Central Plains Water

Resource Consent Hearing

RIVERS' ASSESSMENT

Statement of evidence of Di Lucas

for the Canterbury Regional Council

INTRODUCTION

1. My full name is Diane Jean Lucas. I am a landscape planner with more than 30 years' experience. I am Director of Lucas Associates Limited, a landscape planning, design and management practice, established in Canterbury in1979 and working throughout New Zealand.

2. I hold a Master of Landscape Architecture (planning, Lincoln University), a Bachelor of Science (Otago), am a Fellow of the New Zealand Institute of Landscape Architects (1987), and a Registered NZILA Landscape Architect.

3. Through research and application I have developed a number of landscape, natural character and ecological planning framework and assessment approaches. I have identified outstanding natural features and landscapes in a number of regions, districts and locations, including in Canterbury.

4. I have been involved in a number of studies and plans for various lakes, rivers, streams and wetlands in various parts of New Zealand including in relation to several irrigation schemes. I provided rebuttal evidence to the Buller Water Conservation Order hearing - my evidence received professional endorsement with an award from the NZILA - and I provided evidence to the hearings supporting the Rangitata Conservation Order. In 2001 our office prepared the ECan guide to riparian management, "*Caring for streams of the Canterbury Plains*".

5. I have undertaken research in local and rural areas, including for my masters thesis, Identifying Acceptable Vegetation Change in High Country Landscapes (Lincoln University. 1994) which involved a case study on the Waimakariri - Rakaia high country. Development of pattern and land systems analyses has been fundamental to my approach.

6. The Canterbury Regional Landscape Study (1993) was undertaken jointly by Boffa Miskell and my team for the Regional Council, to identify outstanding and significant natural features and landscapes. In this study the Waimakariri and Rakaia Rivers were both identified as outstanding natural features.

7. I facilitated some preliminary public consultation with regard to plains areas and Malvern Hills, and their landscape values and vulnerabilities, for Council's development of their Selwyn District Plan.

8. I led the team that consulted with the community and last year prepared Reserve Management Plans for Coes Ford and Chamberlains Ford on the Lower Selwyn River, and Lakeside Domain on Te Waihora (Lake Ellesmere) for Selwyn District Council.

9. I am familiar with both the Waimakariri and Rakaia Rivers and have undertaken field work by land and water to specifically visit the vicinity of proposed works.

10. I have reviewed the application data, AEE and evidence provided for CPW, and the S 42A reports for both Councils.

11. I have not considered the proposed water take from the south bank of the Rakaia River for the Ashburton Community Water Trust because at this point in time there is inadequate information for me to make a considered assessment. Similarly the effects of discharges (by-washes) on the Rangitata and Waimakariri, wetlands and other rivers and spring-fed streams are not assessed because of a lack of information as to their nature, extent and effects.

12. This evidence, prepared at the request of Environment Canterbury, is in five sections:

- firstly statutory context (pages 4-10);
- secondly a brief description of the Central Plains Water Ltd (CPW) proposal (pages 10 - 12);
- thirdly The Rivers' Character: an assessment of the natural character, landscape and amenity values of the Rivers (pages 12 - 36);
- fourthly the potential effects of the CPW proposal on these values (pages 36 - 48); and
- fifthly my conclusions (pages 48 - 51).

My evidence includes graphic attachments which are referred to throughout.

13. In this brief I address only the rivers. The rest of the scheme is addressed in a second brief provided for the Malvern Hills Protection Society.

14. My analysis endorses the Environment Canterbury submission that the application lacks specificity to enable the proposal to be assessed in terms of the potential for immediate and long-term adverse effects on important natural character, wild and scenic characteristics, landscape and amenity values. My assessment has been hampered by the lack of specificity in the application and associated reports. With respect to the off-takes, relatively little information has been provided; as to the location, scale, and design of the major works including the diversion and 'take' structures; as to the nature and extent of the ongoing work within the bed of the rivers, as to the changes that may occur in the vicinity and downstream in character, habitat and amenity values, and, as to likely remediation and mitigation works. It is my view that for a proper assessment of effects, all works including relatively minor works such as 'safety features' (e.g. warning signs, barricades, access structures) need to be better described because of their potentially significant adverse effects on valued natural and uncluttered places.

15. I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses (Environment Court Consolidated Practice Note 2006). This evidence is within my area of expertise, except where I state that I am relying on facts or information provided by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

1. STATUTORY CONTEXT

INTERPRETATION

16. In assessing the effects of the applications by Central Plains Water limited I have carefully considered relevant provisions of the Act and in particular the interpretation of terms such as Amenity Values and Natural Character.

17. Natural Character generally excludes the built environment.

"Natural" has been variously interpreted by professionals, and in considering natural features and landscapes, the Environment Court has found[1] that *"the criteria of 'naturalness'" under the RMA include:*

- *the physical landform and relief;*
- *the landscape being uncluttered by structures and/or obvious human influence;*
- *the presence of water (lakes, rivers, sea);*
- *the vegetation (especially native vegetation) and other ecological patterns.*

That Court stated *"The absence or compromised presence of one or more of these criteria does not mean that the landscape is non-natural, just that it is less natural. There is a continuum of "naturalness" from a pristine natural landscape to a cityscape."*

17. "Amenity values" means those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes (RMA s.2). Considering the definition for amenity values, professional interpretation of the component "aesthetic coherence", a new phrase in legislation, is noted. While "aesthetic" is not defined in the statute, a professional working definition[2], supported in case law, is "*pertaining to the quality of human perceptual experience (including sight, sound, smell, touch, taste and movement) evoked by phenomena or elements or configurations of elements in the environment*." It is clearly not only the visual aesthetic that is to be considered.

18. "Coherence" can be defined *"as consistent and easily followed*". Also, *"the quality or state of cohering, especially a logical, orderly, and aesthetically consistent relationship of parts".*[3] Whether considering visual, audial, aural, tactile or kinetic dimensions, I interpret aesthetic coherence to encompass aesthetic harmony and legibility.

CANTERBURY REGIONAL POLICY STATEMENT (RPS).

[1] C180/99 Wakatipu Environment Society v. Queenstown Lakes District Council, para. 89.
[2] Canterbury Regional Landscape Study. 1993. page
[3] C059/02 Main v Rotorua District Council. para. 19

18. As noted in the RPS Chapter 8, *"Freshwater systems contribute significantly to the landscape character of many parts of Canterbury, and provide a major recreational resource." "Riparian areas are the complex boundary between land and water systems."* It notes that wetlands have been greatly reduced, especially on the plains. The RPS recognises the degraded state of a number of landscapes and ecosystems - *"In order to improve the health of many of the ecosystems (and the landscapes to which they contribute), there needs to be an active programme of restoration and management."* The River Recovery Programme in the Mackenzie is noted as an example of restoration and the distinction of restoration from revegetation or creation is noted (page 102). The RPS notes that *"The regions geological and geomorphological features include its braided rivers"*.

19. The RPS identifies at 8.2 Issue 1, *"Adverse effects of the use, development, and protection of natural and physical resources on the integrity, distinctive characteristics, and contribution to a regional sense of identity of:*

a. wetlands, including their overall area and functioning.

b. the natural character of … wetlands, … rivers and their margins.

c. natural features and landscapes including their cultural, amenity and recreational values.

d. indigenous vegetation, habitats of indigenous fauna and ecosystems".

Objective 2 involves *"Protection or enhancement of the natural features and landscapes that contribute to Canterbury's distinctive character and sense of identity, including their associated ecological, cultural, recreational and amenity values."* The only Principal Reason identified is *"So that the value to the Canterbury region of its characteristic natural features and landscapes will be retained or increased."*

18. Hence, Policy 3 "*Natural features and landscapes that meet the relevant criteria of sub-chapter 20.4(1) should be protected from adverse effects of the use, development, or protection of natural and physical resources, and their enhancement should be promoted. Activities that may have adverse effects include … earthworks, alteration to landforms,…or the erection of structures."*

The particular sensitivity of these natural features and landscapes to regionally significant adverse effects in terms of sub-chapter 20.4(2) should be reflected in the provisions of district plans in the region.
Assessments of effects should be made considering:

- *aesthetic values*
- *expressiveness*
- *transitory value*
- *natural science factors.*

19. The explanation (page 107) notes that *"the values most closely associated with visual appreciation are grouped as aesthetic values. Likewise, those that reflect (or express) physical formation and long-term ecological processes are called expressiveness values. The things that come and go within the landscape – the lighting, the seasonal changes to plants and trees, the movements of wildlife – are termed transitory values. Landform, geology, and soil heritage values are grouped as natural science factors."*

20. The explanation to Policy 3 also states CRC as a consent authority considering consents *"is not restricted to considering only natural features and landscapes that meet the relevant criteria in sub-chapter 20.4(1)."* (Page 107)

21. The RPS further explains the landscape criteria on page 108 and 109 RPS:

I. *Aesthetic values with regard to natural features and landscapes are gauged by things such as (a) how memorable they are; (b) their naturalness; and, (c) their composition (how their elements fit together).*

II. *Expressiveness (the ability of a landscape or feature to legibly portray or express the formative processes from which they evolved) comprises: (a) the underlying geology; (b) topography; (c) vegetation and wildlife present; and (d) human influences past and present. Examples are particularly evident in Canterbury's braided rivers….*

III. *Transitory values represent qualities separate from those of the landform or land cover. They include (a) wildlife occurrences or behaviour that are associated with places and impart distinctive qualities that although transitory are a noted characteristic, and, (b) characteristic moods arising from local weather patterns. Examples of these transitory values include visiting birds or animals that have become characteristic*

of a place. The RPS identifies that *"Adverse effects on experiencing these qualities may be avoided by control of land use to facilitate or protect the ways they are experienced."*

IV. *Natural science factors include aspects of special interest to geologists and other students of earth features. They comprise: landforms; soil properties; and their related active physical processes.*

24. The factors are defined somewhat differently to those in the study on which they were based, the "Canterbury Regional Landscape Study", and from the now "widely accepted landscape criteria", known as the "modified Pigeon Bay criteria". They also do not include a number of criteria included in these frameworks, particularly, 'shared and recognised values', 'tangata whenua values', and, 'historic associations'. Mr Glasson references the "modified Pigeon Bay "criteria (para. 83) and assesses that *"the landscape in which the CPW is located within is not an outstanding one*."

25. While Glasson does not make this explicit in his text, I understand that, in para. 84, he assesses the gorges and the upper length of the Waimakariri River below the gorge using the "modified Pigeon Bay criteria" as "*all picturesque, with much modification and would not be considered to be outstanding landscapes*." I understand Mr Glasson supports the Selwyn District Plan in not recognising the rivers below the gorges as outstanding natural features or landscapes.

26. I disagree and note that, as identified in case law[4], a landscape or feature may be considered to be outstanding even if not identified as such in a District Plan.

27. The RPS Ch.10 addresses beds of rivers and their margins. *"Canterbury has the best examples of braided rivers in New Zealand. The Rakaia is considered to be an internationally important example."* Bird species such as black fronted tern and black billed gull are noted as distinctive to the region. The essential inland to coast "pathway" role of rivers is noted, and their role as highly valued fishery (page 147).

[4] Unison Networks v Hastings District Council CIV 2007-485-896 and Chance Bay Marine Farms v Marlborough District Council W70/99

28. As noted in Ch.10, "*The natural character of … rivers is an important component of the Canterbury landscape*." Natural character is not static and expresses the interactions of natural features and processes which form and maintain them. *Elements of natural character include:*

- *the general absence of man-made structures or works.*
- *hydrology and geomorphic functioning expressed by, for example, the rise and fall of rivers…, sediment transport, changing bed patterns, and the open expanse of shingle in braided rivers.*
- *the predominance of natural sounds and smells.*
- *the predominance of natural land forms, indigenous ecosystems, or indigenous flora and fauna*." (page 148)

29. With respect to land use and development within the beds and margins of rivers, Objective 1 of Chapter 10, is the "*protection, and where appropriate, enhancement of: natural character; significant habitats of indigenous flora and fauna; significant natural features and landscapes; mahinga kai areas …; habitat values of braided river beds; significant amenity and recreation values; heritage values; significant habitats of trout and salmon; and, life-supporting capacity (health) of aquatic and riparian ecosystems."* (my underlining)

30. The sole principal reason identified for this broad objective is that such values are being progressively degraded and many may be lost altogether.

As required by Policy 1 of Chapter 10, *"Areas within the beds of rivers … and their margins containing important conservation values are to be identified. These include: areas of natural character; significant habitats of indigenous flora and fauna; significant natural features and landscapes; areas of mahinga kai etc.; significant amenity and recreation values; significant heritage values; and significant habitats of trout and salmon."* For such identified areas, "*development should avoid causing significant adverse effects on the[se] conservation values*". Prior to identification, the adverse effects of land use activities on the bed and margins of rivers are to be *"avoided or mitigated"*, including *"(v) natural character or significant landscape values"*, and *(vii) "amenity and recreation values"* (Policy 1(c)) (page 151). Such areas are to be *"enhanced" where they exist in a degraded state and enhancement will achieve long-term improvement."* (Policy 2(a)) (page 153).

32. Also, under Policy 3, indigenous riparian vegetation is to be retained and promoted for its conservation and amenity value (page 155).

33. The RPS identifies (Explanation to Policy 1, page 152) land use activities that may adversely affect these values including the erection of structures, and the channelling or diversion of flows, or any excavation or filling.

SELWYN DISTRICT PLAN

34. The Selwyn District Plan recognises the significance of the Plains as the largest area of flat land in New Zealand, and that "*It is an outstanding natural feature*". (Part 1, page 28)

26. The Objectives for Water as a natural resource 1.3 include i:

•2. "To protect and enhance … ecosystem processes and amenity values of waterbodies and their riparian margins, their role in maintaining water quality and their significant landscape values."

•6 "Land use activities, and particularly earthworks,.. are managed within catchments and riparian areas to protect water quantity and quality, aquatic habitat, and natural character."

Policy 8 is to *"Ensure any earthworks, … structures .. that must be located in riparian margins, ..: - Mitigate any adverse effects on the natural character of the waterbody*; and - *Avoid adverse effects on trout and salmon habitats."*

27. Section 1.4 of the Plan addresses Outstanding landscapes and Natural Features with a strategy involving "*Policies to identify the outstanding natural features and landscapes in the District."* (page 67). I note that the accompanying maps do not delineate the Waimakariri and Rakaia Rivers below the gorges as outstanding.

2. CPW PROPOSAL

29. Irrigation of some 60,000 ha of the upper Selwyn plains is proposed via abstraction of up to 40 cumecs from the Waimakariri and Rakaia Rivers, via a 54 km headrace canal between the rivers dispensing to a distribution network below. In addition, Waimakariri River water is proposed to be fed to

and stored behind a dam at Coalgate to supply the scheme when the rivers are too low.

WAIMAKARIRI

30. To supply in part water to the Central Plains Water (CPW) irrigation scheme on the upper Selwyn Plains, two offtakes are proposed from the right or south bank of the Waimakariri River, below the Waimakariri Gorge. The upper offtake being from the braided river above the Kowai River confluence, the lower offtake being at the cliffs near the Gorge Bridge (attachments 1). I refer to the former as the Kowai Offtake.

31. **Kowai[5] Offtake**. CPW propose to construct an upper Waimakariri intake in a right bank location below Woodstock, above the Kowai River confluence and around 11 km upstream of the Gorge Bridge. A diversion channel, sand trap, sluice structures, fish screens and settling pond would be constructed.

32. Various locations for diversion channels and offtake structures have been suggested by CPW. I understand that that part of the designation area encircled by CPW, which is some 1.5 kilometre long and within Selwyn District, is sought in which to construct a diversion channel of unknown design and varying location. The channel would lead to the intake structure, sediment trap, canal and siphon under the Kowai river mouth (attachment 1, top right).

33. This intake would enable up to 40 cumecs to be conveyed via a canal, or via a 10 km tunnel down to the Waianiwaniwa Dam.

34. **Gorge Bridge Offtake**. CPW propose to construct a lower Waimakariri offtake through the bluffs above the Gorge Bridge, to a tunnel under the right bank, and thence to a canal.

35. This intake would enable up to 40 cumecs to be conveyed to the 54 km long zero-gradient canal through to the Rakaia that would dispense waters to the irrigation canal infrastructure involving cut and fill along the river terrace.

[5] Note. The word Kowai is not a misspelt reference to the kowhai trees and shrubs that abound nearby. I understand that Kowai refers to the linking of the waters.

RAKAIA

36. **Offtake**. A 40 cumec intake is proposed on the north or left bank of the Rakaia River to contribute water to the contour canal between the Rakaia and the Waimakariri to supply the irrigation infrastructure to the 60,000 ha. Upper Selwyn Plains area.

37. The site is some 8 km down-river from the Rakaia Gorge Bridge, close below the 70+ metre high escarpment enclosing the river corridor to the north, and opposite the Happy Valley flats and Highbank Power Station.

38. From the intake complex, a canal would be cut into the terrace for a distance of 5 – 6 km to deliver the water to the main canal at 235 metres asl running through to the Waimakariri.

Discharges

39. Discharges of bywash are proposed back to these mountain rivers, generally into wetland areas (attachment 1, left). There is insufficient information to enable these to be assessed.

SELWYN & Plains tributaries

40. Whilst having permanent flow in the hard rock hills of their source, the plains' rivers between the Waimakariri and Rakaia are largely ephemeral, although some lengths typically have surface water. The catchment-fed Hawkins, Waianiwaniwa, Selwyn and Hororata Rivers flow across the upper plains (L3 land type) and soon coalesce in the lower plains (L2 land Type). Spring-fed streams, such as the Irwell River, emerge in the lower plains (Glasson Figure 10.3) (attachment 1).

41. Various canal crossings are intended, and discharges generally into wetland areas are proposed for each of these river corridors. There is little information available to enable the crossings or discharges to be properly assessed.

3. THE RIVERS' CHARACTER

42. The Waimakariri and Rakaia emerge from gorges to travel through wide floodplain corridors to the coast (attachments 2, 3 and 4). Where released from bedrock confines they quickly broaden into braided rivers (attachment 10). Cutting down through the upper plains lands (L3 land type) they emerge and naturally sprawl across the lower plains (L2). The river corridors for their braided lengths can be addressed as active and inactive riverbeds (attachments 5 and 6).

43. The Rakaia river braids have been identified as of international geomorphological significance – an "*international text book example of a braided river. Classified as an extremely well-defined landform of scientific/educational value."*[6] Whilst the whole is of significance, a sample area accessible from SH1 and the Rakaia township has been identified.

44. The Waimakariri and Rakaia have been variously identified as of national importance. The rivers between, of the Selwyn system, have not that significance.

45. The Rakaia braids were identified as an outstanding natural characteristic in the Water Conservation Order (WCO) as assessed under the Water and Soil legislation. The Rakaia River is the longest braided river in the southern hemisphere and is subject to a water conservation order "*to protect natural character, wildlife, fishery and reaction values*".

46. The 1993 Regional Landscape Study (the study) identified the full lengths of the Waimakariri and Rakaia Rivers from the high country, through the gorges and through the plains to be outstanding natural landscapes at a regional scale on page 67 and Figure 4 of the study (attachment 2, lower left).

47. The study described the importance of the Waimakariri and Rakaia, including of the lower rivers:

LOWER WAIMAKARIRI and GORGE*. The Waimakariri is one of the outstanding braided rivers of Aotearoa/New Zealand. It still retains much of its natural drama and unpredictability despite its partial containment, discharges*

[6] *Inventory and Maps of Important Geological Sites and Landforms in the Canterbury Region, including the Chatham Islands.* Ed. Jill A Kenny & Bruce Hayward. Geological Society of NZ Misc. Pub. 98. 1998. p. 45.

and the draw-off of water for irrigation. The gravel bed provides habitat for several rare and endangered endemic birds and the river is a focus for reflection, relaxation, fishing and jet boating. Its proximity to Christchurch is a major reason for its popularity.

The river is of great significance to the tangata whenua and is a reminder of the link between plains and mountains. In nor' west conditions the river can be a raging torrent set in a landscape of parched paddocks.

The informal, wild experience that the river offers, in an otherwise tamed landscape, is vulnerable to incremental modifications. … This study supports policies that limit the extent of landscape modifications within the stopbanks particularly where the river retains its open unmodified character. (page 41)

***Lower Rakaia River and Gorge**. The Rakaia is the largest and best example of the unmodified braided rivers in Canterbury. It has many of the same qualities as the Waimakariri. It is less highly used for general recreation, but more highly regarded for fishing – particularly salmon.*

The same issues of sustainability and inappropriate development apply on the Rakaia as they do on the Waimakariri. Any development that seriously reduces the apparent scale, visual simplicity and naturalness of the river should be avoided. (page 42)

48. The Waimakariri River and Catchment Resource Survey Vols 1-3 (North Canterbury Catchment Board, 1986), addressed in section 3.5.6 the riverbed vegetation – "*Open shingle riverbeds crossed by braided streams are characteristic of much of the bed of the Waimakariri and its tributaries. These open riverbeds are maintained by floods, which either sweep away vegetation or deposit gravel over it. If, however, a gravel plain is both above the flood level for a period of time and is protected from erosion by distance from an active stream, then a vegetation cover can develop*" (page 69).

49. The Waimakariri River Plan identifies that *"Below Woodstock, the character of the Waimakariri River has been altered by flood protection works and weeds which have invaded the bed of the river. However, only minor changes have been made to the river's flow regime through takes and diversions and there are no dams on the river*."

OUTSTANDING NATURAL FEATURES AND LANDSCAPES

50. Our 1993 study sought to identify the outstanding natural features and landscapes of Canterbury at a regional scale, and also to identify significant natural features and landscapes. It is recognised that the S.6(b) requirement to protect outstanding features and landscapes, refers to both natural features and natural landscapes.

51. This study involved a land typing of Canterbury to set a framework for inputting data from a desk top analysis and expert knowledge (attachment 2). A considerable range of expertise was involved in the study, so that, although the study was not field-based, the team had considerable field knowledge of Canterbury. To enable wider community values to be recognised, a retrospective approach involved reviewing available information - literature and the visual arts, of recreation and tourism, protected areas, and of various planning documents. It was however a rapid study so that only key known resources were utilised.

52. The criteria developed for this study included:

- natural science
- aesthetic
- legibility,
- transient
- shared and recognised; and,
- tangata whenua.[7]

53. The criteria have since been endorsed and expanded by the Environment Court[8], for the first criterion to explicitly recognise biota as well as geomorphic and soils, and, an additional criterion of historic values included.

54. The Rakaia and Waimakariri were identified in the regional landscape assessment[9], as Outstanding Natural Landscapes primarily on the basis of

[7] "Canterbury Regional Landscape Study. Volume 1" Boffa Miskell Limited and Lucas Associates. 1993. p. 28.
[8] WESI v. QLDC, in Jackson ibid. 2001

recognition as “clearly outstanding” quality in terms of natural science, and tangata whenua values. The natural science values of these rivers are noted below, and other landscape values are also explored.

55. Undertaken prior to notification of the Regional Policy Statement, the landscape study recognised (Volume 2, Appendix 2, page 14) that evaluation at the regional planning scale was required to not be inconsistent with any national policy statements and any water conservation orders.

56. The full length to the sea of the Rakaia River was recognised as of “clearly outstanding” quality in terms of natural science, and, shared and recognised values, due in particular to the Water Conservation Order recognition. The Upper Rakaia landscape was recognised as of clearly “outstanding quality” for legibility, and, aesthetic values.

57. The test to qualify for “outstanding” status has been interpreted as a reasonably rigorous one. This does not, however, mean the characteristic is necessarily unique to the particular feature being evaluated, nor that every part of it is highly natural.[10] I understand that the scale of decision-making sets the scale for considering whether a feature is outstanding. Thus, for a national decision such as that of a water conservation order considered under s.199, the scale of assessment is the national scale, not a regional scale.

58. In the analysis for the Canterbury Regional Landscape Study, the scale of assessment was given particular consideration. In Volume 2, ‘Appendix 3 - The Significance of the Scale at which “Outstanding” is Assessed’ pp.17-20. The question was asked (page 18), “*are nationally outstanding natural features and landscapes automatically included at the regional level?”* Whilst this may seem a logical assumption, we also noted the logic of addressing outstanding “big picture” natural features at the national level, and refining these at the regional and district levels (model 2, page 19).

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[9] “*Canterbury Regional Landscape Study*. Volume 1” Boffa Miskell Limited and Lucas Associates. 1993. p. 67.

[10] “some hillsides, faces and foregrounds are not in themselves outstanding natural features or landscapes, but looked at as a whole together with other features that are, they become *part of a whole that is greater than the sum of its parts.*” WESI v. QLDC C3/2002 para. 31.

59. For the CPW consideration, both the regional and district scales require consideration, and if outstanding at either, then the protection of that landscape from inappropriate activities is of national importance.

BRAIDED RIVERS

60. New Zealand is internationally important for our braided river systems as natural geomorphic features. "Braiding" has been defined as [11] "*The process of successive branching and rejoining of a stream channel, resulting in the formation of elongated islands and bars that split the channel into an intricate network of smaller interlacing channels*." (images attachment cover and10).

61. A braided stream can be defined as "*A stream that divides into or follows an interlacing or tangled network of several small branching and reuniting shallow channels separated from each other by branch islands or channel bars, resembling in plan the strands of a complex braid*."[12]

62. In contrast, a meander is "*One of a series of regular freely developing sinuous curves, bends, loops, turns or windings in the course of a stream. It is produced by a mature stream swinging from side to side as it flows across a floodplain or shifts its course laterally toward the convex side of an original curve."*[13] (image, attachment 10a)

63. Whilst there are braided rivers elsewhere in the country, Canterbury contains the "Big Four" snow-fed braided rivers, the Waimakariri, Rakaia, Rangitata and Waitaki. The Waimakariri and Rakaia are two of the 4 largest braided rivers in the South Island. The Rakaia is almost totally unmodified as a river system. As a braided system, it is extremely dynamic. Directly below their respective gorges, the Rakaia and Waimakariri are full braided rivers (attachment 10). Across the middle plains, the Rakaia is much more

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[11] *Landforms of New Zealand*. Ed. J.M.Soons & M.J.Selby. Longman Paul. 1982. p. 378

[12] *Glossary of Geology*. Bates RL & Jackson JA, 1980 American Geological Institute, Falls Church, Virginia

[13] *Glossary of Geology*. Bates RL & Jackson JA, 1980 American Geological Institute, Falls Church, Virginia

intensely braided. Of the Big Four it is the Rakaia that is the most natural, the least modified.

64. Whilst in the past few thousand years the Waimakariri has wandered widely across the Plains, variously flowing north and south of Banks Peninsula even in recent times. It is now confined north by river control works. The Rakaia seems not to have wandered quite so widely in this same time period but "*now incised below the Plains surface near their mouths, the Rakaia enters the sea along a stretch of coast that is being actively eroded*."[14] The lower Rakaia is however a broader and more complex braided river in all but the very lowest reach.

65. The Waimakariri and Rakaia are braided rivers with multiple, more mobile channels threading between relatively "stable" gravel islands and transient, more mobile islands. This active floodplain is adjoined by varying widths of inactive braided river bed (or intermediate surface) (attachments 5, 6 -8). In times of flood, the whole active river bed or floodplain - up to 2 km wide or more - may be occupied by turbulent sediment-laden water (attachments 24 and 34).

66. Both rivers are deeply incised into the upper Plains surface at the mountain front as they emerge from their respective gorges and the depth of the incision is reduced as the coast is approached (attachment 3). The Rakaia continues in the braiding habit to the coast, where it enters the sea by way of lagoons whose entrance is restricted at times of low river flow and/or high wave activity, but opened when the river is in flood. The Waimakariri is however quite different in that it changes character relatively abruptly 5 -7 km from the coast and becomes a generally single channel stream. This change is associated with a change in gradient, and also marks the point where the river flows from its gravel fan surface, and enters the zone of swamps and lagoons which originally ran along the coast behind the barrier dunes.

67. From mountains, through the gorges, across the plains to the sea, the series of landform models display these characteristics (attachments 3, 7, 8 and 9).

[14] *Landforms of New Zealand*. Ed. J.M.Soons & M.J.Selby. Longman Paul. 1982. p. 349

68. In 2001 Boffa Miskell assessed Canterbury Rivers for ECan, *"to provide an inventory of the natural character, outstanding natural features/landscapes and amenity values of rivers in the Canterbury region*." It was a desk-top evaluation only. Issues addressed included abstraction and discharges. The complexity of management was recognised. Such as that if managed at low flows for long periods, the rivers may not benefit from the weed-clearing effects of natural freshes and floods. They noted that weeds can result in reduced riverbed bird habitat quality.

69. Considering all the different types of rivers in Canterbury, these great mountain-sourced rivers were assessed by Boffa Miskell (2001) to rate higher for naturalness, outstanding landscape and amenity values than other river types.

NATURAL BRAIDED RIVERBED CHARACTER

70. **WAIMAKARIRI.** As stated in the CPW Kowai Intake AEE (2005, para. 5.1, page 29), the Waimakariri River emerges from the gorge and flows to the sea in a braided riverbed, briefly and variously pushed aside at the Kowai confluence, below there is a fixed pinch point at the Gorge Bridge (attachments 10 and 11) and then a confinement downstream of the motorway bridge. Similarly, I agree that below Woodstock the Waimakariri River remains visibly distinct from the surrounding plains, and forms broad braids. The highest flows are typically in spring (October) and lowest February-March.

71. **RAKAIA**. The Rakaia emerges from the Gorge below the Rakaia Gorge Bridge n inland Scenic Highway 72. The river quickly braids and flows through an arena surrounded by a flight of relic terraces fronted by large escarpments it continues to carve below the gorge (attachment 35). The highway winds out up the escarpment to the north. Beneath the escarpments enclaves of stable former riverbed lands lie to north and south.

72. Shortly the river commands the full width, sweeping variously between northern and southern escarpment. Demonstrating their origins. The river channels having cut the scarps though eons (attachment 35).

73. Aerial photos and maps demonstrate a snapshot in time of the channel to scarp relationship. Layering images from the last 7 decades provides a hint

of the formative patterning (attachment 26). After its post-gorge sweep, the southern escarpment bends sharply to set a path directly seaward. The river continues to actively work against this corner before being deflected to sweep northward and leave the Happy Valley Flats as stable riverbed lands.

74. The great scarps varyingly displaying recent or older undercutting by the river demonstrate the essential upper plains character. The great mountain catchments discharging coastwards and in the process cutting down through the outwash plains.

75. At the intake site opposite the stable Happy Valley flats the active braided riverbed remains more than a kilometre wide (attachments 26).

76. The escarpment above and the riverbed below together display the inherent character of the river corridor. The broad braiding river continuously wearing a slot through the high plains. Biodiversity values have been recorded in the vicinity[15] (attachment 28).

77. Where the river sweeps back south to the Highbank site, the stable riverbed lands to the north exhibit some natural flora of such sites, including kowhai, kanuka and cabbage trees below the proposed intake canal (attachment 28, area C).

78. Wildlife values within the riverbed are noted for further downstream, beyond Barrhill (attachment 30), but I as yet know of no assessment of the intake area.

79. **WAIMAKARIRI & RAKAIA.** The calm, the quiet, the emptiness and low flows of winter are a rest period in these great river corridors. Each spring as the thaw enables the braids to re-form and swell, the birds migrate back to feast on the eruption of invertebrate life within the braids. Courtship and nesting rituals follow on the islands and bars between, with noisy flocking species in such contrast to the solitary and camouflage tactics of others. Fish are active. Diminutive and scant plants belonging on higher sites respond with new growth and flower buds emerge. The river beds come alive. A new year has begun.

[15] *Low and High Plains Ecological Districts, Plains Ecological Region, Canterbury*. PNAP draft report. Jenny C Steven & Colin D Meurk, 1996.

80. Likely the riverbed is arrayed very differently than that of a year ago, and a decade ago. A fresh year. A fresh pattern. But a close variant of a pattern here for eons.

81. A vast open place. A fresh expansive gravel ‘canvas’ with waters threaded over it and through it. With stones sorted. Cobbles piled and strewn here; sand consolidated there; segregated or mixed; wetted or dry. All in response to the waters that bring and strew and sift and sort and wash. A fresh canvas for the river to etch and paint, and lap. Or for waters to leave alone allowing plants to establish.

82. A directional place. A corridor between the mountains and sea, from west to east. A contained place, with great scarps and banks enclosing to north and south.

83. The skein of braids scampering and lolling; joining and parting; submerging and emerging; a skein of channels wending and scampering over and through gravels. The land and waters so intertwined. The pattern so varied and so variable. Each thread and interfluve so temporary and awaiting rearrangement. Yet so permanent as a skein of braids draped down the corridor.

84. People visiting; involved in understanding and navigating the braids. Anglers in boats and on foot seek the pools where they imagine their prey lies in readiness to be tempted by the flash of a lure or the flick of a fly. Peering into the waters. Seeking to read the flows. To read the movement, the depth, the water clarity, the light reflecting, the association with connecting channels. Read the likelihood of a catch. The challenge of the plethora of braids. To compare their flows, their character, their potential. Seeking to read the pattern. To read their connectedness above and below, for fish access and for boat access, whether powered or paddled. The complexity providing the challenge. The mystery. The rapidity of change on any length providing diversity of habitat and of opportunity. And every visit it’s different. A dynamic and challenging environment. Raw places. Loved places.

85. Overviewed from front ranges and foothills, and the regular flights from Harewood north, south and westwards, morning and evening the skeins of

braids catching the light. Glinting as a tumble of ribbons wending down the plains. Complexity.

86. In our temperate climate, substantial vegetation will typically colonise any open ground unless inhibited by the impervious or unstable character of the substrate, inundation, the lack of light, or the saltiness of the air. For braided riverbeds, it is the instability of the substrate that limits plants colonising. Such instability is an important characteristic of the youthful land-forming processes that typify much of New Zealand – whether mountain screes, hillside slips, mobile river corridors or migrating coasts. Whilst early settlers from older more stable lands brought perceptions that sought to tame and stabilise such dynamics, and wildness reduced - and thus planted screes, riparian lands and active dunes with fast-growing exotics – increasingly natural processes have been valued.

87. Mountain catchment braided rivers migrating across the outwash plains are a classic demonstration of various natural processes at a range of spatial and temporal scales. For the Rangitata, the braided character was found to be outstanding[16].

88. The great Canterbury outwash plains involve upper plains through which the braided rivers typically downcut and entrench themselves. They erode the river corridor to form great terrace scarps along their flanks either side of a several kilometre wide bed. A highly legible landscape, with the entrenched corridors as cross-sections down across the plains.

89. There are rare windows to the tertiary underlayer to these huge outwash gravel deposits. For example, at the Curiosity Shop exposure opposite Highbank in the Rakaia and the Waimakariri south bank above Woodstock..

90. The rivers through the upper plains are largely natural and unrestrained. Crossings are located where bedrock outcrops.

91. On the lower plains below there is a change of character as the rivers emerge to the plains' surface depositing material and seeking to sit proud and

[16] C 109/2004 Rangitata South Irrigation & ors v. Fish & Game. para. 182.

migrate laterally. The character of the lower plains is thus naturally of the braided rivers with only low banks either side of a wide bed, and the banks periodically overtopped during floods. Stop-banking has been employed to limit the natural migration of the rivers through the lower plains lands, along with removal of riverbed material to avoid the bed continually being raised up. With the greater built infrastructure in close proximity, the Waimakariri through the lower plains has the natural processes more restrained.

92. Spring-fed streams also emerge through these lower plains. Some, such as the Selwyn, are rain-fed rivers in the hills, ephemeral on the upper plains, and spring-fed in the lower plains. These rivers have a very different character, with particular landscape and amenity value in their flowing reaches.

93. However, it is the great braided rivers that are the dominant features and scene setters. Quite distinct and separate from the plains surfaces alongside. The braided river corridors are the major wild and natural places of the plains.

94. The water channels are the focus in the riverbed landscapes. The gravels are the stuff between – spatially and temporally. Essential and important stuff; varied stuff; cobbles, sands and gravels; the stuff that is the setting and context for the channels. Moveable stuff that is burrowed into. For the birds, for the fish, for the boaters, the paddlers, the anglers, the kids, and the viewers, the focus is on the channels. With the braided rivers it is the myriad channels that provide the fascination. The complexity and diversity.

95. The complex display is formed by the plethora of water-filled channels, from primary to seepage channels. Shallow channels, steps, runs and riffles grade to larger channels, or disappear as seepages. They pool, or form a backwater. There are endless permutations and combinations.

96. With the periodic movement of the braids across the riverbed, former patterns are often displayed as braid scarring. Patterns of scars, of former wet braids now dry, tell of changes in flow quantity and flow distribution.

97. Instability and dynamics are key attributes of braided river beds. The characteristic and special birdlife of these braided rivers requires both the

open dry areas and the wet areas. They are intertwined and ever-changing. Each species uses them somewhat differently. From Woodstock to the Kowai, groups of terns flit and dart.

98. Considering wildlife values, braided Waimakariri and Rakaia river systems have both been rated as of “outstanding” value to wildlife under the SSWI ranking.

99. Near or below the proposed intakes, the Waimakariri and Rakaia are both assessed as important in providing habitat for birds with such threatened status as:

- black-fronted tern (nationally endangered)
- wrybill (nationally vulnerable)
- black-billed gull (serious decline)

Both are also important for:

- white-fronted tern (gradual decline)
- banded dotterel (gradual decline)

100. I understand the Waimakariri and Rakaia are both of outstanding wildlife value due to the important bird habitat and species present, particularly wrybill and black-fronted tern (attachments 17 and 30). The foraging character of the short-legged wading wrybills are very different from the terns feeding on the wing.

101. The width of the active bed is an important landscape characteristic. Floods remove invasive vegetation, re-define the braiding pattern, and produce fresh habitat. They are an essential characteristic to maintain the openness and ever-changing riverbed character.

102. Weed encroachment narrows the open riverbed and displaces natural ecosystems, such as mat plants. Considering vegetation, the river corridors associated with the offtakes and discharges involve some significant vegetation sites including the bush-fringed south bank below Woodstock (attachments 13 and 28).

103. The natural patterns, processes and elements of braided riverbeds are highly legible. Particularly where not reduced by man-made intrusions, the naturalness is highly valued and enjoyed. The aesthetic values of the braided rivers, including their memorability and naturalness, are variously and increasingly appreciated. As with wetlands and screes, an appreciation of the aesthetic of dynamic systems that do not display the traditional "usefulness" are increasingly appreciated for their distinctiveness and intrinsic value.

TANGATA WHENUA VALUES

104. The exceptional values of these rivers to the iwi of this place is well known. The Waimakariri and Rakaia were traditional routes to the West Coast. Ngai Tahu whakapapa to the Waimakariri. It is their ancestral river.[17] It is their identity. However with the waters degraded in the lower river particularly through effluent disposal, associations with the river changed over the decades. With the flows reduced in quality and quantity, so that the Waimakariri is a fragile shadow of its former self, needs careful consideration. The importance of maintaining and enhancing the quality and quantity of the waters, and the integrity of the natural river corridor, would appropriately be a focus in any project.

TRANSIENT VALUES

105. With most of the birds migratory and breeding in these habitats, it is the spring-summer conditions that are particularly important.

106. Whilst the birds might be in quite different habitat through winter, these rivers are their place, though they may be experienced very differently elsewhere. As when in winter a great flock of several thousand wrybill, without apparent signal, cease low tide wading and feeding around the edge of the vast open waters in the Firth of Thames, to suddenly lift off and soar and wheel in perfect formation. As the dramatic mass flights increase prior to their seasonal departure south, it serves to dramatise their very solitary, land-based life on the gravels here as a very contrasting experience.

107. Wrybills and dotterels wading and feeding in the riffles and pools of narrow braids and within arrays of greywacke cobbles. Groups of terns flitting and

[17] Te Whakatau Kaupapa

feeding on the wing close to the water surface, settling in flocks on shingle bars and islands, as are the black-billed gulls. Stilts and oyster-catchers amidst the deeper pools. Waders in the pools and riffles of the small channels. Groups and solos roosting and nesting on bare shingle.

108. Birdlife can contribute importantly to peoples' experience of a landscape. In the Rangitata WCO decision[18], the Court found the entire lower river was "o*utstanding habitat for one species – black-fronted terns*".

109. The movement and ever-changing character of the waters, in response to flow levels, riffle and pool character, lighting and season, is a crucial transient value. Beyond the fascination with individual channels, here the complexity of the bundle of threads forming the braids through any stretch result in a very high transient value. The whole is greater than the sum of the parts.

AESTHETIC

110. The aesthetic of the greywacke riverbed, the expanse of grey river-worn stones, sorted, massed and piled, has become increasingly valued in society. It is no longer only the picturesque aesthetic that is appreciated - the tree-framed image with stone edge pool or channel. The grand expanse of gravels, the myriad channels, are increasingly an appreciated aesthetic as society's understanding of and yearning for wild places increases. The braiding scars from earlier patterns are etched in the riverbed as layers of recent history, prior to the next big rearrangement by the great power of the river.

111. The aesthetic, including its naturalness and memorability, of the braided river beds as drawn and regularly re-drawn by the natural river, the experience of great natural powers, of experiencing the pulses of nature, of systems that have operated for eons, is highly valued.

112. The river corridor as a natural system, the whole skein of braids entrenching through the plains, the detail and life within the components, the range of scales is appreciated.

AMENITY , SHARED & RECOGNISED VALUES

[18] C 109/2004 Rangitata South Irrigation & ors v. Fish & Game. para. 81

113. The Waimakariri and Rakaia braided riverbeds provide for considerable recreational activity, in-stream and out. Jet-boating and salmon angling are the most documented. Kayaking, bird-watching, painting, swimming, rafting, picnicking, wandering and pondering are some others (attachments 16 & 29).

BOATING

114. As shown by various surveys, jet boating is outstanding for the length of the Waimakariri from above the gorge through to and including the lower reaches. A jet boater survey estimated about 9,360 visits in the 1983-1984 year. This compared with 4, 330 for the Rakaia and just 590 for the Rangitata.[19]

115. For the Rangitata, the Special Tribunal did not find jet-boating in the lower river to be outstanding, and the Environment Court had insufficient evidence to establish that it was (para. 90). That Special Tribunal (para. 321) found the Rangitata Gorge and stretch below (to Arundel) had outstanding recreational values for kayaking and rafting.

116. If averaging 3.2 passengers per boat, the 1983-1984 data suggested almost 30,000 visitor days per annum to the Waimakariri for jet boating, with almost 14,000 on the Rakaia. These are very substantially greater users than enjoy the Rangitata.

117. A survey through 1984-1985 identified[20] that, unlike fishers, jet boat usage on the Waimakariri is reasonably high all year round. During summer, more weekday usage was identified, visits were longer and there was a greater turnover of jet boaters during the day. The Jet Boat Association's February to June 1985 survey identified that for the river above the Gorge Bridge, 46 % of visits were in February and 28% in March. Below the Gorge Bridge, 25% were in February and 25% in March.

[19] *Waimakariri Catchment & Resource Survey. Volume 3.* North Canterbury Catchment Board & Regional Water Board (NCCB). page 84.
[20] *Waimakariri Catchment & Resource Survey. Volume 3.* NCCB. page 85.

118. For the Waimakariri, the 1983-1984 data suggested 93% of the users visited the river section between the Pylons and ramp down at S.H.1. And, that 49% of users were on the Woodstock to Pylons section. Fewer users were on the river above Woodstock.

119. Surveying launching sites, 12% were identified to launch at the Gorge Bridge, and 9% at Woodstock (page 86). People boating the Pylons to Woodstock section launched at SH1, the Gorge Bridge, or, at Woodstock. There were some 1,080 jet boat visits estimated in 1983-1984 for this Woodstock to Pylons length of the river. 90% of users rated this length highly.

120. Considering 4 sections of the Waimakariri, being above and below S.H.1 and above and below Woodstock, preferences and popularity were assessed. The Woodstock to Pylons length was considered less attractive than the downstream section of the Waimakariri for all types of boating except sightseeing boating and fishing boating (page 88). Picnicking was identified as popular at sites like the willows and the Gorge Bridge (page 87).

121. The popularity of the Woodstock to Pylons section was identified as[21] (in order of importance) its:

- *good scenery or surroundings;*
- *wide choice of channels and braided nature;*
- *variations in flow and channel conditions;*
- *rapids and chutes; and,*
- *associated fishing opportunities.*

122. The NCCB jet boater analysis identified that within Canterbury the Waimakariri is of comparative value to the Rakaia. The higher usage of the Waimakariri was attributed to the convenient location rather than inherent superiority (page 90).

123. The study "*concluded that the Waimakariri between the motorway bridge and the Poulter confluence is a jet boating resource of national importance and outstanding value. The characteristics of the resource which are particularly valued by jet boaters are:*

[21] M. J. Bowden*. 1983. Waimakariri Catchment & Resource Survey. Volume 3*. NCCB. p. 88.

- *its multiplicity of braids;*
- *its ever varying discharge and channel form;*
- *its suitability for picnicking, family and social activities;*
- *the remote and scenic nature of the gorge;*
- *the variety of water forms – bluffs, boils, rapids and chutes, present in the gorge;*
- *its proximity to Christchurch;*
- *the good launching access available;*
- *its associated angling opportunities;*
- *the skill, challenge and adventure boating experiences provided by the river; and*
- *it is navigable by relatively inexperienced boaters.*

124. All of these valued aspects are relevant in considering the CPW application and its potential effects.

FISHING

125. The primary recreational use of the Rakaia has been salmon angling (Bowden, 1983). The fisher use of the Waimakariri and Rakaia Rivers have been well-studied through the years, as they are the most fished rivers in Canterbury. Many of their fishers are from the North Island and other districts of the South Island.

126. The 1983 MAFFish report[22] investigated the relative popularity of 5 reaches of the Rakaia River. They identified some 50, 000 visits annually to fish the Rakaia by people from throughout New Zealand. The reach between the Gorge Bridge and SH1 bridge was the most fished (53%). "*From the anglers' viewpoint, perhaps the most significant characteristic of the river is its braided nature, and the constantly shifting pattern of the river channels."* (page 7). Bowden (1983) identified only that section of Rakaia River below the gorge as having a significant salmon fishery.

127. Comparing fishers' ratings of the Waimakariri and Rakaia (Unwin & Davis, 1983), the fishers rated the Rakaia much higher not just for catch rate but for

[22] M.J.Unwin, S.F. Davis. 1983. *Recreational Fisheries of the Rakaia River.* Fisheries Environmental Report 35. NZ Min of Ag & Fish. Christchurch.

"*scenic beauty*" and "*for the opportunity it affords anglers to fish in peace and solitude*" (page 53).

128. The more recent national angling survey of license holders[23] showed a significant reduction in effort since the 1994-5 survey – falling 49,000 angler days. Due to 2001/2 being a poor salmon fishing season North Canterbury mainstem and lowland fishing was reportedly down by 60%.

129. The NIWA survey's 2001/02 angler day figures suggest (approx):

River	Oct/Nov	Dec/Jan	Feb/Mar	Apr/May	Jun/Jul	Aug/Sep	2001/02 Total	1994/95 Total
Waimak	5, 560	10, 770	15, 510	10,790	2, 790	3, 540	48, 950	58, 360
Hororata								160
Selwyn	350	690	900	60	130		2, 130	6, 700
Rakaia	1, 290	7, 910	7, 890	1, 970	600	1, 800	21, 460	34, 650
Rangitata	2, 750	4, 160	4, 220	760	90	730	12, 710	35, 960

The data demonstrates the very high recreational attributes of the Waimakariri and Rakaia, particularly through summer and autumn. As was identified by both Shelby[24] (1983) and Bowden (1983) with respect to salmon anglers, the rivers are valued differently and one cannot substitute for the other.

130. Recreational and angling surveys of the Waimakariri River[25] in 1983 identified shore-based angling as the most popular activity (60%), with onlooking and walking next favoured (16%); boat-based angling 7%, boating 2% and picnicking 1%. For the Woodstock to Gorge Bridge length (Zone F), jet boating exceeded shore angling in popularity. Swimming was also an identified activity along with picnicking.

[23] Martin Unwin, Katie Image. December 2003. *Angler usage of lake and rivers fisheries managed by Fish & Game New Zealand: results from the 2001/02 National Angling Survey*. NIWA, Christchurch.
[24] B. Shelby. 1983. *Recreational Substitutability and Carrying Capacity for the Rakaia and Waimakariri Rivers.* Agricultural Economics Research Unit, Lincoln College. Report to NCCB et al.
[25] Don Jellyman, Eder & Hardy. 1987. *Recreational & Angling Surveys of the Waimakariri River.* NZ Freshwater Fisheries Report No. 86. Christchurch.

131. On my site visit to the Gorge Bridge area on a Monday morning in March I was surprised at the number and variety of recreationists present. A number of boats, boat trailers, fishers, picnickers, walkers were present in the riverbed, as well as campervans, and other visitors stopping to walk and ponder on the bridge above.

132. The Special Tribunal and the Environment Court (para. 84) at the Rangitata WCO found that salmon fishing is outstanding in that entire lower river. The Court noted the Rangitata was "*second only to the Rakaia out of the four large rivers - the others are the more modified Waitaki and Waimakariri Rivers – in the southern hemisphere as a river which provides outstanding angling in Chinook salmon*." (para. 86)

133. I understand that, like the Rangitata[26], the Waimakariri and Rakaia can be considered outstanding salmon fisheries. The Rakaia has also been assessed as a regionally important trout fishery (Unwin & Davis, 1983, page 98).

134. In the Rangitata analysis[27], channels' were found to need to be 124 mm deep for large salmon to migrate upstream, and that salmon are 1, 000 times more likely to move during a fresh than at low flows. Fishability and angling amenity can be distinguished, as recognised by the Court at Rangitata.[28] In the Rangitata, the Court found that increased flow generally, but not always, increases fishing amenity.[29]

135. In additional to the two great snow-fed rivers, the front country rivers have some important recreational trout fishing value. The Selwyn was identified as attracting anglers from throughout the region. The very accessible lower reaches of the Selwyn are the most popular for fishing (80%), with 40% in the very different middle reaches.

WAIMAKARIRI RIVER REGIONAL PARK

[26] C 109/2004 Rangitata South Irrigation & ors v. Fish & Game. para. 179
[27] C 109/2004 Rangitata South Irrigation & ors v. Fish & Game. para. 180.
[28] C 109/2004 Rangitata South Irrigation & ors v. Fish & Game. para. 190, 193,
[29] C 109/2004 Rangitata South Irrigation & ors v. Fish & Game. para. 199.

136. In 2006 the first stage of a new regional park was opened on the banks of the Waimakariri River. When fully completed in 2012, the park will cover around 11,000 hectares (mapped attachment 16). The aim of the Park is to provide accessible outdoor experiences that link a wide range of leisure activities with the natural environment (ECan media statement, 27/10/2005) As stated by the Chairman, "*Part of the purpose of the regional park is to encourage more people to enjoy this marvellous environmental and recreational resource so close to Christchurch and to encourage people to use parts of the area for a range of purposes."* Mountain biking and walking are of growing interest.

137. Considering the management of the middle and lower reaches and mouths of these mountain rivers, Boffa Miskell 2001 suggested channel and flow processes be managed "*to retain braided river morphology*", "*maintain natural patterns of flows, avoid drawing river down and holding for long periods at low flows. Manage flow to maintain wildlife values. Allow floods and freshes."* From my analysis of these mountain rivers, I endorse these management purposes.

138. As at the Waimakariri Gorge Bridge, the Rakaia Gorge Bridge and associated river lengths are highly valued for their natural character, landscape and amenity value.

139. Selwyn and plains tributaries have valued amenity in specific lengths. Water quantity and quality is a key dimension of their amenity value, as contact recreation is involved, such as at Chamberlains and Coes Fords in the lower reaches. These are long-standing and very highly valued sites. The protection and enhancement of their amenity values is necessary.

140. Through literature and the arts, the importance of these great rivers has long been expressed. For example, Olivier Spencer-Bower came from Woodstock and the river features in her watercolour work (attachment 36, lower right;). She returned to North Canterbury in 1931 and painted the river landscape emerging from the mountain gorge. The 1934 issue of Art in New Zealand commended the vigorous Waimakariri riverbed studies and "*the*

swirl of shingle river".[30] Her 1976 work "The Other Side" recognises the spatial separation caused by the river corridor.

141. New Zealand's foremost narrative painter, Trevor Moffitt[31], who painted New Zealanders in their landscapes, produced substantial series of works on the Rakaia. The earlier Salmon Fishing or Big Fishermen series of 47 works, exhibited in 1971, focussed at the river mouth. They "*are intended, in painterly terms, to convey something of the attitudes, rituals and atmospheres that surrounds the quest for the giant Quinnat salmon that annually centres around the large snow fed rivers of the South Island"*. The later Rakaia Landscapes and Rakaia Series focussed around the Gorge area and were exhibited from 1978 to 1984 (attachment 36, left, Moffitt & painting of 1983). The NZ Herald noted their "grand simplicity".

142. Trevor Moffitt is one of New Zealand's greatest artists … [he] *has indelibly portrayed and cast a "New Zealand way of life" in oils*. Dr Bill Glass described Moffitt as one of New Zealand's three greatest painters alongside Colin McCahon and Ralph Hotere.[32] "*Moffitt tells us who we are*. He shows us the beauty of ordinary people.

143. As noted by Grant Banbury in our 1993 study[33] "*From the foothills down to the sea Trevor Moffitt draws inspiration from the Rakaia River – the winding river cutting through rising terrace formations dotted with pine tress are a rich essay on this area – silver grey sandy banks contrasting with the ricjly coloured surrounds, against the constantly flowing rather opaque 'green-blue' colour of the river."*

144. Bruce Foster produced a dramatic series of aerial photographic works on the Rakaia braided system.[34] As noted by Banbury[35] *'Rakaia River' 1987 presents an aerial view of the Rakaia where pattern and forms dominate along with the intense 'teal' colour of the water. Here photographer Bruce Foster highlights the visually stimulating riverbed and emphasises the*

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[31] Chris Ronayne. 2006. *Trevor Moffitt, a biography*. David Ling Publishing, Auckland. p. 83
[32] Chris Ronayne. 2006. *Trevor Moffitt, a biography*. David Ling Publishing, Auckland. p. 181
[33] Cambell Grant Banbury. 1993. "*Landscape Art of the Canterbury Region. a Pakeha Perspective"* Ch. 4 *in* Canterbury Regional Landscape Study, Volume 2, page 5,
[34] Warwick Henderson, page 180 in "*Trevor Moffitt, a biography*".
[35] Campbell Grant Banbury. 1993. "*Landscape Art of the Canterbury Region. a Pakeha Perspective"* Chapter 4 *in* Canterbury Regional Landscape Study, Volume 2, page 6 and 20.

constantly changing river flow by presenting six separate images on the one theme."

145. Sculptor and painter Bing Dawe has produced many works exploring the past and challenging the management of our great Canterbury rivers. Many works address the effects on fish, particularly eel. Many address the effects on the birds endemic to the braided riverbeds, including the threats to the terns and the wrybills (attachments 36, 37 and 38).

146. The use of art is important in assisting in articulating and challenging our relationship with place, with landscapes.

OFFTAKE SITE VALUES

WAIMAKARIRI

147. The Waimakariri enters the plainscape through the Waimakariri Gorge at Woodstock. As the major pinch-point along the full length of the river, the length that is single channel river as compared to a naturally braided river below (attachments 5 and 11) ends here and the great braided river begins.

148. Released from the hard rock confines of the gorge, the river quickly makes its mark both vertically and horizontally – it cuts down and spreads out. Flights of river terraces are evident. It is very rapidly a braided river incised in the upper plains. It quickly incises to provide the west-east 'cross-section' through the upper plains.

149. The River is enclosed along the true right, the south bank, by a beech-podocarp forest fringe the signature vegetation of the high plains but now rarely seen (attachments 12 and 13, area B). Fronting pastoral areas across the river terraces, this matai-totara-beech forest fringing the natural river provides very high natural character when experiencing the river corridor. In the application, the upper offtake channel is proposed immediately alongside.

150. With the gorge entrance, the forest edge and the hills above Kowai Bush and the Torlesse Range above, the area of the braided river upstream of the Kowai confluence has very high natural character and natural landscape value.

151. The upper offtake is proposed within this upper end of the braided river. The inactive riverbed lands that Rubicon Road comes down into are farmed (attachment 20). Some relic beech trees and odd kahikatea are scattered and grouped on the old interfluves.

152. Toby Hill's Riverside visitor facility is based and the Waimakariri Alpine Jets launch from the north of these flats, with the private access road leading off Rubicon Road. Unformed Rubicon Road extends east to the Kowai, and the former ford to Keens Road opposite.

153. These flats on the former riverbed are a peaceful riverside place, closely associated with the great braided river alongside, and the diverse natural forest fringe enclosing.

154. With the gorge extending down and the river coming through the gateway from Woodstock, it is forest enclosed on the south bank down to these flats.

155. The Kowai offtake structures are proposed to intervene between the inactive and active riverbeds, and to extend upstream and out into the active riverbed.

156. From the pinch point at the Kowai confluence (attachment 11), the broad braided river continues down as a large and variable skein that swings to north and south through the years for a 7 km length to then be pinched in by the bedrock at Gorge Hill. This reach above the Gorge Bridge is enclosed to the south by a very large terrace riser that is crowned with a fringe of native shrubland (attachment 13, area H[36]).

157. The river currently swings in to the Gorge Hill face and the dramatic pinnacles of tilted greywacke strata worn by eons of such flows. Prostrate kowhai cling to any niches above flood level (attachment 12, area I).

158. The deep pooling around the pinnacles forms a beautiful feature on the river in its current layout. The picturesque qualities experienced within the river and riverbed are high. The natural landscape values from the drama of the enclosing pinnacle bluffs and the water pooling (attachments 14 and 15), the gravel channel bars that variously form nearby (attachment 16, "fishing at

[36] Jenny Steven & Colin Meurk. 1996. draft. PNAP report for Plains.

the Gorge Bridge") provide a particular important natural landscape feature on the plains river.

159. The river corridor at Gorge Bridge is dramatic. The bridge and roads enable access which is highly enjoyed all year round and for diverse activities (attachment 16). The bridge is walked over, and the banks explored, picnics enjoyed, the riverbed walked, the channels kayaked, rafted, and boated. The location is a focus. The focus is not merely due to accessibility, it is a dramatic natural place.

4. ASSESSMENT OF EFFECTS

160. The development of intake structures and associated works, and the maintenance of their functionality I assess will have direct effects on the natural character of both river corridors. The effects are different for each of the three proposed offtakes.

161. The removal of up to 40 cumecs from each river may also result in long term changes to the natural character, landscape and amenity value within either or both river beds, due to lesser and flat-lined flows and bedload deposition below the offtakes resulting in a gradual change in the braided character. I understand opinions vary as to the effects likely. Even if of low probability, or a gradual future effect, such effects on the braided character must be considered.

162. Mr Glasson's evidence focuses on the rural character of the landscape of the foothills and plains (para. 7). He does not address the effects on the natural character of the rivers, as required by s.6(a). For the Selwyn District Council, Mr Craig has not addressed the rivers (para. 4.13) only public views of them from beyond and has not taken the rivers and their users seriously (4.35), nor river dynamics. In para. 4.28 he seeks to camouflage the diversion channels. Mr Craig merely seeks to naturalise an impermanent channel through the riverbed.

163. Of the main components of the scheme, Mr Glasson considers that 2 of the 3 intakes "*are located at the two river gorges*" (para. 61). He states (para. 62)

that the intakes will be on the *"edge of the riverbed and at the toe of the batter slopes".*

164. In para. 75 Mr Glasson notes that deep cuts are proposed through the Waimakariri and Rakaia River terraces. He recognises (para. 62) the canal from Rakaia will *"bisect the river terrace slopes for a distance of up to 5 km*".

165. At para. 76 Mr Glasson notes that all cuts and batter slopes would be oversown, hydroseeded and planted. Little detail is provided of where such planting might occur, what the purpose is and what it might involve. Current costings of some $100k per hectare for revegetation on difficult sites appear to not have been allowed for.

166. In para. 104 he states that for the Rakaia terrace canal the upper 5 metres would be grassed and any planting would be 6 metres below the lip to avoid tree root penetration of the structure.

167. Later, in para. 166, Mr Glasson refers to a "revegetation" scheme to reduce the impact of the canals bisecting the river embankments. The biodiversity of the lowland landscapes of the plains and their braided riverbeds have been exceedingly impoverished by settlement of the last 150 years[37]. I have seen no indication that CPW seeks to address this deficiency through active restoration of dynamic riverbed communities.

168. For the proposed Kowai take, Mr Glasson states (para. 63) that the "*canal will run parallel with the river at a level just above the riverbed for approximately 2 km until it reaches the Kowai River*." For a kilometre before the Kowai confluence, it is to be piped and pumped under the Kowai, and then in a canal for a further kilometre, from whence it is in a tunnel (para. 63). No data on this pump station is provided. Para. 77 (b) refers to a pump station downstream of the Kowai. Another is proposed downstream of the Gorge Bridge (para. 77(c)). No details or assessment has been provided with respect to the individual or cumulative effects of these structures and their services on the natural and landscape character of these river nodes.

[37] C. D. Meurk & P A Williams. 1989. "*Plant Ecology of Braided Rivers of Canterbury*." Botany Division, DSIR.
G.A. Knox. "*Natural History of Canterbury*.

169. Mr Glasson states (para. 64) that *"the intakes and canals structures will be of concrete construction."* No further detail is provided of the design of these structures except that they will be of a scale to carry a 20-30 cumec flow, although I understood each intake is proposed to have a 40 cumec capacity. The proposed location of vegetated versus concrete canals is unclear.

170. Mr Glasson notes the components of the proposed Rakaia intake at para. 98, including:

- a low diversion bank across the riverbed;
- a low gravel weir;
- an excavated channel (approx. 25 m wide) "*off a major braid to ensure water enters the intake channel*";
- *works to protect the intake system from erosion and flooding, such as stopbanks, rock groynes, rock lined banks and vegetative protection*";
- a gated intake structure and box culvert surrounded by a stopbank;
- a sluicing race 1 km down from the intake, with sluice gate and side channel;
- a settling pond and control gate;
- a pump station 6 km downstream; and,
- a sidling canal to the top of the terrace to the main canal.

171. Mr Glasson assesses the landscape and visual effects of the construction of this complex as significant (para. 103), due to the reshaping of the escarpment, the incongruity of the canal line across the slope, as well as the vegetation clearance. He assesses this would be very publicly visible for perhaps 10 years. He assesses that for in-river users there would be a localised loss of amenity value for 5 years (para. 105). This evaluation underplays the scale and character of the immediate effects, and the on-going in-stream management effects are entirely ignored with structures

such as excavated channels in the active riverbed, ongoing machined management works would be anticipated. There is no design or management regime provided that substantiates Mr Glasson's assessment of the Rakaia intake complex.

172. The nationally important Curiosity Shop geopreservation site on the true right of the Rakaia, opposite the Highbank Power Station, is alongside the proposed complex (attachment 27), and effects on this have not been assessed. The proposals, such as the Rakaia Intake Drawing No. C-203 (URS) and Mr Glasson's Figure 13.9, are inadequate for an assessment. CPW propose massive earthworks in the vicinity of the site.

173. This Curiosity Shop site with the Otekaike Limestone overlying greensand, tuffaceous mudstone and sandstone, exposed by a former limestone quarry, has long been recognised for its beautifully preserved molluscs, echinoids and sharks teeth. It provides a cue to the seafloor originated lands, the tertiary lands, which underlie the gravel plains. Instead of respecting this cue, it has been ignored.

174. For the upper Waimakariri intake, Mr Glasson rates it as having few public viewpoints (para. 106). He ignores the daily busload of tourists that undertake the jet boat trip in this area (attachment 16). He also ignores the many private jet boaters and kayakers in this reach close below the gorge. The Gorge Bridge location below has a very well-used river entry and exit point as does that at Woodstock just upstream.

175. Begun in 1992, the Waimakariri Alpine Jets, which has hosted up to 6 busloads a day and up to 20,000 passengers per year, is an important activity in the Woodstock to Kowai confluence length of river, as well as the gorge above. The wildness and naturalness of the river corridor is the attraction. The trip enters the braided river from off Rubicon Road, and proceeds upstream to the single stream of the gorge. The entry point to the river thus has to respond to the variability of channel locations. (I note the base aerial photo used by CPW is during the low flows of 1998 when the trips are evident accessing a channel over to the north.)

176. Mr Glasson states (para. 107) that the intake is 3 km upstream of the Kowai confluence, and "*There is also an alternative location 1 km further*

upstream", with a tunnel to protect the intake from flooding (para. 108). I have not seen any such alternative proposal. The area sought within which to construct the intake does not extend to 4 km from the confluence.

177. Mr Glasson states (para. 109) that a 3 km long suite of structures and earthworks would be required. Mr Glasson concedes (para. 111) this will result in a more industrialised landscape. He states (para. 111) that the landscape and visual effects will be minimal in 5 to 7 years.

178. However, the scale of the proposed works, the lack of specificity as to their location and character, and, the significance of the landscape, natural and amenity values, are such that I assess Mr Glasson to have considerably under-estimated potential adverse effects of the upper Waimakariri intake.

179. The prevalence of beech in the location is mentioned (para. 64), along with cabbage tree, kohuhu and manuka "*on the terraced slopes*". No riverbed biodiversity is recognised in the assessment.

180. For the Lower Waimakariri intake, two different locations are referred to as proposed above the Gorge Bridge (para. 112). Only one site is shown (Figure 11.9). The information is scant and the alternatives cannot be assessed.

181. The lower Waimakariri Intake involves a tunnel through the rock to the existing stock water race where a complex of structures would be developed (Glasson para. 113). Mr Glasson acknowledges the recreational importance of the location and the reasonably high visual effects that would result from the proposed development (para. 114). I agree that the effects of the structures and earthworks in this special Gorge Bridge area would have significant adverse effects.

182. For both rivers, Mr Glasson recognises (para 158) that great care is required in siting and constructing the intake canals "*as they bisect the embankments*". However there is woefully inadequate information to enable their assessment.

183. The location and design of the main canal is described by Mr Glasson at para. 65. It is proposed to be 25 m wide for most of its length with "*softly sloping and vegetated batter slopes and it will pass under the Hawkins,*

Selwyn and Hororata Rivers" and crosses over other streams and creeks. His Figure 9.2 suggests the headrace crosses the Hororata River and at 9.6 is siphoned under the Hororata River. Similar confusion occurs for the crossing or passing under the Selwyn River at Coalgate with Figures 9.3 and 9.5. Para. 125 - 126 notes the concrete structures involved. Little information is provided to enable an assessment.

184. Mr Glasson states (para. 65) that he expects the main canal to be widened in key locations for recreation and biodiversity. No plans are provided and there are no apparent proposals, nor certainty, regarding this expectation.

185. Mr Glasson notes the damming proposed for the Waianiwaniwa River, but provides no assessment of its values (para. 67, 69). I address the Waianiwaniwa valley in my later brief.

186. Assessing effects, Mr Glasson recognises the importance of the braided rivers (para. 82) and the importance of this element remaining intact. He then analyses that "*At the intake points, both rivers meander over shingle beds, but the braided rivers begins downstream, well beyond the intake structures of the Scheme."* I have assessed the rivers in the vicinity of the proposed intake points, considered a geomorphic analysis, and conclude that this analysis is incorrect. The intakes are proposed from braided rivers.

187. Mr Glasson refers to accepted landscape criteria (para. 83), and based on these assesses that "*the landscape in which the CPW is located within is not an outstanding one."* In para. 90 he notes that both rivers are dramatic; unpredictable; habitat for rare species; a recreational focus; and, of great significance to tangata whenua. In para. 94 he identifies that "*Both intake locations are memorable places for the legibility of the landscape of the well defined linear landscapes and the steep batter slopes."*

188. Whilst some specific values have not been described, Mr Glasson identifies that the rivers rate highly on natural science values, legibility, aesthetic (including memorability and naturalness, shared and recognised and tangata whenua values. Yet he assesses that the landscape of the river below the Waimakariri Gorge is "picturesque" not outstanding. It is unclear whether he assesses similarly for the Rakaia.

189. Mr Glasson notes that both rivers were identified as outstanding in the Canterbury Regional Landscape Study (1993). He does not assess whether they might be outstanding natural features at the district scale.

190. Mr Glasson identifies (para. 91) that the structures must be integrated into the environment so as to minimise the natural dominance of the landscape. However he provides no assessment of effects on the character and experience of the river environments.

191. From para. 97 Mr Glasson provides a visual assessment, not a landscape or natural character assessment.

192. Whilst recognised that they are significant resources, Mr Glasson has completely ignored the potential effects on the natural and landscape character of the riverbed lands and waters, either through initial construction works, ongoing management to retain their functionality, or through the changes in riverbed character that such intervention will potentially generate.

193. The ongoing works that are likely to be required to manage the intakes within the dynamic river environs will have ongoing adverse effects on the intrinsic values and experience of the river corridors. Following the floods that regularly occur and their likely disruption to various ‘dozed channels, once water levels recede the channels would be repaired or reinstated. To achieve adequate diversion measures, machines would presumably not only be on the dry gravels but working in the water channels. To enable post-flood water access for the irrigation, works within channels would be assumed, and silt movement anticipated.

194. With the 40 cumec offtake, if significant bedload deposition occurs in the vicinity, and channel size reduces, further works might be sought to ensure boat, kayak and salmon access is not impeded. Such works would involve further reduction in natural experience and natural character values.

195. As the application applies to Selwyn District, of course works in the Waimakariri riverbed would be confined south of this line (attachment 11). I note the district boundary bisects the riverbed, and the primary channels are variously in one district, both or the other.

196. I assess the intake management work has the potential to regularly very significantly adversely affect the natural character, landscape and amenity values of the site and the associated visual and aural catchment, and where any associated discoloured waters are experienced. I have experienced the river at different flows and consider a reduction of 40 cumecs from the typical instream flow would adversely affect the natural character and amenity value experienced in the river.

FURTHER UPPER WAIMAKARIRI OFFTAKE EFFECTS

197. The Kowai intake may involve a channel constructed from upstream of the tourist boat entry site, and canal along that river bank to the Kowai siphon.

198. Alternatively, as shown by my colleagues - Glasson Figure 11.7 (& my attachment 11) and Craig page 23 - a diversion channel may instead be created out into the braided river below the tourist boat entry site.

199. This Kowai intake is proposed to have the capacity to remove 40 cumecs from the Waimakariri to supply the Waianiwaniwa Dam. Wherever located, a large canal or channel is intended which would be quite different in character to the natural channels due to the formality of parallel channel banks, the greater height and depth of the channel, and the overall simplicity.

200. Introduction of artificial patterns, with more formal canals and ponds and leading away from the river, would reduce the natural character experienced within the river and for the river margins.

201. As is clearly demonstrated by the historic river flow patterns through the Kowai confluence area (attachment 11), it is a braided river area that characteristically varies enormously, with key channels varying from side to side and centrally. I disagree with Mr Glasson that this is not a length of braided river. I note the Kowai Take AEE (2005, section 2.4.1) purports to maintain fish passage through the system "*from an upstream natural river braid to a downstream natural river braid*".

202. The channel shown in the proposal stretching up the side of the active riverbed would be a very significant disruption to river access. The

formations and structures would reduce natural character, landscape and amenity values, and access.

203. The proposed diversions appear to be of questionable sustainability. I understand that to implement and manage the channels proposed by Mr Glasson and Mr Craig that would cut across the active braided riverbed, would require ongoing machining in the riverbed to reconstruct a channel after each flood and to ensure that adequate water was channelled into it. Also, the flows are periodically beyond the district boundary (attachment 11).

204. With a channel constructed across the braided riverbed the natural riverbed patterns and processes would be disrupted. With the channel formation across a portion of the bed, freshes would be variously interrupted. It is likely that sediment deposition would be varied, thus braiding patterning and habitats too.

205. I assess that any of the options identified for the Kowai offtake would have significant adverse effects on the natural character, landscape and amenity values of this reach of the Waimakariri.

LOWER WAIMAKARIRI OFFTAKE EFFECTS

206. The Gorge Bridge intake is proposed at a very beautiful and spectacular section of the Waimakariri. The intake, proposed to tunnell through the base of the pinnacles, is through an entirely natural formation, a dramatic cliff landform above a dramatic and diverse river. Whilst just upstream of the Gorge Bridge, the intake site has very high natural character, landscape and amenity value. It is an exciting and special site. An entirely natural site - the rock cliffs, their tilted strata weathered to form pinnacles, with prostrate kowhai clinging to their upper surfaces and the waters swirling below (attachments 14, 15 and 22).

207. Whilst many of the tourists would be oblivious to their weed origins, local operators have described their vision to maintain and enhance amenity values and natural character through removal of wilding pines along this length of the river corridor. The removal of pines would assist significantly, and enable the rock formations and biodiversity to be displayed and not belittled (attachment 15). The great cliffs upstream of the proposed offtake are fringed with native shrubland (attachment 13, H).

RIVERBED CHANGE

208. With the river flow potentially reduced here by 40 cumecs, I understand there is the potential for the river to change in behaviour. Whilst historically the river degrades through these high plains (attachment 8), with a reduced flow there may be insufficient to transport material. Hence bedload deposition would elevate the riverbed. Reduced flow and increased material has the potential to alter the natural patterns and processes.

209. As identified in the Kowai Intake AEE (2005, para. 6.4.2), "*it is not known if such an abstraction would result in aggradation downstream of the intake*".

210. If the braided character of the river below the offtakes is lessened, with fewer braids, and more of a single stream character, then the river experience would change. As noted in the S.42A report for ECan by Maurice Duncan (para. 23), the removal of up to 62 cumecs/sec from the Waimakariri River "*affects the number, severity and duration of freshes and floods. Floods are necessary for the appearance and functioning of braided rivers like the Waimakariri. They clear away vegetation to leave bare gravel bars characteristic of braided rivers, and remove periphyton and flush fine sediment to maintain healthy ecosystems. The abstractions reduce the number and duration of small freshes*."

211. Mr Duncan concluded (para. 29) that 41 to 150 cumec flows would be the most affected by the combination of current and proposed CPW abstractions.

212. Mr Duncan states (para. 52) "*There will be no increase in time the river spends at or around the WCO minimum flows, or at the 7-day MALF*." But, "*there will be a reduction in median flows in the river and a significant reduction in the number of days the river would spend above smaller fresh levels."*

213. The strongly braided character is what gives the river its specialness, its distinctiveness, its excellence for recreation, its high amenity, its landscape and natural character value.

214. The flood character is quite different from the typical or low flow character (attachment 24). Flood flows would be unchanged, so that the "split

personality" of the river would remain. With lessened flows during non-flood times, there is the potential for the river to become less special and more ordinary. With fewer ephemeral braids from lower flows and limited freshes, the valued complexity would reduce. There would be less of the characteristics that contribute to the valued excellence of in-river experience.

215. I note that Mr Mabin prepared his evidence assuming that the Waimakariri could not be reduced to 46 cumecs.

RAKAIA OFFTAKE EFFECTS

216. For the Rakaia, whilst 40 cumecs is sought by CPW, I understand this is not all available, due to existing allocations, and other applications in process but perhaps with priority.

217. The offtake proposed below the Rakaia Gorge involves a length of river that is much less impressive to overview than the gorge. Although overall the river is highly valued for in-river experience, particularly from jet boats.

218. The site is opposite Happy Valley, which is just above and opposite the Highbank Power station at the Rangitata Diversion Race discharge. Transmission from this Station crosses the river corridor, along with a pylon route across at Happy Valley striding across near the proposed intake site. These structures lessen the naturalness of this length of the river corridor.

219. The offtake would involve a diversion channel constructed for perhaps a kilometre to catch the flow and divert it to the intake structure. With the movement of the braids (attachment 26), this gravel channel is expected would need to be regularly reformed and relocated to enable it to access adequate flows following floods.

220. The intake structure, overflow, sediment trap gate, screen and fish return are all proposed within the riverbed beneath the escarpment. An intake canal would then be cut into the river escarpment to follow it downstream and eventually climb out onto the plains surface.

The proposed intake structures are extensive. To provide some concept of the scale the plan for each of the 3 complexes is shown overlain on Hagley Park and central Christchurch at attachment 39. A structure such as a

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sediment trap can then be visualised in relationship to a known place such as Cranmer Square, the Hospital a street block or golf fairway.

221. With the weedy and rather scruffy river margins, construction of the intake is assessed may not have significant adverse effects on this river length but active management may do. However the canal cut at grade along the great escarpment for some 5-6 km would have very significant adverse effects on the natural character of this important landform. The very large cut and fill proposed involves constructing steep slopes 50 or more metres high (attachment 31). The proposal is to very substantially reshape the slopes that naturally enclose and define the river corridor.

222. The enclosing scarp on the north or left bank demonstrates the degrading character through the upper plains. The huge bank is part of the river. It is the natural river margin environment. Over eons, the river has cut down through these great outwash plains, and it is here below the gorge that this is best displayed. The canal would involve extensive cut and fill to form a canal along the 235 metre contour across the scarp. It would be contrary to the natural patterns formed by natural processes.

223. The proposal involves no commitment to either protection or restoration.

224. With minimal information available on the proposal, potential effects on geomorphological features and vegetation are unknown (attachment 27 and 28).

225. I assess that the proposed canal would have very significant adverse effects on the natural character and landscape values of the river corridor.

RIVER MOUTHS

226. Duncan addresses the natural processes at the Rakaia River mouth (para. 69), and likely changes from the CPW take. attachment 35a shows some versions of the Rakaia River mouth.

227. I address the potential effects on the river mouths in my later brief.

CHANGES IN RIVER CHARACTER

228. Assessments of effects should be made considering:

1. *aesthetic values*
2. *expressiveness*
3. *transitory value*
4. *natural science factors.*

229. Given the limited information provide I am unable to make an assessment of each river section and associated proposal under these criteria. However I am strongly of the opinion that the matters require more rigorous analysis for a full landscape assessment of the scheme.

230. Whilst ECan have a “clear floodway” policy, the efforts required to sustain this state are expected would increase with decreased flows. The riverbed would require greater inputs to sustain the open character that would naturally be expected to be more readily sustained through freshes and greater typical flows.

231. There appears to be very little information or modelling by CPW to explore the potential effects on the river character. With reduced flows and possible consequent bedload deposition below the offtakes, then the river character above, at and below the takes could change considerably. The aesthetic, expressiveness, transitory and natural science values are all vulnerable to such change.

232. The braided rivers are recognised as having highly significant natural values, landscape values and amenity values.

233. To date there has been no or scant assessment by CPW experts of the potential effects of the CPW proposal on the natural character, landscape or amenity values of the rivers.

234. The information available to enable assessment is severely limited.

5. CONCLUSIONS

235. The braided Waimakariri and Rakaia Rivers flowing from the gorges and through the high plains are features of regional significance for their geomorphological character, wildlife, landscape and recreational value. These rivers have very important natural character, conservation, landscape, amenity and recreational value.

236. Assessed as per the modified “Pigeon Bay criteria” these rivers can be considered outstanding natural features and/or landscapes. Their protection from inappropriate effects is therefore a matter of national importance.

237. The natural character of the rivers is to be preserved and protected from inappropriate effects. The natural character, landscape and amenity values associated with the river margins in the vicinity of the two Waimakariri offtakes are particularly important and vulnerable. That of the Rakaia offtake site is less so, although there are important natural science values. The impacts of the terrace canal are potentially as significant with respect to the Rakaia compared with that for the Waimakariri. I asses that for both the Waimakariri and Rakaia the terrace canals would potentially have very significant adverse effects on the river corridor.

238. The two great rivers have very dynamic natural riverbeds within which the natural patterns, natural processes and natural elements are essential to their valued character. CPW propose to abstract for much of the year, but not flood flows. Such extractions from typical flows and freshes are assessed as likely to result in a reduction in the dynamic character, with lessened and flat-lined flows potentially lessening braiding and/or channel size downstream.

239. Reduced braiding or reduced flows in braids has the potential to significantly reduce the natural character, landscape and amenity values of the riverbed, altering habitat, recreational opportunity and the visual character. The lack of adequate modeling of potential effects on the river system by the applicant makes it difficult to assess the changes in natural character, landscape and amenity values both locally and downstream.

240. In summary I assess the landscape study for CPW to be inadequate. It fails to acknowledge that the rivers (for their full length) have been identified as outstanding natural features, nor are the potential effects on the natural character and landscape values of the rivers appropriately assessed. The landscape assessment is generally confined to visual amenity effects rather than addressing the full range of landscape values. Even with regard to visual effects, the AEE is inadequate in that it fails to address adequately the visual impact of the activities/structures from the perspective of river users, such as those kayaking, boating or fishing. Nor has Mr Craig for Selwyn District Council addressed the natural character, landscape and amenity values within the river corridor.

241. The CPW proposal involves the building of structures and significant alterations to the riverbeds and banks to create and maintain offtakes, and to convey the waters to the dam or inter-river canal prior to distribution over the plains. These works I assess would have significant adverse effects on the natural character, landscape and amenity values, particularly due to the high landscape value and vulnerability of the upper and lower Waimakariri offtake locations, and the scale of earthworks disrupting natural values at the Rakaia.

242. The upper and lower Waimakariri offtakes are both proposed at locations that contribute very high natural character, landscape and amenity value. Whilst specificity with regard to what and where is still not available, the proposed concepts for the complex of structures and earthworks at each site are assessed would have very significant adverse effects on the natural character, landscape and amenity values at and associated with these sites. The proposed developments would reduce the naturalness and integrity of this river corridor through the construction of the works and in the ongoing management of the diversion structures.

243. At both Rivers, the complex of structures from water diversion through to terrace canal are assessed would potentially have highly significant adverse effects on the natural character, landscape and amenity values enjoyed in association with the rivers.

244. Revegetation of the cut and fill slopes for the terrace canals at the 1:1 or 1:1.5 slopes proposed by CPW would be difficult to revegetate. Design or conditions to enable or require mitigation through revegetation certainty and costs (perhaps $100k per hectare surface area) do not appear to have been factored in for the extensive works proposed. Nor have remediation works such as weed control been incorporated.

245. Whilst no data or assessment has been provided by the applicant, with each diversion channel located within an active braided riverbed, the maintenance of each of the three complexes of offtake structures is assessed would involve ongoing river management works to ensure adequate flows are accessed. Such management has the potential to have significant adverse effects on the natural character, landscape and amenity values enjoyed. The presence of machines working in the riverbed, as well as the evidence of the activities that remains, would both devalue the natural experience and integrity of the river system.

246. The water abstraction could substantially reduce the flows typically experienced and valued in both braided rivers. The reduction in flows and the obstruction and disruption of natural patterns, processes and elements by structures and ‘dozed channels

247. The proposed river-associated works would have immediate effect as well as long-term effect through incremental change from reduced flows and disrupted flow patterns.

248. With reduced flows and works in the rivers, the proposal would not maintain or enhance the very important amenity values of the rivers. To remove or reduce threads in the skein of channels comprising these important rivers, to reduce the balance of water channel to gravel bed, is to threaten their integrity, significance and value.

249. The local effects of the offtakes as well as the downstream effects on river flows and potentially on river character I assess have the potential to result in significant adverse effects on the outstanding natural features or landscapes of the Waimakariri, and possibly also on the Rakaia.

Appendix 1.

Waimakariri Vegetation (for locations, refer attachment 13)

LARGE TREES	
Elaeocarpus dentatus	hinau
Dacrycarpus dacrydioides	kahikatea, white pine
Nothofagus solandri	black beech
Podocarpus hallii	Hall's totara
Prumnopitys taxifolia	matai
Prumnopitys ferruginea	miro
SMALL TREES	
Cordyline australis	ti kouka, cabbage tree
Sophora microphylla	South Island kowhai
Griselinia littoralis	kapuka, broadleaf
Kunzea ericoides	kanuka
Leptosermum scoparium	manuka, tea tree
Pittosporum tenuifolium	kohuhu, tawhiri, black matipo
Pseudopanax arboreus	whauwhaupaku, five finger
Pseudopanax crassifolius	horoeka, lancewood
SHRUBS, LIANES	
Coprosma propinqua	mikimiki, mingimingi
Coprosma ciliata	
Coriaria arborea	tutu
Discaria toumatou	matagouri
Muehlenbeckia australis	pohuehue
Olearia paniculata	akiraho
Solanum aviculare	poroporo
Solanum laciniatum	poroporo
Sophora prostrata	prostrate kowhai
LIANES	
Rubus schmidelioides	lawyer
GRASSES & FLAXLIKE	
Cortaderia richardii	toetoe, toitoi
Carex secta	purei, a sedge
Libertia ixioides	mikoikoi, NZ iris
Phormium tenax	harakeke, flax
Poa cita	silver tussock, wiwi
FERNS	
Blechnum novae-zelandiae	kiokio
Polystichum vestitum	puniu, prickly shield fern
Pteridium esculentum	bracken, rahurahu
Pyrrosia eleagnifolia	leather leaf fern

Rakaia Vegetation (for locations, refer attachment 28)

LARGE TREES	
Nothofagus fusca	red beech
SMALL TREES	
Sophora microphylla	South Island kowhai
Cordyline australis	ti kouka, cabbage tree
Pseudopanax crassifolius	horoeka, lancewood
Griselinia littoralis	kapuka, broadleaf
SHRUBS	
Coprosma ciliata	
Coprosma propinqua	mikimiki, mingimingi
Discaria toumatou	matagouri
Melicytus alpinus	porcupine shrub
Pittosporum tenuifolium	kohuhu, tauwhiri, black matipo
LIANES & GROUNDCOVERS	
Clematis marmoraria	the world's smallest clematis
Parsonsia capularis	aka kiore, native jasmine
Muehlenbeckia australis	mat pohuehue
Muehlenbeckia axillaris	pohuehue, creeping wire vine
Muehlenbeckia complexa	pohuehue vine
Raoulia australis	a scabweed cushion
GRASSES & FLAX-LIKE	
Carex secta	purei, a sedge
Carex geminate	rautahi, purei, cutty grass
Cortaderia richardii	toetoe, toitoi
Eleocharis acuta	spike-sedge
Juncus gregiflorus	wiwi, tussock rush
Microlaena spp.	patiti
Phormium tenax	harakeke, flax
Poa cita	wiwi, silver tussock
Rytidosperma clavatum	a small, lax tussock
Schoenus pauciflorus	bog rush
FERNS	
Pteridium esculentum	rahurahu, bracken