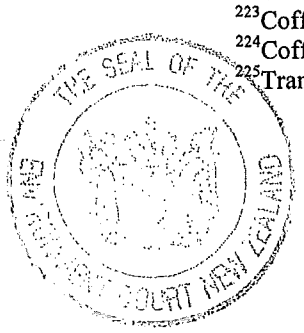
6.5.3 Periphyton and didymo

[385] Dr Coffey described the resident periphyton community that supports the aquatic invertebrates, fish and water birds of the Wairau River. He considered the stable riffles and runs to be important habitat requiring regular disturbance by scouring or rumbling flows to ensure that silt did not accumulate and the periphyton mat was rejuvenated. He observed nuisance periphyton in the minor braids of the river in February 2006 and noted that this was an unusual condition.[222]

[386] *Didymosphenia geminata* (didymo) has been observed in the river although there had been no reports of serious problems. Dr Coffey did not expect the scheme to exacerbate or spread didymo.[223]

[387] Dr Coffey predicted the frequency, duration and peak biomass of short-term proliferations of filamentous green algae may increase in the affected reach as a result of the reduced flow velocity and increased number of consecutive days of low flow[224]. During cross-examination he explained that he considered such an increase in periphyton to be generally beneficial to river productivity. However there would be times when periphyton becomes *over mature* and considered a nuisance.[225] Dr Coffey considered the

[222]Coffey EIC at [6.32] – [6.37] and rebuttal [4.03]
[223]Coffey rebuttal at [4.05] – [4.06]
[224]Coffey EIC at [6.39]
[225]Transcript at 1671



proposed residual flow regime to contribute to up to a doubling of the periphyton biomass[226] but that the frequency of nuisance blooms would not change. He explained that the frequency is controlled by the occurrence of flows greater than 200m^3/s, which remove periphyton, and are unchanged in the proposed flow regime.[227] He accepted that the duration of nuisance events may be greater given an extended period of low flow.[228]

[388] Excessive periphyton growth can affect water quality (pre-dawn oxygen depletion and pH fluctuations) and invertebrate community composition (limiting food for fish). Dr Coffey considered even the worst case scenario for periphyton growth for the proposed flow regime would be unlikely to result in such adverse effects.[229] He recommended a contingency plan to close the intake when river flows increased above 150m^3/s following an extended period of summer low flow and the presence of nuisance periphyton.[230]

[389] Mr Deans also considered the Wairau to be a river with little periphyton or *slime* and had only observed substantial periphyton growth on rare occasions following prolonged low flow. He considered the proposed flow regime to remove *flow fluctuation,* increase water temperatures and nutrient levels. He concluded that the altered periphyton and invertebrate community would result in poor fish habitat.[231]

[390] Mr Deans and Dr Olsen were concerned about the compounding effects of changed land use (resulting in increased nutrients), the advent of didymo and increased fine sediment deposition.[232] Dr Olsen had observed extensive growths of cyanobacteria in the Wairau River and was concerned about the potential for neurotoxins posing a threat to dogs and humans.[233]

[391] During cross-examination Dr Coffey agreed that cyanobacteria were present although he did not share Dr Olsen's concern about the production of toxins. He explained that toxins are typically released following blooms in nutrient rich conditions.

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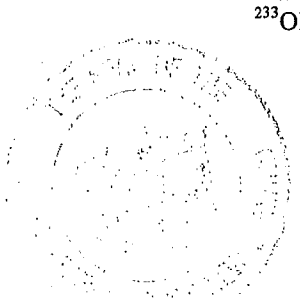
[226]Coffey EIC at [6.51]
[227]Transcript at 1668 and proposed consent condition 173 to cease abstraction when flow >200m^3/s
[228]Transcript at 1669
[229]Coffey EIC at [6.55] – [6.58]
[230]Coffey EIC at [6.62] – [6.64]
[231]Deans EIC at [12.39] – [12.40]
[232]Deans EIC at [12.46] and Olsen EIC at [5.12] – [5.14] and [5.24] – [5.27]
[233]Olsen EIC at [5.22]



He considered the species dominating the Wairau not to be associated with toxin production and the levels of nutrient to be low.[234]

[392] Dr Coffey agreed that the proposed flow regime was more favourable for the growth of didymo and other periphyton. He also agreed that the increase in nutrient concentrations (from landuse change and reduced dilution due to the lower flows) would increase periphyton growth.[235]

Discussion and findings

[393] We agree with the ecologists that the proposed flow regime is likely to increase periphyton growth in the river, including the growth of didymo. We note that nuisance growths are unusual and in general increased periphyton biomass is likely to contribute to the invertebrate productivity of the river and hence to the availability of food for fish and birds. However we consider even occasional nuisance growths to be an adverse effect with respect to amenity of the immediate area. We accept the evidence of Dr Coffey that nuisance levels of periphyton are unlikely to result in adverse effects on water quality and the invertebrate community composition across the river as a whole.

[394] We acknowledge the concern of Mr Deans and Dr Olsen that TrustPower relies on natural floods and freshes to mitigate such nuisance events. However, we note that nuisance events arise from a combination of natural climatic conditions in the catchment, such as those observed in 2006, ongoing agricultural land use intensification (unrelated to this proposal) and the proposed flow regime.

[395] We are not convinced that the frequency of periphyton blooms would be unchanged. While Dr Coffey considered the frequency to be controlled by the occurrence of flows greater than $200m^3/s$ we think it is likely that flows below this may remove a considerable proportion of the periphyton on the river bed. Further, it is the extended periods of low flow that provide favourable conditions for nuisance growths. Therefore, we consider there is a potential for the frequency of nuisance growths to increase.

[234] Transcript at 1666
[235] Transcript at 1679 – 1680

[396] We find that the predicted increase in periphyton growth is unlikely to result in an adverse effect on the overall ecological functioning of the river. We find that nuisance growths of periphyton, with local effects on amenity, may increase in frequency, extent and duration under the proposed flow regime. We agree with the recommendation of Dr Coffey that a contingency plan for long periods of low flow in the river and the growth of nuisance levels of periphyton should be provided for as a condition of the consent. Given such a condition we find the adverse effects of increased periphyton growth will be adequately remedied and will not affect the ecological or amenity values of the river.

[397] The proposed condition (212 in Appendix 2) specifically excludes didymo and refers to *an extended period of low summer flow*. Summer is considered to be between 1 November and 30 April but the period of low flow is not defined. The response is to close the intake and to allow the next flood flow of 150m^3/s or more to flow through the river for at least 24 hours. We consider that nuisance growths of didymo should trigger the requirement to close the intake just as for any other species of periphyton. Further we consider that the response should be repeated if nuisance levels of periphyton persist or re-establish six weeks or more after the most recent flow above 150m^3/s for 24 hours or more.

6.5.4 Macro-invertebrates

[398] Dr Hudson considered the frequent freshes and floods of the Wairau River to be highly disruptive to aquatic life and the resulting disturbance to be limiting rather than the availability of habitat. He considered that any reduction in space was unlikely to result in a reduction in the abundance of various species.[236] Dr Hudson modelled the availability of physical habitat, expressed as weighted usable area (WUA) in square metres, at flows of 10m^3/s through to 80m^3/s for the Argyle, Hillersden and Marchburn reaches.[237]

[399] Mr Jowett also considered flood flows to be limiting invertebrates on the Wairau River.[238] Dr Olsen similarly agreed that disturbance from flood flows was a major determinant of the distribution and productivity of invertebrate communities in gravel bed rivers. He considered the frequency of disturbance to be a critical factor and also the role

[236] Hudson EIC at [7.68]
[237] Hudson EIC Appendix 4
[238] Transcript at 2020

of conditions between flood events.[239] Dr Hayes considered that floods, habitat or food could be limiting depending on the recent history of flow in the river.[240]

[400] Dr Ryder had surveyed the macro-invertebrate community and found it to be generally made up of mayflies, caddis flies, beetles and diptera. He considered invertebrate densities to be comparable with other large east coast South Island rivers and did not find any rare or endangered taxa or community structures. Surveys of invertebrate drift found *Deleatidium* mayflies dominated the water column.[241]

[401] Dr Ryder considered that the retention of 70% of the existing habitat relative to the median flow would maintain the existing aquatic community structure.[242] Drawing on research undertaken by Mr Jowett, Dr Ryder noted that food producing habitat at median flow was strongly associated with trout abundance.[243] Dr Ryder used Dr Hudson's modelling to compare habitat availability at the proposed minimum residual flow regime and at the existing median flow. To estimate habitat retention he took into account the increasing flows, moving downstream from the intake, along the diversion reach.[244] Modelling showed that *'food producing waters'* and *Deleatidium* habitat decreased with decreasing flow although considerable habitat was still available at the proposed minimum flow. The annual average habitat retention was 90.2% for *'food producing waters'* and 86.4% for *Deleatidium* mayfly. Dr Ryder considered the predicted levels of habitat retention to provide an adequate level of habitat for food for fish within the river.[245]

[402] Dr Ryder considered the quantitative survey data gathered for small fish, benthic macro-invertebrates and invertebrate drift to indicate that there is a large amount of biomass available for larger fish and birds under the proposed flow regime.[246] He considered this empirical data to support the model predictions for habitat retention levels.[247] During cross-examination Dr Hudson wryly observed that the amount of fieldwork undertaken during sustained periods of low flow on the Wairau River had essentially eliminated the need for the modelling although he agreed that he did not have

[239]Olsen EIC at [4.10] – [4.11]
[240]Hayes EIC at [7.7]
[241]Ryder EIC at [5.31] – [5.34]
[242]Ryder EIC at [7.1]
[243]Ryder EIC at [6.11]
[244]Ryder EIC at [8.7] and Table 4 in Appendix 3
[245]Ryder EIC at [8.19] – [8.23] and rebuttal at [3.54]
[246]Ryder EIC at [9.2]
[247]Ryder rebuttal at [3.21]

the expertise to comment on the adequacy of the biological data obtained.[248] Dr Ryder confirmed that sampling he had undertaken during low flows demonstrated high quality habitat and high densities of mayflies.[249]

[403] Dr Hayes considered the modelling results to be subject to considerable uncertainty although he acknowledged that the revised predictions (compared to those at the original hearing) probably had less uncertainty.[250]

[404] Mr Jowett considered the model results to be adequate for an assessment of habitat maxima and break points subject to an uncertainty of a few m^3/s in river flow. He did not favour the use of habitat retention levels and preferred to identify the flow at which habitat begins to decline sharply and set minimum flows near this level. Using Dr Hudson's model results Mr Jowett noted that maximum food producing habitat was at $60m^3/s$ reducing sharply at flows below $30m^3/s$ for the Marchburn reach and maximum at $40m^3/s$ reducing at $25m^3/s$ for Hillersden.[251]

[405] Mr Jowett modelled (using his 1-D model) food producing habitat in the main channel of the Wairau River and predicted maximum food producing habitat at 35, 28 and $15m^3/s$ at Marchburn, Hillersden and Argyle respectively.[252] He considered the flow values to be lower than those predicted by Dr Hudson because Dr Hudson had included food producing habitat in the minor braids.[253] Mr Jowett concluded that extended summer flows of $10m^3/s$ at the intake and $15m^3/s$ at Marchburn would reduce food production by about 20%. He considered a minimum flow of $25m^3/s$ at Marchburn during the summer period (December to March[254]) would have no effect on food production for trout.[255]

[406] Dr Hayes considered the key problem of the proposed flow regime to be the lack of mid-range flow variability, particularly in the upper part of the diversion reach, where flows would be *flat lined at the MALF ($10m^3/s$)*. Invertebrate food production would be adversely affected limiting food for trout.[256] He noted the importance of both the

[248]Transcript at 1762
[249]Transcript at 2355
[250]Hayes executive summary at [1.41]
[251]Jowett EIC at [52] – [55]
[252]Jowett addendum at [12]
[253]Jowett EIC at [36] and transcript at 2027
[254]Transcript at 2048
[255]Jowett EIC at [57] – [62]
[256]Hayes executive summary at [1.20]

magnitude and duration of flows between the minimum and median flow in maintaining productive habitat. He considered that a higher minimum flow or a flow sharing regime would provide for this productive habitat.[257]

[407] Dr Ryder considered Dr Hayes' analysis of the influence of flow variability to relate only to the 1km - 2km stretch of the river upstream of the Branch confluence and to ignore the tributaries that contribute to variability along the affected reach. He considered the actual proportion of habitat lost to be minor and considerable habitat to be maintained overall.[258] Overall Dr Ryder did not share Dr Hayes' concerns regarding mid-range flow variability except for flow variation to stimulate the migration of fish and to remove periphyton accumulation.[259] During cross-examination Dr Ryder accepted that the loss of habitat was significant for the Argyle reach but considered the losses to be less than minor for the majority of the diversion reach. Similarly, Dr Ryder considered the *flat lining* to be most accentuated in the Argyle reach and not to occur all the way down the river.[260]

[408] During cross-examination Dr Hayes accepted that he had relied on the evidence and information from the first hearing and had not taken into account the more recent (2007 through to 2009) invertebrate survey data when forming his opinion about the significance of the adverse effects.[261] He agreed that the Wairau River supported a relatively high density of aquatic invertebrates and under low flow conditions maintained a healthy and productive habitat.[262]

[409] Dr Olsen was concerned that prolonged low flow would reduce the extent and productivity of the hyporheic zone (the interface between the surface water and groundwater) with consequential adverse effects on the invertebrate community.[263] Dr Ryder agreed that the hyporheic zone is a potential source of macro-invertebrates but was not aware of any information indicating changes in flow would have an adverse effect on the hyporheic community.[264] During cross-examination Dr Ryder agreed that the hyporheic zone of the Wairau River was large and permeable and would reduce as the

[257]Hayes second rebuttal at [6.29] – [6.30]
[258]Ryder rebuttal at [3.33] – [3.39]
[259]Ryder rebuttal at [3.42]
[260]Transcript at 2327 – 2329
[261]Transcript at 1911
[262]Transcript at 1915
[263]Olsen EIC at [6.1] – [6.15]
[264]Ryder EIC at [10.15] – [10.16] and rebuttal at [4.32] – [4.33]

surface water flows reduced. He agreed that this zone contributed to invertebrate productivity but did not consider there was any evidence to suggest any consequent change to abundance or diversity of invertebrates in the river.[265]

[410] Dr Olsen considered the secondary and tertiary braids and seepages to be productive habitats for invertebrates and any reduced extent and quality of these to be detrimental.[266] During cross-examination Dr Ryder agreed that secondary and tertiary braids provided productive invertebrate habitat and a source for re-colonisation of the main channel following flood events. He agreed this habitat and colonisation source would potentially be lost at the proposed minimum flows.[267]

[411] Dr Hudson considered spring fed channels to be high quality stable habitats that become a much larger proportion of total available habitat as the river flows reduce. These channels have not been included in the habitat modelling therefore predicted habitat is conservative at low flows.[268] Mr Jowett considered the exclusion of spring-fed channels to be correct because although they contribute to invertebrate production, and hence food for native fish and birds, trout are found in the main stem in deeper water. Therefore food producing capacity for trout should be calculated in the main channel only and not in the other braids.[269]

Discussion and findings

[412] We accept the modelled predictions of 80 to 90% annual average habitat retention for the invertebrates within the river. While we acknowledge some uncertainty with this modelling we agree with Dr Hudson that it is conservative and additional habitat will be available within the spring fed channels. We also agree with Dr Ryder that while absolute accuracy (area of habitat for a particular flow) cannot be attained the model is helpful in terms of estimating the change in available habitat with flow.[270]

[413] We do not accept Dr Hayes' evidence as to the magnitude of the impact of the loss of mid range flow variability. We agree with Dr Ryder that this has been

[265]Transcript at 2345 – 2347
[266]Olsen EIC at [5.9] – [5.10]
[267]Transcript at 2333 – 2334
[268]Hudson rebuttal at [3.2]
[269]Transcript at 2008
[270]Transcript at 2353

exaggerated by focussing on the reach upstream of the Branch confluence and ignoring the contribution of the tributary flows along the diversion reach. We acknowledge Dr Olsen's concerns about the lack of knowledge of the impact of the reduced flows on the hyporheic zone. However we consider that there is sufficient empirical evidence to show that healthy and abundant invertebrate communities continue to thrive in the Wairau River following extended periods of low flow.

[414] We acknowledge that the habitat modelling is a useful predictive tool but it is inherently uncertain. We recognise that even the best model is an approximation as it does not take into account the dynamic effects of freshes and floods, and the recovery time following these events, and ignores any potential effects from the loss of tributary connections. However, we find that the modelling provides a useful indication of the likely response of the invertebrate community to changes in the flow regime. We consider the aquatic ecology survey data to be comprehensive and to support the model predictions. We find the combination of modelling work and empirical evidence sufficient to demonstrate that adverse effects on invertebrate productivity and community composition are most unlikely and, if they occur, will be minor. Consequently we consider that the invertebrate community is expected to provide adequate food supplies for both fish and birds under the proposed flow regime.

6.5.5 Trout and salmon

[415] Mr Deans considered the proposed scheme to interfere with the life cycle of salmonids in several ways – impede migration (low water levels and physical structures), reduce spawning cues (lack of freshes and higher temperatures), reduce habitat for adult and juvenile trout, reduce feeding opportunities, entrain and kill juveniles and adults, and interfere with spawning (attract adult migratory fish to artificial outflows).[271] We return to the issue of fish screening later in this decision.

[416] Dr Ryder estimated habitat retention for adult brown trout relative to the median flow to be approximately 100% (monthly range 93 – 106%), for yearling fish 89 – 90% and for spawning habitat 87%. He noted that using habitat retention relative to the median flow was conservative with respect to assessing effects on the brown trout population.[272] He considered the spawning habitat available in the river under the

[271] Deans EIC at [12.8]
[272] Ryder EIC at [8.14]

proposed flow regime to be more than adequate for the existing population of trout and salmon.[273] Dr Ryder considered the amount of adult trout and food producing habitat in the Wairau, under the proposed flow regime, to be comparable with or higher than other South Island rivers with salmonid fisheries.[274]

[417] Dr Hayes described trout habitat in the Wairau River as *highly variable in space and time* resulting in a highly mobile population. He commented on the patchy distribution of trout with concentrations in deep water refuges at times of low flow. He considered the maintenance of mobility and habitat throughout the river to be important to the growth and abundance of trout.[275] Mr Jowett agreed that the affected reach of the Wairau River has a variable trout population and considered it to be a *corridor* with the number of trout stopping to become resident varying from year to year.[276]

[418] Dr Hayes described trout in the Wairau as having variable growth rates with some growing fast to reach a large size. Studies indicate movement out to sea or to the lower river where fish prey is abundant. Dr Hayes agreed with Mr Deans that free passage through the Wairau River and its tributaries is crucial for growth and abundance. He recommended the release of freshes, if trout appear to be concentrated in particular areas waiting for higher flows, all year round and not just in the spawning season.[277]

[419] Mr Dungey agreed that fish move extensively through the Wairau with a definite migration upstream during the spawning season. Adults move to and from spawning grounds and juveniles move from the spawning grounds to the mainstem.[278] Mr Dungey observed salmon to spawn mostly in the Rainbow River and occasionally in the mid reaches of the Wairau and lower Goulter. Brown trout were recorded spawning in the Wairau, Goulter, Leathem and Branch Rivers.[279] Patterns of fish movement varied in response to flow conditions with long periods of low flow delaying spawning migrations. He considered low flow periods may need to be alleviated with occasional freshes to facilitate fish movement up and down the river.[280]

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[273]Ryder EIC at [8.11] – [8.15]
[274]Ryder EIC at [9.5] and Table 5 in Appendix 3 listing the Ashburton, Clutha, Hawea, Waitaki, Rangitata, Monowai, Hakataramea, Oreti, Mataura, Mararoa, Arnold, Taieri and Pomahaka Rivers
[275]Hayes EIC at [3.17] – [3.18]
[276]Transcript at 1990 – 1992
[277]Hayes EIC at [7.20] – [7.26]
[278]Dungey rebuttal at [6] – [11]
[279]Dungey EIC at [42] – [43]
[280]Dungey EIC at [50] – [52]

[420] Dr Ryder agreed with Mr Dungey that should stable low flow patterns occur, and hold up the movement of fish during spawning, the intake should be closed to allow the next fresh to pass down the river. Dr Ryder and Mr Dungey considered this would be an uncommon occurrence given the variability provided by the tributaries and floods from the upper Wairau River.[281] Mr Dungey maintained that the critical period is February to July to cover the spawning season and the period of low flows.[282]

[421] Mr Dungey proposed a condition of consent with a trigger (40 days of flow 15-20m^3/s or less below the Goulter and groups of more than 25 trout in a single pool in the Hillersden reach) then a response of allowing the next fresh to pass down the river. The Aquatic Ecology Management Plan is to include a discussion of fish spawning and monitoring over the period April to June and the contingency action of flows of at least 45m^3/s for 48 hours.[283] During cross-examination Mr Dungey agreed that if review following the contingency action found it to be ineffective then the next fresh should also be released down the river.[284] In response to questions from the court he clarified that the count for 40 days of low flow would start at a flow of 15m^3/s or less and not stop until flows reached 20m^3/s or more.[285]

[422] Dr Hayes reasoned that an extended duration of low flow, concentrating trout in deep refuge habitats, may lead to food limitation. He considered the habitat modelling to have been undertaken at too coarse a scale to understand such local effects. He recommended bioenergetics modelling to link flow influences on invertebrate drift with feeding habitat requirements of trout and to complement the habitat modelling.[286] The natural variable flow regime ensured that potentially limiting conditions at low flow would regularly be alleviated.[287] Such variability would be reduced by the proposed scheme.

[423] Mr Jowett reviewed the evidence of Drs Hudson and Hayes.[288] As noted in the discussion of invertebrate habitat Mr Jowett considered the model results to be adequate for an assessment of flows that provide habitat maxima and break points.[289] He

[281]Ryder EIC at[10.12] & rebuttal [3.42], Mr R G Dungey rebuttal at [24]
[282]Deans EIC at [12.64], Dr J W Hayes EIC at [7.26], and Mr R G Dungey rebuttal at [12] – [25]
[283]Dungey supplementary statement at [3.1] and [4.1]
[284]Transcript at 1872 – 1873
[285]Transcript at 1877
[286]Hayes EIC at [7.16] – [7.18]
[287]Hayes EIC at [7.19]
[288]Jowett EIC at [13]
[289]Jowett EIC at [52]

considered there to be relatively little trout habitat available in the diversion reach and little variation in the amount of habitat with flow. He considered suitable habitat to be limited by the area of water deeper than 0.5m and the response of trout to be influenced more by changes to food producing habitat.[290] He wrote:

> In terms of the natural flow regime, flows near the median provide maximum food producing habitat, whereas flows near the mean annual low flow provide near maximum adult brown trout habitat. I have often found that maximum trout habitat occurs at low flow and maximum food producing habitat appears at median flow in rivers of this size.[291]

[424] Mr Jowett considered extended summer flows of $10m^3/s$ at the intake and $15m^3/s$ at Marchburn would reduce adult trout habitat slightly but have a greater effect on food production (reduction of about 20% in the affected reach). He expected trout to respond by moving to more productive areas on the river.[292] During cross-examination he estimated a 20% reduction in habitat could result in, at worst, a 20% reduction in trout numbers.[293] Dr Hayes considered the 20% reduction in food producing habitat to pose a *fair degree of risk* that there would be a change in the trout population. He considered that some 15 to 20 years of monitoring data would be required to detect such a change.[294]

[425] During cross-examination Dr Ryder agreed that the period December through to April was important to trout in terms of being able to access adequate food supplies because of warmer water temperatures (increasing the metabolism and hence energy requirements) and the need for the fish to put on condition before spawning.[295]

Discussion and findings

[426] We accept that the reduction in food producing habitat and the proposed flow regime could have an impact on the distribution, abundance and condition of the trout population. We have found that the modelling of food producing habitat is conservative, ignoring the spring fed channels, although we accept that trout are concentrated in the main stem and not the minor braids. We have accepted the modelled prediction of 80% - 90% average annual retention of food producing habitat while noting this does not take

[290] Jowett EIC at [48]
[291] Jowett EIC at [55]
[292] Jowett EIC at [57] – [60]
[293] Transcript at 2032
[294] Transcript at 1964 – 1965
[295] Transcript at 2320

into account the dynamic effects of freshes and floods that are likely to disrupt invertebrate communities.

[427] Dr Ryder's comparison of available habitat in other rivers that support salmonid fisheries demonstrates that adequate food producing habitat is available in the diversion reach of the Wairau River with the proposed flow regime. We find that at worst there could be a 10% - 20% reduction in trout numbers in the diversion reach due to the loss of food producing habitat but consider this to be unlikely to affect the trout population of the river as a whole. We agree with Mr Jowett that trout are likely to simply move to another part of the river if they are able.

[428] All of the experts agree that trout have a patchy distribution in the Wairau River and movement up and down the main stem as well as into the tributaries is essential for the maintenance and condition of the population. We accept the evidence of Dr Ryder and find that the physical habitat for trout will be maintained in the diversion reach. However, we note the importance of migration through this reach and share the concerns of Mr Deans, Dr Hayes and Mr Dungey about restricted movement during extended periods of low flow. We consider that extended periods of low flow have the potential to significantly impact on the trout population both by restricting movement and elevating temperatures in the river over the summer period.

[429] Proposed condition 211 provides for monitoring of flows and triggers for trout held up in pools in the period 1 April to 30 June each year. During cross-examination Mr Dungey explained that this is the critical period with respect to the spawning migration.[296] Once triggered the condition provides for part or all of the flow from the next fresh to be released down the river such that the flow is at least 45m^3/s on the recession of the fresh for 48 hours. While this condition addresses the issue of the movement of trout during the spawning migration it does not assist with the potential for limited movement and elevated temperatures through the summer period.

[430] We will return to the issue of the flow regime through the summer period after we have considered the potential effects on river birds and proposed conditions with respect to the minimum residual flows and flow sharing.

[296] Transcript at 1871

6.5.6 Native fish

[431] Dr Ryder described the fishery of the Wairau River as *typical of those found in South Island braided rivers.*[297] Native fish are dominant with dwarf galaxiids, upland bully and long fin eel in abundance. No regionally or nationally endangered species were found.[298] Dr Ryder considered it to be generally accepted that native fish have lower flow requirements than adult trout. Thus if the minimum flows are sufficient for adult trout then there will be adequate suitable habitat for the native fish species.[299] Dr Ryder noted that the Department of Conservation was satisfied with the proposed flow regime with regard to effects on native fish.[300]

[432] Dr Hayes considered adult brown trout and invertebrates to have the highest flow requirements.[301]

[433] Given that no party has raised any issues with respect to native fish we accept the unchallenged evidence of Dr Ryder and find that there will be no adverse effects on the native fish populations in the Wairau River.

6.5.7 Fish screening

[434] Dr Ryder noted that fish, particularly edge dwellers (such as bullies, juvenile trout and eels and galaxiids), would be attracted to the intake and drawn into the canal system and injured or killed by passage through the turbines. He considered a 5mm slot spacing would exclude salmonid fry as smaller live stages live in the gravels. Juvenile bullies and galaxiids are likely to have a high survival rate through turbines.[302] Small salmonids have a survival rate of 90 - 95% depending on fish size and turbine characteristics.[303]

[435] Dr Ryder considered fish (including trout and eels) would be attracted by the discharge from PS5 to feed on invertebrate drift or attempt to gain access upstream. Adverse effects could be avoided by a barrier system to prevent fish from entering the

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[297]Ryder EIC at [5.46]
[298]Ryder EIC at [5.47]
[299]Ryder EIC at [6.11]
[300]Ryder rebuttal at [3.30]
[301]Hayes EIC at [5.9]
[302]Ryder EIC at [11.2] – [11.10]
[303]Ryder rebuttal at [3.7]

tailrace and returning them to the river. Other occasional discharges would be of short duration and could be ramped to avoid fish stranding.[304]

[436] Mr Bejakovich was concerned that the proposed fish screen (with 5mm spacing) and associated conditions were inadequate to protect sports fish particularly as there was no requirement to target juvenile sports fish.[305] He recommended specific criteria for fish screens to ensure effective protection for juvenile fish.[306]

[437] Dr Ryder recommended further survey work and trials before detailing the fish screen specifications. He considered Mr Bejakovich's criteria to be conservative and more appropriate for irrigation intakes where the flow is not returned to the river. Dr Ryder estimated a survival rate of 60 – 77% for small salmonids passing through the five turbines.[307]

Discussion and findings

[438] There is a potential for juvenile salmonids to enter the canal system and either remain resident or suffer as a result of one or more trips through a turbine. We are somewhat sceptical of the survival rates quoted by Dr Ryder given the passage through six turbines in series and consider that higher mortalities are possible. However, the overall proportion of juvenile fish that might become entrained within the canal system and lost to the main stem of the river is unknown. We agree with Dr Ryder's recommendation that further survey work and trials should be undertaken to determine the most effective approach to fish screening.

6.5.8 Downstream flow fluctuations

[439] Dr Olsen expressed concern at the potential for flow fluctuations downstream of PS5 to adversely affect invertebrates in the *varial zone* – that section of the surface of the riverbed periodically wetted and dried and therefore generally unproductive. He was concerned that reduced productivity in the lower river may have adverse effects on food for trout.[308]

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[304]Ryder EIC at [13.2] – [13.4]
[305]Bejakovich EIC at [3.4]
[306]Bejakovich EIC at [7.23]
[307]Ryder rebuttal at [3.3] – [3.16]
[308]Olsen EIC at [5.36] – [5.40]

[440] The Branch Scheme presently introduces such flow fluctuations. Dr Ryder described the results of aquatic surveys on the Wairau River downstream of the Branch Scheme as revealing *healthy and relatively diverse benthic macroinvertebrate and fish communities*.[309] He agreed with Dr Olsen that a varial zone may develop but considered this would be a very small proportion of the wetted width of the river.[310] He noted that the flow fluctuations from PS5 would be less than those from the Branch Scheme and considered this to be a positive effect.[311]

[441] During cross-examination Dr Ryder acknowledged that flow fluctuations from PS5 would be greater in the medium flow band but approximately half of those that exist now in the low flow range. On balance he was not concerned about the potential effects of these flow fluctuations on the downstream ecology.[312]

[442] Flow fluctuations from the proposed scheme would replace those from the Branch Scheme. Given the conditions controlling the magnitude and rate of change we find that there would be no adverse effect with respect to aquatic ecology. Accordingly, we reject the suggestion of Fish and Game that a regulatory pond is required to reduce the flow fluctuations from the PS5 discharge.

6.6 River birds

[443] The parties are agreed that the Wairau River is an outstanding habitat for wildlife supporting populations of the black-fronted tern and black-billed gull, both threatened species.

[444] Mr Whata, for TrustPower, submitted that the scheme is unlikely to affect the food supply or predation rate of the terns and that there was a good chance that the proposed mitigation would result in increases in the black-fronted tern population. He described the adaptive management approach as appropriately precautionary given the inevitable uncertainties with a large complex scheme.[313] Mr Whata submitted that the

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[309]Ryder EIC at [12.3]
[310]Ryder rebuttal at [4.29]
[311]Ryder rebuttal at [3.62]
[312]Transcript at 2336
[313]Whata opening submissions – water at [10.33]

predator management programme to be implemented for black-fronted tern nesting sites could be considered as a positive effect of the scheme.[314]

[445] Mr Hardy-Jones, for Save the Wairau, submitted that the scheme would impact on the availability of food for river birds and allow predators to access breeding sites on islands within the river. He submitted that these adverse effects may be such that the black-fronted tern may decline below a sustainable population.[315]

[446] The court was assisted by three ecologists with expertise in avifauna. Dr Mark Sanders and Dr James Jolly, called by TrustPower, and Mr David Melville, called by Save the Wairau. These three ecologists (and three other ecologists)[316] had filed a joint statement[317] following an expert witness caucus and further discussions in July 2009.

[447] The ecologists were agreed that the Wairau River is a significant habitat for indigenous fauna in terms of s 6(c) of the Act and outstanding in terms of its importance for birdlife. They noted a number of threatened species and, of these, considered the black-fronted tern, the black-billed gull and the banded dotterel to be the species most vulnerable to the proposed scheme. They considered management actions to sustain the terns and gulls to also confer benefits to the dotterels and other bird species living on the river.[318]

[448] The Wairau River is particularly significant for black-fronted terns, supporting 11 to 19% of the national population, and hosting the largest population on a single river. During the breeding season 40 to 50% of Wairau breeding terns nest within the diversion reach. The most important months for breeding are August to January with peak nesting from mid October to late December. The ecologists were uncertain as to how long fledged young terns were dependent on the river for feeding with most leaving breeding colonies by end of January but some being present on the river through to March or April.[319]

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[314] Whata opening submissions – water at [10.44]
[315] Hardy-Jones opening summary of submissions at [17]
[316] O'Donnell, Steffens and Gaze on behalf of DOC
[317] Joint statement bird fauna witnesses dated 23 July 2009
[318] Joint statement at [2.1] – [2.2]
[319] Joint statement at [2.3] – [2.6]

[449] The ecologists were agreed that two of the most significant threats to braided river birds (including black-fronted terns) are flooding and predation.[320] These two factors resulted in the destruction of in the order of 80% of nests on the Wairau monitored over two years. Harriers were responsible for most of the predation of eggs where the cause could be identified. Cats and hedgehogs were identified as nest predators and cats also killed adult breeding birds. The impact of stoats and black-backed gulls was uncertain.[321]

[450] The ecologists noted that nesting habitat and suitable food resources are essential for river birds.[322] Flow modification as proposed was agreed to potentially: reduce aquatic food producing habitat and food availability; promote weed encroachment and thereby reduce nesting habitat; and increase mammalian access and predation.[323]

[451] The ecologists were not agreed on the degree of risk posed by the predicted loss of food producing water under the proposed scheme or on the relative importance of terrestrial food sources for black-fronted terns.[324] Nor were they agreed on the issue of weed encroachment and potential adverse effects on nesting and foraging.[325]

[452] The proposed conditions of consent provide for increased minimum residual flows and some flow sharing during the peak nesting season for the black-fronted tern. Condition 176 specifies the minimum residual flows in the Wairau River below the intake:

January to July	$10m^3/s$
August	$12m^3/s$
September	$15m^3/s$
October to November	$20m^3/s$
December	$15m^3/s$

[453] Condition 177 provides for a limited 2:1 flow sharing arrangement from 1 October to 31 January when the flows at The Wash bridge exceed the minimum residual flow by $5m^3/s$ or more. During these months when the proposed scheme is drawing

[320] Joint statement at [4.1]
[321] Joint statement at [5.4] – [5.5]
[322] Joint statement at [4.1]
[323] Joint statement at [5.3] and Figure 1
[324] Joint statement at [4.1] and [5.2]
[325] Joint statement at [5.9]

water from the Wairau River, the flow in the Wairau River below the Goulter confluence will be equal to the minimum residual flow required by condition 176 plus one third of the flow above the sum of the minimum residual flow and $5m^3/s$.

6.6.1 Food sources for the tern

[454] Dr Jolly described the results of his study of the diet and feeding of adult black-fronted terns at their nesting colonies.[326] Flying insects were the most frequently caught food and dip-feeding for insect larvae was important. Small native fish were caught infrequently and more often later in the nesting season. There were no significant differences in preferred feeding habitats (riffles, runs or pools) within the river channels.[327] However feeding rates were higher in primary channels, than in minor channels, and higher mid-channel, than at the edge or in pools. Feeding in seeps was rare.[328] Terns also feed off-river, both before and during nesting, on terrestrial invertebrates.[329] Stable isotope analysis of chick blood indicated they were fed primarily on terrestrial invertebrates (about 50%) and fish (about 40%) with a minor contribution from aquatic insects (about 10%).[330]

[455] Dr Sanders considered it most unlikely that the proposed scheme would adversely affect tern by affecting their food supplies as he considered that food is unlikely to be limiting terns on the Wairau.[331] In response to questions from the Court Dr Jolly agreed that historically there would have been higher densities of birds on the river suggesting the numbers today are well below the carrying capacity. However, he noted that the fairway has also reduced over time making it difficult to distinguish between the effects of predation and reduced food supply.[332]

[456] Dr Hudson modelled the relationship between flow and aquatic food production using the *Deleatidium* mayfly curve, the general invertebrate 'food producing' curve, the Rangitata tern feeding curve (relating to aquatic insects and feeding early in the season) and the Waimakariri tern feeding curve (relating to fish and feeding later in the season

[326] Jolly executive summary at [2.1][f]
[327] Jolly EIC at [8.23]
[328] Jolly EIC at [8.21]
[329] Jolly EIC at [8.27] – [8.31]
[330] Jolly EIC at [8.35]
[331] Sanders EIC at [12.1] – [12.2]
[332] Transcript at 988

including feeding of chicks).[333] Dr Hudson's modelling showed more than 80% of the food producing habitat for aquatic invertebrates was retained under the proposed flow regime when compared to the median flow. More habitat is available for terns feeding on small fish as flows decrease below the median flow.[334] Dr Hudson noted that these relationships should be treated as conservative given the importance of off-river feeding to the tern diet.[335]

[457] Mr Melville considered knowledge of tern feeding to be limited and the relative importance of aquatic and terrestrial habitat to be unresolved.[336] He noted a 2006 study by Dr O'Donnell[337] that found adult terns were dependent on aquatic habitat and avoided farmland during the breeding season. Approximately 93% of feeding observations were within the active river flood plain with 80% over river channels. The terns were using both major (42%) and minor (58%) channels for feeding and were mostly (87%) over broken or undulating water (rapids, riffles and runs).

[458] Mr Melville acknowledged the variety of food fed to tern chicks, as indicated by the isotope study, but did not consider the data to be sufficient to assess the relative contributions of the different food sources.[338] Similarly, he agreed adults terns feed over farmland but considered that the relative importance, compared with river feeding, could not be determined. He noted the importance of sufficient food of suitable composition during courtship and egg formation as well as nesting.[339]

[459] It is clear from the evidence that the food available to birds, particularly the black-fronted tern, could be reduced under the proposed flow regime for the river. The habitat modelling indicates a reduction of up to 20% in aquatic invertebrate food sources. However, we accept that both fish and terrestrial invertebrates also contribute to the diet of both adult birds and chicks. We also note the context of the reduced population of birds compared with historical numbers even allowing for the reduction in fairway width. Given these two factors we find that the predicted reduction in aquatic invertebrates is most unlikely to adversely affect the black-fronted tern population on the Wairau River.

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[333] Jolly addendum to reply at [4.2] and Fig 1
[334] Hudson EIC at [8.23] – [8.26]
[335] Hudson EIC at [8.27]
[336] Melville EIC at [8.1]
[337] Melville EIC at [8.1] and Appendix 3
[338] Melville EIC at [8.7]
[339] Melville EIC at [8.14]

6.6.2 Nesting habitat for the tern

[460] Mr Melville considered the reduced flow variability may result in weed encroachment around channel margins and adversely affect nesting and foraging opportunities for terns and other river birds. Drs Jolly and Sanders considered that any such effect would be *de minimis* and very short term given the frequent floods that pass down the Wairau River.[340]

[461] Dr Hudson evaluated the effects of the scheme on the vegetation across the riverbed and concluded that river characteristics and expanses of exposed or sparsely vegetated riverbed are determined by the flood regime, which would not change.[341]

[462] We accept Dr Hudson's evidence that it is the flood flows that manage vegetation across the riverbed. While the issue of exotic weeds invading the riverbed is of concern, and may well have contributed to the decline in the river bird population, it is not a problem that is of TrustPower's making and nor will the scheme exacerbate the weeds.

[463] We find that the proposed scheme would not have an adverse effect on the nesting habitat of river birds through weed encroachment.

6.6.3 Predators and the tern population

[464] Dr Sanders' study of terns on the Wairau over the 2007 and 2008 nesting seasons indicated 70% and 62% loss of nests due to predation.[342] Terns nesting on islands had, on average, a much higher success rate almost certainly because the water around them deters mammalian predators.[343] Dr Sanders noted that eggs took approximately 25 days to hatch and chicks 28 days to fledge.[344]

[465] Dr Sanders observed 15% (2007) and 44% (2008) of nests in the diversion reach were located on islands and therefore potentially affected by the flow reduction.[345] Dr Sanders could find no relationship between rates of predation of colonies and flow,

[340] Joint statement bird fauna witnesses dated 23 July 2009 at [5.9]
[341] Hudson EIC at [8.2] – [8.3]
[342] Sanders reply at [3.14]
[343] Sanders EIC at [9.4] – [9.8]
[344] Sanders EIC at [5.1(d)]
[345] Sanders EIC at [4.3]

velocity, channel width, channel depth or the number of channels between the island colony and the mainland. He concluded that the safety on islands was not related to the amount of water or the hydraulic characteristics but simply to the presence of water.[346]

[466] Dr Sanders considered DNA and video evidence on predators to indicate that avian predators, especially harriers and possibly black-backed gulls, currently account for the majority of nest predation on the Wairau River. Mammalian predators are also present and the impact of cats on adult birds at mainland sites was a concern.[347] In response to questions from the Court Dr Sanders said:[348]

> I think we can be pretty confident that stoats in particular, but stoats, cats and ferrets, are all able to cross braids ... stoats are a terrible predator and are very able to capture adults and are essentially oblivious to flow.

[467] Dr Jolly recorded the presence of mice, rats, hedgehogs, cats and ferrets.[349] He also observed goats, people (including quad bike riders) and a dog moving close to or through black-fronted tern colonies.[350] He considered human related disturbance near access points to the river to be a potentially significant factor in nesting failure.[351]

[468] Dr Hudson looked at the relationship between flow and the number of islands available for nesting and concluded that the reduced flows would not reduce the number of islands available for nesting and would not materially change the degree of isolation (the moat effect) around islands.[352]

[469] Mr Levy noted the possibility of in-river engineering works affecting nesting river birds and recommended conditions to ensure no construction or diversion activities within 50m of nesting areas (condition 87(e)) and no diversion that would remove an existing water barrier between nesting areas and the river bank (condition 87(g)).[353]

[470] Mr Melville agreed that predation of terns was of great concern nationally and noted[354] that *predation is severely limiting the number of young fledged on the Wairau at*

[346]Sanders EIC at [9.21] and Fig 3
[347]Sanders EIC at [10.1][c]
[348]Transcript at 1021
[349]Jolly EIC at [7.24]
[350]Jolly EIC at [8.8]
[351]Jolly EIC at [8.10]
[352]Hudson EIC at [8.28]
[353]Levy EIC at [5.13]
[354]Melville EIC at [9.1]

present. He considered the research methods used in the DNA study to be untested although accepted that harriers were an important predator.[355] He expressed concern that harrier control may result in a proportional increase in mammalian predation.[356]

[471] During cross-examination Dr Sanders agreed that reducing the numbers of harriers or black-backed gulls might influence the predator/prey dynamics of mammalian species.[357] While he considered that avian predators should be given priority in a predator control programme on the Wairau he considered it would be prudent to also target mammalian predators.[358]

[472] Mr Melville considered little was known about the population structure and dynamics of the black-fronted tern, particularly whether the Wairau terns *are a source or sink population or one which is self-sustaining.*[359] He considered Dr Sanders' assessment of predation rates related to flow to be confounded by harrier predation.[360] He concluded that an assessment of the effects of the loss of adult birds and lack of recruitment could not be done.[361] Dr Melville recommended additional monitoring to assess recruitment to the tern population and to assess causes of mortality other than predation.[362]

[473] Dr Sanders agreed with Dr Melville that harrier predation would be unaffected by flow but maintained this did not alter his conclusion that there is no relationship between predation (and abandonment) of nests and flow.[363] He did not support further monitoring to directly measure recruitment or to assess causes of mortality as he maintained that it is the survival of the vulnerable egg and chick life-history stages that is crucial.[364]

[474] In response to questions from the Court Dr Sanders clarified his position on predator control and the conditions of consent.[365] He recommended predator control be implemented regardless of the findings of the monitoring given the threatened status of the species on the river.

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[355]Melville EIC at [9.2]
[356]Melville EIC at [9.9]
[357]Transcript at 1002
[358]Transcript at 1004
[359]Melville EIC at [9.10]
[360]Melville EIC at [9.16]
[361]Melville EIC at [9.17]
[362]Melville EIC ats [10.14] – [10.18]
[363]Sanders reply at [3.16]
[364]Sanders reply at [3.24]
[365]Transcript at 1021 – 1023

[475] We accept the ecologists' evidence that predation is limiting the numbers of black-fronted terns nationally and this is likely to be the dominant factor in the Wairau River. We accept the evidence of Dr Sanders that the survival of eggs and chicks is crucial to maintaining the tern population on the Wairau River. We accept the evidence of Dr Sanders that it is the presence of water around islands that is important rather than the flow characteristics in the range of flows of interest here. We find that the residual flow regime is unlikely to significantly reduce the moat effect protecting nests and chicks from mammalian predators.

[476] We accept Mr Melville's concerns about the potential effect of predation on adult terns and the consequential effects on recruitment to the population. We note that Mr Melville and Dr Sanders agree that control of harriers and, possibly black-backed gulls, may alter the predator/prey dynamics.

[477] All the ecologists acknowledge the presence and importance of a number of threatened river bird species particularly the black-fronted tern, the black-billed gull and the banded dotterel. While the residual flow regime is unlikely to have an adverse effect on the river bird populations through increased predation there remains an element of uncertainty. Given the importance of the bird species dependent on the riverbed environment we agree with Dr Sanders' recommendation that predator control should be carried out as part of the conditions of consent.

6.6.4 Mean river flow and number of terns

[478] Mr Melville referred to research by O'Donnell and Hoare[366] looking at trends in breeding populations of black-fronted terns. This study found tern numbers appeared to be highest on rivers with large average flows with the largest contemporary counts from rivers with relatively high and little modified flows. Their models suggested that there was an average 10% per annum decline in populations on low to medium flow rivers (mean flow $<30m^3/s$). Mr Melville was concerned that the reduction in flow in the Wairau River might cause it to change from the 'high flow' to 'medium flow' category and hence a decrease in the tern population could be expected.[367]

[366]Melville Appendix 2
[367]Melville EIC at [5.12] – [5.14]

[479] Mr Melville expressed a general concern as to the adequacy of the available information:[368]

> Notwithstanding recent research in Black-fronted Terns on the Wairau there remain gaps in our knowledge which reduce the level of certainty with which potential effects of the project may be predicted.

[480] During cross-examination Mr Melville was referred to Mr Keane's evidence on mean flows in the Wairau River (below the intake, below the Branch and Goulter confluences and above the outfall) currently and predictions post-scheme.[369] For convenience we reproduce some of that information in the following table.[370]

	Mean annual flow (m^3/s) along main stem of Wairau River			
	Intake	Branch	Goulter	Outfall
Existing	34.2	40.9	60.2	83.5
Post-scheme	18.8	25.5	36.9	59.3

[481] Mr Melville agreed that the mean annual flows post-scheme would still be in the high flow category, although at the lower end, downstream of the Goulter confluence. At the intake the existing monthly mean flows are less than $30m^3/s$ for six months of the year and post scheme less than $30m^3/s$ every month except October ($35.4m^3/s$) and November ($35.6m^3/s$). Mr Melville agreed that October and November were important months for the black-fronted terns and noted that he considered the period from August through to January/February to be important.

[482] Mr Melville acknowledged that predator management was also a factor influencing the number of terns in the O'Donnell and Hoare research and even partial pest management strategies had a beneficial effect. He agreed that a comprehensive pest management regime on the Wairau would benefit the black-fronted tern population.[371]

[483] Dr Jolly compared tern densities on the Wairau River with the Lower Ohau River and the Lower Rangitata River and concluded that controlling the flow would have no discernable effect.[372]

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[368]Melville EIC at [4.3]
[369]Transcript at 1039
[370]Keane EIC Appendix 3 Table 3 based on flow statistics July 1989 - June 2008
[371]Transcript at 1045 – 1046
[372]Jolly EIC [11.5]

[484] During cross-examination Dr Jolly accepted that populations of black-fronted terns were in decline on medium to low flow rivers and rivers with higher flows, such as the Wairau, were very important. He agreed on the need for caution if there is likely to be a significant effect on the black-fronted tern.[373] When asked about the adequacy of knowledge about the river birds Dr Jolly said he had appropriate information to be very confident that the scheme would not have a more than minor effect on the birds.[374]

[485] In response to questions from the court Dr Jolly commented on the distinction between stable bird populations on larger rivers and those in decline on small to medium rivers and noted that the figure of $30m^3/s$ is somewhat arbitrary. He did not know what was driving this difference.[375]

[486] Dr Sanders also acknowledged the research showing a decline in tern populations on rivers with a mean flow of less than $30m^3/s$ but warned against using that relationship to predict how a change in flow might influence bird numbers.[376] He considered it important to take into account other factors known to affect braided river birds, particularly predators and physical habitat.[377]

[487] Dr Sanders agreed with Dr Melville that there is uncertainty about the likely effects of the scheme on river birds but that the research undertaken had reduced this uncertainty considerably. He considered the scheme and associated monitoring and management provided for in the conditions to be more likely to have beneficial effects on birds.[378]

[488] During cross-examination Dr Sanders addressed the question of adaptive management and scientific uncertainty.[379] He agreed we could not have complete certainty about the future but was confident that the scheme, with the proposed monitoring and management, would not result in adverse effects on the river birds. However he considered the adaptive management approach to be necessary because of the threatened status of the species present on the river.

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[373]Transcript at 957
[374]Transcript at 960
[375]Transcript at 992
[376]Sanders evidence-in-reply at [3.6]
[377]Transcript at 1001
[378]Sanders reply at [4.1]
[379]Transcript at 1007 – 1010

Findings

[489] We share the concern of the ecologists that there is some uncertainty with respect to the outcomes for the black-fronted tern population at the lower flows associated with the scheme. We acknowledge the considerable research that has been undertaken and accept that this demonstrates that adverse effects are unlikely. However, any adverse effect would have a high potential impact given the importance of the black-fronted tern population on the Wairau. In accordance with the meaning of effect in s 3(f) of the Act we find that there is a potential adverse effect on the black-fronted tern population although acknowledge that this is a low probability.

6.6.5 Proposed conditions for predator control

[490] During the course of the hearing the proposed conditions of consent were revised to include an obligation on the consent holder to carry out predator control for the habitat of birds within the diversion reach from October to January each year (condition 144(g)).

[491] Mr Delamore did not think that the proposed condition was sufficient to provide a benefit to the river birds given that the overall objectives for the management plan were to maintain the status quo.[380] We agree that the objectives constrain the management plan to maintaining the status quo and do not provide for the possibility of enhancement of the river bird population. We think the objective stated in condition 144(a)(iii) should be amended such that mortality at nests of black-fronted terns or black-billed gulls is reduced as a result of the scheme. Further we consider that the primary objective of the plan should be to maintain or enhance the populations of black-fronted terns and black-billed gulls on the Wairau River. Such an objective maintains the bottom line of no biologically significant difference in fledging success or population growth rate but allows for the possibility of improvements in both of these measures. The conditions recognise that the black-billed gulls are in decline nationally and halting or slowing that decline for the population on the Wairau would be a benefit.

[492] Conditions 217 and 218 provide for an expert panel to advise on measures to be taken if a biologically significant decline in populations or fledging success is reported. These measures may include an increase in the minimum residual flow during the nesting season, further predator management and/or habitat enhancement.

[380] Transcript at 2645 – 2647

6.6.6 Overall findings on river birds

[493] The monitoring conditions ensure that good information on the river bird populations will be available. If a biologically significant decline is reported there is provision for an adaptive management response.

[494] The commitment of TrustPower to undertake predator control, even if monitoring data show the populations of river birds are stable or increasing, is likely to be beneficial. The amended conditions of consent provide sufficient certainty that the river bird populations will be maintained or enhanced and adequately remedy the potential adverse effects of the proposed scheme on river birds.

6.7 Riparian vegetation, wetlands and game birds

[495] Mr Slaven noted numerous small ephemeral wetlands in the Wairau valley which were dependent on rainfall rather than groundwater. He identified 16 perennial wetlands containing indigenous vegetation in the potentially affected area of the valley (between the intake and the outfall of the proposed scheme) and noted that most suffered from on-going drainage, were open to stock and degraded by weed infestation. Some had been identified by DOC, the Council or Mr Slaven as having ecological significance. Mr Slaven opined that the majority of these wetlands would be unlikely to be present in a decade or so irrespective of whether or not the proposed scheme proceeds.[381]

[496] Mr Slaven noted the willow wetlands along the banks of the Wairau river provide little habitat of ecological significance except where the tributaries enter and form a floodplain. Ten such areas were identified although none had been identified as having ecological significance in the DOC Protected Natural Areas Programme (PNAP) or Council Significant Natural Areas (SNA) surveys. Mr Slaven noted the on-going loss of riparian willows through land clearance for viticulture.[382]

[497] Relying on Mr Callander's predictions as to the drawdown of groundwater Mr Slaven considered it unlikely that there would be adverse effects on the indigenous wetland habitats. The willows in the riparian zones are potentially most affected with the change in species composition and health being somewhat uncertain. However Mr

[381] Slaven EIC at [5.5] – [5.11]
[382] Slaven EIC at [5.12] – [5.14]

Slaven considered these stands to be predominantly exotic and weedy and therefore any adverse effects were not considered to be significant with respect to botanical values.[383] Mr Slaven considered that any decline in health in these wetlands would be fully compensated by the establishment of 4.3ha of indigenous wetland at the regulation pond, and 1ha of wetland and 1.2ha of riparian planting associated with the embayment areas of Canals 4 and 5.[384]

[498] During cross-examination Mr Slaven emphasized that his assessment was of the botanical values of the wetland habitat and not the values for fish or birds.[385] He acknowledged that a number of the willow wetlands did contain indigenous plant species but maintained that their botanical conservation value was low.[386] Mr Slaven agreed that he had not undertaken rigorous assessment of the riverbed vegetation but he had observed that it is dominated by invasive exotic weed species with few native plants.[387]

[499] Mr Slaven acknowledged that the Beverly Hills Flax wetland on Ms Parr's property has high conservation values and would potentially be affected by fluctuating groundwater levels during the construction phase. He considered the wetland to be fed by the Huddleston Stream and there to be little chance of catastrophic effects. He was happy for that wetland to be included in the monitoring programme.[388]

[500] Mr Deans was concerned about the loss of freshwater wetland habitat, waterfowl habitat and game-bird hunting opportunity.[389] He considered the effects on wetlands and game-birds to have been overlooked and was concerned at the loss of wetted area and riverine wetlands within the Wairau River bed.[390] Mr Deans initially estimated that 250[391] to 275[392] hectares of wetted area would be lost. After reading Dr Keesing's supplementary evidence he acknowledged the improvement in information but was still not confident that the estimates were accurate.[393] On cross-examination he agreed that

[383]Slaven EIC at [6.8] – [6.12]
[384]Slaven EIC at [6.18] and [7.12] – [7.13]
[385]Transcript at 314 – 315
[386]Transcript at 325
[387]Transcript at334 – 336
[388]Transcript at354 – 356
[389]Deans executive summary at [10][i]
[390]Deans EIC at [10.20] – [10.23]
[391]Deans EIC at [13.12]
[392]Deans EIC at [10.22]
[393]Transcript at 1530

the figure is likely to be considerably less than 250 hectares but rather more than Dr Keesing's estimate of some 44 hectares.[394]

[501] Mr Jolly considered the wetlands associated with the river to be small and modified with low to moderate values for wetland birds. He did not find specialist wetland fauna such as the bittern, spotless crake or marsh crake.[395] Mr Jolly noted the presence of 18 species of riverbed birds including a number of game birds[396] – mallard, paradise shelduck, Canada goose and Californian quail.[397] He considered the canal itself, the enhanced embayment areas and the regulation pond would offer substantial additional habitat for wild fowl.[398]

[502] During cross-examination Mr Jolly agreed the survey was not designed specifically for game birds and wild fowl populations, rather it was to ascertain the presence of native species. He agreed that his survey work did not produce an accurate picture of the game bird populations. Mr Jolly was not aware that Fish and Game considered the wetlands and the river to be of significant importance for game birds.[399]

[503] When asked about the quantification of wetland loss and the adequacy of the environmental compensation proposed Mr Slaven was confident the compensation was sufficient.[400] Mr Slaven did not think it was possible to quantify the loss of wetlands except by monitoring, as proposed, once the scheme is in operation.[401] Condition 81(b) specifies the monitoring of the vegetation in the wetlands and willow stands and requires remediation or mitigation of any adverse effects. The Vegetation Management Plan outlines contingency measures such as supplying additional water, transplanting at risk species or any other means as determined by the Council to be appropriate.[402]

[504] Dr Keesing mapped the riparian area (between the fairway and the agricultural land) from aerial surveys and riparian transects through the larger and more complicated areas. He recorded vegetation type, the species present, standing water, damp soils and

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[394]Transcript at 1567 – 1569
[395]Jolly executive summary at [2.1][d]
[396]Jolly EIC at [7.8]
[397]Jolly reply at [4.1]
[398]Jolly reply at [4.3] – [4.4]
[399]Transcript at 951 – 956
[400]Transcript at 343
[401]Transcript at 344
[402]Transcript at 349

wetland fauna observed.[403] Of the 1277 hectares of riparian area Dr Keesing estimated 44ha to be wetlands area – 38ha willows and 6ha native. Dr Keesing described the willow wetland areas as having a dense canopy of grey and crack willow with a ground cover of native and exotic species. The native wetlands were typically associated with old river channels or holes with standing water. Carex grasses and Juncus were mixed with exotic species along with kiokio, cabbage trees and *Coprosma propinqua.* Dry native shrubland areas totalled about 157ha comprising kanuka and kowhai.[404]

[505] Dr Keesing adopted a groundwater drawdown effect of 0.3m across the riparian zone and considered that the majority of the vegetation in the riparian zone, including the willow wetlands, would be unaffected as it was tolerant of a range of groundwater conditions. He noted that the small native wetland areas would be potentially affected.[405] Overall he concluded that the riparian area would not be diminished or changed in an adverse way and the predominantly exotic habitat would persist. He considered the primary threat to be continued clearance and development of land for production.[406]

[506] Dr Keesing did not observe any concentrations of game birds, other than quail, in the riparian areas and opined that the Wairau riparian forests contained no water or wetland habitat for water fowl.[407]

[507] Mr Deans analysed Dr Keesing's new mapping of the wetland areas using his familiarity of the river system and recent aerial photographs from Google Earth. He identified a number of wetlands in the riparian zone that he considered would provide wetland wildlife habitat but had not been mapped by Dr Keesing. He included still water wetlands and still or slow moving water from inflowing tributaries. Mr Deans considered the additional areas to be a significant addition to the estimated total of 44ha.[408]

[508] Dr Keesing confirmed that his mapping was based on and updated Mr Slaven's work[409] and incorporated Dr Simpson's[410] descriptions of the wetland sites. During cross-examination he accepted that he had mapped a number of areas as dry when in fact

[403]Keesing supplementary evidence at [1.5] – [1.10]
[404]Keesing supplementary evidence at [1.17] – [1.19]
[405]Keesing supplementary evidence at [1.25] – [1.27]
[406]Keesing supplementary evidence at [1.38] and [1.47]
[407]Keesing supplementary evidence at [1.48]
[408]Deans addendum to rebuttal at [7] – [11]
[409]Transcript at 2115 – 2116 and Slaven EIC Appendix 2 Fig 4a, 4b and 4c
[410]Transcript at 2132 and Slaven EIC Appendix 6 Vegetation report prepared by Simpson

they did have slivers or ribbons of wetland running through them. He agreed that some of these contained open water wildlife habitat and were up to 400m in length and 50m wide. Dr Keesing did not consider these pockets of wetlands to change his estimate of the total area and stated that even if he had missed some 20ha he did not consider this to make a difference to the quantity of habitat available. He considered the willow wetlands in question to be strongly braid or tributary driven and the plant species to be tolerant of even a half metre change in water level. Dr Keesing noted the difficulty in classifying ephemeral wetlands as wetland or dry land and noted that many wetland plants could also be found in dry areas. He classified ephemeral willow wetland areas as dry where he considered the area to be *predominantly dry.*[411]

[509] On re-examination Dr Keesing explained that he did not consider even an additional 20ha of wetland habitat in the riparian zone to be ecologically significant when looking at the wetland habitat available on the river as a whole. He noted that the tertiary braids within the fairway are commonly used by ducks and geese.[412]

[510] Dr Bartlett considered the riparian areas and the willow wetlands to have some ecological value in terms of habitat and biodiversity but did not consider these values to be at risk from the predicted groundwater drawdown.[413] She agreed with the monitoring approach recommended by Mr Slaven although did not consider it necessary to monitor the willow stands.[414] In response to questions from the Court Dr Bartlett agreed that proposed condition 221 on monitoring could be clarified and usefully linked to the Vegetation Management Plan (VMP).[415] Conditions 222 to 225 specify the proposed monitoring in considerable detail. The objectives of the management plan are set out in condition 78.

Findings

[511] The riparian margins of the Wairau River are dominated by invasive exotic vegetation and contain only small areas of wetland habitat. Very little of this wetland habitat contains significant native vegetation. We agree with Mr Deans that the total area of riparian wetland habitat is likely to have been underestimated. However we accept Dr

[411]Transcript at 2117 – 2136
[412]Transcript at 2149 – 2150
[413]Bartlett EIC at [6.27] – [6.29]
[414]Bartlett EIC at [8.1] – [8.2]
[415]Transcript at 2165 – 2166

Keesing's evidence that these wetland areas are small compared with the wetland habitat available across the Wairau River as a whole.

[512] We accept the evidence of Drs Keesing and Bartlett and Mr Slaven that it is unlikely that the predicted drawdown of groundwater in the vicinity of the river will adversely affect the wetland vegetation in the riparian area. While adverse effects on the very small native wetlands areas are possible we agree with Mr Slaven that the establishment of some 6.5ha of wetland and riparian area associated with the canals and regulation pond will compensate for this potential loss.

[513] We accept the evidence of Dr Jolly that the canals and regulation pond will also provide habitat for wild fowl. We acknowledge the difficulty in retaining or constructing wetlands in the riparian areas given the extent of invasive weed species present along the river.

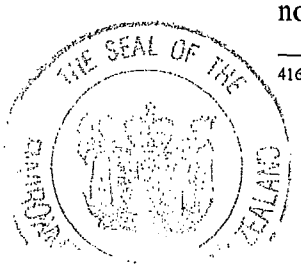
[514] We find that adverse effects on wetlands are unlikely to be more than minor and the proposed wetland areas to be constructed in association with the canal embayments and the regulation pond to provide adequate compensation. We find no adverse effects on game birds.

[515] The proposed consent conditions specified the monitoring, trigger levels and contingency actions in excessive detail. While we appreciate that these new conditions were offered in response to questions from the Court we consider that much of the detail provided in this part of the consent conditions is better to be contained within the VMP and able to be more easily reviewed and amended as necessary. Proposed conditions 78 and 79 provide sufficient detail on the objectives and proposed mechanisms within the VMP.

6.8 Native bush and shrubland

[516] As well as the effects within the riparian areas described above there are direct effects from the clearance of vegetation required to construct the scheme. Mr Slaven noted that the canal route, power stations and spillways were located almost exclusively within pastoral and viticultural land and while a few native plants would be lost that did not constitute a significant adverse effect.[416]

[416] Slaven EIC at [6.2]



[517] The proposed regulation pond at Traverse Spur is sited within a *mosaic of remnant indigenous vegetation* identified as H5 or RAP15 in the DOC PNAP survey. The area affected is kanuka forest with associated kowhai treeland, growing on post glacial alluvium. While noting that the area has been grazed and degraded Mr Slaven considered the loss 0.8ha at the site to be an adverse effect that could be mitigated by protection and enhancement planting of the wider H5/RAP15 site.[417]

[518] Mr Slaven described the legal protection and enhancement proposed to compensate for the loss of the area within the footprint of the regulation pond:[418]

[a] 18.7ha of existing native vegetation at the H5 site would be legally protected , including 10.7ha of RAP sites;

[b] 15.6ha of exotic forest, providing ecological corridors linking the bush remnants in the H5 area, would be legally protected;

[c] enhancement of the H5 area with both active revegetation (3.6ha) and passive restoration (6.7ha);

[d] 4.7ha of indigenous bush would be planted around the two wetland embayments (1.2ha) and at Traverse Spur (3.5ha);

[e] 7.7ha of regenerating shrubland and stone fill habitat would be restored.

[519] A predator and weed management programme would be implemented for the entire H5 complex and the two embayment revegetation sites to assist in establishing the plantings. In total the proposed mitigation covers 34.3ha of existing vegetation and 16.8ha of revegetation/restoration (including the wetland areas). Mr Slaven considered this to be more than sufficient mitigation for the predicted adverse effects associated with the loss of kanuka bush at the regulation pond site and minor declines in riparian vegetation associated with the groundwater changes.[419]

[417] Slaven EIC at [6.3] – [6.5]
[418] Slaven EIC at [7.4] – [7.14]
[419] Slaven EIC at [7.15] – [7.18]

Discussion and findings

[520] The predicted effects on native vegetation are minor with the only significant loss being the removal of vegetation for the regulation pond at Traverse Spur. This loss has been adequately compensated for and the restoration and enhancement programme described is expected to provide benefits within the H5/RAP15 area. We accept that the VMP, as described by Mr Slaven, provides sufficient detail of the protection and enhancement work to ensure that these benefits are delivered. We have simplified the proposed conditions by reference to the VMP.

6.9 Proposed conditions and ecological findings

6.9.1 Overall findings on ecology

[521] We have found that increased periphyton growth will generally contribute to the biological productivity of the river. The adverse effects associated with nuisance growths are adequately remedied by the proposed conditions of consent and will not affect the overall ecological or amenity values of the river.

[522] Adverse effects on the invertebrate community are most unlikely and if they occur would be minor. Accordingly, we consider the invertebrate productivity would provide adequate food supplies for both fish and river birds.

[523] The habitat modelling predicts, at worst, a 10 to 20% reduction in the number of trout within the diversion reach. This may result in displacement of fish to other parts of the river. Despite the modelling results there is a concern over fish passage through the diversion reach in the event of prolonged periods of low flow during the summer months. Severe restrictions to the movement of fish through the diversion reach could result in adverse effects on the number and condition of trout. The passage of trout during the spawning season is the subject of conditions as discussed elsewhere in this decision.

[524] No adverse effects are predicted for native fish.

[525] The black-fronted tern has been the subject of considerable monitoring and research. There is a potential adverse effect on the population of the black-fronted tern given the reduction in flows along the diversion reach. We acknowledge that this is of

low probability, given the conditions of consent, however the tern is a threatened species and any adverse effect would be of considerable concern.

[526] We also note that the proposed predator management programme is likely to improve the breeding success of the black-fronted tern. This would be a benefit to the populations of the back-fronted tern and other river birds including the black-billed gull and banded dotterel.

[527] We have found that effects on wetlands have been adequately mitigated by proposed enhancement and compensation for the potential loss of habitat due to reduced groundwater levels. The loss of native bush and shrubland due to the regulation pond and other infrastructure is a minor effect and more than compensated for by proposed revegetation and enhancement programmes within legally protected areas at Traverse Spur.

6.9.2 The flow regime as proposed

[528] TrustPower proposed amended conditions of consent during closing submissions on 14th May 2010, the final day of the hearing. Three conditions specify the flows in the Wairau River at which the consent holder must cease abstraction:

[a] When flows exceed $200m^3/s$ at The Wash bridge (condition 173);

[b] When flows are below $10m^3/s$ at The Wash bridge (condition 174);

[c] When flows are below $14m^3/s$ downstream from PS5 (condition 175).

[529] Two conditions (conditions 176 and 177) provide for increased minimum residual flow and flow sharing through the river bird nesting season (agreed with DoC):

[a] Minimum residual flows below the intake must be:

[i] $10m^3/s$ January to July

[ii] $12m^3/s$ August

[iii] $15m^3/s$ September

[iv] $20m^3/s$ October and November

[v] $15m^3/s$ in December

(except when the natural flow upstream of the intake is less than these flows).

[b] From 1st October to 31st January flow sharing shall apply when the Wairau River flows at The Wash bridge exceed 25 m^3/s in October and November, $20m^3/s$ in December and $15m^3/s$ in January. The flow in the Wairau River immediately below the Goulter confluence must equal the minimum residual flow required by condition 176 plus one third of the flow above the sum of the minimum residual flow and $5m^3/s$ (i.e. if the flow at The Wash bridge is $31m^3/s$ in October then the flow below the Goulter must equal $20 + (6/3) = 22m^3/s$).

[530] A further condition (condition 179) ensures that the minimum residual flows at the downstream end of the diversion reach are at least $5m^3/s$ greater than those at the intake.

6.9.3 Comparison with SFR scenarios

[531] We have already compared the proposed flow regime with the flow regimes that would result from the application of the Plan provisions, SFR8 and SFR9, and found little difference with respect to the hydrology. We now consider the outcomes for the ecosystem.

[532] Dr Ryder assessed habitat retention for adult brown trout, *Deleatidium* mayflies and 'food producing' water under the SFR8 and SFR9 scenarios compared to the proposed flow regime. He concluded that all three flow scenarios provided identical habitat for adult brown trout. The proposed flow regime would have small losses in invertebrate habitat over the summer months (up to 6% for mayflies) and distinct gains from September through to November (around 20% for mayflies). There were only very small differences (less than 5%) between the flow scenarios for the food producing

waters. Dr Ryder concluded that ecological outcomes were very similar overall with the proposed flow regime potentially more favourable over the bird breeding season.[420]

[533] The habitat modelling shows little difference in the availability of habitat for invertebrates and adult brown trout between the proposed flow regime and the SFR scenarios. This is not unexpected given the very similar outcomes of the three scenarios with respect to mean and median flows. The differences are in the distribution of flows. While the proposed flow regime provides for higher minimum residual flows during some months, SFR8 and SFR9 provide a greater variability in the mid-range flows. We accept Dr Ryder's assessment that the outcomes for the invertebrates are likely to be very similar.

[534] We have noted the importance of mobility and passage through the diversion reach for trout and salmon. This is a particular issue during the spawning season when trout are moving upstream and into the tributaries. The proposed flow regime may lead to extended periods of low flow from January to July including through the spawning season. These periods of low flow may hinder the movement of trout within and through the diversion reach. Such extended low flow periods are less likely under the SFR8 and SFR9 scenarios with the 2:1 flow sharing providing higher flows during freshes and floods. Thus the SFR8 and SFR9 scenarios are likely to provide better outcomes for trout.

[535] The higher minimum residual flows and limited flow sharing through the bird breeding season are expected to provide benefits in terms of both the food supply and the protective moat effect when compared to the SFR scenarios. In this case the proposed flow regime is likely to provide better outcomes for the river birds with the potential for improved breeding success.

6.9.4 Performance standards

[536] Fish and Game proposed[421] amendments and additions to the conditions including a range of performance standards and triggers, for aquatic ecology and river birds, linked to the contingency actions contained within the aquatic ecology management plan.

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[420] Ryder EIC at [8.25] – [8.29]
[421] Conditions of consent version handed up Monday 10th May 2010

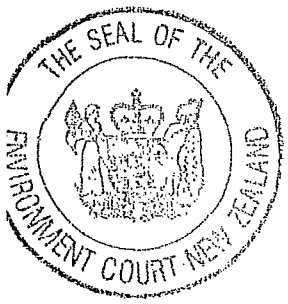
[537] The first of the performance standards is the retention of 80% adult trout habitat and 90% aquatic invertebrate habitat to be determined by an appropriately qualified expert. This is in addition to the monitoring requirements of the conditions and associated aquatic ecology management plan. As discussed habitat modelling is not an exact science and estimating the habitat retention post-scheme would be a difficult and expensive exercise. The result would be a theoretical estimate of available physical habitat rather than a measure of either trout or invertebrate population health. We do not see any benefit in adding this to the monitoring requirements.

[538] Fish and Game seek a performance standard for water quality to be maintained at Class F and Class FS standards as defined in Appendix J of the Plan. Given the multiple uses of the river and the catchment it is not appropriate to require this as a condition of consent.

[539] The third performance standard requires the maintenance of fish passage through the diversion reach and tributaries at all times. We agree that passage through the diversion reach should be maintained at all times but note that some of the tributaries are known to dry up, that is, lose their surface water connection to the Wairau River, during low flow periods. The proposed residual flow regime and conditions requiring limited flow sharing and the passage of freshes during long periods of low flow will provide for improved passage along the main stem. Condition 189, as amended by us, provides for connection to be maintained with the *major northbank tributaries* if obstructed by the formation of gravel banks or reduced surface water flows. We consider these conditions to be appropriate and the proposed performance standard to be unhelpful.

[540] The fourth standard concerns trout and salmon spawning success. Spawning success varies from year to year depending on natural conditions in the river and varies across the catchment. As with the proposed standard for habitat retention a considerable monitoring effort would be required to estimate compliance with such a standard.

[541] While rejecting these quantitative performance standards we acknowledge that the objectives of the aquatic ecology management plan do not explicitly acknowledge the importance of the salmonid fishery. Hence, we consider that a qualitative objective requiring the maintenance of the habitat of trout and salmon would be appropriate. We suggest an additional objective for condition 58:



Maintain the habitat of trout and salmon within the affected reach of the Wairau River.

6.9.5 The triggers

[542] Condition 59(i) specifies the trigger for macro-invertebrates:[422]

> 30% reduction in the average density of mayfly and caddisfly larvae within the scheme diversion reach of the Wairau River relative to pre-operational levels and/or the control sites

[543] Fish and Game proposed condition 57B(a):[423]

> (i) A 30% reduction in average density of macroinvertebrate and native fish community relative to pre-operational levels and control site levels for two consecutive monitoring occasions
>
> (ii) A statistically significant reduction in the density of caddisfly

[544] A healthy and diverse macroinvertebrate community is essential for the overall health of the instream ecosystem. The EPT taxa are an important food source for trout and the river birds. Therefore we consider the proposed condition 59(i) specifying mayfly and caddisfly density as a trigger to be appropriate and sufficient. We do not accept Fish and Game's proposed condition 57B(a).

[545] Fish and Game have suggested additional triggers related to the trout population and the trout spawning migration. The trigger for the spawning migration considerably simplifies the condition 211 as proposed by TrustPower by removing the requirement to count trout potentially held up in pools along the river and increasing the low flow trigger from 15 to 20m^3/s.

[546] We agree that simplifying this trigger would be an improvement and we do not see any need to introduce additional delays and costs by requiring an aerial survey to count trout. Given that the critical period for the spawning migration is April through to June we consider that the count of low flow days should begin in March. Otherwise there is the potential for low flows to extend all through March and April before the trigger is set off (10 May at the earliest) and there is potentially a further period waiting for a fresh

[422] Conditions of consent TrustPower closing submissions Friday 14th May 2010
[423] Conditions of consent version handed up Monday 10th May 2010

to come down the river. Similarly, we consider that the 40 days should be reduced to 30 days to better facilitate the movement of trout.

[547] To reflect the above condition 211 will read:

> (a) The consent holder shall operate the scheme to ensure that it does not cause or exacerbate conditions which impede trout spawning migration.
>
> (b) The consent holder shall as part of the Aquatic Ecology Management Plan include methods to ensure that trout spawning migration is not impeded as a result of the scheme including the following requirements:
>
> (i) Monitor the mean daily flows calculated immediately below the Goulter (in accordance with condition 177) during the period 1 March to 30 June each year;
>
> (ii) In the event flows fall and remain below $20m^3/s$ for 30 consecutive days the consent holder shall ensure that on the next fresh of $45m^3/s$ or more (calculated below the Goulter) the residual flow in the river is at least $45m^3/s$ (calculated below the Goulter) on the recession of the fresh for at least 48 hours.

[548] This amended condition will better provide for fish passage through the diversion reach particularly leading up to the critical spawning season. However we consider there is still a potential adverse effect on the movement of trout outside of this period and consequently on the numbers and condition of trout in the river. This would only occur during very dry years where prolonged periods of low flow, due to the absence of significant freshes, may be exacerbated by the scheme. We consider this to be a low probability but it would be a significant impact on the productivity of the fishery and subsequently on the amenity of Wairau fishery.

[549] The suggested trigger for the trout population reads:[424]

> A 30% reduction in the average abundance, age structure, fish size, condition or species recruitment of brown trout relative to pre-scheme levels for three consecutive years

[550] The trigger requires a considerable amount of monitoring and evaluation in order to determine compliance and would be expensive to implement. The ecologists were all agreed as to the variability of the trout population within the diversion reach and its

[424] Conditions of consent version handed up Monday 10th May 2010

function as both home and corridor for trout. Given this variability, the expense incurred in monitoring, the three year lag time before the trigger can be set off and the potentially confounding factor of changes in fishing pressure we do not consider such a trigger to be appropriate. Given the potential for adverse effects as a result of restricted passage through the diversion reach we agree with Dr Ryder[425] that the adult trout population in the river should be monitored and trout numbers considered, in the context of other monitoring data, by the Ecological Advisory Group (as required by conditions 206 and 207).

6.10 Natural character, landscape and amenity

[551] Natural character is not defined in the Act. Historically, the Court has received evidence on this topic from landscape architects and there has been a tendency to combine evidence on natural character with that on landscape and visual amenity. While we acknowledge some overlaps this approach opens the door for confusion.

[552] The dictionary definitions[426] can assist:

> **natural** – of, existing in, or produced by nature;
>
> **character** – all those qualities that make a person, group, or thing what he, she or it is and different from others.

[553] Thus, the natural character of the Wairau River and its margins consists of those qualities, produced by nature, that make the river (and its margins) what it is and different from others.

[554] The Plan aligns with the dictionary definitions in its description of natural character in the introduction to Chapter 10:

> Natural character can generally be described as being those characteristics (qualities and features) of a particular environment.
>
> The natural character of the coastal environment and freshwater bodies is comprised of a number of key elements:
>
> - Coastal or freshwater landforms

[425] Transcript at 2361
[426] The New Zealand Oxford Dictionary

- Indigenous flora and fauna, and their habitats
- Water and water quality, including marine and freshwater ecosyatems
- Scenic or landscape values
- Cultural heritage values
- Habitat of trout and salmon.

[555] Mr Kyle produced a similar list of the elements comprising the natural character of the Wairau River – water flows, sediment movement, water quality, instream habitat quality, fish habitat, avifauna habitat, and scenic or landscape values. He considered the assessment of natural character to have evolved over time from an early reliance on visual perception to a consideration of the *natural elements with a natural distribution arrived at as a result of natural processes rather than human activities.*[427]

[556] The three landscape witnesses took somewhat different approaches to their assessments. In terms of natural character they all acknowledged the importance of the natural elements, natural processes, natural patterns *triumvirate* but had diverging views on the importance of the biophysical (or scientific) component compared with the perceptual component of natural character.

[557] Dr Steven's evidence addressed:

[a] Effects of the scheme on the naturalness or natural character of the Wairau River;

[b] The implications for the amenity of the river of changes in naturalness.

[558] Dr Steven set out and explained, at some length, the framework he used to analyse the effects of the scheme on natural character:[428]

> Naturalness and natural character are synonymous constructs, in my opinion. Naturalness can be understood as two distinctly different concepts:
>
> Biophysical naturalness, based upon the objective assessment of natural elements, natural patterns and natural processes and the extent to which these have been subject to human modification or intervention; and

[427] Kyle EIC at [6.23] – [6.24]
[428] Steven EIC at [15], [16] and [22]

> Apparent naturalness – that seems like nature. The basis for the assessment of apparent naturalness varies, but I regard it as being predominantly an aesthetic judgment.
>
> I regard it as a matter or importance that assessments undertaken for the purposes of s6(a) of the Resource Management Act (RMA) be based upon a scientific approach to the assessment of biophysical naturalness, rather than apparent naturalness. This opinion is based upon the premise that there are greater intrinsic values associated with landscape and landscape features that have not been the subject of human modification. The value associated with naturalness increases as naturalness approaches the pristine end of a naturalness scale. That is to say, landscapes and landscape features displaying natural elements, natural patterns and natural processes in a substantially unmodified state maybe regarded as having greater value by virtue of that relatively unmodified state.
>
> Apparent naturalness is a subjective assessment that informs the assessment of aesthetic quality. Accordingly, it is relevant to s6(b) assessments of landscape significance and 7(c) assessments of landscape amenity. However, I do not regard apparent naturalness as being relevant to s6(a) assessments of the natural character of the coastal environment, or wetlands, and lakes and rivers and their margins. Landscapes assessed as being highly natural according to biophysical natural parameters will embody the qualities and characteristics that are valued in assessments of apparent naturalness.

[559] Dr Steven accepted, with the exception of the comments on natural character, the broad descriptions of the landscape context for the scheme provided by Dr Boffa.[429]

[560] Dr Steven noted the high degree of visual separation of the river fairway from the adjacent agricultural and horticultural landscapes of the river valley. From within the river fairway the intensive land use activities of the adjacent landscape have little or no affect on the recreational experience of being on the river.[430]

[561] Dr Steven used a 5-point scale[431] when describing natural character and we reproduce that table below:

Naturalness of Rivers				
Completely Natural	Partly Modified	Substantially	Mostly Modified	Completely
Very high	High	Moderate	Low	Very Low

[429] Ibid EIC at [44]
[430] Steven at [45(a)]
[431] Steven at [20]

Existing naturalness → Post scheme naturalness

[562] Dr Steven outlined the natural elements, patterns and processes of a braided river by way of examples:[432]

[a] Natural elements – the water, the sediments of the bed and banks, the biological elements including fish, invertebrates and avifauna

[b] Natural patterns – braided channel pattern, behaviour of water, width of riverbed, physical nature of riverbed.

[c] Natural processes – erosion, transport and deposition of sediment, degradation and elevation of riverbed, transport of nutrients and invertebrates, aquifer recharge.

[563] He considered the abstraction to have effects that extended beyond the reduction in flow (with direct effects such as changes in braiding pattern), given the complex web of relationships between biological and physical elements of the river and the processes operating within the ecosystem. Dr Steven accepted that the proposed flow regime was within the natural range of flows but that the variation in flow differed both spatially and temporally. For example post-scheme low flows are likely to occur at a greater frequency.[433]

[564] Dr Steven's position, and a fundamental element of his evidence, was that the residual flow regime is a direct consequence of the manipulation of flow for electricity generation, and must by definition, diminish the natural character of the river.[434] A significant abstraction of what is the river's principal element – water – is a significant human modification to the river and results directly in a reduction of the natural character of the river.[435]

[565] Dr Steven was highly critical of the Boffa Miskell Assessment of Environmental Effects (the AEE)[436] where it found that the modifications to river flows can have an

[432] Steven EIC at [61]
[433] Steven EIC at [64] – [66]
[434] Steven EIC at [67]
[435] Steven EIC at [79]
[436] Boffa Miskell April 2005 (Appendix 9 to Trust Power AEE)

effect on natural character, but suggested this aspect should be dealt with as it relates to the *perception of change*. He was critical of the *perception of change* theme through the evidence of Dr Boffa. Dr Steven's opinion was that, while changes to natural character are able to be perceived, the capacity of a lay observer to notice such changes should not be a factor in determining the extent to which (the human) interventions diminish natural character.[437]

[566] Where the AEE claims at 3.3.3.4 that the residual flow regime protects the intrinsic value, Dr Steven argued:[438]

> In environmental terms, intrinsic values are those aspects of the environment that are valued for their own sake – nature valued in its own right, rather than for instrumental or use purposes. The notion that the intrinsic values of a resource can be acknowledged and protected while at the same time using that resource for instrumental purposes (the generation of electricity) is contradictory.

[567] In answer to the Applicant's claim that the proposed flows in the diversion reach will follow or *mimic* seasonal patterns, Dr Steven's evidence was that this is only in the sense that these flows will exhibit a pattern of peaks and troughs that respond in frequency and occurrence to the seasonal patterns of rainfall events.[439] He described this outcome as naturalistic but not natural – the defining difference being that the flows in the diversion reach will be the direct result of human induced modifications to the natural flow pattern.

[568] Dr Steven went on to say that in a braided river such as the Wairau a reduction of flow is accompanied by a relatively large reduction in the wetted area which usually results in a direct loss of aquatic habitat for many aquatic species or a change to the habitat quality. He was careful to point out that he is not qualified to comment on the implications of these changes for invertebrates, fish life and avifauna – and we note the Court has before it a plethora of expert testimony on these matters. Dr Steven's opinion and a further important element of his evidence was that the concepts of ecological sustainability and natural character are not synonymous[440].

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[437] Steven EIC at [62]
[438] Steven EIC at [68]
[439] Steven EIC at [83]
[440] Steven EIC at [84] – [86]

[569] In answer to questions from the Court Dr Steven confirmed his approach by agreeing that it was the abstraction of water that is the primary effect on natural character. The greater the abstraction in proportion to the flow of the river the greater the effect on natural character.[441] He acknowledged that measures to reduce the manipulation of the flow regime, such as flow sharing, would mitigate effects on natural character.[442]

[570] Other factors such as any reduction in habitat, aquatic life or avian life are what Dr Steven considered consequential effects and the preserve of other specialist witnesses.

[571] Dr Frank Boffa provided both a primary and a rebuttal brief and a series of visual simulations to illustrate the appearance of the project from representative public viewpoints.

[572] Dr Boffa stated that the post-scheme river flows are to be within the range of natural and seasonal flows, the flood and major fresh flows will be retained, and that ecological investigations demonstrate that there will be no more than minor adverse effects. For these reasons he considered the flow regime under the scheme would not have an adverse or significant effect on natural character.[443]

[573] This conclusion was based on the evidence of TrustPower's expert witnesses such as Dr Ryder and Dr Hudson (in terms of ecological processes), Dr Keesing (in terms of aquatic systems), Mr Slaven (in regards to indigenous terrestrial and wetland systems) and Dr Sanders and Mr Jolly (in regard to avian fauna).

[574] In respect of any effects on the river, Dr Boffa started by defining natural character (and we note this definition accords with that used by Dr Steven). However, he went on to say in respect of the in-river structures that neither the intake nor the outfall structures and their associated river training works would create adverse effects on natural character nor would they have visual effects beyond their immediate river environment.[444]

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[441] Transcript at 1446
[442] Transcript at 1451 – 53
[443] Boffa Executive Summary at [12]
[444] Boffa EIC at [9.7]

[575] We pause here to note our appreciation of Dr Boffa's helpful visual attachments, Tab 1 Viewpoint 7 of which illustrated his opinion (noted above) in respect of the intake area.

[576] The remainder of Dr Boffa's analysis on this issue related to the perception of natural character and he relied on the Riverscape and Flow Assessment Guidelines[445] (the Guidelines). The Guidelines note there are many situations where significant effects on natural character will be avoided or minimised if:

[a] The proposed flows are within the natural range of flows;

[b] The river forming flows such as floods and major freshes are retained;

[c] The proposed flow regime mimics the natural fluctuations such as seasonal highs and lows;

[d] Ecological investigations suggest that any adverse effect on flora and fauna will not be significant.

[577] Dr Boffa's consideration of the effects of the scheme on the braided pattern of the river was assisted by 3D simulations of the topography (based on Dr Hudson's modelling) and a study of available aerial photography, flown between November 2003 and March 2006. He concluded that the braided river pattern will be retained under the flow regimes proposed by TrustPower.[446]

[578] Dr Boffa went into some detail describing catchment river control works that have been carried out on the river since the late 1950s:[447]

> The River and its margins are substantially modified. I also consider the effects of the scheme on natural character and amenity values as a result of reduced flows are likely to be considerably less than the effects of the physical activities and river fairway modifications that are currently occurring within the river and on its margins.

[445] Riverscape and Flow Assessment Guidelines: Guidelines for the selection of methods to determine river flows based on landscape natural character and visual amenity considerations. Boffa Miskell June 2009
[446] Boffa EIC at [9.20]
[447] Boffa EIC at [9.33]

[579] While Dr Boffa accepted (during cross-examination) that the flume carrying the scheme water across the Branch River adjacent to the State Highway 63 road bridge is a *very visible part of the scheme*, it remained his opinion that the most significant effect of this scheme is the abstraction of water[448] and its consequential effects. He accepted that this would diminish natural character, however, he did not resile from his opinion that this was not of significance.[449]

[580] Mr Brown provided *"A critical review of the visual and landscape implications of the Proposed Scheme"* – what he describes as *an entirely independent examination of the situation in relation to landscape effects.*

[581] Mr Brown also accepted that the abstraction of water is *the most significant component of the project in terms of landscape and natural character effects.*[450] Mr Brown went on to say that the scheme would not cause a fundamental change to the *braided river* nature of the Wairau, and the perceived effects of the water diversion would be quite low. Accordingly, the potential changes to the river's biophysical and landscape character would not be as significant as was perhaps initially foreseen.[451]

[582] Mr Brown's evidence in relation to the Wairau Valley – outside of the river fairway – accords with that of the other landscape experts. It is very much a working landscape with power stations:[452]

> ... encased within buildings that are compatible with other rural buildings in terms of their scale and general profile. With power stations 2 and 3, in particular, sited well away from local roads and all five stations designed and finished in materials and colours that are appropriate and in keeping with the rural Wairau landscape it appears most unlikely that they would either singularly or collectively have a significant impact on the perceived character and the many values of the local environment.
>
> At worst, the amalgam of canal, penstocks and power stations might appear to compound the current state of flux evident within the Wairau Valley. As a result, they might – cumulatively, but also incrementally – increase the feeling of widespread transition towards a working, as opposed to amenity, landscape.

[448] Transcript at 1511
[449] Transcript at 1510-11
[450] Brown Executive Summary at [4]
[451] Brown Executive Summary at [8]
[452] Brown EIC at [75] – [76]

[583] While he agreed that the impacts on the more intrinsic landscape and natural character values of the river system maybe more elevated, he argued along with Dr Boffa that this fairway has already been the subject of extensive stream bank modification and reclamation.[453]

[584] Mr Brown stated that:[454]

> ... intuitively, up to a 44 percent reduction in such river flows seems significant: certainly it raises the prospect of considerable changes to the extent of water visible on a day to day basis and potential modification of the braiding.

[585] However, the combination of aerial photographs and photo simulations/montages convince him that it is difficult to discern visible differences between river flow and at different levels.

[586] In contrast to Mr Kyle, Mr Brown considered that assessments of natural character under the Act had initially revolved around the three categories – natural elements, natural processes, and natural patterns – and now there was more emphasis on the perception of such values. He presented a set of indicators for natural character from a 2002 workshop:[455]

[a] Abiotic factors (landform);

[b] Vegetation type (native/endemic and exotic);

[c] Vegetation cover and patterns;

[d] Land use / activities (presence / absence of buildings and structures);

[e] Seascapes and water areas;

[f] Natural processes.

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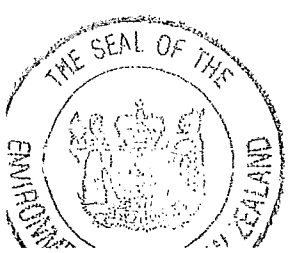
[453] Brown EIC at [80]
[454] Brown EIC at [81]
[455] Brown EIC at [56]



[587] Mr Brown considered natural character to have both a perceptual and biophysical component and noted that landscape architects, depending on their qualifications, were generally more competent to address the perceptual component and the indicators were tools to use in that assessment. He was clear that *landscape architects are not specialists in all of the fields that pertain to natural character values.* Mr Brown considered he had focused on the perceptual component and the evidence of the ecologists would also contribute to the Court's consideration of natural character values.[456]

[588] Overall Mr Brown concluded:[457]

> ... the reduced flow levels within the river would have an impact on the perceived and intrinsic landscape and natural values, especially during times of average to lower in-river flow rates, but such changes would not affect the fundamental structure or character of the river environs and landscape. Such effects appear likely to be essentially incremental and lower than was intuitively expected given the degree of flow reduction proposed.

6.10.1 Evaluation of natural character

[589] As we have discussed there is a degree of overlap in the evidence on natural character, landscape and visual amenity. We intend to evaluate and come to findings on them separately.

[590] To properly evaluate the evidence on natural character we first must consider the approach of Dr Steven (who contends that the abstraction of water and change in the flow regime is itself an adverse effect on natural character and therefore on the environment) and Dr Boffa, (who contends that it is any biophysical effects – such as any reduction in habitat and adverse effects on trout or river birds – that determines any effects on natural character of the scheme). Mr Brown acknowledged that both aspects must be considered and his own evidence focussed on the perceptual component of such changes.

[591] An abstraction of a significant volume of water – one of the river's primary elements – from the river for a significant distance (48km or about a quarter of the river's length) in excess of 50% of the time such that periods of low flow are extended beyond the seasonal patterns, impacts on the natural character of the river. We see that logic as

[456] Brown rebuttal at [4] – [18]
[457] Brown EIC at [90]

unassailable. We accept that any human induced changes to the natural elements, patterns and processes are an effect on natural character.

[592] For this reason we, generally speaking, prefer the approach of Dr Steven. However, we find his preference for the use of the word(s) *natural* and *naturalness* over *natural character* somewhat unhelpful.

[593] While we think biophysical assessment of the natural elements, natural patterns and natural processes is critical in assessing components of natural character, the word *character* requires that any assessment must also recognise and consider what is perceived. Hence our use of the words *generally prefer the approach of Dr Steven.* We agree with Mr Brown that both the biophysical and perceptual components of natural character must be considered. These effects on natural character will be able to be perceived but not necessarily to an untrained eye or someone unfamiliar with the river.

[594] We note that through the cross-examination and in response to questions from the Court, Mr Brown and to a lesser extent Dr Boffa appeared to resile slightly from their original position. Mr Brown accepted[458] that the abstraction degrades natural character – but the question was *to what degree?* Dr Boffa accepted[459] that the reduction in flow *would diminish the naturalness that occurs* but went on to say that it would not be of significance.

[595] We are mindful of and agree with Mr Whata's submission that should we find that the abstraction by itself has a more than minor adverse effect on natural character, then that does not mean the scheme is inappropriate either under s 6(a) or the Plan. However, we do not agree with Mr Whata's further submission that such an approach would ... *present an impossible bar for water abstracters.*[460] To determine whether or not an abstraction would have an adverse effect on natural character one must consider the volume of the take as a proportion of the natural flow, its geographic extent, and the duration of the abstraction. Each case must be considered individually. In the case before us our finding that the proposed scheme impacts on the natural character of the Wairau River is but one of a number of issues to be factored in to our final determination under s 5 of the Act.

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[458] Transcript at 1397
[459] Transcript at 1510
[460] Whata closing submissions at 60 at [16.7]

6.10.1.1 The quantum of the abstraction and the length of the diversion reach

[596] The abstraction is a maximum of $40m^3/s$ from a mean river flow at the intake of $35m^3/s$. A minimum residual flow of between 10 to $20m^3/s$ (depending on the time of year) is required to remain in the river immediately below the intake point. The mean flow (at the intake) will go from 34 to $19m^3/s$ post-scheme. Mr Mitchell provided evidence describing existing and post scheme flows at different points on the affected reach.[461] The maximum flow reductions of $35m^3/s$ for 2km, $55m^3/s$ for approximately 7.5km, and $40m^3/s$ for 38km and these reductions occur for 14%, 11% and 27% of the time respectively.[462]

[597] It was obvious from his answers in cross-examination that Dr Steven was not entirely clear in his understanding of the proposed flow regime, and in particular the percentage of time that the maximum abstraction would actually occurr. He has omitted to consider the duration and variability of the take, the reduced impact moving downstream from the intake, or the geographic extent of the diversion reach. For this and other related reasons we hold that Dr Steven has overestimated or exaggerated the abstraction and resulting changes to the flow regime.

[598] We have found the Branch River abstraction to be part of the existing environment. As noted above, the maximum new abstraction of $40m^3/s$ will only occur 27% of the time and the $55m^3/s$ abstraction, to which Dr Steven repeatedly refers, will occur approximately 11% of the time within a 7.5km stretch of the river. Post-flow hydrology and any consequential bio-physical effects are analysed in some detail elsewhere in this decision.

[599] Approximately a quarter of the length of the river will be affected by the diversion due to the scheme. We accept Mr Mitchell's evidence[463] in relation to the quantum of abstraction, the length of the river affected and the percentage of time that particular abstraction occurs. We note that the greatest effect is in the upper 7.5km of the diversion reach and below that tributaries increase the rate of flow and contribute to flow variability.

[461] Mitchell Evidence in rebuttal at [10.11]
[462] Mitchell evidence in rebuttal Fig 1
[463] Mitchell rebuttal, at [10.11]

6.10.1.2 The character of the abstraction

[600] Mr Mitchell's evidence is that the average abstraction at the intake is $15m^3/s$ resulting in a 44% reduction in mean flow at the intake. This reduces to a 27% reduction in mean flow above Power Station 5.[464]

[601] Dr Steven stated that the duration of the abstraction is not *particularly pertinent.*[465] We disagree with this opinion. We have already noted our agreement with Dr Steven that:

> As a general principle one might state that the greater the level of abstraction in proportion to the flow of the river, the higher the effect on naturalness.

[602] It must therefore follow that both the volume of the abstraction and the duration are factors in any assessment of effects on natural character.

[603] We are firmly of the view that the maximum (new) abstraction of $40m^3/s$ is significant. However, the fact that this maximum abstraction is likely to occur only 27% of the time reduces, to some degree, the adverse effects on natural character.

[604] In coming to a finding on the adverse effects on natural character it is necessary to consider the existing natural character of the river. While the witnesses are not in complete agreement on this point, they do agree that the existing natural character is somewhere between very high to high (Dr Steven) and high to moderate (Dr Boffa and Mr Brown). The difference relates to the impact on natural character due to historical river catchment and flood protection works, the Branch Scheme and agricultural development of the margins. While not completely in the natural state, we find the Wairau River and its margins retain a moderately high level of natural character.

Findings

[605] We have already considered the effects on braiding patterns and sediment transport and found no significant changes are likely with respect to the riverbed. There are temporary and localised effects on turbidity and clarity associated with the flushing of sediment but these are not expected to be significant.

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[464] Mitchell rebuttal, at [5.10]
[465] Transcript at 1426

[606] The overall findings on the ecology of the river indicate some changes in the periphyton and invertebrate community in response to changes in the flow regime. However the scale and extent of these changes will not impact significantly on natural character. Similarly the distribution of trout along the river may change in response to the proposed flow regime. However given the large variability in trout populations this is not considered to be significant with respect to natural character. The river bird populations may benefit from predator control programmes and the predator control itself is seen as a benefit and may enhance natural character.

[607] However, we consider the water and the flow regime to be *the most* important aspects of the natural character of the Wairau River – without the water there is no river. The abstraction will result in significant changes to the mean and median flows in the diversion reach. The low flow periods would be extended well beyond the natural pattern. The diversion reach is a significant proportion of the length of the Wairau River. Accordingly, we find the adverse effects of the proposed water abstraction and diversion on the natural character of the Wairau River are significant.

6.10.2 Landscape and visual amenity

[608] With respect to any off-river adverse effects on landscape, Dr Boffa stated that the scheme has been planned and designed to be an integral part of the rural working landscape and to, as far as possible, avoid the creation of adverse environmental impacts.[466] He stated that the scheme can be sensitively accommodated and visually integrated into the rural Mid-Wairau Valley working landscape.[467]

[609] Dr Boffa described the Wairau River as a difficult river to view because it is visually contained, that it is expansive and difficult to access. From within the river bed only local and confined views are available. Those most likely to experience these views have direct contact with the river such as anglers, boat users and recreational walkers. The witness did acknowledge that while the stretch of river affected by the scheme is not particularly visible from public and frequently used viewpoints (such as roads) – the relative isolation is an attribute valued by some sections of the community.

[466] Boffa EIC at [8.3]
[467] Boffa EIC at [8.4]

[610] His evidence, which accords with that of Dr Steven, was that the intrinsic ecological values are important in terms of landscape perceptions and how people feel, experience and respond to the river.

[611] Dr Boffa discussesd the landscape amenity effects of the proposed flow regime with reference to Table 1 of Dr Mitchell.[468] He explained, by reference to Riverscape Flow Assessment Guidelines,[469] that people's ability to accurately assess a given river flow was generally poor. The research found that *people generally overestimate low flows and underestimate high flows, with estimates being wrong by as much as 50 percent to 100 percent in large single stem rivers.*

[612] Dr Boffa's evidence was, that notwithstanding the effects of low flows over extended periods of time contributing to other effects, and in particular those on natural character, he considered the survey results to be relevant in terms of the visual effects of low flows. The research findings confirmed his own conclusions relative to the appearance and visual effects of modified flows in the Wairau River.[470] His evidence in terms of river flow preferences was that recreational users probably relate individual flow preference to their main interests associated with the river. He considered however, that most casual users and observers of the Wairau River are unlikely to be aware of differences in the flows/volumes of the river under the proposed scheme.

[613] Mr Brown agreed with the conclusions of Dr Boffa and stated:[471]

> During periods of lower rainfall, when diversion has a greater physical effect, there would inevitably be a reduction in wetted surfaces within the river course, some loss of vigour and dynamism in relation to the water courses, and potentially a long term increase in the vegetative content around and across the river braids. But, analysis to date indicates that such effects would remain of a low order and would not fundamentally or significantly affect the landscape and natural character values associated with the Wairau River at present.

[614] We accept Dr Boffa's evidence, sourced from the Flow Assessments Guide that the majority of people recreating on or near the river will have difficulty in assessing

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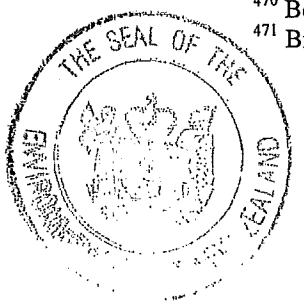
[468] Mitchell rebuttal at [3.4]
[469] Boffa Miskell 2008 ***The Aesthetic Value of River Flows: an online assessment of flow preferences and flow level estimations*** - unpublished
[470] Boffa EIC at [9.49]
[471] Brown EIC at [104]



flows and changes to these flows. And for this reason the artificially regulated flows, as a result of abstraction may not be readily detectable by most people.

[615] The exceptions are those that use the river regularly and for whom flows are important. Anglers are likely to be the most significant group in this category. It was clear to us from their evidence that many anglers have an intimate knowledge of the river, its characteristics at different flows, the habitat and the food that the river provides for trout. We accept the evidence that kayaking was not undertaken to any great extent on the Wairau.

[616] Any adverse effects on trout or angling – matters to be considered with respect to s 7(c) and s 7(h) of the Act – are assessed in separate sections of this decision.

[617] We accept the expert evidence (agreed by the 3 landscape witnesses) that off-river effects of the scheme on landscape and visual amenity will be minimal on the grounds that the Wairau Valley is a working landscape and is undergoing change. The conversion of pastoral land to the more intensive uses of viticulture and dairying adds to the industrialisation of this working landscape. It is then more easily able to accommodate such a scheme.

Findings

[618] We find that as a result of the extended low flows some of the dynamism of the river will be lost and this would be a loss of amenity, particularly for those familiar with the river. However, we note that few of the general public would be aware of this change and we note that very low flows (less than $10m^3/s$) and flood flows (greater than $200m^3/s$) will be unchanged.

[619] After considering all the expert evidence on the subject we find the adverse effects (outside of those on anglers) from the scheme on the landscape and visual amenity of the Wairau River to be minor.

6.10.2.1 Amenity impacts on the Parr/Rogers, McLauchlan and Doyle properties

[620] Ms Parr, in particular, raised a number of concerns about the proposed scheme and the effects it may have on the use and enjoyment of properties affected by the scheme.

[621] A number of these issues, particularly those of a technical nature (such as flooding, danger as a consequence of canal failure, ground water effects) and the legal issue of futility (because both the McLauchlans and the Parr/Rogers refuse to let TrustPower either onto or to use their land) have already been addressed. As we have already noted, no expert technical evidence was adduced by any of the landowners to support their various contentions. However, we accept as genuine and can understand the landowners' submissions and evidence in respect of the impacts of the proposed scheme on their amenity.

[622] Both homes on the Parr property are in close proximity to, and immediately below, the proposed scheme. Ms Parr and her family have recently relocated from Auckland for the express purpose of enjoying the stress free amenity and rural lifestyle of their Wairau Valley property. The presence of the canal will be imposing and, notwithstanding the expert evidence, will affect their enjoyment of their property.

[623] By the same token the McLauchlans, who have been farming and improving their property for nearly three decades, and who intend passing it on to their children, will be greatly impacted if the scheme proceeds. The McLauchlan property will effectively be subdivided by 2.2 kilometres of canal 8, have a significant canal structure above the homestead and host Power Station 5. Short of redesigning the scheme, there is little TrustPower can do or offer that will reduce or mitigate the adverse effects on amenity for the McLauchlans.

[624] We accept the concerns with respect to amenity held by both families. TrustPower also appears to accept that these concerns are genuinely held, and that on their face the impacts on amenity will be as the Parr/Rogers and McLauchlan families describe.[472]

[472] Transcript at 2770

6.10.2.2 Effects on the amenity of Ms Doyle

[625] Ms Doyle is concerned about the flooding on her land should the Kiernan Creek spillway be used for an emergency discharge.

[626] Proposed conditions of consent only allow discharge down this spillway in an emergency. In response to questions from the Court, Mr Dawson explained that there would be operational and testing requirements for use of the Kiernan Creek drop shaft, on an annual basis, releasing small amounts of water. Larger volumes would only be released if required by major seismic events, expected extremely infrequently, one in several thousand years.[473]

[627] We acknowledge Ms Doyle's concerns are genuinely held, but find that such flooding is unlikely. The canals and headponds are some distance from the Doyle home. We find that the potential adverse effects on the Doyle's amenity to be minor.

Finding on amenity effects on individual landowners

[628] The adverse effects on amenity of both the Parr/Rogers and the McLauchlans in their ability to farm, use and enjoy their properties would be significant.

6.11 Recreation

[629] Angling is a key recreational activity which occurs throughout the river. The Wairau River is the most significant salmonid fishery in the Nelson-Marlborough Fish and Game Society region. Fish and Game provide 47 access points over the entire river with 11 along the diversion reach.[474]

[630] Ms Baker submitted[475] that the proposed scheme would significantly reduce the number of angling days, the length of accessible and fishable river, the natural character values and potentially the number and condition of trout. The scheme would affect access, both during construction and after commissioning. Ms Baker further submitted

[473] Transcript at 241–244
[474] Hovell EIC at [4.46]
[475] Baker opening submissions at [170]

that irrespective of angler use – remote areas are important and those remote, natural experiences are worthy of protection.[476]

[631] In summary[477] Fish and Game's case is that the Wairau Fishery is top quality and highly valued for a range of reasons, including:

- The number of large fish;
- Extensive range of fishable water;
- Tranquil, peaceful surroundings;
- High catch rate;
- Opportunities to catch salmon and trout;
- Angling opportunities provided when other rivers are unfishable;
- Ease of access;
- Low encounter (other anglers) rate;
- Only between 9 and 19 percent of angling occurs within the affected reach (we believe that she was referring to the diversion reach).

[632] In response, Mr Whata submitted that there is (if salmonid habitat is maintained) unlikely to be any significant loss of angling opportunity in the river when flows are between 8 and 14 m^3/s.[478]

6.11.1 Importance of the fishery

[633] The Wairau River supports wild populations of brown trout, rainbow trout and Chinook salmon and is best known as a trout fishery. Most fish caught are brown trout with some rainbow trout in the middle reaches of the river. The trout fishery is entirely a wild stock requiring fish to move freely between different parts of the river system to complete their life cycle. The Wairau has 140km of fishable water with a wide variety of fishing opportunities and a discontinuous or patchy distribution of fish along the river.[479]

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[476] Baker supplementary closing submissions at [12]
[477] Baker closing submissions at [12.4]
[478] The proportion of time river clarity is within the fishable range will change little as a result of the extraction
[479] Deans EIC at [5.1] – [5.13]

[634] Messrs Deans, Greenaway and Hovell were agreed the upper Wairau River above The Wash bridge is nationally significant for its salmonid angling and the river downstream of The Wash bridge is regionally significant.[480] They were also agreed that adult salmonids would be able to pass through the diversion reach via the main channel and would be able to access spawning tributaries.[481] They were not certain the proposed flow regime would provide adequate habitat for brown trout or salmon or the range of fishing opportunities that currently exist in the diversion reach and possibly downstream.[482]

[635] Mr Deans expressed some concern about dividing the Wairau River into separate reaches and considered it to qualify as an outstanding fishery in its entirety.[483] He considered the river as a whole to be a nationally important trout fishery and a regionally important salmon fishery.[484] During cross-examination he agreed it was generally appropriate to subdivide larger rivers where their character alters. However, he did not think the amenity changes in an abrupt way at The Wash bridge on the Wairau.[485] Mr Deans explained that angler surveys divided the river at The Wash bridge as it is easily identifiable and the point at which the regulations (for species, bag limits and seasons) change for fishing. He considered the recreational amenity to be quite different at the extremes of the catchment and to *grade imperceptibly* from one end of the river to the other.[486]

[636] The Wairau provides a valuable and extensive fishery resource which is well used by anglers from the local community and beyond. While the character of the river does not change abruptly at The Wash bridge it is a convenient and identifiable point with respect to fishing and the associated recreational amenity. We find that it is appropriate to subdivide such an extensive fishery and accept that the river downstream of The Wash bridge is regionally significant for salmonids.

[480] Joint statement of recreation witnesses dated 17 July 2009 at [3.3]
[481] Joint statement of recreation witnesses dated 17 July 2009 at [6.1]
[482] Joint statement of recreation witnesses dated 17 July 2009 at [10.2]
[483] Deans EIC at [5.70]
[484] Deans EIC at [18.1]
[485] Transcript at 1556
[486] Transcript at 1585 – 1586

6.11.2 Angling amenity

[637] We note the summary of angling visits to the various reaches of the Wairau derived by Mr Hovell from the data supplied by Messrs Deans, Boyes and Winter. Mr Boyes spent 13% of his total angling effort between 1992 and 1998 in the diversion reach. For Mr Winter the figure was 42% and from the collated data supplied by Mr Deans, 26% of total effort was in the diversion reach.

[638] This data supports Mr Hovell's evidence[487] that while the portion of Wairau River below The Wash bridge is of regional significance, the diversion reach is subject to less use by anglers.

[639] Mr Boyes' evidence was that changes to water flow, water clarity, periphyton and temperature resulting from the scheme could adversely affect the optimal conditions for angling on the Wairau River. He stated the scheme would have serious adverse effects on the ability of anglers to successfully catch fish. The residual flow regime would result in sustained periods of low flow which could adversely affect fish passage. Increased periphyton growth and temperature increase would adversely affect fish habitat. Mr Boyes' evidence is that the TrustPower proposal would induce drought conditions for unnaturally extended periods in the middle river, this would force the majority of trout out of the diversion reach, and create unnaturally high numbers of stressed, still uncatchable fish in the lower reaches.[488]

Evaluation

[640] We accept the figures supplied by Messrs Deans, Boyes and Winter related to total angling effort and agree that the diversion reach is the least used when compared to downstream of Marchburn or above The Wash bridge.

[641] We also accept Ms Baker's submission, derived from the evidence of the expert anglers (Messrs Boyes and Winter) that fishing in flows below $20m^3/s$ is far from optimal although fish are still able to be caught. We agree with Ms Baker's further submission[489] that irrespective of angler use, the remote natural areas and remote experiences are

[487] Hovell summary of evidence at [2.7]
[488] Boyes EIC at [6.24]
[489] Baker Supplementary Opening Statement at [12]

worthy of protection. However, post-scheme such experiences will in the main be still available, albeit with a reduced optimal opportunity. The one qualifying aspect is the presence of warning signs advising of river fluctuations. While providing for increased safety these signs will detract from the remote/natural experience.

[642] We have found that there is a potential effect on the numbers and condition of trout as a result of extended periods of low flow during the summer. This concern is the subject of specific conditions of consent requiring the release of freshes to facilitate the spawning migration. Monitoring and adaptive management provisions provide an additional safeguard. However, these conditions do not guarantee that this potential effect will be satisfactorily remedied in very dry years with prolonged low flows.

[643] There was not sufficient evidence to persuade us that some or all of those anglers who currently fish the affected reach would be displaced to other reaches. However, we accept Mr Winter's evidence that there will be a change in the quality of the angling experience in the affected reach and that this is an adverse effect on those anglers who value their current experience.

[644] While the Wairau River, in its current state, could not be said to deliver a *big river* experience – such as that of the Waitaki – we note the evidence of Mr Brown that post-scheme the Wairau will be of reduced vigour.[490] We think this supports the evidence of Mr Winter – when he discusses change in perception. We also think it important to repeat the premise held, we are sure, by most anglers that the values associated with the angling experience are far wider than an opportunity or ability to catch fish.

[645] When we consider all the evidence before us on the impacts of the scheme on the total angling amenity we find there will be an adverse effect somewhere between moderate and significant.

6.12 Disputed Group 2 effects - health and safety

6.12.1 Dust and air quality

[646] Construction activities inevitably generate dust and possibly odours that reduce amenity and may cause health problems. For this proposal problems may arise from

[490] Transcript at 1394

vehicle use of haul roads, from vehicle emissions, from earthworks including excavations which can release odours as well as dust and from stockpiling of topsoil.

[647] Condition 17 requires air quality monitoring for 12 months. Such monitoring was undertaken in 2008 and 2009.[491] The results showed the existing air quality in the upper Wairau Valley to be generally good but that dust from farming activities can cause some nuisance effects. Seasonal effects were noted with the potential for dust nuisance being greatest in spring and summer.

[648] Condition 18 requires the Construction Management Plan (**CMP**) to contain provisions outlining the methods to be used for dust management. These include speed restrictions on haul roads, use of water trucks to dampen dust, minimising works during high winds and ensuring the MfE dust nuisance criteria are not exceeded at adjacent properties.

[649] The CMP acknowledges it may not be possible to meet the criteria at a number of residences. Methods to mitigate the associated effects include relocation of residents to other parts of the valley together with provision of air conditioning and cleaning and laundry services.[492] Relocation is to be offered to all who reside within 100m of construction activity and to those residing within a defined construction envelope and who have any respiratory condition which is likely to be affected by discharges from the scheme construction.[493] The above listed services will be offered to residents within 100m of construction and to those within 200m if the effects are likely to occur for more than six months.

[650] Ms Parr seeks to have the 100m limit of condition 93 (relocation of residents) and the 100m and 200m limits of condition 97 (air conditioning and cleaning and laundry services) extended to 300m thus encompassing an extra 20 residences. We thus consider the reasons advanced for proposing 100m. Mr Cudmore notes the various buffer distances put forward by Mr Curtis are based on his experience, are generally consistent with his (Mr Cudmore's) experience and with various buffer distance guidelines in Australia. His discussion of these buffer distances[494] however suggests a note of caution since the scale of the project is greater than those for which guidelines are generally

[491] Curtis EIC at [4.6]
[492] CMP Section 18 page 39
[493] Proposed condition 93
[494] Cudmore EIC at [5.50] – [5.54]

devised. We are thus sympathetic to Ms Parr's suggestion but only in respect of condition 97 in which each limit is to be increased by 100m.

[651] Condition 95 requires real time particulate monitoring equipment to be installed adjacent to those properties whose owners choose not to be relocated. This is in response to a suggestion by Mr Cudmore[495] which we endorse. Trigger levels for particulate concentrations as measured by these monitors are to be set in conjunction with the Consent Authority and used to require increased mitigation or cessation of the works should the lower or higher level be exceeded respectively. The reference to condition 95 within the condition should be to condition 96.

[652] Condition 96 requires the MfE dust nuisance guidelines to be met at the notional boundary of any residence on another site. The units used for the 24 hour average total suspended particulate within the condition are incorrect and should read 120$\mu g/m^3$.

[653] Other conditions require revegetation (91 and 92) and work scheduling to avoid work affecting properties within 100m of construction work during the spring months (condition 98).

[654] Odour problems arising from uncovering contaminated sites (offal and refuse pits) are to be dealt with by remediation of the sites as set out in conditions 100 and 101.

[655] Health issues associated with PM_{10} and $PM_{2.5}$ were raised by Counsel for Fish and Game and for Save the Wairau as well as by various witnesses.[496] Dr Kelly a physician and a specialist in the field of public health medicine addressed these issues for TrustPower. Her overall opinion is that the construction of the scheme is highly unlikely to produce any general adverse health effects in the community. Further she considered the CMP will adequately ensure control of exposure to risks for those individuals who may have increased susceptibility because of pre-existing health conditions.[497]

[656] In reaching her conclusions Dr Kelly considered the presence of respirable particulates including silica and asbestiform that could be encountered in excavations. Mr B Symanns, a geotechnical engineer for Meridian, assessed the likelihood[498] of

[495] Cudmore EIC at [5.33]
[496] PM_x refers to particulate matter smaller in size than x μm
[497] Kelly EIC at [2.1]
[498] Symanns EIC ats [15.1] – [15.4]

encountering ultramalfic rocks (which can produce asbestiform on breaking down) and silica based materials during scheme construction. He states that for each case it is unlikely that any significant amounts of these materials will be encountered. The Air Quality section of the CMP contains a process for identifying the presence of these materials and Dr Kelly notes that there are established mitigation approaches to deal with them.[499] We are satisfied that the risk associated with abestiform and siliceous materials is insignificant.

[657] Based on the evidence of Mr Curtis, Dr Kelly is satisfied that vehicle emissions do not require specific consideration. However, Mr Cudmore, while admitting that this is probably correct, recommends a more cautious approach. His recommendation is to measure carbon monoxide levels, as a proxy for particulate emissions from fuel oil and diesel powered construction equipment, at two representative sites for a limited period.[500] These measurements would be expected to confirm Mr Curtis' opinion that Dr Kelly relied upon.

[658] Given the monitoring of particulates required in the conditions, we see no need for additional monitoring of vehicle emissions. With the change to condition 97 increasing the mitigation package to residents, we find that the adverse effects with respect to dust and air quality are minor.

6.12.2 Seismic matters

[659] The geological structure of the Wairau valley is dominated by the Wairau fault which runs adjacent to the south bank of the Wairau River throughout the diversion reach. The proposed canal crosses the fault line ten times and the penstock leading to PS4 also crosses the fault line. Hazards associated with the canal as a result of the proximity of the fault include ground shaking and rupture, liquefaction and slope stability.[501] These hazards were of particular concern to Ms Parr and Mr Rogers.[502]

[660] Ms Parr chose not to call evidence on the seismic hazard nor on the design philosophy and solutions proposed to mitigate the hazards. She expressed the belief that

[499] Kelly EIC at [3.14]
[500] Cudmore, EIC at [5.61]
[501] Symmans EIC at [10.9]
[502] Parr closing submission at [4]

the safety of some 500 people living close to the scheme was secondary to TrustPower's desire for an effective scheme.[503]

[661] Dam safety, which includes safety of canals, is managed primarily under the dam safety regulations of the Building Act 2004.[504] It is of relevance under the RMA and thus to this decision because the effects of a failure of low probability could have a high impact. It is the NZSOLD[505] Guidelines that are the basis for the dam safety regulations.

[662] The approach embodied in the regulations and the guidelines is to relate the design specifications to the consequences of failure. These consequences must be evaluated and then the dam or canal placed within one of three Potential Impact Categories (**PIC**), low medium or high. The structure must then be designed to withstand, without failure, a specified extreme event that varies with the PIC.

[663] For seismic design two levels of event are defined. The Operational Basis Earthquake (**OBE**) must be sustained with only minor damage and the Maximum Design Earthquake (**MDE**) under which the impounding capacity of the structure must be maintained.[506] The magnitudes of these earthquakes are determined from an analysis of the geology of the region and a detailed examination of the fault line to determine its earthquake history. Mr Berryman, an earthquake geologist for Meridian, presented the results of such examinations as: a slip rate of 4-5mm/yr, a single event displacement of 5-7m and a maximum earthquake of magnitude 7.6.[507] He also discussed recurrence intervals and the elapsed time since the last earthquake on the Wairau fault and attached a paper[508] to his evidence in which it is stated *the time elapsed since the last event {on the Wairau fault} is in the order of 1-2 times the average recurrence interval implying that the Wairau fault is near the end of its interseismic period.* The need for conservative design with respect to earthquake loadings is thus emphasised.

[664] Dam break analyses for the canal led to PIC categories being assigned to each section of the canal. From the intake to PS1 the PIC was mostly low, from PS2 to PS4 there were approximately equal lengths of low and medium PICs, and from PS4 to the

[503] Parr closing submission at [6]
[504] Dawson EIC at [7.1]
[505] New Zealand Society On Large Dams
[506] Dawson EIC at [7.10]
[507] Berryman EIC at [3.2]
[508] Berryman EIC Appendix 2

outfall the PIC was mainly medium.[509] The associated design values for the OBE are an earthquake of 1 in 150 AEP[510] for both low and medium PIC and MDE of 1 in 1000 AEP for the low PIC and 1 in 10000 AEP for the medium PIC.[511] These values are all at the conservative end of recommended ranges.

[665] With respect to ground displacement the canal crossings and the penstock crossing of the fault line are to be designed to withstand 13m of lateral movement without collapse and release of the stored water. This is almost twice the maximum value of 7m suggested by Mr Berryman as a result of his investigations.

[666] There is no question that the proposal carries the risk of failure due to an earthquake on the Wairau fault. The procedure above has identified the possible impacts and following international and New Zealand best practice determined appropriate design specifications. This is the appropriate procedure which has been applied conservatively thus reducing (but not eliminating) the risk of failure to nationally accepted levels. Detailed risk assessment of the final design is a matter for the building consent stage. We certainly do not have the ability to do that assessment or to comment on it further.

[667] We note that construction of water retaining structures on fault lines is not unusual in New Zealand. Examples of such structures include the Clyde Dam, Aviemore Dam and the Matahina Dam.

[668] The importance of proper process during the final design and construction phases has been recognised by TrustPower. The Construction Management Plan and the proposed conditions address these issues. Particularly important is the role of a geotechnical engineer which is provided for in Condition 16(b)(vi) with his or her role being required to be set out by Condition 16(b)(vii). We endorse Mr Symanns' suggestion that a geotechnical design statement should be prepared prior to commencement of construction and his list of items that should as a minimum be included.[512] Mr Dawson also addressed the dam safety assurance programme to be adopted.[513] We see all these measures as appropriate to the design and construction stage and accept the uncontested opinion of Mr Symanns that the conditions of consent from a

[509] Core Bundle of Visuals Tab 5
[510] Annual Exceedance Probability
[511] Dawson EIC Appendix B Table 2
[512] Symmans EIC at [23.3] – [23.7]
[513] Dawson at [10.1] – [10.14]

geotechnical perspective are robust and compatible with the NZSOLD Guidelines.[514] These we have noted as being in accord with international and New Zealand best practice.

[669] Liquefaction of soils poses a hazard under earthquake conditions. The likelihood of this occurring can be assessed by identifying soils in the vicinity that are prone to liquefaction. No such soils were found in the investigations carried out to date.[515] Should such soils be encountered during construction the problem can be managed as part of the construction programme.[516]

[670] Land instability could result in embankment movement or deposition of material into the canal causing overtopping and possible erosion. The various geological features adjacent to the canal have been evaluated for their susceptibility to sliding under earthquakes or heavy rain. Mitigation measures that could be employed should any of the features become prone to sliding are listed in Mr Symmans' Appendix B Table 3.

[671] We accept that it is unlikely there will be any significant land instability issues that cannot be appropriately managed.[517]

[672] We are satisfied that within the relevant statutory framework there is no reason to decline consent on the basis of possible canal failure due to earthquakes.

7 COST/BENEFIT ANALYSIS AND ALTERNATIVES

[673] Mr Donnelly produced a cost/benefit analysis for the construction of the scheme compared with doing nothing (referred to as a CBA assessment). That CBA assessment was criticised by the parties opposed to the proposed scheme. Also, a s 274 party (the Green Party – Kaikoura Electorate Branch) alleged that there was an onus on TrustPower to produce a cost/benefit analysis compared with alternative methods of producing electricity.

[674] A CBA assessment is a tool which can assist us to assess the proposed scheme against s 7(b) of the Act. CBA assessment attempts to value all relevant costs and

[514] Symmans EIC at [23.1]
[515] Symmans EIC at [10.20]
[516] Symanns EIC at [10.22]
[517] Symmans EIC at [11.4]

benefits, both market and non-market, in dollar terms. Even though in environmental cases, it is generally not possible to quantify all costs and benefits in this manner, there is still an advantage in undertaking a partial CBA assessment. This is because it helps to focus on those matters that cannot be quantified in dollar terms, and therefore, of necessity, be assessed using different decision making criteria.

[675] Because of the complexity of the electricity industry – both its structure and market – Mr Donnelly employed three alternative valuation methods:

[a] Value of output;

[b] Long-run marginal cost; and

[c] Case study simulations.

[676] His methodology and findings were peer reviewed by Associate Professor Sharp who concluded:[518]

> In my opinion the economic assessment provided by Mr Donnelly is based on methods accepted by the profession. Application of the cost/benefit framework has been consistently applied. New Zealand's electricity market is quite unique and presents its own particular challenges, especially in the area of benefit estimation and, in the case of the Proposed Scheme, changes in the flow of environmental services. Mr Donnelly's evidence is balanced and recognises the importance of these limitations.
>
> Subject to the unavoidable difficulties outlined above relating to the exclusion of some non-market values associated with the likely changes in the flow of environmental services, I accept the costs and benefits as projected by Mr Donnelly.

[677] Mr Donnelly set out in some detail his alternative methodologies and his costs and revenue assumptions. Because we did not receive any expert economic evidence that challenged Mr Donnelly's findings, we do not propose to set them out in full in this decision. Mr Donnelly concluded:[519]

> All three valuation methods produced positive net benefits at 10% discount rate, which indicates the scheme is efficient, although the values of environmental impacts have not been included. For the scheme to not produce a benefit to the

[518] Sharp EIC at [28] & [29]
[519] Donnelly EIC at [12.26]

> nation, the value of the net non-quantified impacts on the environment would have to be negative and greater than the net quantified benefits. For example, based on the preferred Method 3 – National General Costs Avoided, net negative impacts on the environment would have to exceed $475M.

[678] We accept the findings of Mr Donnelly, subject to recognising the limitations of the three valuation methods employed. His assessment gives us an indication as to the economic efficiency of the scheme from both a national and regional perspective.

[679] In so finding we are mindful of and adopt the caveat of the Environment Court in *Lower Waitaki River Management Society Incorporated v Canterbury Regional Council*:[520]

> Finally, there are two other points to note about section 7(b) of the RMA. First costs benefit analysis and economic efficiency under the RMA do not determine resource allocation decisions. That is consistent with economic theory which recognises that cost benefit analysis provides information and organizes that information, enabling it to be placed alongside other decision-making criteria in a useful manner.

7.1 Alternatives

[680] The Green Party – Kaikoura Electorate Branch in their closing submissions, presented by Mr Browning, submitted that there is an onus on TrustPower to properly explore the options of alternative methods of producing electricity when considering the use of the Wairau River as a resource in energy generation.

[681] Mr Shearer, a long-standing member of the Green Party, gave evidence to support this contention. It was Mr Shearer's opinion, that there is no need for the output of the scheme or the need could be totally avoided by a combination of:

[a] Increased energy conservation through better household design and insulation, more efficient lighting, the adoption of improved appliances and electric motors;

[b] Increased use of small-scale distributed generation and energy sources such as solar water heaters, micro-wind generators, photovoltaic cells,

[520] C80/2009 at [202]

domestic bio-energy (i.e. wood and pallet burners), and micro-hydro stations; and

[c] The adoption of marine generation technologies.

[682] There was argument as to the need for a cost/benefit analysis with respect to alternatives. The cost/benefit analysis provided by Mr Donnelly was restricted to considering the proposal against the status quo – in other words, the alternatives are between the proposal or doing nothing. It is accepted that from an economic efficiency perspective, least cost requires consideration of alternatives and that this includes alternative ways of achieving the same objective, as well as the alternative of doing nothing. The issue before us is whether, from a resource management perspective, the consideration of alternatives and the use of cost/benefit assessment needs to incorporate all credible alternatives to the proposal.

[683] Mr Browning, for the Green Party, relied on the following passage from *Lower Waitaki*:[521]

> We conclude that the role of a consent authority, when having particular regard to Section 7(b), is, where possible, to internalise the effects of a proposal, so that the cost of the externalities are imposed on the consent holder. It is then left to that person to decide whether their proposal can compete against others in the market. Consequently it is not usually necessary to consider alternative uses of the resource in question, or the use of alternative resource to obtain a similar benefit. However there are at least three exceptions:
>
> (1) where the costs cannot be fully internalised to the consent holder;
>
> (2) where there is no competitive market (e.g. in congestion on roads where the relevant resource is the land near those roads; we also note there is a very limited market in water permits); or
>
> (3) where there is a matter of national importance in Part 2 of the Act involved and the cost benefit analysis requires comparing measured and unmeasured benefits and costs (as is usually the case) so that the consent authority has to rely principally on its qualitative assessment, e.g. *TV3 Network Services Limited v Waikato District Council.*[522]

[684] Mr Whata submitted that the statement of the Environment Court quoted above was wrong and contrary to *Brown v Dunedin City Council.*[523] We do not accept that submission. *Brown* was considering a different point, namely the consideration of

[521] C80/2009 at [201]
[522] [1997] NZRMA539; [1998] 1NZLR360 (HC)
[523] [2003] NZRMA420 at [16]

different methods under s 32 of the Act – methods referring to the methodologies that could be used in a proposed plan. However, we can find no statutory foundation for the three exceptions, nor were we referred to any.

[685] There is no direct statutory direction requiring us to consider alternative locations or methods in a s 120 appeal. Section 88(2)(b) of the Act requires a person applying for a resource consent to include, in accordance with Schedule 4, an assessment of environmental effects in such detail as corresponds with the scale and significance of the effects that the activity may have on the environment. Subsection (3) provides that if an application does not include an adequate assessment of environmental effects, the local authority may, within 5 working days after the application was first lodged, determine that the application is incomplete and return the application, with written reasons for the determination, to the applicant. Section 92(1) of the Act authorises a consent authority to request further information that may include the consideration of alternatives in accordance with Schedule 4.

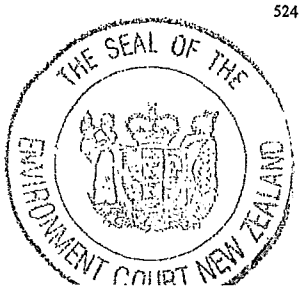
[686] Schedule 4 includes the following:

> **1. Matters that should be included in an assessment of effects on the environment**
>
> Subject to the provisions of any policy statement or plan, an assessment of effects on the environment for the purposes of section 88 should include—
>
> ...
>
> (b) where it is likely that an activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity:
>
> ...

[687] There are other provisions in the Act that require consent authorities to consider alternatives but these are specific to circumstances that are not applicable here.[524] There is a strong policy direction in the Act that alternatives should be a part of the overall assessment of the effects of a proposed activity, when the threshold of significant adverse effects is reached.

[688] We are of course bound by the High Court decision of *TV3 Network Services Limited.* In our view its principle is simple and straight-forward. Where a proposal

[524] See sections 105(1)(c) and 107A(2) (f)



would result in significant adverse effects on matters of national importance, alternative locations or methods may need to be considered.

[689] In *Maniototo Environmental Society Incorporated v Central Otago District Council*,[525] the Environment Court held that it is possible that alternatives should also be considered in cases where significant environmental effects are present (other than that they involve matters of national importance). However, the Court did not go so far as to decide this issue.

[690] It seems to us that whether alternatives should be considered depends firstly on a finding of fact as to whether or not there are significant adverse effects on the environment. If there are significant adverse effects on the environment, particularly if they involve matters of national importance, it is a question of fact in each case as to whether or not an applicant should be required to look at alternatives, and the extent to which such an enquiry, including the undertaking of a cost/benefit analysis, should be carried out.

[691] We are mindful of what the Environment Court raised in *Waiareka Valley Preservation Society Incorporated & Ors v Waitaki District Council & Anor*:[526]

> [316] As the Planning Tribunal noted in *Transpower New Zealand Limited v Rodney District Council*[527]; there ought to be some limit to what is raised in terms of alternative locations and methods, though it is difficult, except in extreme cases, to prescribe that limit in advance. The Tribunal also held that in the circumstances of significant adverse effects it would be open to opponents of the proposal to test (and we presume for the Court to make findings on) the adequacy of the applicant's consideration of alternative locations and methods.

[692] The consideration of alternatives in an assessment of effects on the environment is a broad concept. It includes alternative locations and methods of generation, or methods to avoid the need for generation, as outlined by Mr Shearer. However, it also encompasses variations to the proposal in terms of the scale, geographic extent, or mode of operation in order to address particular environmental concerns.

[693] TrustPower has considered alternatives and presented its preferred layout and operation by way of the technical specifications for the construction and operation of the

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[525] C103/09
[526] C58/2009
[527] A56/1994

scheme as well as the proposed conditions of consent, particularly those addressing the flow regime in the river. Mr Lilley described the initial scoping process and an early decision to reduce the output of the scheme in order to provide a higher minimum residual flow in the river (from 6 to $10m^3/s$). The subsequent engineering feasibility study and assessment of environmental effects were conducted in parallel to identify both engineering and environmental constraints and make adjustments to the scheme design.[528]

[694] Mr Lilley outlined the consideration of alternative generation options in the region including hydro-generation on the upper Wairau River (between Dip Flat and The Wash bridge), the lower Wairau River (between The Wash bridge and the Narrows) with a dam, an enhanced Branch Scheme, hydro-generation on the Clarence River and options for wind farms.[529]

[695] Clearly TrustPower has considered a broad range of alternatives as part of its scoping for this project and assessment of effects on the environment. While it has not undertaken a detailed CBA assessment of each of these alternatives we do not think that such an assessment is always necessary or even appropriate. It is entirely open to TrustPower to consider the merits of these alternatives using other decision making criteria.

[696] We also acknowledge that the alternative methods proposed by Mr Shearer in his evidence, are not within the capacity of TrustPower to arrange. This raises problematic practicalities. Indeed, if we were to embark on intensive analysis between TrustPower's proposal and various alternative options and methods proposed by Mr Shearer, we would be entering into the field of central planning, which is neither TrustPower's responsibility as an applicant nor our function as a Court.

[697] We consider that TrustPower has properly considered alternatives as part of its assessment of environmental effects. We do not agree with the Green Party submission that a CBA assessment of all potential alternative generation options is required.

[698] Since writing this part of the decision the judgment of the full High Court in *Meridian Energy Limited and Ors v Otago Regional Council*[530] has been released. It has

[528] Lilley EIC at [4.27] – [4.37]
[529] Lilley EIC at [4.1] – [4.11]
[530] CIV 2009 412 000980 at 76

held that the three imperatives set out in the extract from the Lower Waitaki, relied upon by the Green Party are erroneous in law. On our reading of the High Court judgment we see no reason to amend what we have written.

8 STATUTORY TESTS

[699] In considering the statutory tests we consider the proposed scheme subject to the amended proposed conditions of consent as set out in Appendix 2.

8.1 Section 104(D) Gateways

8.1.1 First gateway – adverse effects

[700] The first gateway test requires us to consider the effects of the proposed scheme on the environment. We must be satisfied that the effects of the proposed scheme on the environment will be minor. Mr Whata, relying on the authority of *Bayley v Manukau City Council*[531] submitted that in considering this gateway we should have regard to positive effects that offset adverse effects. That case, of course, was not concerned with the gateway tests, but to the notification procedures under s 94 of the Act as it then was.

[701] There have been a number of conflicting decisions of the Environment Court as to whether the Court should consider the positive effects of a proposal when deciding whether the threshold test has been met. We prefer the reasoning set out in *Stokes v Christchurch City Council*[532] where the Court said:

> ... The Court of Appeal's decision in *Bayley* must cast doubts on transferring the Elderslie Park approach to s 105(2A) as this division of the Court did in *Baker Boys* (with qualifications). Especially since we have to consider the 'adverse effects' (plural) we consider that while it is still appropriate to consider each adverse effect as mitigated, there is no statutory authority for us to consider the positive effects of a proposal when deciding whether the threshold test in s 105(2A)(a) is met. To that extent we consider that in the light of *Bayley*, we were wrong in *Baker Boys* in adopting a (qualified) net adverse effect approach to the first threshold test. The test is whether the adverse effects as proposed to be remedied and/or mitigated, and taken as a whole are more than minor.

[702] Stokes has been followed in a number of Environment Court decisions including:

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[531] [1999] 1NZLR568 (CA) at 571
[532] [1999] NZRMA409 at 434

[a] *The Warehouse Limited v Dunedin City Council*;[533]

[b] *Stretch v Queenstown Lakes District Council*;[534]

[c] *Mainframe Limited v Queenstown Lakes District Council*;[535]

[d] *River Management Society Incorporated v Canterbury Regional Council.*[536]

[703] We thus propose to consider the effects of the proposed scheme as mitigated by the conditions of consent – but not the positive effects of the proposed scheme.

[704] It is obvious from our discussions of, and the findings on, the adverse effects on the environment in Chapter 6 of this decision, that some of the adverse effects of the proposed scheme are more than minor. These include:

[a] The reduction of flow in the river over the diversion reach and the resulting diminishment of natural character;

[b] The potential effect on trout within the diversion reach if there are extended periods of low flow through the summer period;

[c] The potential effects on the black-fronted tern which are considered to be of low probability but high impact.

[705] Accordingly, the proposal does not pass through the first gateway.

8.1.2 Second gateway – objectives and policies of the Plan

[706] We now consider the proposed activity and effects on the environment against the relevant objectives and policies of the Plan. We must be satisfied that the activity will not be contrary to the objectives and policies of the Plan.

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[533] C101/2001
[534] C09/2004
[535] C08/2004
[536] C80/2009

[707] We have identified and discussed in some detail in Chapter 2.2.3 the relevant provisions of the Plan. The objectives and policies of particular relevance to this threshold are:

[a] Natural character;

[b] Landscape and amenity (including recreation);

[c] Flora and fauna;

[d] Water quality; and

[e] Water allocation.

8.2 Consideration against the provisions of the Plan

[708] The activity having the greatest potential effect on the environment is the abstraction and diversion of water from the main stem of the Wairau River. The operation of the scheme including, in particular, the provision of power during peak demand and the flushing of sediment add to the effects of that diversion. The activities and the effects on the environment, as modified by the proposed conditions of consent, must now be considered in the context of the Plan.

8.2.1 Chapter 6 - Fresh Water

[709] Chapter 6 of the Plan addresses fresh water with relevant objectives relating to provision for use while safeguarding the life supporting capacity of the resource, and maintaining and enhancing water quality.

Objective 6.2.1.1 - Life-supporting capacity of the resource

[710] Policies in support of the provision for the use of water while safeguarding the life-supporting capacity of the resource propose the SFRs and flow sharing. These tools are to provide for protection of the instream ecology, fish passage and spawning, and water quality as well as associated cultural and amenity values.

[711] We have found that the proposed flow regime is slightly different to the flow regime indicated by the SFRs and 2:1 flow sharing provisions of the Plan. The proposed regime has higher minimum residual flows and limited flow sharing during the critical bird nesting season. However, it has reduced mid-range flow variability particularly outside of this nesting season.

[712] Policy 1.4 relates directly to the setting of SFRs on the basis of monitoring information and states that amendments would be sought through a plan change. Mr Wadsworth[537] considered the proposed minimum residual flows to amount to a *de facto SFR* that is higher than that set by the Plan. We consider this to be consistent with the policy as, while there has not been a plan change process, the proposed minimum residual flow has certainly been based on extensive monitoring and other research.

[713] Flow sharing is addressed through Policy 1.6 setting aside a proportion of the abstraction flow, over and above the SFR, for instream values. The scheme addresses instream values in two ways, first through the limited flow sharing, and secondly through the increased minimum residual flows during some months of the year. While not following the precise methods set out later in the Plan this approach does meet the policy intent.

[714] Turning to the instream ecology we have found that the proposed flow regime is likely to increase periphyton with generally positive outcomes for biological productivity. The small likelihood of increased nuisance growths is adequately addressed by a condition requiring flood flows to be passed down the main stem of the river, if triggered by nuisance growths, including didymo.

[715] The macro-invertebrate community is unlikely to be adversely affected. The inevitable scientific uncertainty associated with the model predictions is addressed through conditions requiring monitoring, with a trigger linked to the sensitive EPT taxa. An adaptive management plan sets out the responses, and a review of conditions may be undertaken should the trigger level be breached. The composition and productivity of the macro-invertebrate community is predicted to be sufficient to support the fish and river bird populations.

[537] Transcript at 2182

[716] Fish passage and spawning migration were found to be potentially affected by the proposed flow regime. A proposed condition requiring small freshes and floods to be released during the spawning migration of trout has been included to address this effect. The management plan for aquatic ecology has been amended to include a specific objective on the habitat of trout and salmon. This is to ensure that the revised condition is effective and the potential for restricted movement of trout and salmon does not result in unanticipated adverse effects.

[717] The use of the scheme to provide for peak power demand will result in fluctuations in river flow downstream of the discharge and the potential formation of an unproductive varial zone. However, the proposed scheme will remove the flow fluctuations that currently affect the river in the diversion reach as a result of the operation of the Branch Scheme. Downstream of the discharge point fluctuations in flow from the proposed scheme will replace those of the Branch Scheme. We have found any increase in adverse effects from this to be minor.

[718] Discharges associated with the flushing of sediment from the scheme will introduce concentrated quantities of fine sediment with localised and temporary effects on the invertebrate community. This is unlikely to affect the overall invertebrate productivity and monitoring is proposed to check the extent of such effects.

[719] We have compared the outcomes of the proposed flow regime (with seasonally varying minimum residual flows and limited flow sharing) with the SFR (set minimum flow) and 2:1 flow sharing provisions of the Plan. We found that the proposed flow regime would have better outcomes for the river birds and the SFR scenarios were likely to provide better outcomes for trout and salmon. The outcomes for instream periphyton and the macro-invertebrate communities would be very similar.

[720] Overall we are satisfied that the proposed abstraction and diversion of water and the associated discharges will be managed in such a way that the life-supporting capacity of the resource will be maintained and the effects on the environment will be adequately remedied or mitigated. We find that the proposed activity, subject to the conditions of the consents, is not contrary overall to this objective and the associated policies. While the potential effects on fish passage are contrary to one part of Policy 1.5 *to improve fish passage and spawning*, overall we find the proposal to be consistent with this policy. The proposal is consistent with Policy 1.6, on additional flows above the SFR, as it sets a

higher minimum residual flow and provides for flow sharing (albeit limited when compared to the rules in the Plan) for instream values, particularly the river birds.

Objective 6.2.1.2 - Maintaining and enhancing water quality

[721] The direct impacts of the proposed scheme on water quality are a possible increase in temperature in the diversion reach and the increase in turbidity associated with sediment flushing. The predictions are for very minor changes in water temperature and comprehensive conditions and trigger levels are proposed to manage this concern.

[722] The extent of the increased turbidity as a result of sediment flushing will not be known more precisely until field trials have been undertaken. We note that the conditions require flushing to occur when the flow in the river is high and already turbid.

[723] We have accepted that the mixing zone may be taken from the intake to the confluence with the Branch River. There will be localised and temporary increases in turbidity and decreases in clarity along this stretch of the river, particularly before the discharge is fully mixed across the braids. However, we consider this to be reasonable given the nature of the river.

[724] We have found that nuisance periphyton growths are unlikely to be exacerbated by the scheme to such an extent that there will be consequential adverse effects on water quality.

[725] Overall, we find the proposed scheme to be consistent with the objective and policies for water quality.

Objective 6.3.1.1 - Equitable allocation and use

[726] The triple class permit system is introduced in Policy 1.2 to set and enforce maximum allocations of water. We have found that this application is not subject to the triple class system. Nor do we consider it to undermine the application of the triple class system as the rule framework clearly identifies which applications would be subject to the permit classes.

[727] We have noted that the scheme would carry irrigation water for the WVWES. Mr Wadsworth considered that the allocation of water through Class B permits on the south bank of the Wairau River already exceeded what was required for irrigation. He indicated that the Council would rationalise individual consents where they overlapped with the WVWES and that process would reduce the total allocation. He considered there was sufficient Class B water available for both existing and future irrigation needs on the north bank.[538]

[728] We find the proposed scheme to be consistent with the objective for equitable allocation and use of water from the Wairau River.

Objective 6.5.1.1 - Sustainable and equitable allocation during low flow

[729] Policies 1.1 and 1.2 emphasize the SFRs and the need for rationing during periods of low flow. The rules set out the flow level at which rationing should take place on the Wairau River. TrustPower's proposed take would not be subject to such rationing conditions although the higher minimum residual flows and limited flow sharing, during some months, would contribute to the policy intent. The requirement to ensure that flow in the Wairau River above PS5 is at least $5m^3/s$ above the minimum residual flow at the intake provides additional protection to instream values during low flow periods.

[730] The conditions of consent include a non-derogation clause to ensure that existing downstream consent holders are able to take water in accordance with their consents. Minimum flows are set at which TrustPower must suspend its take. In addition TrustPower is required to allow some part of freshes down the river following prolonged periods of low flow through the trout spawning season.

[731] We find that the scheme is consistent with these policies and contributes to the objective for sustainable, equitable and efficient allocation of the water during low flow periods.

8.2.2 Chapter 4 - Flora, Fauna and their Habitats

[732] Relevant objectives address the protection of significant indigenous vegetation and habitat, and the protection of fresh water and riparian ecosystems.

[538] Transcript at 2238

Objective 4.2.2.1 - Significant vegetation and habitat

[733] The forest remnants of the Wairau River are noted as a major value under threat from clearance and stock. Drainage of wetlands is an ongoing concern. The proposed scheme does involve the clearance of areas of indigenous vegetation and the potential loss of native wetlands. We have found that the proposed wetland and riparian areas associated with the canals and regulation pond will compensate for this loss. The proposed revegetation, enhancement and legal protection of remnant native vegetation at Traverse Spur and exotic forest corridors is consistent with the policies relating to the protection and restoration of wetland areas and riparian vegetation.

Objective 4.3.2.1 - Freshwater and riparian ecosystems

[734] As discussed with respect to the objectives and policies relating to the life-supporting capacity of the resource we find the proposed scheme to be consistent overall with the policies relating to the natural functioning of the aquatic ecosystem, water quality, and the Wairau River as a corridor along which fauna can move and flora spread. The predator management required by the conditions of consent will enhance the habitat for the river birds. We note that one of the anticipated environmental results from the implementation of the objectives and policies relating to indigenous flora and fauna and their habitats is:[539]

> Sustainable habitats that enable the maintenance or enhancement of population numbers and distribution of rare and endangered species.

[735] Policy 1.4 requires a precautionary approach in the absence of detailed knowledge on hydrology or ecology. While some uncertainty remains with respect to the extent and exact nature of the effects of the proposed scheme we do not consider this to amount to the *absence of detailed knowledge*. We find the extent of monitoring and modelling work undertaken with respect to the potential effects of the proposed scheme to be sufficient to not trigger a precautionary approach under this policy.

[736] We have noted the potential for adverse effects on the movement of trout and salmon which is contrary to that part of Policy 1.5 on the habitat of trout and salmon.

[539] Plan at 4-11

However, the habitat of native fish and birds is provided for, so overall we find the scheme to be not contrary to this policy.

[737] Similarly, the proposed scheme is contrary to Policy 1.12 on instream values including fish passage. We have noted that trout numbers may decline in the diversion reach as the longer periods of low flows could lead to the displacement of fish to other parts of the river.

[738] While we find the proposed scheme to be contrary to one policy and partially contrary to another it is consistent with the other relevant policies contributing to this objective. The likely benefits for the river birds have to be considered alongside the potential hindrance to the passage of trout and salmon during extended periods of low flow. Overall, we find the proposed scheme to be not inconsistent with the objective of protecting and enhancing the ecosystem.

8.2.3 Chapter 10 - Natural Character

[739] The objective of this chapter is the preservation of the natural character of the rivers and their margins, repeating s 6(a) of the Act. Policy 1.1 discourages use and development of rivers which are predominantly in their natural state where natural character is not compromised. As we have noted, while not completely in its natural state – as a result of flood protection works, the presence of the Branch Scheme and agricultural development of the margins – the Wairau River retains a moderately high degree of natural character. While the proposed scheme is not contrary to this policy nor is it entirely consistent with it.

[740] Policy 1.3 requires the consideration of effects on the listed qualities and features of natural character. There has been a comprehensive assessment of effects and we have found adverse effects with respect to natural character concerning three out of nine matters on the list. We note that the policy merely requires a consideration of effects. However, in the context of the overall objective we find that the adverse effects on natural character to be inconsistent with parts of this policy. The benefits in terms of bush restoration and potential improvements in the breeding success of river birds are consistent with other aspects of this policy.

[741] Policy 1.4 directs the reader to other chapters of the Plan dealing with (relevantly) flora and fauna, open space and recreation. As it is so broad we found it of little assistance and to repeat the intent of Policy 1.3.

[742] Policy 1.6 concerns the ability to restore or rehabilitate natural character in the area subject to the proposal. When the scheme is operating there is no ability to restore or rehabilitate the natural character impacted as a result of the abstraction. However, the rehabilitation of bush remnants and some wetlands, through planting and protection, is consistent with the policy.

[743] Policy 1.7 recommends a precautionary approach when effects are unknown. We have a high degree of certainty as to the effects of the scheme on natural character and do not consider the precautionary approach to be triggered.

[744] Policy 1.8 promotes rivers as ecological corridors. The diversion scheme does not interrupt the river in the manner of a dam and the minimum residual flows will ensure connectivity. However, we have found potential adverse effects on the movement of trout through the diversion reach during prolonged periods of low flow. Specific conditions are proposed to deal with this particularly through the spawning season and an adaptive management approach is incorporated. No interruption to the movement of invertebrates or bird species is anticipated. Overall we find the scheme to be consistent with this policy.

[745] We find the scheme to contribute to some policies on natural character and to be inconsistent with others. Overall, we find it to be not inconsistent with the objective of preserving natural character from inappropriate development.

[746] Accordingly, we find that the proposal passes through the second gateway.

9 SECTION 104 MATTERS

9.1 Introduction

[747] It is now necessary for us to consider our findings on the matters we have discussed, and make a judgment as to whether the single purpose of the Act, as set out in s 5, is achieved. This involves a careful balancing and weighing of the contested and

non-contested factual issues within the statutory framework as we have described it. In reaching our conclusion we are required to apply the relevant matters set out in s 104(1).

9.2 Effects on the environment

[748] We have discussed at some length in Chapter 6 of this decision the actual and potential effects on the environment of allowing the proposed scheme. We summarise our findings:

[a] *Positive Effects* – we found that there were a number of positive effects that would result from the proposal including;

[i] contributing to the supply of renewable electricity generation,

[ii] assisting in reducing carbon emissions,

[iii] assisting in the security of supply of electricity for the Nelson/Marlborough area,

[iv] the provision of improved amenity and recreation opportunities by the construction of the regulation pond, new walkways, kayak course, viewing areas and access to the Wairau River,

[v] the mitigating and compensation initiatives proposed, such as the creation of new wetlands, planting of indigenous bush, predator and weed management programmes, and predator control to benefit river birds.

[b] *Negative Effects* – we found that there were a number of negative effects that would result from the proposal, including;

[i] a likely increase in periphyton growth in the river, including didymo, which may cause some impact on amenity, but is unlikely to result in adverse effects on the overall ecological functioning of the river,

[ii] the reduction in food producing habitat and the proposed flow regime could have an impact on the distribution, abundance and condition of the trout population. We have found that, at worst, there could be a 10% – 20% reduction in trout numbers in the diversion reach, but consider this to be unlikely to affect the trout population of the river as a whole,

[iii] there is some uncertainty with respect to the outcomes for the black-fronted tern population at lower flows associated with the proposed scheme. The considerable research undertaken to date, demonstrates that adverse effects are unlikely, but any adverse effects would have a high potential impact, given the importance of the black-fronted tern. The amended conditions of consent adequately remedy the potential adverse effects,

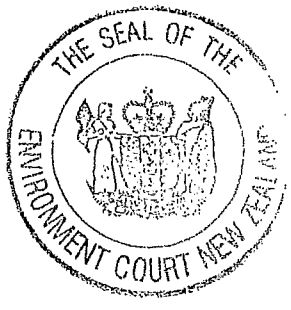
[iv] there will be adverse effects on the very small native wetland areas, but the establishment of some 6.5ha of riparian wetland area will compensate for any loss,

[v] the quantity of water that would be extracted from the affected reach would be an effect on the natural character of the river that is more than minor – water being a fundamental element of the river. We consider the impact on natural character to be significantly adverse,

[vi] there would be an adverse effect on the angling amenity that would be more than minor,

[vii] there would be adverse effects on the amenity of the properties of Ms Parr/Mr Rogers and Mr & Mrs McLauchlan.

[749] We must consider all of these effects and evaluate their significance and the weight to be given to them in the context of the Plan provisions and Part 2 of the Act.



9.3 Relevant provisions of the Plan

[750] We have earlier in this decision, in Chapter 8.1.2, related our findings to the relevant objectives and policies of the Plan. The relative objectives, policies and rules were part of the statutory framework against which our assessment and findings in Chapter 6 were carried out.

[751] We are satisfied that the proposed scheme would generally satisfy the Plan's provisions designed to protect the natural values of the river and its margins, including:

[a] Natural character;

[b] Landscape and amenity;

[c] Flora and fauna;

[d] Water quality; and

[e] Water allocation.

The conditions of consent as amended by us would ensure an adequate flow regime will be retained in the river at all times when compared with the existing flow.

[752] There was some suggestion that the Plan provisions do not anticipate a development of the scale proposed. There is some credibility in that comment. However, the Plan does allow for larger water takes as a non-complying activity and gives comprehensive policy guidance. The complex and detailed conditions constrain the proposed scheme within the confines of the objectives, policies and rules of the Plan. So much so that we reject the submission of those opposed to the proposed scheme, that to allow it would set a dangerous precedent, or more particularly, would compromise the Plan's integrity.

9.4 Part 2 of the Act

[753] In Chapter 2 of this decision we identified that s 6(a), (c) and (d) of the Act were particularly relevant matters of national importance.

[754] Section 6(a) of the Act requires us to recognise and provide for the preservation of the natural character of the river and its margins from inappropriate use and development. We have found that the natural character of the river will be significantly adversely affected by the abstraction over the diversion reach. This diminution of natural character needs to be considered in the context of the other matters that we are required to provide for by the statutory directions.

[755] It is settled law that the preservation of natural character is not to be achieved at all costs. In an early and important case, *NZ Rail v Marlborough DC*, Greig J had this to say:[540]

> The recognition and provision for the preservation of the natural character of the coastal environment in the words of s6(a) is to achieve the purpose of the Act that is to say to promote the sustainable management of natural and physical resources. That means the preservation of natural character is subordinate to the primary purpose of the promotion of sustainable management. It is not an end or objective on its own but is accessory to the principal purpose.
>
> ...
>
> It is certainly not the case that the preservation of the natural character is to be achieved at all costs. The achievement which is to be promoted is sustainable management and questions of national importance, national value and benefit, and national needs must all play their part in the overall consideration and decision.

[756] Section 6(c) of the Act requires us to recognise and provide for the protection of significant vegetation and significant habitats of indigenous fauna. We have found that indigenous vegetation and fauna are generally adequately protected by the amended proposed conditions. While we acknowledge potential for adverse effects on threatened river bird species, given the reduced flows along the diversion reach, we also consider the potential for benefits from the proposed predator control programmes. Public access to the river is maintained, and in some cases, enhanced by the proposed conditions of consent.

[757] We turn now to the relevant matters that we are to have particular regard to under s 7 of the Act. We are satisfied that this is an efficient use of water and of the existing generation infrastructure of the Branch Scheme. The canals will also deliver water for irrigation along the length of the scheme. While we have found adverse effects on the

[540] NZRMA [1994] at 70 at [85] and [86]

amenity of particular properties and on aspects of angling, we consider that overall amenity values are maintained to a satisfactory degree.

[758] The proposed conditions of consent, as amended by this decision, safeguard the values of the ecosystem and maintain the quality of the environment. The waters of the river are clearly a finite resource. We are satisfied that there has been adequate provision made for irrigation water and recreational use as well as ecosystem services. We note that electricity generation is a non-consumptive use and the water is returned to the river, albeit at some considerable distance downstream.

[759] The proposed scheme will assist in reducing greenhouse gas emissions, improving security of electricity supply in the region and contribute to the supply of renewable generation.

[760] Sections 6 and 7 of the Act inform and guide our ultimate decision as to whether or not this scheme is an appropriate development and one that will promote sustainable management of natural and physical resources. This exercise is not a mechanistic checklist or simple score sheet. Nor do we consider s 6 matters to somehow trump or override s 7 matters. We must take all these matters into careful consideration

10 EXERCISE OF DISCRETION

[761] In exercising our discretion we have regard to all our findings which we have come to in accordance with the legal and statutory framework and directions. We acknowledge that there are some unavoidable effects of allowing the scheme, in particular taking relatively large flows from the river over the diversion reach.

[762] The large amount of water abstracted impacts on our obligations under s 6(a) and (c) of the Act. As we have said earlier, impacts on natural character within the diversion reach should not be seen in isolation. We must also consider the benefits of renewable generation in accordance with s7.

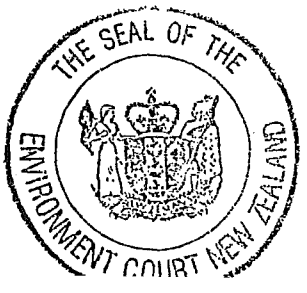
[763] The relatively large flows that would be taken are, as we have said, constrained by the conditions to ensure a flow regime that generally meets the objectives of the SFR in the Plan and sustains the ecosystem. We acknowledge that there will be comparatively longer periods of low flow during the summer months.

[764] We acknowledge the need for a cautious approach with respect to the river birds. The conditions requiring the consent holder to undertake extensive monitoring and reporting, with triggers to activate an adaptive management regime, ensure that any unanticipated adverse effects on the river bird populations can be addressed. We are satisfied that the broad suite of conditions, as amended by this decision, is sufficiently robust to protect the ecological values of the river and its margins.

[765] When we stand back and balance all of the factors we have identified and considered with respect to the generation of electricity, the effects on the environment, and the life supporting capacity of the ecosystem, our decision is finely balanced.

[766] Overall, we are satisfied that the proposed scheme would fit within the statutory directions in Part 2 of the Act. It would give effect to the single purpose of the Act – the promotion of the sustainable management of natural and physical resources.

[767] Accordingly, we exercise our discretion in favour of allowing the proposed scheme subject to the amended conditions in Appendix 2.



11 DETERMINATION

[768] The appeal of TrustPower is allowed to the extent that the decision of the Marlborough District Council is upheld as per the amended conditions of consent as contained in Appendix 2.

[769] The remaining appeals are dismissed save for the amendments to the conditions of consent as contained in Appendix 2.

[770] Because of the complexities of the conditions of consent the Marlborough District Council is given 30 days to apply for the correction of any errors.

R G Whiting
Environment Court Judge

A J Sutherland
Environment Commissioner

J R Mills
Environment Commissioner

H M Beaumont
Environment Commissioner

APPENDIX INDEX

Appendix 1	List of Witnesses
Appendix 2	Conditions of Consent
Appendix 3	Schematic of Branch Scheme
Appendix 4	Schematic of Proposed Scheme

APPENDIX 1

List of Witnesses

TrustPower

Baines, James	Social effects
Bartlett, Dr Ruth	Wetlands/ecology
Berryman, Kelvin	Earthquake safety
Boffa, Frank	Landscape and natural character
Brown, Stephen	Landscape and natural character
Calderwood, Peter	Corporate
Callander, Peter	Groundwater
Clough, Rod	Cultural, archaeology and historical effects
Coffey, Brian	Aquatic ecology
Cudmore, Roger	Air quality
Curtis, Andrew	Air Quality
Dawson, Robin	Scheme Design
Donnelly, Phillip	Economics
Dungey, Ross	Aquatic ecology
Greenaway, Rob	Recreation
Hegley, Neville	Noise
Hovell, Keith	Recreation
Hudson, Henry	Hydraulic and hydrology modelling
Jolly, Jim	Avifauna
Kedian, Michael	Corporate
Keesing, Vaughn	Aquatic ecology
Kelly, Francesca	Health effects
Kyle, John	Planning
Layton, Brent	Electricity Market
Lees, Ian	Corporate
Levy, Graham	Intake design and sedimentation
Lilley, Peter	Corporate
McKenzie, Stephen	WVWES Project
Metherell, Andrew	Traffic
Mikaere, Buddy	Cultural/iwi effects
Mitchell, Paul	Hydrology
Ryder, Greg	Aquatic ecology
Sanders, Mark	Avifauna
Sharp, Basil	Economics
Slaven, Dave	Terrestrial ecology
Symmans, Bruce	Safety/Geo technical
Watson, Kerry	Corporate

Fish and Game

Bejakovich, Davor	Fish screening
Boyes, Peter	Angling
Deans, Neil	Fishery and angling values of the Wairau
Delamore, Robin	Planning
Hayes, John	Fisheries, Biologists, and Flow/Habitat modelling
Keane, Alasdair	Hydrology
McKenzie, William	Chair of Nelson Fish and Game Council
Olsen, Dean	Aquatic Invertebrate Ecologist
Winter, Roger	Angling

Save the Wairau Incorporated

Blackmore, Robin	Angler
Davies, Tim	Sedimentation
Melville, David	Avifauna
Steven, Michael	Natural character

Green Party Kaikoura Electorate

Shearer, Ian	Energy Information Services

Marlborough District Council

Constantine, Peter	Planning
Jowett, Ian	Aquatic Ecology
Quickfall, Tony	Planning
Wadsworth, Vailyn	Civil Engineering/Hydrology

Section 274 Parties

McLauchlan, Jean
McLauchlan, John
Parr, Alison

CONDITIONS ATTACHING TO GRANT OF CONSENTS TO TRUSTPOWER LIMITED TO CONSTRUCT THE WAIRAU HYDRO POWER ELECTRICITY SCHEME

(U050729 & U060284)

GENERAL

Interpretation

1. Where any consent is required of the Consent Authority for the doing of any act by the consent holder, such consent shall not be unreasonably or arbitrarily withheld.

2. Nothing in these conditions shall prevent the consent holder from reaching an agreement with affected persons to undertake measures to avoid, remedy or mitigate effects in place of measures specified in any condition. Prior to implementing any such measure, the consent holder shall first obtain the approval of the Consent Authority.

3. No scheme construction shall commence until all obligations emanating from the pre-construction conditions have been met to the satisfaction of the Consent Authority.

Consent Lapse

4. That the consent lapsing period for this consent shall be ten years from the commencement of the consent.

5. Pursuant to section 116 of the Resource Management Act 1991 these consents shall commence upon the date all appeals on consents UO50729 and UO60284 are determined.

Non-derogation

6. The scheme shall be operated at all times such that it will not derogate from the rights of those consented irrigation takes from the Wairau River and its tributaries within the reach of the river affected by the scheme that existed at the date of granting this consent, but excluding those consents that were notified after the date of notification of the applications for which this consent was granted. Where a consent holder renews on the same terms or for a lesser rate and volume of water, this non derogation obligation shall continue to apply.

Management Plans

7. The consent holder shall prepare ~~to~~for the approval of the Consent Authority such management plans as are required to give effect to the purposes and objectives specified in this consent.

8. The consent holder may, without changing the purpose or objectives of a management plan referred to in condition 7, seek the approval of the Consent Authority for any necessary amendment to such plan.

9. The consent holder may review and revise any management plan at any time on the following terms:

   (a) The review shall be undertaken in consultation with and be approved by the Consent Authority;

   (b) The Consent Holder shall, in relation to any change to any management plan, consult with the same parties it is required to consult in relation to the preparation of the original management plan under these conditions of consent;

   (c) Such review shall be necessary to give effect to the purpose or objectives of the management plan.

10. All Management Plans shall state the objective or objectives sought to be achieved by such Plans.

11. The following management plans shall be prepared and submitted to the Consent Authority for approval. The likely timing of the delivery of these management plans shall be identified by the consent holder within three months of the issue of this consent. The consent holder shall work collaboratively with the Consent Authority to ensure that ample notice of the delivery date for each plan is provided to assist the Consent Authority with planning the allocation of resources to assess each of the plans. The Aquatic Ecology Management Plan shall be submitted for approval at least 6 months before commencement of instream construction works.

   (a) The Construction Management Plan.

   (b) The Traffic Management Plan.

   (c) The Landscaping Plan.

   (d) The Health and Safety Plan.

   (e) The Groundwater Management Plan.

   (f) The Aquatic Ecology Management Plan.

   (g) The Pre-Scheme Black-Fronted Tern and Black-billed Gull Research Monitoring-Plan.

   (h) The Black-Fronted Tern and Black-Billed Gull Work Plan and Programme.

   (i) The Vegetation Management Plan.

12. The consent holder shall pay all actual and reasonable costs of the Consent Authority in connection with the review of all management plans prior to their approval.

Advice Note:
Consent Authority approval to be within 90 working days of receipt of each plan or plans.

Review

Advice Note:

These conditions apply where specific review conditions have not otherwise been imposed.

13. The Consent Authority may during the month of June in the fifth year after the commencement of this consent, and every five years thereafter, serve notice on the consent holder of its intention to review the conditions of the consent pursuant to section 128(1) of the Resource Management Act 1991 for the purpose of avoiding, remedying or mitigating any adverse effect on the environment that may arise from the exercise of these consents and that was not anticipated at the time of commencement of this consent.

14. In accordance with section 127 of the Resource Management Act 1991 the consent holder may, no earlier than twelve months after the approval of the management plans required by condition 9 of this consent, apply to change or cancel any of the conditions of this consent.

Sequence of Compliance

15. Except with the prior written consent of the Consent Authority the consent holder shall not proceed from the pre-construction to construction phase unless and until all pre-construction conditions have been fully complied with.

PRE-CONSTRUCTION

Construction Management Plan

16. (a) A Construction Management Plan shall be prepared and submitted to the Consent Authority for approval in accordance with Condition 11. The objectives of the management plan shall be to provide guidance on environmental management for the construction of the Scheme, and to impose measures to avoid, remedy or mitigate any adverse environmental effects associated with construction activities. The purpose of the Construction Management Plan shall be to:

(i) describe the methods proposed for the construction of the scheme and the programme for construction of each element;

(ii) describe what actions will be taken to manage the actual or potential effects of construction activities (including effects relating to traffic movements, dust, noise, stormwater discharges, sediment runoff, earthworks) associated with the scheme and to satisfy conditions 83 and 84;

(iii) provide a list of key personnel and points of contact during scheme construction; and

(iv) describe how stakeholders will be kept informed during construction and how complaints will be managed.

(b) The Construction Management Plan shall include the following details:

(i) The staging plan, identifying the works and proposed duration of each stage;

(ii) The detailed design responsibilities and method of construction, including methods of conducting earthworks, disposal of excavation material, in river works management, surface water and erosion management;

(iii) Methods to avoid the spread of Didymo. The Plan shall ensure that no equipment is used in the exercise of this consent that has been used previously to undertake activities in any water body known to contain Didymo, unless that equipment has been thoroughly cleaned in accordance with the Biosecurity New Zealand document titled *Cleaning Methods for Freshwater Activities;*

(iv) The methods for management of hazardous substances, dust management and noise management, and fire prevention;

(v) The name and contact details of key positions and points of contact, including an appropriately qualified staff members, to manage environmental issues and any community complaints on site, to have responsibility for managing and responding to environmental issues and, any community complaints, and to ensure management plans and consent conditions are adhered to throughout construction;

(vi) The name and contact details of the geotechnical engineer to be engaged by the consent holder throughout earthworks construction, and an outline of the role and responsibilities of the geotechnical engineer during construction;

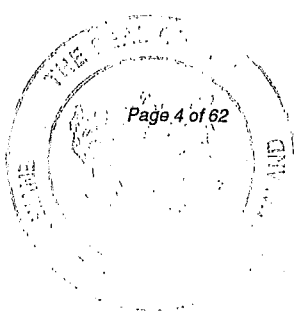
(vii) An outline of the critical elements of the scheme where geotechnical involvement is required for the construction;

(viii) An outline of the critical elements of the scheme where groundwater engineering involvement is required for the construction;

(ix) Details of the minimum requirements for investigations, inspections and monitoring throughout construction to ensure that construction is being undertaken in accordance with the requirements of this consent;

(x) The consent holder shall engage an expert peer reviewer to review the Construction Management Plan prior to it being submitted to the Consent Authority for approval. The peer reviewer shall be nominated and appointed by agreement between the consent holder and the Consent Authority; and

(xi) The steps which the consent holder shall take to ensure that the effects of construction ~~mitigate against~~minimise loss of public access to the Wairau River during the construction period.



Dust Management (Construction Management)

17. Prior to the commencement of construction the consent holder shall undertake background air quality monitoring, including total suspended particulate (TSP) monitoring for a period of 12 months. The consent holder shall submit this data to the Consent Authority prior to the commencement of construction of the scheme.

18. As part of the Construction Management Plan described in condition 16, the consent holder shall include provisions which set out the methods for dust management and shall include the following details:

(a) Limiting vehicle speed to 60kmp/h on haul roads when they are not within 300m of any residence and 20kmp/h when the haul roads are within 300m ~~to~~of residences;

(b) Ensuring a high level of maintenance on the haul roads; in accordance with, as applicable, the Marlborough Roads document Operational Performance Measure, General Maintenance Marlborough South Area;

(c) The implementation of wind breaks should affected residents choose not to be relocated as specified in condition 93; and

(d) The use of crusting agent additives to water used to control dust where necessary.

Cultural and Archaeological Protocols (Construction Management)

19. Prior to the commencement of construction:

(a) The consent holder shall appoint a project archaeologist. This person shall be a suitably qualified and experienced contract archaeologist whose qualifications and experience would allow the New Zealand Historic Places Trust to authorise them to carry out any work specified by an Authority under the Historic Places Act 1993. The project archaeologist shall be engaged for the duration of the construction activities and may nominate a suitable representative. Overall responsibility for archaeological matters shall remain with the Project Archaeologist.

(b) The project archaeologist as appointed in condition 19(a) (or their nominated representative) shall undertake an archaeological survey of the canal route and the areas likely to be affected by earthworks associated with the construction of the scheme. The purpose of the survey shall be to identify any potential archaeological sites prior to the commencement of construction. The survey and reporting results shall be submitted as part of the Construction Management Plan required by condition 16. The report shall include a map of the canal route and areas potentially affected by earthworks activities associated with the construction of the scheme with all items of archaeological significance plotted.

(c) Prior to the start of earthworks, the consent holder shall implement a training programme for construction staff under the direction of the project archaeologist regarding methods of identifying, reporting and managing features of archaeological significance. The training programme shall be repeated as necessary to accommodate any new staff who may be engaged for earthworks construction.

Fish Screening and fish bypasses

20. Prior to the commencement of construction of the scheme, the consent holder shall prepare design specifications for:

(a) A fish screen to be installed at the downstream end of the ~~settling~~sediment retention basin in Reach 1.

(b) A fish bypass channel to return fish excluded by the screen safely back to a permanently flowing channel connected to the main stem of the Wairau River.

(c) The performance objectives for design of the fish screen and fish bypass channel shall be:

(i) to exclude all adult Eels and Salmonids and where practicable juvenile Eels and Salmonids from passing through the fish screening device and to return them safely back to the Wairau River downstream of the scheme intake;

(ii) ensure a sustainable population of dwarf galaxias (Galaxias divergens) remains in the diversion reach of the Wairau River;

(iii) to establish a method for ensuring that the fish screen is kept substantially clean and free from debris excluding Didymo; and

(iv) to exclude elvers and other fish from entering the downstream entrance of the fish bypass channel.

(d) ~~A f~~Fish barriers to be installed at the downstream end of the outfall of PS5 and~~,~~ to the ~~existing~~enlarged Wairau Power Station tailrace.

(e) ~~A f~~Fish bypass channels to return fish excluded by the barriers of (d) above safely back to a permanently flowing channel connected to the main stem of the Wairau River.

(f) The performance objectives for design of the fish screen bypass channels shall be:

(i) To exclude all adult Eels, and Salmonids and, where practicable, juvenile Eels and Salmonids from passing through the fish barrier and return them safely back to the Wairau River upstream of the outfall.

21. To ensure the effectiveness of the fish screen in achieving its objectives in condition 20(c) above the consent holder shall undertake a trial prior to the commissioning of the scheme. The trial will consist of:

(a) Monitoring of small fish (trout and salmon fry) in the Wairau River to determine whether the small fish are moving past the

intake location in such numbers as to warrant fish screening~~, and at what size~~.

(b) Based on the monitoring undertaken in condition 21(a) the consent holder shall derive a screen size, or an alternative appropriate method, to avoid, remedy or mitigate the effects of the scheme intake on fish passage in this location of the river.

Using the information obtained in condition 21 (a) and (b) the consent holder shall implement a trial of the fish screen to guide design specifications in condition 20.

The fish screen and bypass specifications shall be submitted to and approved by the Consent Authority and shall incorporate, but not be limited to, the following features:

(c) A report detailing the outcome of fish monitoring and the fish screen trial and the design considerations that emerge from that trial;

(d) The standards for maintenance and operation of the fish screen including operation during flood events up to 200m^3/s ~~cumecs~~;

(e) A monitoring programme to ensure the ongoing efficiency of the fish screen.

Sediment Retention Basin

22. Prior to the commencement of construction the consent holder shall prepare design specifications for the sediment retention basin and shall submit the specifications to the Consent Authority for approval. The performance objectives for the sediment retention basin shall include provision for the implementation of the best practicable option for mitigating the adverse effects of sediment flushing on the water quality of the Wairau River including options for managing visual clarity and turbidity.

Scheme Design Standards

23. The design of the scheme shall generally accord with the plans submitted as part of the resource consent application and hearing for the applications for consent. Prior to the commencement of construction of any structures authorised by this consent, accurate site plans and detailed structural plans including the dimensions and elevations of all structures shall be submitted to and approved by the Consent Authority.

24. Structures authorised by this consent shall be designed, constructed and maintained for the life of the scheme in accordance with the NZSOLD Dam Safety Guidelines, November 2000 (and any subsequent amendments).

25. Prior to the commencement of construction of the structures authorised by this consent, a geotechnical design statement shall be prepared by an experienced chartered geotechnical engineer and shall be submitted to and approved by the Consent Authority.

26. Prior to the commencement of construction of the scheme the consent holder shall ensure that a recognised engineer as defined by section 149 of the Building Act 2004 is engaged to review the proposed scheme design. The peer reviewer shall be nominated and appointed by agreement between the consent holder and the Consent Authority. The sole function of the reviewer shall be to review the proposed scheme design and advise the Consent Authority whether it is in accordance with accepted industry standards.

Traffic Management

27. The consent holder shall ensure that all accessways to State Highway 63 necessary for construction activities are designed in accordance with the New Zealand Transport Agency's Planning Policy Manual. The consent holder shall complete these accessways to the satisfaction of the NZ Transport Agency and the Consent Authority prior to commencement of construction for that stage of the scheme necessitating the access in question.

28. The consent holder shall prepare detailed design plans for the widening of Centre Valley Road to at least 6m over the section between State Highway 63 and the canal alignment (a distance of approximately 130m). Those plans shall be submitted to and approved by the New Zealand Transport Agency and the Consent Authority. The widening of Centre Valley Road shall be completed by the consent holder to the satisfaction of Marlborough Roads and the Consent Authority prior to the commencement of construction of the scheme.

29. The consent holder shall ensure that a Traffic Management Plan is prepared and submitted to the Consent Authority in accordance with Condition 11. The objectives of the Traffic Management Plan shall be to identify and detail the traffic management measures that will be put in place during construction and to manage any adverse actual or potential traffic effects arising from construction activities. The Traffic Management Plan shall be prepared in consultation with the New Zealand Transport Agency and the Consent Authority. It shall detail the traffic management measures to be put in place during construction including details of the following:

    (a) The safety of all road users including pedestrians;

    (b) The temporary traffic management locations and methods to be put in place during the construction period;

    (c) The locations where works will occur within the road reserve and the general method of traffic management and control that will be utilised;

    (d) Routes for haulage of materials on any public road, and measures for ensuring the local road network is maintained in a satisfactory condition;

    (e) How provision will be made for property access to affected properties during construction;

(f) All necessary temporary site access requirements, design and traffic management; and

(g) Procedures for liaison between the community, the consent holder and the contractor with regard to traffic related matters.

Landscape and Visual Amenity

30. The consent holder shall ensure that a Landscaping Plan is prepared and submitted to the Consent Authority for approval in accordance with Condition 11. This plan shall be prepared by a suitably qualified and independent landscape architect. Where landscaping works are located on land owned by parties other than the consent holder, the consent holder shall be required to consult with that landowner about the proposed works and the results of that consultation shall be reflected in the Plan. The purpose of the plan shall be to provide for the following matters:

(a) All cuts, fills and embankments shall be graded and formed so that they appear as natural extensions of the adjacent landforms and landscape patterns;

(b) All disturbed areas shall be grassed and managed to appear as an integral part of the wider rural landscape;

(c) Where shelter belts are removed in whole or in part, replanting or, as an alternative, the construction of an artificial screen to meet the shelter requirements of directly affected landowners shall be undertaken in consultation with the respective landowners;

(d) Where screen planting is necessary to mitigate any adverse effects of the scheme on adjacent landowners, the consent holder shall provide landscaping mitigation in consultation with land owners as appropriate;

(e) Disposal areas for surplus excavation material shall be placed in locations agreed with landowners and contoured so they visually integrate with their rural setting;

(f) Power stations shall be designed and finished in materials and colours that are in keeping with the rural Wairau landscape;

(g) The steel penstocks and other built elements shall be finished and maintained in a colour that integrates with the landscape;

(h) The design plans for the recreational areas at the regulation pond and outfall shall be generally consistent with the plans attached as Figures A and B. The design plans shall be submitted to the Consent Authority for approval prior to commencement of construction of the scheme;

(i) With respect to planting, the plan shall include proposed details of species location and selection, plant density, maintenance and pest control; and

(j) This Plan may allow for staged implementation. If it does then an overall plan showing the various stages and their inter-relationships shall be included in the Landscaping Plan.

Health and Safety

31. The consent holder shall ensure that a Health and Safety Plan is prepared and submitted to the Consent Authority for approval in accordance with Condition 11.

32. Prior to the commencement of construction the consent holder shall, in order to minimise the risk of persons undertaking recreational activities in the vicinity of the scheme:

(a) Erect signs at appropriate locations to be determined in consultation with the Nelson Marlborough Fish and Game Council, the applicable kayaking and jet boating clubs, and the Consent Authority to warn users of dangers in that area both during and after construction;

(b) Include appropriate information in the public newspaper prior to the undertaking of the construction works and weekly during the construction period;

(c) Liaise with known user and interest groups advising of programmed works; and

(d) There shall also be two signs erected on State Highway 63 - one at each end of the works site. On each sign shall be clearly displayed the details of the construction manager, contact person and a free phone number.

Advice note:
Other health and safety issues are dealt with at: 16 – 18, 91 – 99, 107 – 108, 110 - 111.

Community Liaison Group

33. Prior to the commencement of construction of the scheme, the consent holder shall undertake an open public process to offer local residents and interested people, including representatives from the consent holder, the Consent Authority and the contractors for the scheme the opportunity to be involved in a Community Liaison Group. In the event it is possible to establish such a group the Community Liaison Group, shall be chaired by an independent facilitator appointed by the consent holder in consultation with the Consent Authority.

34. In the event that it is not possible to establish such a group through no fault of the consent holder then such failure to do so shall not be a breach of these conditions.

35. The objectives of the Community Liaison Group shall be to:

(a) Build effective working relationships and mutual trust between the local community and the consent holder (including its contractors), especially during construction;

(b) Promote the free flow of information in all directions between the local community, the consent holder, the contractors and the Consent Authority, in order to try to anticipate and resolve any potential issues before they arise;

(c) Evaluate the results of monitoring activities on a periodic basis;

(d) Oversee a Community Complaints Procedure, ensuring appropriate responses from the consent holder are forthcoming; and

(e) Recommend any changes to proposed mitigation measures that might be appropriate in light of the monitoring.

Complaints Procedure

36. Prior to the commencement of construction of the scheme and at all times during construction of the scheme, the consent holder shall establish and operate a Community Complaints Procedure as follows:

(a) The consent holder shall have a clearly nominated and publicly communicated contact person within its own organisation or within one of its local agents for receipt of and attendance to complaints during construction;

(b) The consent holder shall establish a 24 hour free phone number for the local community to call if they have any concerns or complaints regarding construction. The free phone number shall be advised to all residents within that part of Wairau Valley affected by scheme construction via post and shall be advertised in the local newspaper prior to the commencement of construction of the scheme and at regular periods during construction;

(c) The consent holder shall maintain a log of any complaint received including the following: the date, time, complainant name and contact details, nature of the complaint including the cause and effect if known, record of action taken to address or mitigate the complaint;

(d) The consent holder shall respond to complaints as soon as is practicable but not later than 24 hours and shall log the action that it intends to take in response to the complaint;

(e) The consent holder shall communicate with the complainant about actions taken;

(f) The consent holder shall document any other longer term actions to be taken;

(g) The consent holder shall present an incident summary (ie (c) to (e) above) to the meetings of the Community Liaison Group (in the event it is established) for review; and

(h) The consent holder shall make the complaints and response log available to the Consent Authority on request.

Southern Tributaries

General

37. The consent holder shall give Ormond Aquaculture Ltd (OAL) at least six months notice in writing of its intention to give effect to the resource consents for the proposed scheme.

Monitoring Mill Stream / Walkers Stream Flow

38. Prior to the commencement of construction of the scheme, the consent holder shall, at its own cost, monitor the flows in Walkers Stream and Mill Stream to determine the existing flow regimes. Monitoring locations will be as close as practical to immediately upstream and downstream of the canal structure, and be established to the satisfaction of the Consent Authority as follows:

(a) Walkers Stream

(i) water level / flow site to be established at Parsons Road Bridge (approx. Map ref. O28: 521584);

(ii) water level / flow site to be established upstream of the canal alignment on Walkers Stream at side road (approx. Map ref. O28: 511578 – naming to be determined);

(iii) monthly visits to include concurrent gaugings at both recorder sites plus twice for tributary inflows within 0.5km upstream of Parsons Road site.

(b) Mill Stream

(i) Mill Stream at the Ormond Aquaculture site – Marlborough District Council permanent site (60130) to be continued;

(ii) water level / flow site to be established at Mill Road near Ford (approx. Map ref. O28: 515596);

(iii) water level / flow site to be established in Mill Stream between Andersons Floodway and Canal 8A crossing (location to be determined);

(iv) monthly visits to include concurrent gaugings at all recorder sites plus minor tributary adjacent to upstream recorder site (as required).

39. (a) Data from at least two years records shall be used to determine the existing flow regime for Walkers Stream and Mill Stream. After the first 12 months the monitoring undertaken in accordance with condition 38(a) and (b) shall be reviewed by the consent holder.

(b) The flow relationships shall be established with concurrent gauging data up to median flow as determined by at least two years of record at each site. ~~The f~~Flow relationships between the streams ~~should be statistically significant~~shall be derived. Should the flow relationships between the upstream and downstream sites on each stream not be deemed to be statistically significant by the Consent Authority, the consent holder may submit flow relationships based

on other data for consideration. All data used in deriving any flow relationships is to be provided to the Consent Authority.

40. The consent holder shall supply Ormond Aquaculture Limited and the Consent Authority with a copy of its Construction Management Plan required under condition 16 where it relates to the proposed construction work within the Mill Stream Catchment, one month prior to that work commencing.

41. The Construction Management Plan shall include the following provisions:

(a) A summary of the consultation undertaken by the consent holder with Ormond Aquaculture Limited in relation to the construction programme in the Mill Stream Catchment;

(b) An appropriate and agreed protocol for ongoing consultation by the consent holder with Ormond Aquaculture Limited during both the construction and operational phases of the scheme;

(c) An appropriate and agreed methodology for managing water quality within Mill Stream and its catchment during construction to ensure that Ormond Aquaculture Limited is able to continue to extract water from Mill Stream for the purposes of its fish farming operations; and

(d) The procedures to be followed in the event that sediment discolours the receiving waterway and does not disperse after a period of reasonable mixing occurs in Mill Stream.

42. Prior to the commencement of construction of the scheme within the Mill Stream and Walkers Stream catchments, the consent holder shall investigate construction dewatering options including the pumping of groundwater from dewatering wells around the edge of the excavation or the utilisation of other methods such as drainage or pumping from within the construction area. These options shall first be identified in the Construction Management Plan required by condition 16. The de-watering method that will be adopted shall be determined from a consideration of the feasibility of achieving the required de-watering and a consideration of the environmental outcome in terms of discharge flows and discharge quality effects on the receiving environment. The selected method shall be advised to the Consent Authority.

43. In the event that low flows at the downstream monitoring sites are lower than the flows predicted by the derived relationships the consent holder shall release sufficient water from the canal to Mill Stream as required to maintain the existing low flow regime as determined under condition 39. Such release of water shall be via a vegetated swale, or concrete channel, sufficient to ensure no decrease in water quality or clarity in the receiving stream.

Walkers Stream Canal Crossing

44. During the detailed design for the scheme the consent holder shall investigate options for the Walkers Stream canal crossing point. This investigation shall include assessment of the use of:

(a) An option to capture the flow of Walkers Stream into the canal and release the flow via a controlled gate back to the stream; or

(b) a culvert; or

(c) a flume.

45. Prior to construction of the canal between the Wye River and Lansdowne Road, the consent holder shall submit to the Consent Authority for approval full design details of the selected option for the canal crossing, together with a management plan for managing flows in Walkers Stream. The management plan shall include provision for retention of suitable low flows as outlined in conditions 38 and 39 in order to provide for in stream ecological values, as well as an assessment of the requirement for provision for suitable periodic flushing flows. These flow regimes shall be set having received advice provided by independent hydrological and ecological experts.

Advice Note:
This condition notes that the consent holder's preferred option at the time of issuing this consent is to capture the stream flow and release an equivalent flow to back to Walkers Stream downstream of the canal via an automatically controlled release gate. The required release flow would be calculated in real-time based on the flow at the upstream gauge (condition 38) and the flow relationship derived in condition 39. The design capacity of the controlled release gate shall account for the range of flows observed during the pre-scheme monitoring (condition 38) excluding flood flows. The release of flow back to Walkers Stream shall be via a vegetated swale, sufficient to ensure no decrease in water quality or clarity in the receiving stream.

Monitoring of Water Quality in Mill Stream/Walkers Stream

46. The consent holder shall determine an appropriate methodology for monitoring water quality in Mill Stream and Walkers Stream post construction of the scheme. The methodology shall include a protocol for establishing any significant change in baseline water quality caused by the operation of the scheme. The methodology for conducting this monitoring shall be developed in consultation with Ormond Aquaculture Limited and submitted to the consent authority for approval, prior to the commencement of construction of Canal 8A.

Spill Ways

47. The consent holder shall ensure that all operational and emergency spillways are designed to have a stabilised path to a receiving stream. This can be via either an existing channel with erosion protection as necessary or a new designed overland flow path.

48. At no time shall emergency and operational discharges exceed the permitted maximum flows under U050729 & U060284 – Operational Discharge Permits.

Groundwater Management

49. A The consent holder shall ensure that a Groundwater Management Plan is prepared and submitted to the Consent Authority for approval in accordance with Condition 11. The objectives of the Groundwater Management Plan are to:

(a) Ensure the adverse effects on groundwater resources as a result of the construction and operation of the scheme are appropriately avoided, remedied or mitigated.

(b) Determine the approach to be adopted to adaptively manage construction activities and the subsequent operation of the scheme in order to manage effects on the existing groundwater resource within the area defined within the plan referred to in condition 51.

(c) The Groundwater Management Plan shall include the following details:

(i) The approach to monitoring, assessment and mitigation that will be implemented by the consent holder to address the effects related to the interception, abstraction and/or discharge of groundwater where these are caused by the construction and subsequent operation of the scheme;

(ii) The trigger levels to determine when action is necessary on the part of the consent holder and shall include provision for appropriate methods to be assessed and applied to successfully mitigate any adverse effects on existing groundwater abstractions or the groundwater resource more generally;

(iii) The pre-construction/baseline investigations and monitoring of existing groundwater usage and quality;

(iv) The monitoring and mitigation measures required during the preconstruction, construction and operational phase;

(v) The level of reporting required at each phase; preconstruction, construction and operational phase;

(vi) How the Groundwater Management Plan shall assist in giving effect to the obligations inherent in conditions 124 to 135, and 201 - 204; and

(vii) The procedures for resolving complaints/disputes.

50. The consent holder shall engage an expert groundwater peer reviewer to review the Groundwater Management Plan prior to it being submitted to the Consent Authority for approval. The peer reviewer shall be nominated and appointed by agreement between the consent holder and the Consent Authority. The peer reviewer's report shall be part of the documentation submitted to the Consent Authority.

51. The Groundwater Management Plan shall encompass a defined area as shown on the Figure C attached to these conditions.

52. Prior to the commencement of construction of the scheme the consent holder shall submit to the Consent Authority the following details for groundwater benchmarking purposes:

(a) The number and location of appropriate control sites (being bores and spring fed streams) within the Wairau Valley that will be utilised for the purpose of monitoring groundwater levels and spring flows; and

(b) Confirmation of the location of all groundwater abstractions existing at the time of granting this consent within the Groundwater Management Plan area defined in condition 51. The following details are to be recorded for each groundwater abstraction point:

(i) name of well owner

(ii) well depth and screen position

(iii) type of pumping system

(iv) pump operating level

(v) well use

(vi) depth to water

(vii) well yield and drawdown characteristics;

(viii) Field measurements of electrical~~ity~~ conductivity, pH and temperature

(ix) maximum permitted take under any water permit.

(c) Identification of any feasible alternative water supply system for those existing groundwater abstractors identified in Condition 52(b).

53. For 12 months prior to the commencement of construction of the scheme the consent holder shall carry out monthly groundwater level monitoring at the locations and /or abstraction points specified in accordance with condition 52(a).

54. At least six months prior to the commencement of construction of the scheme the consent holder shall conduct monitoring of groundwater quality at representative points within the area defined by condition 51. Groundwater quality samples will be analysed for pH, electrical conductivity, alkalinity, E.Coli, Chloride, Nitrate-N, Nitrite-N, Ammonia-N, Total-N, Dissolved Reactive Phosphorus, Total Phosphorus and Arsenic. This monitoring shall occur at least twice during this six month period.

55. Prior to the commencement of construction of the scheme the consent holder shall conduct detailed geotechnical investigations. This shall include in-situ testing to assist with determining the permeability parameters of the ground materials in areas likely to be affected by construction of the scheme. It shall also include further analysis to determine the quantity of water expected from dewatering areas, and more detailed design of the temporary support/groundwater cut-off mechanisms.

56. Prior to the commencement of construction of the scheme the consent holder shall install trial de-watering bores to adequately determine optimal

pumping rates and de-watering methods for construction purposes. These trial bores shall be used to test the quality of the de-watering discharge and to check the drawdown extent that the pumping creates in the surrounding strata.

57. Prior to the commencement of construction of the scheme, the consent holder shall supply the results of all monitoring (Conditions 53 and 54) and the additional groundwater investigations in accordance with conditions 55 and 56 to the Consent Authority in writing. This information shall be coupled with a report which shall detail the following:

(a) The information gathered from the work described in conditions 52 - 56 above;

(b) An estimation of the natural seasonal range of groundwater level, stream flow, wetland condition and groundwater quality fluctuations, based on a review of all groundwater data and an assessment of the longer term range of climatic fluctuations;

(c) The identification of trigger levels that will represent abnormal conditions that could be caused by scheme activities. These trigger levels will take into account natural fluctuations and comparison with monitoring bores located outside the area of influence from the scheme. They will be determined on a location by location basis and may include absolute water levels and/or rate of change of water levels and/or the potential lateral extent of effect;

(d) An identification of specific wells, wetlands or streams likely to be adversely affected, based on the de-watering trials;

(e) Definition of targeted mitigation measures for each location where the potential for adverse effects has been defined;

(f) A programme of works prepared for the approval of the Consent Authority for the implementation of mitigation measures prior to the occurrence of any adverse effects that are more than minor; and

(g) Establishment of a forward monitoring programme prepared to the approval of the Consent Authority, appropriate for each identified location, such that trigger levels can be effectively measured.

Aquatic Ecology - Main Stem

Aquatic Ecology Management Plan

58. The consent holder shall ensure that an Aquatic Ecology Management Plan is prepared and submitted to the Consent Authority for approval in accordance with Condition 11. The formulation of this management plan shall be carried out in consultation with the Department of Conservation, Nelson Marlborough Fish and Game Council and the Royal Forest and Bird Protection Society. The Aquatic Ecology Management Plan shall set out the approach to monitoring and adaptive management that will be implemented by the consent holder to mitigate any actual and/or potential adverse effects on aquatic ecology related to the construction and operation of the scheme. The objectives of the Aquatic Ecology Management Plan shall be to:

(a) Protect the overall health and vitality of the existing aquatic ecosystem of the Wairau River and those tributaries that lie within the affected reach of the River;
(b) Ensure that the activities associated with the construction and operation of the scheme do not give rise to adverse effects on the existing aquatic ecosystem in the Wairau River or exacerbate any pre-existing adverse effect;~~.~~
(c) Maintain the habitat of trout and salmon within the affected reach of the Wairau River.

59. The Aquatic Ecology Management Plan shall establish environmental triggers to provide an indication of ecosystem stress and a process which directs consent holder action upon a trigger threshold being exceeded. The Aquatic Ecology Management Plan shall include the following triggers:

(i) A 30% reduction in the average density of mayfly and caddis_fly larvae within the scheme diversion reach of the Wairau River relative to pre-operational levels and/or the control sites.
(ii) Within the Scheme diversion reach, the instantaneous (hourly) water temperature exceeds 23.0°C and temperatures exceed 20.0°C for more than four hours in a 24 hour cycle, and for more than three consecutive days.
(iii) Immediately downstream of the Power Station 5 tailrace after full mixing, instantaneous (hourly) water temperatures exceed 24.0°C and temperatures exceed 20.0°C for more than six hours in a 24 hour cycle, and for more than three consecutive days.
(iv) A sustained decrease in dissolved oxygen throughout the scheme diversion reach to below 80% saturation.
(v) A sustained decrease in water clarity throughout the scheme diversion reach by greater than 33% relative to the upstream control sites.
(vi) A 25% increase in the embeddedness of riffle habitats within the scheme diversion reach over two consecutive monitoring occasions through the diversion reach relative to pre operational levels and upstream control sites.
(vii) During sediment flushing a sustained decrease in water clarity downstream of the scheme diversion reach greater than 50% relative to upstream control sites.

60. Without limiting conditions 63–69 below, the Aquatic Ecology Management Plan shall set out the methods by which the consent holder conducts:

(a) Pre construction/baseline investigation and monitoring of existing aquatic ecosystem composition and abundance, and water quality characteristics;
(b) Monitoring and identification of mitigation / management measures during the construction and operational phases; and

(c) Reporting obligations at each phase (preconstruction, construction and operation of the scheme), and identification of appropriate and robust contingency plans should any adverse effects be detected.

61. The consent holder shall engage an expert aquatic ecology peer reviewer to review the Aquatic Ecology Management Plan prior to it being submitted to the Consent Authority for approval. The peer reviewer shall be nominated and appointed by agreement between the consent holder and the Consent Authority. It is envisaged that this peer reviewer will later be appointed to the Ecological Advisory Group (EAG) required by condition 207. The report of the peer reviewer shall form part of the documentation submitted to the Consent Authority.

62. The consent holder shall be responsible for the implementation of the Aquatic Ecology Management Plan throughout the pre construction, in-river construction and operation of the scheme, and its regular review as appropriate. Any review of the Aquatic Ecology Management Plan shall be completed to the satisfaction of the Consent Authority to ensure that it meets the objectives set out in condition 58.

63. Prior to the commencement of any in-river construction activities the consent holder shall conduct the following monitoring. This monitoring shall be undertaken for at least two years prior to any in river construction activities associated with the implementation of the scheme.

(a) Abundance and distribution of benthic macroinvertebrates, periphyton and fish;
(b) Water quality, including water clarity, electricality conductivity, dissolved oxygen, pH, Nitrate/Nitriate-Nitrogen, Ammoniacal-Nitrogen, Total-Nitrogen, Dissolved Reactive Phosphorous, Total Phosphorous, Total Suspended Solids and temperature;
(c) Any other monitoring deemed necessary by the consent holder to properly characterise existing aquatic ecological values.

Advice note:
For the purpose of satisfying this condition, research and monitoring data collected prior to the grant of consent may be utilised to established baseline conditions.

64. The consent holder shall ensure that the monitoring outlined in condition 63(a) and (b) is undertaken:
(a) In November, February, and May of each year or as close as possible to these months should high flow prevent effective sampling over these months for benthic macroinvertebrates, periphyton and fish.
(b) In November, February, May and August of each year or as close as possible to these months should high flow prevent effective sampling over these months for water quality.

65. The consent holder shall ensure that the monitoring outlined in condition 63(a) and (b) is undertaken at the following sites within the Wairau River, or such other sites as determined and described in the approved Aquatic Ecology Management Plan:
   (a) A site known as 'Six Mile' located approximately 12km upstream of the bund associated with the intake for the scheme, to be used as a control site;
   (b) A site known as 'Airstrip' located approximately 1 – 2 km upstream of the bund associated with the intake for the scheme, to be used as a control site;
   (c) A site known as 'Argyle' located approximately 3.5km downstream of the sediment ~~pond~~retention basin sluice tailrace confluence with the river;
   (d) A site known as 'Wairau Valley' located approximately midway between the intake for the scheme and the Power Station 5 tailrace confluence with the river;
   (e) A site known as 'Marchburn' located just upstream of the Power Station 5 tailrace confluence;
   (f) A site approximately 1km downstream of Power Station 5 tailrace confluence;
   (g) A site known as 'Renwick' located approximately 500 metres upstream of the Renwick Bridge (SH6).

66. Prior to the commencement of any in-river construction activities and for at least two years, the consent holder shall undertake an annual drift dive survey of the salmonid population at the following sites within the Wairau River, or such other sites as determined and described in the approved Aquatic Ecology Management Plan:
   (a) Dip Flat
   (b) Intake site
   (c) Below the Branch River confluence
   (d) Top Valley
   (e) Marchburn
   (f) The Narrows
   (g) Tuamarina.

67. Prior to the commencement of any in-river construction activities and for at least two years, the consent holder shall undertake two annual helicopter counts of salmonids (one prior to and the other during peak spawning (March to May)) in the Wairau River between the Power Station 5 tailrace confluence and The Wash bridge.

68. Prior to the commencement of in-river construction activities and for at least two years, the consent holder shall undertake continuous water temperature monitoring at the following sites along the Wairau River, or such other sites as determined and described in the approved Aquatic Ecology Management Plan:
   (a) Either at The Wash bridge or at the Scheme intake site;

(b) A site known as 'Marchburn' located just upstream of the Power Station 5 tailrace confluence;

(c) A site approximately 1000 metres downstream of the Power Station 5 tailrace confluence.

69. The consent holder shall ensure that the results from the monitoring undertaken in accordance with conditions 60-68 are reported and a copy of this report submitted to the Consent Authority as part of the Aquatic Ecology Management Plan prior to the commencement of construction.

River Birds

70. Prior to the commencement of construction the consent holder shall prepare, and implement a Pre-Scheme Black-Fronted Tern and Black-Billed Gull Research and Monitoring Plan. This plan shall be prepared and submitted to the Consent Authority for approval in accordance with Condition 11. This Plan shall be prepared in consultation with the Department of Conservation, Royal Forest and Bird Protection Society and the Ornithological Society of New Zealand and with input from a biostatistical expert.

71. The purpose of the Pre-Scheme Black Fronted Tern and Black-Billed Gull Research and Monitoring Plan shall be to build on current knowledge of the ecology of Black-fronted Terns and Black-billed Gulls on the Wairau River to ensure that there is a sound statistical base to enable the implementation of adaptive management to mitigate any adverse effects arising from the construction and/or operation of the scheme. The plan shall incorporate but not be limited to the following requirements whereby the consent holder shall be required to:

(a) Collect data on Black-Fronted Tern and Black-Billed Gulls and other river birds on the Wairau River during the nesting season October to January inclusive);

(b) Investigate the relationship between breeding success (including number of chicks fledged) and river flows;

(c) Determine the breeding success of Black-Fronted Tern and Black-Billed Gulls colonies and predation rates throughout the nesting season;

(d) Select monitoring sites including nesting sites within the diversion reach and outside of it and in sufficient numbers to ensure that monitoring is statistically valid and scientifically robust;

(e) Collect data for Black-Fronted Terns and Black-Billed Gulls at sufficiently regular intervals to effectively monitor egg and chick survival and fledging success during the nesting season (October to January inclusive) but in a manner that minimises disturbance to the birds;.

(f) Collect data including but not limited to:

(i) number of nests with eggs

(ii) number of eggs per nest

(iii) number of eggs hatched

(iv) number of failed eggs

(v) number of fledged chicks

(vi) details of the cause of death of eggs, chicks and adults, as far as practical.

(g) Collect data on other species of river birds if determined to be appropriate in the preparation of the Black-Fronted Tern and Black-Billed Gull Research and Monitoring Plan. Undertake surveys of the number and distribution of Black-Fronted Terns and Black-Billed Gulls and other river birds on the Wairau River for at least two years prior to the commencement of operation of the Scheme.

Advice note:

For the purpose of this condition, research and monitoring data may include data obtained prior to the grant of consent.

72. The consent holder shall submit the Pre-Scheme Black-Fronted Tern and Black-Billed Gull Research and Monitoring Plan to an expert peer review panel consisting of two appropriately qualified experts, one nominated on behalf of the consent holder and the second nominated by Department of Conservation. The expert panel shall review the plan having regard to, but not limited by, the purpose of the plan and criteria (a) to (g) set out in condition 71.

73. Prior to the commencement of construction of the scheme, the consent holder shall submit the Pre-Scheme Black-Fronted Tern and Black-Billed Gull Research and Monitoring Plan to the Consent Authority for approval. The report of the expert panel shall form part of the documentation submitted to the Consent Authority.

74. In the event that the expert panel cannot agree as to the appropriate research and monitoring and measures required, each expert shall submit their preference to the Consent Authority and the Consent Authority who shall then make the final decision as to the contents of the Pre-Scheme Black-Fronted Tern and Black-Billed Gull Research and Monitoring Plan. The Consent Authority may seek such independent expert advice as it thinks fits in its decision making.

75. Immediately following approval of the Pre-Scheme Black-Fronted Tern and Black-Billed Gull Research and Monitoring Plan the consent holder shall implement the Plan. The consent holder shall continue to implement the Plan so as to ensure that it obtains at least two years of research and baseline monitoring data prior to the commencement of operation of the scheme.

Advice note:

For the purpose of this condition, research and monitoring data may include data obtained prior to the grant of consent.

76. By the 15th of May each year, the consent holder shall submit to the Consent Authority a report prepared by an appropriately qualified expert detailing the results of the annual research and monitoring required under condition 71. The consent holder shall provide a copy of this report to the Department of Conservation, Royal Forest and Bird Protection Society and the Ornithological Society of New Zealand.

Terrestrial Vegetation and Wetlands Management

77. The consent holder shall ensure that a Vegetation Management Plan is prepared and submitted to the Consent Authority for approval in accordance with Condition 11. The formulation of this plan shall be carried out in consultation with the Department of Conservation, New Zealand Fish and Game Council and the Royal Forest and Bird Protection Society.

(a) In formulating the Vegetation Management Plan the consent holder shall ensure that the following objective is achieved:

(i) That adverse effects on terrestrial vegetation and wetlands are appropriately avoided, remedied or mitigated throughout the construction and operation of the Scheme.

(b) The purpose of the Vegetation Management Plan shall be to determine the approach ~~to be adopted~~ to monitoring, assessment and mitigation that will be implemented by the consent holder related to the construction and operation of the scheme to address the actual and potential effects of the scheme on terrestrial vegetation and wetlands. The plan shall include the following details:

(i) A description of the vegetation protection and restoration associated with the scheme;

(ii) The proposed monitoring of the existing significant vegetation and wetlands within the scheme footprint to be undertaken, in order to verify predictions; and

(iii) Identification of a range of contingency measures which can be implemented if necessary.

78. In accordance with the Vegetation Management Plan the consent holder shall ensure that the following objectives are achieved:

(a) Protect as much as possible of the presently isolated and fragmented copses of remnant indigenous vegetation within the RAP 15 (as shown on Figure 1: Proposed Protection and Restoration contained in the Vegetation and Wetlands Management Plan) *Argyle Kanuka* complex at Traverse Spur;

(b) Connect the RAP 15 sites by way of protecting stands of exotic forest that provide habitat linkages and also by way of additional plantings of native vegetation. Exotic stands will be managed towards a greater presentation of indigenous vegetation;

(c) Establish an appropriate and functional forest type in the revegetation sites, both at RAP 15 and in the Canal 4 and 5

embayments. These revegetation plantings will need to be dominated by indigenous species which in the past would have characterised the area;

(d) Establish indigenous wetlands within the Regulating Pond, and within Canal 4 and 5 embayments, which will serve as waterfowl and wader habitat;

(e) Assist in the natural regeneration cycle that is presently occurring within some of the existing shrubland and stonefield habitat at RAP 15, and assist in the conversion of the exotic habitat linkages referred to above into native bush corridors;

(f) Restore self sustaining ecosystem processes within the rehabilitated, linked and revegetated areas, including natural regeneration, successional processes, evolving habitat opportunities, soil formation, seed dispersal and nutrient cycling;

(g) Implement ongoing ecological management of the protected and restored sites, including pest, predator and weed control.

79. Subject to condition 80, as part of meeting the obligations inherent in condition 77, the consent holder shall prepare and submit a Vegetation Protection and Restoration Plan (being a sub-set of the wider Vegetation Management Plan) for the approval of the Consent Authority. This Plan shall be required to achieve the following:

(a) The legal protection of 18.7 ha of existing ecologically significant indigenous bush, including 10.7 ha of RAP 15 Argyle Kanuka and an area of manuka shrubland that may be unique within the context of the Hillersden Ecological District;

(b) The legal protection of 15.6 ha of exotic forest (comprising a variety of species) that presently provides functional connections (i.e. ecological corridors) between the otherwise fragmented remnants of RAP 15 Argyle Kanuka;

(c) The gradual replacement of the exotic component of these existing corridors with indigenous forest species, by way of incremental ring-barking and low-level direct efforts such as seed-broadcast by hand or planting within the created light wells;

(d) The passive ecological restoration of 6.7 ha of presently regenerating shrub land and moss-stone field habitat at RAP 15 Argyle Kanuka;

(e) The active revegetation (ie physical planting) of 3.6 ha of native forest at RAP 15 Argyle Kanuka;

(f) The active revegetation (ie physical planting) of 4.3 ha of indigenous wetlands at RAP 15 Argyle Kanuka;

(g) The active revegetation (ie physical planting) of 1.2 ha of native riparian forest around the Canal 4 and Canal 5 embayments;

(h) The active revegetation (ie physical planting) of 1.0 ha of indigenous wetlands at the Canal 4 and Canal 5 embayments;

(i) Control of weeds as well as animal pests and predators in the RAP 15 Argyle Kanuka area and at the Canal 4 and Canal 5 embayment revegetation sites.

80. The consent holder shall use best endeavours to secure the legal protection of the lands and habitats specified in condition 79. In the event that the consent holder is unable to secure such protection in some instances, the consent holder shall in consultation with the Department of Conservation and the Consent Authority, provide equivalent protection elsewhere for alternative indigenous habitat of at least the same ecological value, or otherwise provide works in lieu of protection up to a similar dollar value that would have been associated with the protection of alternative sites.

81. As part of meeting the objectives inherent in condition 77, the consent holder shall prepare and submit a Vegetation Monitoring Plan (being a sub-set of the wider Vegetation Management Plan) for the approval of the Consent Authority. This Plan shall be required to set out methods necessary to:

(a) Monitor the existing native terrestrial bush and shrub lands within the Wairau River, its margins, and in areas influenced by the canal construction, to determine whether or not there are any adverse effects directly attributable to the lowering or mounding of groundwater levels and the lowering of average river stage height associated with the construction and operation of the scheme;

(b) Monitor the natural wetlands and riparian willow stands within the Wairau River and its margins to determine whether or not there are any adverse effects directly attributable to the lowering or mounding of ground water levels and the lowering of average river stage height.

82. The consent holder shall ensure that the monitoring conducted to give effect to the Vegetation Monitoring Plan includes the following measures:

(a) Establishment of a full set of sites and identification of a sub-set of bush sites suitable to provide sufficient information about the existing ecological health of native terrestrial bush and shrub lands within and adjacent to the margin of the Wairau River.

(b) The completion of a baseline (pre-construction) survey including:

(i) a survey of the vegetation health of up to seven bush sites (all north bank) and two control sites; and

(ii) monthly piezometer readings at all monitoring sites (as required by the Groundwater Management Plan).

CONSTRUCTION

Construction Management Plan

83. The consent holder shall implement and adhere to the requirements of the Construction Management Plan required by condition 16 at all times during construction of the scheme.

84. The consent holder shall ensure that the scheme is constructed in generally accordance with conditions 23 – 26.

In-River Construction Works Management

85. No fuel storage or machinery refuelling shall be undertaken within 50 metres of a surface water body as defined by the Resource Management Act.

Advice note:
Water body (RMA Definition): means fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.

86. Bunds will be positioned around the perimeter of fuel stores and the bunded area shall be lined with an impermeable layer to capture spills and clean-up equipment shall be maintained in a serviceable manner at each fuel store throughout the duration of the construction period.

87. In carrying out construction works in relation to the intake site, the tailrace and any other in-river works (including the Wairau River main stem and south bank tributary water bodies) the consent holder shall:

(a) Keep the affected working area to a practicable minimum and ensure that all plant and machinery working in the river is cleaned so as to be free of weeds or pest plants or seeds prior to entering the water;

(b) As far as practicable, work outside the flowing water;

(c) Ensure that any reinstatement of works after floods ~~are~~is, as far as practicable, on the recession of the flood, while the river flow is still naturally turbid;

(d) Install velocity barriers to prevent the upstream movement of fish at the end of all operational outfalls;

(e) Ensure that no construction or diversion activities occur within 50 metres of an occupied Black-Fronted Tern or Black-Billed Gull nesting area;

(f) Prior to undertaking any construction or maintenance activities in the months 1 July to 31 January (inclusive), ensure that a river bird nesting survey is undertaken by a suitably qualified expert to determine the location of any nests / nesting areas. A copy of this report shall be provided to the Consent Authority and the Department of Conservation.

(g) Ensure that any diversion of river braids for the purpose of the intake, facilitation of operational sediment flushing and outfall works does not: prevent an existing water channel from flowing between any Black Fronted Tern nesting colony and the river bank, or impede fish passage; and

(h) Ensure that the installation of culverts adheres to the Fish Passage Guidelines prepared by the Department of Conservation (1999).

(i) Ensure that public access to the Wairau River is maintained as far as practicable throughout the construction period but in a manner consistent with maintaining public safety.

For the avoidance of doubt, this condition applies only during the construction of the Scheme and shall not apply during operation to works in the Wairau River bed necessary after flood events or freshes to reinstate flow diversions or repair bunds.

Scheme Construction Earthworks

88. In carrying out all earthworks (excluding earthworks necessary for the construction of the canal which are addressed in condition 89 below and in-river works undertaken in the bed of the Wairau River and its tributaries being those water courses covered in conditions 87 and 90), the consent holder shall adopt the recommendations of the Environment Canterbury Erosion and Sediment Control Guidelines 2007 for control and treatment of storm water runoff including the following measures:

(a) Divert clean runoff around the construction area;

(b) Contain runoff from a worked site in a pond to settle sediment before discharge to the receiving stream or water;

(c) Where practicable, pass the discharge through a grassed swale to further reduce the sediment load to be discharged to the receiving stream or water;

(d) Provide protection against erosion and entrainment of further sediment at the discharge point;

(e) Reinstate and re-grass any worked areas as soon as practicable following completion of earthworks or where there will not be any works for more than six months, in order to minimise the potential entrainment of sediment in water.

89. In carrying out earthworks relating to the construction of the canals and head ponds, the consent holder shall (without derogating from the guidelines referred to in condition 88):

(a) Divert clean runoff around the construction area;

(b) Capture storm runoff from worked areas and treat in ponds prior to discharge to receiving streams or to clean water drainage channels;

(c) Where practicable, pass the discharge through a grassed swale to further reduce the sediment load to be discharged to the receiving stream or water;

(d) Provide protection against erosion and entrainment of further sediment at the discharge point;

(e) Keep the worked area to a practicable minimum, and reinstate as soon as practical following the completion of any work;

(f) Ensure that those areas of natural vegetation that are to be retained post construction of the scheme are protected by a 10 metres wide buffer from earthworks and that other areas of natural vegetation are not used for staging or turning areas, avoid disturbing the

surface of such areas and where such areas are disturbed, reinstate as soon as practical following the completion of such work;

(g) Collect groundwater and "clean" surface runoff and convey it along the invert of the canal to the first convenient discharge point; and keep the catchment area for any discharge point as small as practicable;

(h) Keep machinery and haul roads out of flowing water (except as indicated below in condition 90 relating to stream crossings);

(i) The consent holder shall create a register of names and contact details of the downstream property owners and implement a communication and complaints protocol with these owners.

90. In carrying out earthworks relating to stream crossings, the consent holder shall adopt the following standards:

(a) Keep work areas outside flowing water as far as practicable;

(b) If there is continuous flowing water, install a temporary culvert or other practicable method to convey base flows in the event that a haul road needs to cross the stream;

(c) Construct stream crossings in stages so that there is always a floodway available outside the work area or via completed permanent structures;

(d) Where the method imposed by condition 90(b) is to be implemented, the culvert is to be constructed adjacent to the stream and once finished, the stream is to be diverted through the culvert;

(e) Reinstate worked areas as soon as practicable following completion of the work;

(f) When installing culverts a minimum diameter of 300mm shall be utilised.

Dust Management

91. In order to mitigate the effects of dust nuisance the consent holder shall undertake the revegetation of any earthworks areas (including stockpile areas) within one month of completion of construction works on a particular site or if earthworks are not planned on the particular site for a period of more than two months.

92. If climatic conditions are such that revegetation of worked areas is not successful then the consent holder shall as soon as practicable undertake necessary additional mitigation measures to ensure that dust nuisance does not occur.

93. Where construction activities are to occur within 100 metres of a residence, the consent holder shall offer to temporarily relocate the affected persons of that residence. The relocation may be to other residences in the Wairau Valley, or other accommodation as agreed individually by the resident and the consent holder. The rights created by this condition shall also extend to any person who is living within the "construction envelope" which is attached as Figure D to these conditions

who is able to demonstrate to the satisfaction of the Consent Authority by reference to an objective ambient air quality monitoring standard and on production of a medical certificate from a suitably qualified independent medical practitioner approved by the Consent Authority, that the resident or any person under their care has a respiratory condition which has been or is likely to be adversely affected by any discharges to air caused by the scheme construction works.

94. The dust mitigation measures identified in the Construction Management Plan shall be implemented by the consent holder at all times during the construction process.

95. The consent holder shall install real time particulate monitors adjacent to those properties whose owners choose not to be relocated as provided for in condition 93. Two trigger values will be established in consultation with the Consent Authority. The lower value will be used to warn construction staff and contractors that dust concentrations are increasing and that further mitigation measures as described in condition 18 are required. Where this trigger is exceeded, the mitigation in question shall be employed. The second value will be that at which all work affecting the said dwelling will be required to cease immediately. Where this trigger is exceeded, all work creating dust which affects the said dwelling shall cease until environmental conditions are such that the second value will not be exceeded by construction operations. The consent holder shall maintain a log of the monitoring data and shall make copies of the logs available to the Consent Authority when dust limits exceed the limits in condition 9~~6~~5 and/or upon request by the Consent Authority.

96. The consent holder shall ensure that the concentrations of nuisance dust attributable to construction activities do not exceed the Ministry for the Environment's dust nuisance criteria of 120~~um~~ug/m^3 as a 24 hour average for total suspended particulate, and 4g/m^2/30 days above ambient for deposited particulate, at the notional boundary of any residence on another site.

97. Where the construction activities causing dust discharges to air are within ~~1~~200m of a residence or where construction causing dust discharges to air occurs for more than six months within ~~2~~300m of a residence the consent holder shall offer to undertake the following:

(a) Internal cleaning services;

(b) External cleaning services;

(c) Provision of alternate arrangements for drying clothes, and

(d) Except where the occupants have been relocated under condition ~~8~~93, provision of air conditioning for so long as the activity will be in close proximity to the residence.

98. The consent holder shall schedule portions of the construction programme that have the potential to generate dust, to avoid work affecting properties within 100m of construction work during the spring, being from 1 September to 30 November inclusive.

Noise Management

99. The noise from construction works shall be measured and assessed in accordance with the requirements of NZS6803:1999 Acoustics – Construction Noise. The consent holder shall ensure that construction noise from the scheme complies at all times with the requirements of NZS6803:1999 Acoustics – Construction Noise.

Contaminated Sites

100. Should the consent holder uncover a contaminated site, it shall notify the Consent Authority and the consent holder shall formulate a method for remediation of the site. This method shall be submitted to the Consent Authority for approval.

The consent holder shall then implement the remedial action to the approval of the Consent Authority.

101. If any offal pits are uncovered during the construction of the scheme the consent holder shall undertake the following actions:

(a) Notify the Consent Authority;

(b) Temporarily cease all construction work within a 50m radius of the offal pit, until remediation as outlined in condition 101 (d) is completed;

(c) Take immediate steps to secure the offal pit against incursion by vermin such as rats and seagulls and cover the offal pit with clean fill to minimise odour until remediation can occur;

(d) Arrange immediately for compliance staff from the Consent Authority to investigate the discovery and provide recommendations for remediation. The consent holder shall follow these recommendations and provide confirmation in writing to the Consent Authority that it has done so, and arrange for a final inspection by the Consent Authority once remediation has been completed.

Cultural and Archaeological Protocols

102. The consent holder shall ensure that the Project Archaeologist or nominated representative appointed in accordance with condition 19 supervises all earthworks activity on sites identified in the survey undertaken in accordance with condition 19.

103. If any artefacts or historical, cultural or archaeological material, is found or uncovered whilst undertaking work authorised by this consent, the following shall be complied with by the consent holder:

(a) Work shall cease immediately within a 50m radius of the artefact or cultural, historical or archaeological material;

(b) Notice of the discovery shall be given, as soon as possible, to Te Runanga a Rangitane o Wairau, Ngati Toa Ki Wairau, Ngati Rarua Iwi Trust, and Ngati Apa Ki Te Waipounamu;

(c) No work shall recommence until 72 hours after advice has been given to such iwi or agreement reached between the parties regarding appropriate protection measures, whichever is the sooner;

(d) If any activity associated with the above proposal (such as earthworks and planting) is likely to modify, damage or destroy an archaeological site, an authority from the New Zealand Historic Places Trust must be obtained for the work to proceed lawfully. In the event that an archaeological site is encountered during work, all works must cease on the site and the New Zealand Historic Places Trust must be contacted as soon as possible.

Advice Note:
The consent holder is advised to consult with officers of the New Zealand Historic Places Trust regarding the need for any archaeological assessment of the site or archaeological authority prior to any earthworks or construction taking place.

In the event of the accidental discovery of any artefacts or historical, cultural or archaeological material the consent holder shall ensure that the Project Archaeologist or ~~their~~ nominated representative is on site within 48 hours to advise on and supervise the necessary course of action in general accordance with condition 103.

Fish Screen

104. To ensure the effectiveness of the fish screen and fish barriers in achieving the objectives in conditions 20 and 21 the consent holder shall undertake a trial to determine the efficacy of the proposed fish screen and fish barriers. The trial shall require the consent holder to trial the fish screen and fish barrier designs and refine the designs prior to the commissioning of the scheme to ensure the objectives as stated in condition 20 are achieved.

105. The consent holder shall prepare a report detailing the findings of the trial undertaken in accordance with condition 104 in particular the effectiveness of the fish screen and fish barriers and specifying whether any design refinements are required to achieve the objectives as stated in condition 20.

Sediment Retention Basin~~Pond~~

106. The consent holder shall construct the sediment retention basin~~pond~~ in accordance with the performance objectives outlined in condition 22..

Traffic Management

107. All traffic management measures associated with scheme construction shall be implemented in accordance with the Traffic Management Plan required by these conditions and with the New Zealand Transport Agency Code of Practice for Temporary Traffic Management including:

(a) If road closures or deviations are adopted then the effects on local traffic shall~~euld~~ be monitored in accordance with the Code of Practice for Temporary Traffic Management ~~to ensure~~and no traffic hazards or excessive disruption ~~are~~ created;

(b) The monitoring of the effect of dust on visibility at the haul road crossings;

(c) If traffic signals are installed at construction road/public road intersections, road safety audits and on-going monitoring will be required to ensure road safety is maintained and that excessive delays do not result in disruption to the public road traffic.

108. The consent holder shall ensure that Church Lane is not utilised as a haulage route at any time during construction of the scheme.

Landscape and Visual Amenity

109. The consent holder shall implement the requirements and methods set out in the Landscaping Plan required by condition 30 during, and where necessary post construction of the scheme. All planting obligations shall be completed within six months of the completion of work on the stage for which planting is intended. If any plant or tree should die or become diseased it shall be replaced with either the same or more suitable species, at the consent holder's expense.

Health and Safety

110. Prior to the commencement of operation of the scheme, the consent holder shall ensure that:

(a) Warning signs are placed at the intake and immediately upstream of the rock groyne, warning people that the southern channel is a power station intake, and to keep out;

(b) Signage is erected in locations agreed by the Consent Authority indicating the potential for river flow fluctuations downstream of the intake structure;

(c) These signs shall be maintained by the consent holder for the duration of these consents; and

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~~(c)~~(d) The consent holder shall erect and maintain warning notices informing people about the variable nature of the discharges from Power Station 5. Such notices shall be placed adjacent to the downstream end of the outfall from Power Station 5 and at Fish and Game access points in the vicinity of the outfall.

111. The consent holder shall implement an early warning system to assist in advising residents in the vicinity and users of affected waterways that are designated spillways that spilling from the canal is about to occur and/or sediment flushing is about to be carried out within the Wairau River.

Recreation

112. Prior to the commencement of operation of the scheme, the consent holder shall ensure that:

(a) A haul-out area for kayaks is provided on the Wairau River upstream of the scheme intake channel;

(b) Play facilities for kayakers are provided below Power Station 5 and within the canal above the scheme outlet;

(c) The design and operation of the intake structure on the Wairau River enables kayaks and jet boats to pass safely and continue along the Wairau River; and

(d) Appropriate pedestrian access is provided to the Wairau River for the public in the vicinity of the existing Fish and Game access at Tapps Road.

113. The consent holder shall ensure that the design of the recreational facilities in condition 112 shall generally accord with the layout plans submitted as part of the consent application.

Dam Safety and Surveillance Management Plan During Operation (Scheme Design)

114. Structures authorised by this consent shall be designed, constructed and maintained for the life of the consent in accordance with the NZSOLD Dam Safety Guidelines, November 2000 (and any subsequent amendments).

115. Prior to the commencement of operation of the scheme, commissioning procedures, operation and maintenance manuals and safety management plans (including an Emergency Action Plan) which meet the recommendations of the NZSOLD Guidelines shall be prepared by the consent holder and submitted to the Consent Authority for approval.

Community Liaison Group and Complaints Procedure

116. Prior to the commencement of construction and at all times during construction of the scheme, the consent holder shall establish and operate a Community Liaison and Complaints Procedure as follows:

(a) The consent holder shall have a clearly nominated and publicly communicated contact person within its own organisation or ~~with~~in one of its local agents for complaints during construction;

(b) The consent holder shall establish a 24 hour complaints freephone number for the local community to call if they have any concerns regarding construction. The freephone number shall be advertised in the local newspaper prior to the commencement of construction and at regular periods during construction;

(c) The consent holder shall maintain a log of any complaint received including the following: the date, time, complainant name and contact details, nature of the complaint including the cause and effect if known, record of action taken to address or mitigate the complaint;

(d) The consent holder shall respond to complaints as soon as is practicable but not later than 24 hours and shall log the action that it intends to take in response to the complaint;

(e) The consent holder shall communicate with the complainant about all actions taken;

(f) The consent holder shall document any other longer term actions to be taken;

(g) The consent holder shall present an incident summary (ie (b) to (e) above) to the meetings of the Community Liaison Group for review; and

(h) The consent holder shall make the complaints and response log available to the Consent Authority on request.

117. The Community Liaison Group ~~if established in accordance with condition 116~~ shall meet as decided by members of the ~~committee~~Group during both the construction and post construction of the scheme to receive and deal with any feedback or complaints from affected members of the local community.

118. The consent holder shall provide the Community Liaison Group with a copy of all environmental monitoring reports once they have been completed. The reports shall be submitted to the Community Liaison Group at the same time as they are submitted to the Consent Authority.

119. During construction of the scheme the consent holder shall ensure that independent social monitoring is undertaken. Social monitoring shall include interviews with residents and community members within the vicinity of the scheme. The interviews shall be undertaken once every six months during the construction period and a report shall be prepared. The consent holder shall submit a report outlining the results of the social monitoring to the Consent Authority and Community Liaison Group along with an action plan of how the consent holder intends to mitigate the concerns raised. The report and plan shall be submitted not later than four weeks after it is prepared.

Southern Tributaries

120. The consent holder shall ensure that it does not modify the low flow regime of Walkers Stream, or Mill Stream during construction or operation of the scheme. For the purposes of this condition low flow shall be considered to be any flow below the median flow. The regime shall be monitored during construction by gauging stations immediately upstream and downstream of the canal as specified by condition 38.

121. The consent holder shall use reasonable endeavours to ensure that existing water flows into Mill Stream and Walkers Stream are not disturbed or affected by the construction of the scheme.

122. The consent holder shall continue to monitor all permanent gauging stations used to derive the relationships ~~derived~~ in accord with conditions 38 and 39 during the construction and operation of the scheme, and

supply that information to the Consent Authority in electronic format on a daily basis.

123. The consent holder shall ensure that all construction work affecting Mill Stream and Walkers Stream is conducted and completed between 1 November and 15 April.

Groundwater Management

124. During the construction period the consent holder shall implement the mitigation and monitoring regime as described in condition 49.

125. Where reporting and/or monitoring (including Complaint Logs in accordance with condition 127) are required to be undertaken by the consent holder then unless specifically stated elsewhere, the consent holder shall supply such information to the Consent Authority on a monthly basis.

126. In addition, for each de-watering discharge point the following records shall be kept:

(a) Daily records of the peak and average discharge flow;

(b) A description of the discharge point; and

(c) A daily field measurement of the discharge water quality to determine the pH, electrical conductivity and turbidity of the discharge.

127. The consent holder shall establish a Groundwater Complaints Log. This log will operate throughout the construction period and record complaints or concerns which are related to changes in groundwater conditions or changes in surface waterways due to groundwater activities and the subsequent response actions taken by the consent holder.

128. The consent holder shall analyse the groundwater monitoring data. The analysis shall be provided to the Consent Authority and should identify:

(a) A comparison with the measurements made before the construction activities commenced;

(b) Comparison with measurements made outside of the areas that could be affected by the scheme activities.

129. The consent holder shall implement mitigation measures as described within the Groundwater Management Plan if the following triggers are breached during the construction period:

(a) A breach of the 'natural' range of fluctuations in the groundwater monitoring network ~~set out~~estimated in accord with condition 57(b) ~~above~~; or

(b) A discharge of a quality that is likely to cause abnormal exceedance or variances of existing levels of pH, electrical conductivity, alkalinity, E.Coli, Chloride, Nitrate-N, Nitrite-N, Ammonia-N, Total-N, Dissolved Reactive Phosphorous, Total Phosphorous and Arsenic in the receiving environment, as determined by the discharge quality

measurements that are undertaken as part of the water quality monitoring detailed in conditions 54 and 126; or

(c) In the event that a complaint related to credible groundwater effects is received.

130. If the consent holder receives a credible complaint related to groundwater effects and the nature of that complaint is such that an existing domestic or stockwater supply has been interrupted, the consent holder shall take all reasonable and necessary steps to immediately restore that supply or provide an alternative suitable supply of a standard that is of similar or better quality and quantity.

131. Following the construction period and prior to commencement of operation of the scheme the consent holder shall prepare a report for the Consent Authority detailing the groundwater monitoring that has been undertaken, the effects created by the construction activities and the mitigation measures that have been implemented. This report shall include all data collected as well as the recommendations as to the following:

(a) The future monitoring requirements;

(b) The trigger levels to be used during the operation of the scheme for determining any adverse effects on the groundwater system, or on those who rely on it;

(c) The mitigation measures to be maintained or implemented during the operational phase of the scheme.

132. The consent holder shall appoint an expert groundwater peer reviewer for the duration of the construction period associated with the scheme. The peer reviewer shall be nominated and appointed by agreement between the consent holder and the Consent Authority (and be the same person in accordance with condition 50). The groundwater peer reviewer may be called upon for determining any claim that changes to ground water conditions arising from scheme construction have caused a breach of the natural range of groundwater fluctuations whereby that breach removes or dewaters an existing well or groundwater take, or has caused an abnormal exceedance of existing levels of those values referred to in conditions 57 and 129 within the area defined within condition 51.

Process for the Assessment of Claims

133. If the Consent Authority is notified of an adverse effect of the nature specified in condition 127 by the owner of an existing well or groundwater take (claimant) within the area defined by condition 51, or it has been necessary for the consent holder to take remedial action in accordance with condition 130, then:

(a) The Consent Authority (or a suitably qualified nominee) and the consent holder (or a suitably qualified nominee) shall undertake a joint inspection of the affected site;

(b) If the Consent Authority forms the view that there are reasonable grounds for the claim and that the effect may be a result of the exercise of this consent, the Consent Authority shall formally notify the claimant that the consent holder will either remedy the adverse effect if that has not occurred already or invite the claimant to refer the claim to the groundwater peer reviewer;

(c) If following assessment the groundwater peer reviewer concludes that the claimed breach or exceedance was caused by the scheme construction then the consent holder shall take steps to remedy the breach or exceedance at its own cost if it has not done so already;

(d) For the purpose of this condition the findings of the groundwater peer reviewer shall be binding to both parties;

(e) The consent holder may, instead of undertaking any remedial work or completing the assessment process, choose to negotiate with the claimant to undertake or pay the cost of those remedial works directly to the claimant, or otherwise reach agreement with the claimant in respect of any damage;

(f) For the purpose of this condition, remedy shall include a water supply of similar, or better quality ~~or~~and quantity as determined by the groundwater quality monitoring in conditions 57 and 129;

(g) If the groundwater peer reviewer concludes that the claimed breach or exceedence was not caused by the scheme construction then the consent holder shall not be required to take remedial action. If remedial action has already been implemented in accordance with condition 130, then all reasonable costs associated with remedy shall be reimbursed to the consent holder by the claimant.

134. The consent holder shall ensure that in the event that there is any discharge required for remediation purposes, the discharge shall be strictly limited to that needed to remedy any breach or exceedance identified in accordance with conditions 129 or 130.

135. ~~Should disagreement arise in relation to the remedial actions proposed or undertaken in accordance with conditions 133(e) - (g) t~~The Groundwater Management Plan shall set out procedures to resolve any ~~such~~ disputes that may arise in relation to the remedial actions proposed or undertaken in accordance with conditions 133(e) - (g).

Aquatic Ecology - Main Stem

136. The consent holder shall be responsible for the implementation of the Aquatic Ecology Management Plan throughout the construction and operation of the scheme, and its regular review as appropriate. Any review of the Aquatic Ecology Management Plan shall be completed to the satisfaction of the Consent Authority to ensure that it meets the objectives set out in condition 58.

137. During the in-river construction works the consent holder shall conduct the following monitoring:

(a) Abundance and distribution of benthic macroinvertebrates, periphyton and fish;

(b) Water quality, including clarity, electrical conductivity, dissolved oxygen, pH, Nitrate/Nitraite-Nitrogen, Ammonia-Nitrogen, Total-Nitrogen, Dissolved Reactive Phosphorous, Total Phosphorous and suspended sediment.

138. The consent holder shall ensure that the monitoring required by condition 63(a)–(c) is undertaken:

(a) In November, February, and May of each year or as close as possible to these months should high flows prevent effective sampling over these months, for benthic macroinvertebrates, periphyton and fish.

(b) In November, February, May and August of each year or as close as possible to these months should high flows prevent the effective sampling over these months for water quality.

139. The consent holder shall ensure that the monitoring in condition 63(a)–(c) throughout the construction period is undertaken at the sites listed in condition 65.

140. During the in-river construction works the consent holder shall undertake an annual drift dive survey of the salmonid population at the sites listed in condition 66.

141. During the in-river construction activities the consent holder shall undertake continuous water temperature monitoring at the following sites along the Wairau River:

(a) Either at The Wash bridge or at the Scheme intake site;

(b) A site downstream of the Wairau power station;

(c) A site known as 'Marchburn' located just upstream of the Power Station 5 tailrace confluence;

(d) A site approximately 1km downstream of the Power Station 5 tailrace confluence;

(e) The Scheme canal ~~water~~ in the immediate vicinity of Power Station 5.

142. The consent holder shall ensure that the results from the monitoring undertaken in accordance with conditions 137-141 are analysed and submitted to the Consent Authority.

143. The contingency actions contained in the Aquatic Ecology Management Plan are to be implemented if the analysis of the information gathered from the monitoring undertaken in accordance with conditions 137–141 shows that the triggers set out in Condition 59 have been breached.

River Birds

Management Plan

144. Prior to commencement of operation of the scheme, the consent holder shall prepare a Black-fronted Tern and Black-billed Gull Work Plan and Programme for the first five years of scheme operation. The Black-fronted Tern and Black-billed Gull Work Plan and Programme shall be a rolling five year plan which is revised annually to update research, monitoring and work obligations for the life of the Scheme and it shall include an annual work programme. The need for this work plan and programme shall be reviewed at five yearly intervals. The Black-Fronted Tern and Black-Billed Gull Work Plan and Programme shall incorporate, but not be limited to, the following provisions:

(a) The objectives of the Black-Fronted tern and Black-Billed Gull Work Plan and Programme shall be to:

(i) Monitor and assess the effects of the scheme and associated management actions on river birds, particularly Black-Fronted Terns and Black-Billed Gulls;

(ii) Ensure that good quality breeding and foraging habitat is retained within the Wairau River environment for Black-Fronted Terns and Black-Billed Gulls;

(iii) ~~Ensure that~~Reduce mortality at nests of Black-Fronted Terns and Black-Billed Gulls~~ does not increase as a result of the scheme~~;

(iv) Improve knowledge and techniques for management of Black-Fronted Terns and Black-Billed Gulls.

(b) The Work Plan and Programme shall contain the methods for estimating Black-Fronted Tern, Black-Billed Gull and other river bird abundance and distribution on the Wairau River during the breeding season using data collected in accordance with condition 71;

(c) An appropriate five year monitoring and work programme outlining methods shall include (but not be limited to):

(i) The type and timing of monitoring of aquatic invertebrates and fish (including Dwarf Galaxias (*Galaxias divergens*)), including monitoring during the October to January (inclusive) bird nesting season, and the means by which data shall be incorporated into the analysis of food supplies and feeding by Black-Fronted Terns and Black-Billed Gulls.

(ii) Methods for identifying any biologically significant difference between pre-scheme and post-scheme breeding success and populations of Black-Fronted Terns and Black-Billed Gulls. These methods shall include assessments of the fledging success of Black-Fronted Terns and Black-Billed Gulls within and outside the diversion reach and shall include the use of a biostatistical expert to determine whether there has been a biologically significant change in fledging success.

(iii) Predator control that is required to be implemented in the scheme diversion reach of the river in order to assist in meeting the objectives of the Black-Fronted Tern and Black-Billed Gull Work Plan and Programme set out in condition 144(a).

(iv) Methods for managing any reduction in the population and/or breeding success (including fledgling success) of the Black-Fronted Tern and Black-Billed Gulls, as a result of the scheme including but not limited to aquatic food availability, flow management, predator control, habitat enhancement including shrub weed removal at known breeding sites, and the means by which the consent holder will implement these methods.

(v) The reporting obligations of the consent holder during operation to detail the monitoring that has been carried out, the effects created by the scheme, the mitigation measures that were implemented and the cost of implementing the monitoring and mitigation measures.

(d) The work plan and programme shall set out the projected costs of implementing the five year monitoring and mitigation measures.

(e) The work plan and programme shall set out the details of the annual work programme to be implemented in the following year including the projected costs of implementing the programme.

(f) The consent holder shall investigate the efficacy of a public awareness and education campaign aimed at raising awareness of the conservation status of Black-Fronted Terns and Black-Billed Gulls in the Wairau River Catchment.

(g) The Black-fronted Tern and Black-billed Gull Work Plan and Programme shall incorporate an obligation on the consent holder to establish and implement predator control for the habitat of the birds within the scheme diversion reach of the Wairau River, from October to January each year.

Advice note:

For the purposes of these conditions:
A biologically significant difference for Black-Fronted Terns is a negative growth rate, as estimated from pre-scheme and post-scheme bird counts. One approach for estimating population growth rate would be to use general linear models. However, the final method will be confirmed with a biostatistician, in consultation with the Department ~~O~~of Conservation and stakeholders.

For Black-Billed Gulls, a biologically significant difference in population size is defined as a negative growth rate which is greater (steeper decline) than the existing (negative) growth rate for Black-Billed Gulls. The rationale for this is that because Black-Billed Gulls are currently declining, monitoring should aim to detect further decline, beyond that which is already occurring.

A biologically significant difference for Black-Fronted Tern and Black-Billed Gull breeding success is defined as a fledgling success rate less

than that determined through pre-scheme research and monitoring studies.

145. Prior to the commencement of the operation of the scheme and annually thereafter the consent holder shall submit the Black-Fronted Tern and Black-Billed Gull Annual Work Plan and Programme to an expert peer review panel. The panel shall consist of two appropriately qualified avifauna experts, one nominated by the consent holder and one nominated by the Department of Conservation. The panel shall be assisted by a mutually agreed biostatistical expert. In undertaking the review the expert panel shall have regard to, but not be limited by, the purposes and objectives of the plan and the provisions ~~criteria (a) to (f)~~ set out in condition 144.

146. Prior to the commencement of operation of the scheme the consent holder shall forward the Black-Fronted Tern and Black-Billed Gull Work Plan and Programme to the Consent Authority for approval. A report of the expert panel on the efficacy of the work plan and programme shall form part of the documentation submitted to the Consent Authority.

147. In the event that the expert peer review panel cannot agree as to the appropriate course of monitoring and measures required, each expert shall submit their preference to the Consent Authority who shall then make the final decision as to which programme of works and monitoring will be required during the operation of the scheme. The Consent Authority may seek such independent expert advice as it thinks fit to assist in its decision making.

148. The consent holder shall be responsible for meeting the costs of the approved monitoring and management measures included in the Black-Fronted Tern and Black-Billed Gull Annual Work Plan and Programme and the annual work programme provided that:

(a) The maximum amount payable over the term of the consent shall not exceed $3 million (the amount outstanding at the end of each year shall be adjusted by an amount equivalent to the increase in the Consumer Price Index);

(b) In the event that the $3 million referred to in 148(a~~d~~) has been fully expended and Black-fronted Tern numbers are in decline as a direct result of the operation of the scheme determined in accordance with condition 217, a further $1 million will be made available (adjusted annually by an amount equivalent to the increase in the Consumer Price Index);

(c) The maximum amount of funding to be made available in any single year shall not exceed $200,000 (adjusted annually by an amount equivalent to the increase in the Consumer Price Index).

Advice Notes:

1. *The purpose of condition 144(c)(i) shall be to evaluate habitat retention for Deleatidium mayfly (Waitaki) and ensure that the desired minimum 80% habitat retention for Deleatidium mayfly (Waitaki) assessed as a monthly median averaged over the*

diversion reach of the Wairau River from 1 October to 31 January is being achieved.

2. *As a general principle the amount to be made available annually for implementation of the measures specified in condition 148(c) shall exceed the amount to be used on monitoring and research.*

3. *For the avoidance of doubt, the consent holder's financial liability under condition 148 in terms of funding to be made available for the Black-fronted Tern and Black-billed Gull Annual Work Plan and Programme shall not exceed $4 million over the term of the consent (provided that the amount outstanding at the end of each year shall be adjusted by an amount equivalent to the increase in the Consumer Price Index).*

Terrestrial Vegetation and Wetlands Management

149. The consent holder shall during the construction period implement the requirements of the Vegetation Management Plan. Monitoring conducted to give effect to this management plan shall include the following measures:

(a) Routine monitoring of the sub-set of three Impact Bush Sites and one Control Site;

(b) Routine monitoring of ~~all~~ wetland sites, willows and two of the Control Sites;

(c) Routine monitoring shall be undertaken at six monthly intervals over the course of the construction phase;

(d) Routine monitoring shall also include monthly piezometer readings at all monitoring sites;

(e) Routine monitoring shall include single wetland specific one-off surveys involving a single pre and a single post construction sampling run at the wetland sites when canal excavations occur in their immediate vicinity.

150. (a) In the event that monitoring undertaken in accordance with conditions 149 shows ~~the following effects have occurred~~ a deterioration in the Vegetation Health Indices (as specified in the Vegetation Management Plan) ~~and these effects are, in the opinion of~~the consent holder shall appoint an expert peer reviewer ~~appointed by the consent holder,~~to determine if the effects are attributable to the construction or operation of the scheme~~., then the consent holder shall implement the contingency responses outlined in condition 150(b):~~

~~(i) Obvious dieback in the canopy of any of the stands of indigenous vegetation within the wider Scheme footprint, as may be observed over the course of the route monitoring surveys, or otherwise reported by the local community; or~~

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~~(ii) Greater than 10% dieback of indigenous canopy along any of the 3 transects at any one monitoring site; or~~

~~(iii) Greater than 10% mortality of key understorey indigenous species within all 3 plots along any one transect; or~~

~~(iv) Discolouration and/or wilt of leaves in more than 25% of the indigenous vegetation within all 3 plots along any one transect; or~~

~~(v) Mortality of greater than 10% of indigenous wetland plants (recorded by tier and species) as evidenced by direct observation of dead vegetative material; or~~

~~(vi) A reduction in the species diversity of indigenous wetland plants of greater than 10%; or~~

~~(vii) Significant decrease in the size of the indigenous part of the wetland (greater than 10%); or~~

~~(viii) Replacement of greater than 10% of indigenous wetland species by terrestrial or weed species.~~

~~(c)~~(b) If the expert reviewer considers the effects to be attributable to the scheme ~~T~~the consent holder shall, in consultation with the Consent Authority, prepare and implement an appropriate contingency response plan in accordance with the Vegetation Management Plan. ~~The contingency response plan may include the following:~~

~~(i) Supplying water to the affected stands on the south bank directly from the canal to the extent that the observed health decline is halted;~~

~~(ii) Supplying additional water to affected stands on either the south bank or the north bank by excavating around spring discharge areas to enhance the hydraulic efficiency of the spring outlet;~~

~~(iii) Supplying additional water to affected stands on the south bank or the north bank by excavating deeper inverts within existing tributary streams to provide enhanced inflows to affected areas under lowered water table conditions;~~

~~(iv) Supplying additional water to affected stands on the south bank or the north bank by works at the confluence of north bank tributaries with the Wairau River.~~

~~(v) If necessary and practicable, the translocation of affected plants to a safe area.~~

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OPERATIONAL

Fish Screen, Barrier and Bypasses

151. The consent holder shall operate, maintain and monitor the fish screen, ~~and~~ fish barriers and bypasses ~~in accordance with condition 104~~to ensure the objectives stated in condition 20 are achieved.

152. In the first year of operation of the Scheme the consent holder shall prepare and submit quarterly monitoring reports as to the effectiveness of all aspects of the fish screening and barrier systems, including the size of the screen to the Consent Authority. Each monitoring report shall be submitted to the Consent Authority no later than 4 weeks following its completion. The monitoring reports shall include an evaluation by an independent expert of the effectiveness of all aspects of the fish screening and barrier systems, including the fish screen size.

Dam Safety and Surveillance Management Plan During Operation

153. The consent holder shall ensure that inspections and safety reviews of structures shall be carried out in accordance with the recommendations of the NZSOLD Guidelines.

154. The consent holder shall provide affected residents or landowners with at least one weeks notice prior to carrying out any planned maintenance work associated with the scheme that may affect them.

Community Liaison Group and Complaints Procedure

155. The Community Liaison Group referred to in condition 33 shall meet as required by condition 117.

156. The consent holder shall provide the Community Liaison Group with a copy of all environmental monitoring reports once they have been completed. The reports shall be submitted to the Community Liaison Group at the same time as they are submitted to the Consent Authority.

Southern Tributaries

Mill Stream /Walkers Stream

157. The consent holder shall ensure that it does not modify the low flow regime of Walkers Stream or Mill Creek during operation of the scheme. For the purposes of this condition low flow shall be considered to be any flow below the median flow. The regime shall be monitored by gauging stations immediately upstream and downstream of the canal.

158. The consent holder shall use reasonable endeavours to ensure that existing water flows into Mill Creek and Walkers Stream are not disturbed or affected by the operation of the scheme.

159. The consent holder shall continue to monitor all permanent gauging stations used to derive the relationships derived in conditions 38 and 39 during the operation of the scheme, and supply that information to the Consent Authority in electronic format on a daily basis.

160. The consent holder shall compare monitored flow data at Walkers Stream and Mill Creek with the predicted derived relationships on an ongoing

basis to determine whether flow regimes have been affected by the scheme operation and report to the Consent Authority on a monthly basis.

161. In the event that low flows at the downstream monitoring sites are lower than the flows predicted by the derived relationships the consent holder shall release sufficient water from the canal to Mill Stream to maintain the natural low flow regime as determined under conditions 38 and 39. Such a release of water shall be via a vegetated swale, sufficient to ensure no decrease in water quality or clarity in the receiving stream.

162. The consent holder shall ensure that any discharge from the canal into Mill Stream is discharged via the vegetated swale at a point as close as practicable to the Canal.

163. The consent holder shall keep records of all recorded and predicted data, and of any releases ~~to~~of water, and make these available to the Consent Authority on an annual basis (following data audit) for verification. Daily data will be made available in an electronic format as required by condition 159.

Vegetated Swale

164. In the event that the consent holder is required to convey water from the Canal into Mill Stream in accordance with condition 161, the consent holder shall convey the required water via a vegetated swale constructed by the consent holder at its cost in general accordance with the following:

(a) Be fenced with a standard six wire fence along both sides of its length where it traverses through land used for farming;

(b) Be formed and vegetated prior to the commencement of the operation phase of the scheme;

(c) Be maintained (either mechanically or by grazing of sheep only - not cattle) at least once per year to ensure that excessive vegetation does not cause flooding of the adjacent farm land and so that an unimpeded flow of water along the swale can occur at all times.

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Use of Emergency Spillways

165. Where practicable, the consent holder shall notify Ormond Aquaculture Limited not less than 24 hours prior to using the Emergency Spillways within the Mill Stream catchment. Where it is not practicable to do so the consent holder shall notify Ormond Aquaculture Limited immediately upon the use of such emergency spillways.

Monitoring of Water Quality in Mill Stream / Walkers Stream

166. For a period of two years following the commencement of the scheme operation, the consent holder shall at its own cost conduct water quality monitoring in Mill Stream and Walkers Stream in accordance with the methodology established under condition 46.

167. The consent holder shall report the results of the monitoring conducted under condition 166 to the Consent Authority, with a copy being made to

Ormond Aquaculture Limited and Nelson Marlborough Fish and Game Council to determine whether any observed changes result in an adverse effect on water quality.

168. In the event that the results of the monitoring under condition 166 show the quality of the water has deteriorated the consent holder shall immediately and, at its own cost, appoint an appropriately qualified independent expert:

(a) To identify the cause of the deteriorated water quality; and

(b) In the event the expert concludes that the scheme has caused the deterioration of the water quality, to provide recommendations for remedial action to return the water quality to the baseline standard.

169. In the event that the independent expert's assessment concludes that the scheme has caused the deterioration in water quality in Mill Stream and Walkers Stream the consent holder shall forthwith undertake the recommended remedial action to return the water quality to the baseline water quality standard.

170. The consent holder shall ensure that no herbicide is applied to the water being conveyed in Canal 8A (being the reach of canal that traverses Mill Stream).

171. The consent holder shall monitor fish passage at the Mill Stream culvert within Canal 8A and shall ensure that fish passage is maintained to the satisfaction of the Consent Authority.

Upland Bully Monitoring

172. At five yearly intervals in November the consent holder shall monitor upland bully presence in Saltwater, Hillersden and Walkers tributaries upstream of the flumes which intersect with the canal. In the event that upland bully is not present, and that event coincides with a known period of drought then in the following spring the consent holder shall transfer rocks with upland bully egg masses and adults of both sexes into that tributary reach to assist recolonisation.

Flow Regime

173. The consent holder shall cease abstraction from the Wairau River intake once the flow rates in the Wairau River exceed 200m^3/s as measured at The Wash bridge recorder site.

174. The consent holder shall cease abstraction from the Wairau River intake when the flow in the Wairau River measured at the Wash Bridge is below 10m^3/s.

175. The consent holder shall cease abstraction from the Wairau River intake when the flows in the Wairau River measured at the permanent flow monitoring station installed in the Wairau River immediately downstream of Power Station 5 (pursuant to condition 182(c)) is below 14m^3/s.

176. The consent holder shall ensure that the scheme operation is such that the minimum residual flows in the Wairau River below the scheme intake (as derived by differencing the flows as measured at The Wash bridge recorder site and the take to the scheme) accords with the following:

(a)	January - July	10m³/s
(b)	August	12m³/s
(c)	September	15m³/s
(d)	October - November	20m³/s
(e)	December	15m³/s

Provided that when the natural instantaneous flow immediately upstream of the Wairau intake is less than the flows detailed in condition 17660 (a) to (e) above the residual flow shall be equal to the natural instantaneous flow immediately upstream.

Flow Sharing 1st October to 31st January

177. During the period 1st October to 31st January, the consent holder shall adhere to an additional flow sharing regime to that imposed via condition 176. This flow sharing regime shall apply whenever the Wairau River flows at The Wash bridge recordered site exceed the following flows:

(a)	October – November	25m³/s
(b)	December	20m³/s
(c)	January	15m³/s

This flow sharing obligation shall only apply to that portion of the flow that passes The Wash bridge recorder that exceeds the flow (a) – (c) above. When the flows in (a) – (c) above are exceeded the consent holder shall ensure that the minimum total flow in the Wairau River immediately below the Goulter River confluence equals the residual flows in condition 176 plus one third of any of the flow above the limits in (a) to (c) above.

The total Wairau River flow immediately below the Goulter confluence shall be derived by totalling the following:

(i) Wairau River residual flow at the scheme intake (as derived by differencing the flows measured at The Wash bridge recorder site and the take to the scheme)

(ii) Branch River residual/spill flow.

(iii) Wairau Power Station tailrace discharge flow.

(iv) Goulter River flow.

Monitoring

178. The total flow data measured ~~at the tailrace~~ in accordance with condition 177 shall be recorded at hourly (average) intervals and forwarded

electronically to Marlborough District Council's website twice daily at 12 hourly intervals. The information provided to the Consent Authority shall include all flows (i) to (iv) above and the total of all flows being the derived total Wairau flow immediately below the Goulter River confluence.

~~*Advice Note*~~

~~*For the avoidance of doubt, provided that the residual flows in conditions 177 are met, this condition shall not require the consent holder to release further flow into the Wairau River where the additional one third flow above the levels in condition 177 (a) to (c) is met immediately below the Goulter River confluence using the method for deriving total flow set out below including, but not limited to, the inflow from the Goulter River.*~~

~~*The flow sharing regime established under condition 177 is intended to provide at least 80% habitat retention for Deleatidium mayfly (Waitaki) assessed as a monthly median average over the diversion reach of the Wairau River from 1 October to 31 January.*~~

179. The consent holder shall ensure that the scheme operation is such that the minimum residual flows in the Wairau River immediately upstream of the Power Station 5 discharge as derived by differencing the flows as measured at the Wairau River recorder (as described in Condition 182(c)) and the Power Station 5 discharge shall accord with the following:

(a)	January - July	15m³/s
(b)	August	17m³/s
(c)	September	20m³/s
(d)	October - November	25m³/s
(e)	December	20m³/s

Provided that when the natural instantaneous flow immediately upstream of the Wairau River intake is less than the flows detailed in condition 179(a) – (e) above the residual flow shall be equal to the natural instantaneous flow immediately upstream of the Wairau intake plus 5m³/s.

Advice Note:
The flows referred to in condition 179 are net of all other consented abstractions in the ~~affected~~diversion reach consented prior to the lodgement of TrustPower's application.

180. In the event that the flows in condition 176 are not realised, a top-up flow will be released from the ~~existing~~ Wairau Power Station tailrace or via the tailrace from the regulating pond located below the ~~existing~~ Wairau ~~P~~power ~~S~~stations to achieve the required minimum flow in condition 176. When the Wairau River Intake is closed, however, top up flow shall not be less than the instantaneous flow abstracted by the Branch Hydro Electric Power Scheme (as measured by the Branch River de-silting basin discharge weir).

181. The consent holder shall undertake gauging checks in the ~~affected~~diversion reach of the Wairau River once the scheme is

operational over a range of flow conditions to confirm that the flows required by conditions 176 and 179 are consistently achieved. These gaugings are to be undertaken quarterly until a stable relationship is derived:

(a) Upstream and downstream of the Wairau River Intake

(b) Upstream of Hillersden

(c) Upstream of Wairau Valley

(d) Immediately upstream of the Power Station 5 discharge.

182. The consent holder shall ensure that the following monitoring equipment is installed, maintained and monitored to the satisfaction of the Consent Authority. The consent holder shall prepare a map showing the location of the equipment and shall install the equipment in the locations shown on the map or within 100m of those locations.

(a) Existing hydrological monitoring at the Branch Hydro Electric Power Scheme shall be continued to enable the accurate calculation of flows from the Branch River intake on a real time basis;

(b) A generation flow versus station generation (cumecs per MW) relationship and its variability under differing headwater and tailwater conditions shall be maintained and established for Power Station 5 such that station flow can be accurately derived in real time;

(c) A permanent flow monitoring station shall be installed in the Wairau River immediately downstream of the Power Station 5 discharge to measure the total flow in the river; ie the sum of the residual flow upstream of Power Station 5 and the Power Station 5 discharges. The consent holder shall ensure that regular gauging of the residual flow (quarterly and following freshes) upstream of the Power Station 5 discharge is carried out to confirm compliance;

(d) Headwater and tailrace level gauges shall be installed to calculate the observed head differential for use in the calculation of generation flow; and

(e) Relocation or reinstatement ~~levels~~ of the Narrows (site 60119) water gauge currently used for flood warning purposes by the Consent Authority to provide a midpoint indication of the water level and flow response between Marchburn and Tuamarina. This site is not to be rated.

(f) A permanent flow monitoring station shall be installed in the Goulter River.

183. The permanent flow monitoring site to be installed by the Consent Authority at The Wash bridge will be used by the consent holder as an indicator of the total flow upstream of the Wairau River intake. The consent holder shall upgrade the telemetry at the Dip Flat site to act as a backup site, and shall ensure that the flow relationships between all three sites (Dip Flat, The Wash bridge and the Wairau River intake) are kept up to date. The consent holder shall ensure that regular gauging of the residual flow (quarterly and following freshes) downstream of the intake is carried out to confirm compliance.

Advice Note:
Any upgrade of the Dip Flat recorder shall be undertaken in accordance with the provisions of condition 2236.

184. The consent holder shall continuously monitor (or derive by difference) the residual flow of the Wairau River in accordance with conditions 176 and 179. The monitoring shall be in real time and the residual flows data shall be recorded at hourly (average) intervals and forwarded electronically to the Marlborough District Council's website twice daily (at 12 hour intervals).

Power Station 5

185. The consent holder shall ensure that if and when instantaneous flows in the Wairau River fall to 15.5m^3/s as measured at Tuamarina, Power Station 5 will be operated at all times to ensure that the magnitude of the flow fluctuations at Tuamarina will be no greater than ±10% about the rolling 24 hour average flow measured at Tuamarina.

186. The consent holder shall ensure that whenever the 24 hour rolling average inflow to Power Station 5 exceeds 5m^3/s the discharges from Power Station 5 are operated at all times to ensure that the minimum discharge (base flow) does not fall below 50% of the 24 hour rolling average inflow.

187. The consent holder shall ensure that Power Station 5 is operated to ensure that the discharge from it does not exceed a maximum ramping rate of 20m^3/s per hour.

188. On one occasion per calendar year from the commencement of operation the consent holder shall manage the discharge from Power Station 5 such that the discharge occurs on a steady state basis for a continuous 24 hour period to enable the Consent Authority to undertake state of the environment aquifer monitoring within the lower reaches of the Wairau River catchment as follows;

(a) The steady state discharge shall occur when flows as measured at Tuamarina are less than 50m^3/s and the daily average river flow has been in a natural decline for a minimum of 7 days.

(b) In order to provide a variety of monitoring opportunities, the steady state discharge shall occur within two different flow ranges in alternate years in one year in flows below 25m^3/s as measured at Tuamarina, and in the following year in flows between 25m^3/s and 50m^3/s as measured at Tuamarina.

(c) For the 24 hours previous to, and during the steady state discharge, the residual flows at the Wairau River and Branch River intakes shall be maintained at a constant rate.

(d) The consent holder shall provide not less than 72 hours notice to the Consent Authority that the steady state discharge from Power Station 5 is to occur subject to the river flow remaining in a state of natural decline.

(e) The steady state discharge shall commence between 12am and 5pm on the date advised, and continue for at least 24 hours.

(f) The commencement of the steady state discharge shall not be scheduled to occur on a Friday or Saturday, except with the specific approval of the Consent Authority.

(g) In the event that the steady state discharge is interrupted by rising river levels, or other scheme operational issues which cause the discharge flows to fall outside of the definition below, the Consent Authority may require the consent holder to repeat the steady state discharge.

Advice Note:
"Steady State discharge, in the context of this condition, shall mean that the discharge flow from the station shall be maintained within a range of ±10% or ±1m^3/s as measured by the flow discharge device at the outlet of Power Station 5, which ever is the lesser."

Northbank Tributaries

189. ~~The consent holder shall monitor, at least once per month during May – August (inclusive), and thereafter once every four months the connection between the Wairau River and its major northbank tributaries to ensure that flow connection is maintained and not interrupted by the formation of a gravel obstruction. In those circumstances where such obstruction occurs then the consent holder shall carry out remedial works to remove the obstruction to the satisfaction of the Consent Authority. For the purposes of this condition the north bank tributaries to be monitored are; Goulter River, Top Valley Stream, Timms Creek/Cat Creek, and Fabians/Bartletts Creek.~~

The consent holder shall monitor the connection between the Wairau River and Goulter River, Top Valley Stream, Timms Creek/Cat Creek and Fabians/Bartletts Creek to ensure flow connection is maintained and not interrupted by either the formation of a gravel obstruction or reduced surface water flows:

(a) Monitoring shall be carried out at least once a month during May – August (inclusive) in periods of low flow and once every four months for the remainder of the year;

(b) The consent holder shall submit the results of the monitoring to the Consent Authority with seven days of completion of the monitoring;

(c) In the event that the monitoring shows that connectivity between any of the monitored tributaries and the Wairau River has been lost, the

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consent holder shall immediately prepare and submit to the Consent Authority for approval a plan for restoring the lost connection and seek any necessary consents for its implementation;

(d) Having obtained the Consent Authority's approval and any necessary resource consents the consent holder shall immediately implement the plan in (c) to the satisfaction of the Consent Authority.

Spill Ways

190. The consent holder shall ensure that back up power systems or fail safe overrides are in place at critical locations being the isolating gates, to maintain key functions of the scheme operation at all times.

191. In the event that there is spill from an emergency spillway, the consent holder shall:

(a) Keep records of any spills that occur and responsive actions, and report to the Consent Authority where spills have caused damage and have required reparation;

(b) Maintain spill maps showing inundated areas and provide spill maps to the Consent Authority on request.

192. The consent holder shall ensure that the spillways and stabilising paths are inspected annually, consistent with NZSOLD requirements.

193. In the event that it is necessary to dewater the canal, the consent holder shall:

(a) Determine the rate and duration of any discharge required and, where the dewatering is via outlets other than the canal directly to the Wairau River, advise affected property owners by giving them at least 8 hours ~~of~~ notice that dewatering is to occur;

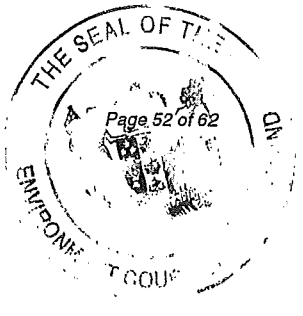
(b) Ensure that the rate and duration of discharge established in condition 193(a) will not be exceeded during dewatering of the canal;

(c) Inspect the downstream receiving waterway for any potential damage that might occur from the discharge prior to dewatering of the canal, and any effects on property or access, and put in place appropriate mitigation measures to avoid damage or nuisance;

(d) Ensure that the inspection undertaken in accordance with condition 193(c) shall be documented and the records held by the consent holder shall be supplied to any affected property owners identified in condition 193(a);

(e) Inspect the downstream receiving waterway for any damage following the dewatering of the canal event and reinstate any damage that occurs by a method agreed by the consent holder and the property owner directly affected as a result of the discharge; and

(f) During emergency situations where dewatering is undertaken, the consent holder shall use its best endeavours to achieve conditions 193(a)-(d) above.



Sediment Flushing

194. The consent holder shall ensure that sediment flushing from the sediment ponding area immediately in front of the intake ports and/or the sediment retention basin ~~adjacent to the intake into the Wairau River~~ only occurs if the following requirements are met:

(a) When the river flow is greater than 80m³/s as ~~measured~~determined immediately downstream of the intake ~~at the Wash Bridge recorder site~~ and the river hydrograph is likely to rise further (the flow is to be determined by differencing the flow as measured at The Wash bridge recorder site and the intake flow);

(b) ~~When t~~The turbidity in the river is greater than 5.6 NTU (nephielometric turbidity units) as recorded at The Wash bridge recorder site;

(c) Sediment flushing shall not occur during the period 1 May to 31 July except where necessary to avoid compromising the operation of the intake pond or the sediment retention basin. ~~The basin o~~Operation of these facilities will be deemed to be potentially compromised, and flushing will be allowed during the trout spawning season, in the event that more than 65% of the designed sediment storage capacity is filled with sediment~~.~~;

~~(c)~~(d) The intake pond and the sediment retention basin shall not be flushed simultaneously but may be flushed sequentially on the same flow event.

195. The consent holder shall keep reliable records of sediment flushing activities and, shall supply a copy of relevant reports to the Consent Authority within 48 hours of each event.

196. The consent holder shall maintain a significant river braid continuous with each sediment~~the~~ flushing outlet~~,~~ to facilitate the conveyance of the flushed sediment~~,~~ and provide for the safe passage of fish from the fish screen bypass leading from the sediment retention basin.

197. The sediment flushing channel must be separate from the fish bypass.

198. For the purpose of assessing the effects of sediment flushing, the mixing zone shall extend to the confluence of the Branch River with the Wairau River

199. Where practicable during the first year of scheme operation, the consent holder shall give advance notice to the Consent Authority and to nominated representatives of the Department of Conservation and of Nelson Marlborough Fish and Game Council of the possibility that a flushing event might occur. As soon as practicable after the decision by the consent holder to commence flushing, these parties shall be notified that flushing has commenced.

200. The consent holder shall monitor sediment flushing flows as follows:

(a) ~~During sediment flushing, the consent holder shall m~~Maintain continuous records of turbidity at ~~t~~The Wash bridge recorder site,

~~upstream end of the intake channel adjacent to the river, and~~ in the sediment flushing outlet channel and in the channel containing the major portion of the flushed sediment immediately upstream of the Branch confluence.

~~(b) For each sediment flushing event the consent holder shall calculate the time series for sediment concentration in each part of the river upstream of the intake, and in the fully mixed river flow downstream of the flushing channel.~~

~~(c)~~(b) These records ~~and calculations~~ shall be available to the Consent Authority on request within two weeks of a flushing event occurring, or on 48 hours notice at other times.

Groundwater Management

201. During the operation of the scheme the consent holder shall implement the monitoring and mitigation regime as described in condition 131.

202. Within 12 months following the commencing of the operation of the scheme the consent holder shall analyse the groundwater monitoring data. The analysis shall be provided to the Consent Authority and will identify:

(a) A comparison with the measurements made before the scheme activities commenced; and

(b) Comparison with measurements made outside of the areas that could be affected by the scheme activities.

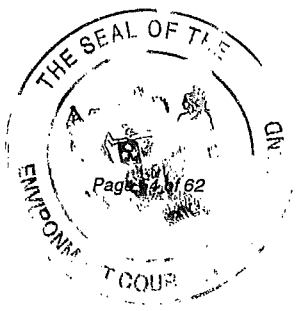
203. The consent holder shall implement mitigation measures as described within the Groundwater Management Plan if the following triggers are breached during the operation of the scheme:

(a) A breach of the 'natural' range of fluctuations in the groundwater monitoring network set out in condition 131.

(b) A discharge of a quality that is likely to cause an abnormal exceedance or variances of existing levels of pH, electrical conductivity, alkalinity, E.Coli, Chloride, Nitrate-N, Nitrite-N, Ammonia-N, Total-N, Dissolved Reactive Phosphorous, Total Phosphorous and Arsenic in the receiving environment, as determined by the discharge quality measurements that are undertaken as part of the water quality monitoring detailed in condition 131.

(c) In particular, the consent holder shall ensure that a water supply of similar, or better, quality and quantity is available to all groundwater users located within the area that is affected by groundwater changes resulting from the scheme activities, as determined by the groundwater level monitoring specified in condition 131.

(d) The provisions set out in conditions 133, 134 and 135 for assessing and addressing claims shall also be available during the operation of the scheme if there is a breach of the triggers set out herein.



204. Within six months following the first two years of operation of the scheme the consent holder shall prepare a report for the Consent Authority detailing the groundwater monitoring that has been undertaken, the effects created by the operation of the scheme and the mitigation measures that have been implemented.

Aquatic Ecology - Main Stem

205. The consent holder shall be responsible for the implementation of the Aquatic Ecology Management Plan through the operation of the scheme and its regular review as appropriate. Any review of the Aquatic Ecology Management Plan shall be completed to the satisfaction of the Consent Authority to ensure that it meets the objectives set out in condition 58.

206. During the operational phase of the scheme the consent holder shall for a period of at least three years, continue to monitor at the sites listed in condition 65 to determine:

(a) Abundance and distribution of benthic macroinvertebrates, periphyton and fish;

(b) Water quality, including clarity, electrical conductivity, dissolved oxygen, pH, Nitrate/Nitrite-Nitrogen, Ammonia-Nitrogen, Total-Nitrogen, Dissolved Reactive Phosphorous, Total Phosphorous, and suspended sediment;

(c) Water temperature.

207. In the event that the monitoring undertaken in accordance with condition 206 shows that the early warning triggers identified in the Aquatic Ecology Management Plan have been exceeded then the consent holder shall report the monitoring results to an Ecological Advisory Group (EAG) made up of three independent and suitably qualified aquatic ecologists (approved by the Consent Authority). The EAG shall determine:

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(i) Whether the recorded reduction or change is likely to be prolonged, or is a result of a natural perturbation, or a short term or unforeseen event; and

(ii) Whether the Scheme has contributed to or caused the recorded reduction or change.

(a) If in the opinion of the EAG the reduction or change is likely to have been caused by the operation of the Scheme, the EAG will recommend an appropriate contingency action which could include, amongst other things:

(i) A change to the minimum flow regime to the extent necessary to reverse the reduction or change and restore the ecological health of the affected reach of the river.

(b) The consent holder shall implement the recommendation of the EAG in accordance with condition 207 to the satisfaction of the Consent Authority. In the event that benthic invertebrates, periphyton, fish communities, water temperature and/or water

quality parameters have not been restored to levels within the trigger values identified in condition 59 in monitoring carried out subsequent to the implementation of the recommendations of the EAG, the Consent Authority may review the conditions of consent.

208. In the first year of operation of the scheme the consent holder shall monitor four sediment flushing events from the sediment retention basin to assess the effects on embeddeness on rifle habitats and water clarity. The monitoring shall be undertaken at the following sites in the Wairau River immediately before and as soon as practicable after the flushing event:

(a) A site known as 'Six Mile' located approximately 12km upstream of the bund associated with the intake for the scheme, to be used as a control site;

(b) A site known as 'Airstrip' located approximately 1 – 2km upstream of the bund associated with the intake for the scheme, to be used as a control site;

(c) A site approximately 1km downstream of the Scheme intake;

(d) A site known as 'Wairau Valley' located approximately midway between the intake for the scheme and the Power Station 5 tailrace confluence with the Wairau River;

(e) A site known as 'Marchburn' located just upstream of the Power Station 5 tailrace confluence;

(f) A site approximately 1km downstream of the Power Station 5 tailrace confluence;

(g) A site known as 'Renwick' located approximately 500m upstream of the Renwick Bridge (SH6).

209. The consent holder shall ensure that the monitoring of the sediment flushing events in accordance with condition 208 is undertaken using the black disk method to assess clarity.

210. (a) In the event that the monitoring undertaken in accordance with condition 208 shows:

(i) A 25% increase in the embeddedness of riffle habitats within the diversion reach over two consecutive monitoring occasions ~~through the diversion reach~~ relative to pre operational levels and upstream control sites; and/or;

(ii) A decrease in water clarity downstream of the diversion reach greater than 50% relative to upstream control sites;

then the consent holder shall form an Ecological Advisory Group.

(b) The ~~consent holder shall be required to form an~~ EAG shall be made up of three independent and suitably qualified aquatic ecologists (approved by the Consent Authority) to determine:

(i) whether the recorded change is likely to be prolonged or is a result of a natural perturbation, or a short term or unforeseen event; and

(ii) whether the scheme has contributed to the recorded change.

(c) If in the opinion of the EAG the change is likely to have been caused by the operation of the scheme, the EAG will recommend an appropriate contingency action which could include amongst other things:

(i) Reducing the sediment concentrations in the flushing discharge by approximately 25% by using alternative methods of disposal.

(d) The consent holder shall implement the recommendation of the EAG in accordance with condition 210(c) to the satisfaction of the ~~e~~Consent ~~a~~Authority. In the event that embeddedness and water clarity have not been restored to levels within the trigger levels identified in condition 210(a) in monitoring carried out subsequent to the implementation of the recommendations of the EAG, the ~~e~~Consent ~~a~~Authority may review the conditions of consent.

211. (a) The consent holder shall operate the Scheme to ensure that it does not cause or exacerbate conditions which impeded trout spawning migration.

(b) The consent holder shall as part of the Aquatic Ecology Management Plan include methods to ensure that trout spawning migration is not impeded as a result of the Scheme including the following requirements:

(i) Monitor the daily mean flows calculated immediately below the Goulter River confluence (derived in accordance with ~~the methodology contained in~~ condition 177) during the ~~trout spawning season~~period from 1 ~~April~~March to 30 June each year;

(ii) In the event that from 1 ~~April~~March to 30 June each year the daily mean flow falls and remains below 20m^3/s for 30 consecutive days the consent holder shall ensure that on the next fresh of 45m^3/s or more (calculated below the Goulter) the flow in the river, immediately below the Goulter confluence, is at least 45m^3/s for at least 48 hours.~~:~~

~~(a) Flows fall below 15m^3/s calculated immediately below the Goulter confluence; and~~

~~(b) Remain below 20m^3/s calculated immediately below the Goulter confluence for the following 40 consecutive days.~~

~~(iii) As soon as viewing conditions permit immediately conduct an aerial survey of the Hillersden reach to check for any groups of adult trout greater than 25 in number in a single pool in the Hillersden reach.~~

~~(iv) In the event that any groups of trout greater than 25 in number in a single pool are identified, ensure that on the next fresh of 45 cumecs or more (calculated immediately below the Goulter~~

~~River confluence) the residual flow in the river is at least 45 cumecs (calculated immediately below the Goulter River) on the recession of the fresh for at least 48 hours to facilitate adult trout spawning migration.~~

~~(v) As soon as viewing conditions permit immediately following the action set out in (iv) above, repeat the aerial survey to check whether any groups of adult trout greater than 25 in number remain in a single pool in the Hillersden reach.~~

~~(vi)~~(iii) ~~Re-implement the actions in (iv) and (v) above until such time as no groups of adult trout greater than 25 in number remain in a single pool in the Hillersden reach.~~

212. (a) In the event that nuisance periphyton growth (~~exclu~~including didymo) has occurred in the Wairau River relative to pre-operational levels and/or the control sites for two consectutive monitoring occasions, the consent holder shall ensure that when ambient river flows increase to 150m3/s as measured at The Wash bridge recorder site following an extended period of low summer flow (ie conditions under which nuisance growths of periphyton have developed), the scheme intake shall be closed or water shall be diverted back to the river via the ~~sedimentation~~intake pond for a 24 hour period.

(b) Should nuisance levels of periphyton re-establish or persist an additional flushing flow is not required sooner than six weeks following a flushing flow provided in accordance with condition 212(a) or a high flow event in accordance with condition 173.

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Advice Note:

For the purpose of this condition, a nuisance periphyton growth shall be defined as a 60% maximum cover of diatoms/cyanobacteria on the visible stream bed that is >0.3cm thick or a 30% maximum cover of filamentous algae on the visible stream bed that is >0.2cm long between 1 November and 30 April in any given year.

213. The consent holder shall notify surrounding land_owners and water abstractors of the intent to utilise herbicide control in the canal not less than four weeks in advance.

River Birds

214. Following commissioning of the scheme the consent holder shall immediately implement the monitoring and measures required by the Wairau Valley Black-Fronted Tern and Black-Billed Gull Work Plan and Programme in accordance with conditions 144 to 148. The consent holder shall continue to implement this plan for as long as such a plan is required in accordance with condition 144.

215. A report detailing the results of monitoring and management work undertaken in accordance with the Black-Fronted Tern and Black-Billed Gull Work Plan and Programme shall be reviewed by the expert panel

established under condition 145. The consent holder shall submit the monitoring and management report together with the review panel's report to the Consent Authority following the ~~for the~~ completion of monitoring in February each year by 1 May in the same year.

216. In the event that a biologically significant decline in Black-Fronted Tern and/or Black-Billed Gull population and/or fledging success is reported under condition 215 the consent holder shall instruct the expert panel required under condition 145 to advise the Consent Authority on the probable reasons for the reduction in fledging success. The expert panel shall prepare and submit a report to the Consent Authority by 31 July each year assessing whether the decline in population and/or fledging success is likely or unlikely to be a result of the scheme.

217. (a) In the event that a biologically significant decline is reported under condition 215 and unless in the opinion of the expert panel that decline is unlikely to have been caused by the scheme, the consent holder shall obtain further advice from the expert panel as to what measures should be implemented immediately in order to mitigate ~~against~~ the decline, including determining whether it is necessary to increase the minimum residual flow during the river bird nesting season.

(b) Upon the receipt of the advice from the expert panel the consent holder shall implement the recommended measures.

218. In addition to the requirements of condition 21~~7~~5 the consent holder shall instruct the expert panel to:

(a) Prepare a report outlining and assessing methods for avoiding further reductions in fledging success in the next breeding season including where appropriate, but not limited to implementation of:

(i) a permanent increase in the minimum residual flow during the river bird nesting season;

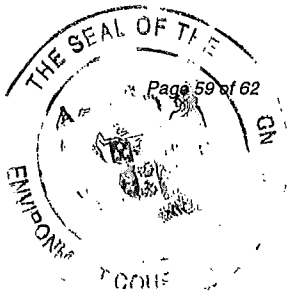
(ii) further or amended predator management techniques; and/or:

(iii) habitat enhancement measures.

(b) This report shall be submitted to the Consent Authority ~~for approval~~.

219. If in accordance with condition 21~~7~~8(a) the expert panel recommends that the minimum residual flow should be permanently altered then a review of the conditions of consent by the Consent Authority shall be undertaken in accordance with condition 22~~6~~30. If a review is conducted in accordance with condition 22~~6~~30, the consent holder shall continue to implement the measures required by condition 21~~7~~8 during the river bird nesting season for the duration of the review period.

220. The consent holder shall place and maintain annually during the period 1 October to 31 January at public access points on the diversion reach as defined in the Annual Work Plan and Programme, appropriate signs advising of the Black-Fronted Tern and Black-Billed Gull nesting colonies and of the importance of avoiding disturbance to birds during the nesting season. This shall be completed in consultation with the Department of Conservation.



Advice Note:

For the purpose of these conditions fledging success means the percentage of eggs laid that produce a fledged chick.

Terrestrial Vegetation and Wetlands Management

221. The consent holder shall implement the requirements of the Vegetation Management Plan throughout the operation of the scheme. Monitoring shall be undertaken in accordance with the management plan and include:

(a) Routine monitoring of the sub-set of three Impact bush sites, as well as ~~all~~three wetland sites, ~~willows~~ and two control sites.

(b) Routine monitoring shall include monthly piezometer readings at all monitoring sites.

222. The consent holder shall monitor Vegetation Health Indices and ~~undertake Photo Surveys~~implement contingency actions if required in accordance with the Vegetation Management Plan. ~~This monitoring shall be undertaken at 6 monthly intervals for an 18 month period following the commissioning of the Scheme.~~

~~223. Following the initial 18 month monitoring period identified in condition 222, the consent holder shall monitor Vegetation Health Indices and piezometers readings annually for a period of five years, and from there, once every five years for the consent term.~~

~~224. In the event that monitoring undertaken in accordance with conditions 222 shows the following effects have occurred and these effects are, in the opinion of an expert peer reviewer appointed by the consent holder, attributable to the construction or operation of the scheme, then the consent holder shall implement the contingency responses outlined in condition 225~~

~~(i) Obvious dieback in the canopy of any of the stands of indigenous vegetation within the wider Scheme footprint, as may be observed over the course of the route monitoring surveys, or otherwise reported by the local community; or~~

~~(ii) Greater than 10% dieback of indigenous canopy along any of the 3 transects at any one monitoring site; or~~

~~(iii) Greater than 10% mortality of key understorey indigenous species within all 3 plots along any one transect; or~~

~~(iv) Discolouration and/or wilt of leaves in more than 25% of the indigenous vegetation within all 3 plots along any one transect; or~~

~~(v) Mortality of greater than 10% of indigenous wetland plants (recorded by tier and species) as evidenced by direct observation of dead vegetative material; or~~

~~(vi) A reduction in the species diversity of indigenous wetland plants of greater than 10%; or~~

~~(vii) Significant decrease in the size of the indigenous part of the wetland (greater than 10%); or~~

~~(viii) Replacement of greater than 10% of indigenous wetland species by terrestrial or weed species.~~

~~225. The consent holder shall in consultation with the Consent Authority prepare and implement an appropriate contingency response plan. The contingency response plan may include the following:~~

~~(i) Supplying water to the affected stands on the south bank directly from the canal to the extent that the observed health decline is halted;~~

~~(ii) Supplying additional water to affected stands on either the south bank or the north bank by excavating around spring discharge areas to enhance the hydraulic efficiency of the spring outlet;~~

~~(iii) Supplying additional water to affected stands on the south bank or the north bank by excavating deeper inverts within existing tributary streams to provide enhanced inflows to affected areas under lowered water table conditions;~~

~~(iv) Supplying additional water to affected stands on the south bank or the north bank by works at the confluence of north bank tributaries with the Wairau River.~~

~~(v) If necessary and practicable, the translocation of affected plants to a safe area.~~

Flow Measurement

2236. The consent holder shall ensure that the following international standards are adhered to for all flow measurements associated with the scheme as may be relevant.

(a) ISO/TR 8363:1997 Measurement of liquid flow in open channels – New General guidelines for selection of method.

(b) ISO 11655:1995 Measurement of liquid flow in open channels – Method of specifying performance of hydrometric equipment.

(c) ISO 748 Measurement of liquid flow in open channels – Velocity area methods.

(d) ISO/TS 24154 Hydrometry – Measuring river velocity and discharge with acoustic Doppler profilers.

(e) ISO 110-1 Measurement of liquid flow in open channels – Part 1; Establishment and operation of a gauging station.

(f) ISO 110-2 Measurement of liquid flow in open channels – Part 2; Determination of the stage-discharge relation.

REVIEW CONDITIONS RELATING TO GROUNDWATER, FISH SCREENS & RIVER BIRDS

2247. The conditions of this consent with respect to groundwater management may be reviewed in accordance with section 128 of the Resource Management Act 1991 at the following times:

(a) At any time up to six months after the consent holder completes the reporting required under condition 57;

(b) At any time up to six months after the consent holder completes the reporting required under condition 131;

(c) At any time up to six months after the consent holder completes the reporting required under condition 204;

(d) At five yearly intervals thereafter.

~~228.~~ *Advice note:*

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The results of all investigations and surveys will be used by the Consent Authority to assess whether the project is likely to have, or is having, any unforeseen and significant adverse effects on the groundwater resource within the area defined within the Groundwater Management Plan required by condition 51.

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2259. The conditions of consent concerning fish screens may be reviewed by the Consent Authority pursuant to section 128 of the Resource Management Act 1991 upon receipt of a report under condition ~~136~~152 which concludes that the fish screening system is not meeting the terms of these conditions

22630. The conditions of this consent with respect to River Birds may be reviewed in accordance with section 128 of the Resource Management Act 1991 at the following times:

(a) Immediately upon the receipt of a report under condition 2169 which concludes that there has been a biologically significant reduction in breeding success and that an alteration to the residual flow regime is necessary to mitigate ~~against~~ the decline in river bird population decline.

(b) At any time following the commencement of construction of the Scheme to address any unanticipated effects of the Scheme on avifauna (including, for the avoidance of doubt, any reduction in breeding success as a result of the Scheme).

Advice note:

It is recorded that this review condition is not intended to restrict, replace or abrogate the right of the Consent Authority to review the consent pursuant to the provisions of s128(1)(c) and section 132(4) of the Resource Management Act 1991.

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22731. The conditions of this consent with respect to Aquatic Ecology may be reviewed upon receipt of any report that trigger levels set in Condition 59 have been breached.