Part VII Protection and Preservation of Outstanding Features and Qualities

Introduction

1. Having determined that there are outstanding features in the Rangitata River, we then considered what was required to retain these. Evidence was given by many experts and other witnesses on both the optimum and satisfactory flow regimes and water quality requirements for different species, activities, values etc. We only discuss these in detail for those features and characteristics that we have found to be outstanding.

Preservation of waters in a natural state

2. We found that there are waters in their natural state in the headwaters, the upper Rangitata and the gorge. However, we also found that there are demands for water in the upper Rangitata and we consider that preservation could unduly disadvantage primary industry in the catchment. While there are no particular industry needs identified for the gorge we note that it may not be practical to maintain these waters in a natural state if the section immediately upstream is not preserved in its natural state.

3. Therefore we conclude that only the headwaters (Clyde and Havelock rivers and their tributaries) should be preserved in a natural state. The upper Rangitata and the gorge are worthy of protection for the outstanding features that we have identified, including waters that are in a natural state.

Protection of outstanding characteristics

Salmon Fishery

Adult salmon passage

4. Water depth and water temperature are the key factors to be considered for ensuring upstream passage of adult salmon. The annual spawning run begins in November, with fish continuing to arrive in the spawning streams until early May.

5. The depth of water required for salmon passage was the subject of some debate amongst witnesses. However, we conclude that most parties agree that a depth of 25 cm will generally give adult salmon passage, and that fish can negotiate shallower water for short distances but may suffer loss of condition. Modelling work that was reported by Duncan and Hicks (ECan) estimated that in the braided Ealing reach 35 m^3/s would give almost continuous fish passage, but in the Arundel reach, which is a semi-braided channel, only 15 m^3/s is needed to

give almost continuous fish passage. We consider that the modelling work gives a fair picture of the change in depths and habitat available at different flows, but we do not take it to give absolute values for fish passage.

6. Basil Ivey (professional fishing and hunting guide (RDR)) says he sees salmon moving upstream in flows of 20 m^3/s, and in 25-30cm of water. In commenting on fish passage, Mosley notes that flows below 35 m^3/s may be adequate for fish passage, as long as freshes can occur, and he suggests an absolute minimum of 20 m^3/s. Other witnesses also noted that flow variability was important. Mosley noted that flows greater than 20 m^3/s occur 94% of time i.e. the current minimum doesn't usually persist for long periods.

7. Taking into account the Duncan and Hicks modelling, Mosley concluded that 35 m^3/s during November – March is a desirable minimum flow for upstream salmon migration.

8. The applicant considered that the current minimum of 20 m^3/s during the period of salmon migration is not ideal, but is adequate.

9. Jowett (applicant) noted that, for fish, the change from winter to summer minimum flows in September is more appropriate than August as recommended by ECan, and for summer to winter May is more appropriate than April as ECan recommended.

10. Ryder (RDR) noted that salmon migration is directly affected by temperature, with fish using the colder flows during high flow events to carry out their migratory movements. While temperatures do increase on average as one moves further downstream, and high flows are generally associated with low river temperatures, he concluded there is little positive correlation between flow and temperature. He considered that under present conditions salmon will be experiencing occasional thermal stress, but these are probably not maintained for long enough to be lethal. Thermal refugia are likely to be important. Water temperature will probably act as a migratory block at least for short periods in summer. Salmon have an optimum water temperature of 14.8°C and would have a preference for temperatures below 19°C. Ivey (RDR), who is a commercial fishing guide, also provided information, based on his experience, of the importance of cold "flushes" for salmon migration.

Conclusions

11. We conclude that a minimum flow of 35 m^3/s during the period of salmon upstream migration would be desirable, but that the current minimum flow of 20 m^3/s is adequate, given that it does not occur very often, or for long periods, especially during the months when salmon are migrating.

12. At present water temperatures get sufficiently high to cause thermal stress. Therefore, new uses must not let the water temperature increase beyond acceptable limits. From the evidence presented, a maximum temperature of 20°C appears appropriate. This is consistent with the water temperature requirements in the Motueka River water conservation order.

Salmon spawning

13. Most of the spawning is in the upper Rangitata, with some 70% occurring in two spring-fed stream systems, known locally as Deep Stream (Mesopotamia) and Deep Creek (Erewhon or Mt Potts). Only 5% is estimated to occur below the gorge, most of this in Ealing Springs Stream.

14. Although some spawning occurs in the main stem of the upper river, the preference is clearly for the characteristics of the stable, spring-fed flows of streams such as Deep Creek and Deep Stream. Passage to and from these streams is vital for the salmon fishery.

15. Water quality in the spawning streams is mainly determined by the natural flow regime but could be affected by adjacent land use.

Conclusions

16. Successful salmon spawning depends not only on upstream passage of the adult fish, but also on maintenance of the high water quality, gravel substrate and stable flows of spring-fed streams in the upper Rangitata, especially Deep Stream and Deep Creek. Ealing Springs Stream is also important as one of the few remaining salmon spawning streams in the lower river.

Effects of damming on salmon population

17. Only 5% of spawning in Rangitata River is believed to take place downstream of the likely dam site. Unwin, a fisheries scientist (applicant) considered that, in the absence of a suitable fish pass, a dam at the Rangitata River gorge would have a profound impact on the Rangitata River salmon population. He made a comparison with the Roxburgh Dam, which also had much of the spawning area above the dam. There the annual run strength declined from a peak of 50,000 before the dam to between a few hundred and a few thousand fish after the dam.

18. Glova, a fisheries scientist, (applicant), presented evidence on overseas experience with fish passes, especially in North America. He concluded that although the technology does exist to construct fish passes that successfully allow salmon to migrate upstream, there are difficulties that cannot always be predicted in the design phase, such as getting the fish to find and use the fish passes and development by trial and error may be necessary. For example, significant delays can occur in fish passage at the dam, or the pass may not be used. The salmon run in the Rangitata River typically comprises fish 2 - 4 years old, so the wild run would be seriously threatened if fish pass facilities were not working well within 2 - 4 years.

19. Glova's view was that the effects of a dam on downstream passage of juveniles would be greater than the effects on adult salmon passage. Even with the best technology he considered that significant delays and mortalities would be likely.

20. In addition to the effects of the dam on salmon passage, there would be significant loss of important rearing habitat for juveniles in the main stem of the Rangitata River above the gorge. Glova considered that the reservoir could be

expected to be extensively silted and unproductive and would not provide a substitute for the existing habitat. Unwin noted that there is no quantitative data on how much of the juvenile rearing habitat is provided in this reach, but demonstrated that loss of this reach would conservatively represent 10% loss of rearing habitat and quite possibly 25% - 50% loss.

21. A dam at the gorge would also significantly affect the flow variability in the lower river. The experts recognised that there might be some benefits to the fishery from a managed flow regime from an impoundment, but considered that the disadvantages, including problems such as loss of spring floods causing decreases in juvenile survival, outweighed possible advantages.

Conclusions

22. Damming of main stem Rangitata River would put the outstanding salmon fishery at high risk. Even with successful fish passes the flow regime would be altered and the reservoir would affect habitat for both spawning and rearing and possibly fish passage. All the problems with salmon migration found at dams in the Columbia River system – injury, stress, disease, predation - are expected to occur here.

Salmon Angling

23. The flow requirements for salmon angling are more demanding than the biological requirements of the fishery. Salmon anglers prefer naturally low clarity during the fishing season and are concerned that further abstractions will increase the clarity at the preferred angling flows.

24. Preferred flows are 40 - 80 m^3/s in lower river. We note that 71% of angler activity and 79% of the salmon catch occurred during these flows in 3 seasons (1990 - 1993). Lower than this the water is too clear and the salmon stop moving. The water is also getting too shallow for fish passage in places. Above 80 m^3/s the flow is considered to be too high and water too turbid. Salmon may be holed up and not moving.

25. The applicant (Scarf evidence) considered that 40 m^3/s in the river downstream of the RDR intake to the sea is the minimum flow necessary for salmon angling success, but flows in the range 40-80 m^3/s would be optimal.

26. Desirable minimum flows for salmon angling were given by Mosley as
    - 50 m^3/s year round
    - 70 m^3/s November – December
    - 60 m^3/s January – February

27. Ivey (RDR) considers that setting flows such as these focuses too narrowly on flow and not enough on temperature and turbidity, which he considers are the more important factors in determining preferred flows for angling. He attributes good fishing conditions to periods following freshes in the river which bring a drop in water temperature and an increase in turbidity.

28. Ivey told us that "To me, in order to maintain “fishability” of the river, it is far more important to impose a cap on abstraction and/or a flow sharing regime, so that the variability of flow continues, rather than to raise the current minimum flow." "I consider the current flow regime is effective from a fisherman’s point of view as it maintains the variability of flow which is so important for both salmon migration, and for fishability. I believe that water temperature and turbidity are the major factors determining fishing success in the Rangitata River. Both limitations are natural – high temperatures occur in the upper reaches as the river flows over wide, shallow braids; and turbidity is related to rainfall and snowmelt.” “The strengths of the Rangitata River as a fishing river are its extensive areas of fishable water, the sense of solitude that can be obtained and the scenic qualities.”

29. Salmon anglers prefer low clarity during the fishing season and are concerned that further abstractions will increase the clarity at the preferred angling flows. However, the anglers were clear that at their preferred fishing flows (40 - 80 m^3/s in the lower river) the present regime provides adequate, but not optimum time when the clarity is in the preferred range. Their rule of thumb for ideal clarity is that one should only just be able to see the toe of one's wader when standing in knee-deep water.

Conclusions

30. Flow rate and flow variability (freshes), water temperature and clarity are key factors in determining desirable river conditions for angling. Although these are interrelated, management of flow rate alone will not necessarily provide the greatest number of angling days. Higher minimum flows would increase the available days for angling, but increased abstraction that reduced freshes would be detrimental.

31. Capping the maximum allowable abstraction at or about the present levels would ensure that freshes are maintained in the river system.

Habitat for aquatic birds

32. Maintaining aquatic bird habitat in the Rangitata River depends particularly on ensuring that the macro-invertebrate food source is maintained and that large areas of unstable bare gravels persist for the birds to breed. We note that human activity in the river-bed (e.g. 4WD vehicles) is not an issue that a water conservation order can address. (See Part III Bird Habitat for a description of the bird species and their habitat requirements.)

33. Hughey gave minimum flows designed primarily around providing adequate early season food resources and feeding opportunities for black-fronted terns and wrybills which feed mainly on food of aquatic origin. His suggested flows are intended to maximise invertebrate densities, especially in the early part of the breeding season. His recommended minimum flows were:
    - 20 m^3/s May/June/July
    - 35 m^3/s August
    - 40 m^3/s September - January

- 30 m^3/s February/March/April

34. Although Hughey considered that the higher minimum flows would improve nesting success, we note that in the range that he is considering (i.e. an increase from 20 - 40 m^3/s) there is little change in the number of braids in the river, and probably insufficient increase to seriously deter predators such as stoats.

35. Hughey recommended that the upper Rangitata be protected both from damming and from significant abstraction of water, especially in the Potts River delta. He also sought protection of the flood regime, especially flows above 250 m^3/s.

36. Mosley recommended 35 m^3/s minimum flow especially from August - January for macro-invertebrate food production for birds. Jolly contested the need for the higher minimum flow in August, as this is too early for most of the critical bird species. Jolly concluded that the applicant's draft water conservation order would be appropriate to protect existing bird habitat values.

37. The disturbance caused by instream works can directly affect birds by reducing populations of their fish and invertebrate foods, and interfering with their ability to find prey. Jolly noted that the present level of works associated with the RDR weir and intake being short-term and infrequent do not appear to adversely affect the bird populations in the lower river, but that more frequent activity could cause problems. The RDR sand-trap discharge only occurs when flows are high and the water naturally discoloured.

38. Jolly (RDR) considered that the existing level of takes and protection of bird habitat is appropriate but that a dam on the main stem would have a severely adverse effect on bird habitat and diversion of the tributaries would affect macro-invertebrate supply. He also noted that without a cap on abstraction there is the potential to reduce the flushing ability of the river.

Conclusions

39. September to January are the critical months for habitat quality for threatened bird species. Excessive water takes and frequent river works (e.g. maintenance of intakes, weirs, river control) during this period are likely to have adverse effects.

40. Modelling work has suggested that higher minimum flows (35 m^3/s) would produce higher densities of invertebrates, and therefore more food, but not all witnesses agreed that the higher minimum is necessary.

41. Maintenance of flood flows is important for maintaining the open gravel habitat.

Scientific and ecological values: Aquatic macro-invertebrates

42. The aquatic macro-invertebrate communities in the Rangitata are dominated by species that are tolerant of disturbance by frequent high flows. The attributes of the river regime that are particularly important to protect the character and

abundance of the macro-invertebrates include flood flows, periods of stable flow, and water temperature.

43. Water temperatures above 25°C are usually considered deleterious to NZ invertebrate species (Jowett). Stoneflies are particularly sensitive and are usually restricted to rivers with summer temperatures that do not exceed 19°C (Quinn & Hickey, in Jowett). Ryder stated that most of the common invertebrates in Rangitata River will not be experiencing temperatures that exceed their tolerance. Some may occasionally be affected by temperatures approaching their lethal limit (e.g. *Deleatidium* spp. 23°C), but for very short periods only. He noted that water temperatures that exceed the preferred temperature of taxa may result in a decline in numbers and condition, or total loss, of species but that under the present flow regime temperatures reach levels that stress invertebrates, but are probably not maintained for long enough to be lethal.

44. Digby estimated invertebrate production in the Rangitata River using his own work and data from other braided rivers. He concluded that production would be reduced by extended minimum flows as the minor braids and seepage streams that support a large proportion of the invertebrate production would be dewatered for longer periods. Ryder challenged the validity and logic of Digby's approach to calculating invertebrate production, and suggested that the relationship between flow and macro-invertebrate production is not straight forward. Invertebrate production is affected by factors other than flow, including depth, temperature and turbidity. He believed that it is not possible to conclude that production would be reduced at a minimum flow of around 20 m^3/s.

45. Simulations by Duncan and Hicks indicate that the preferred macro-invertebrate habitat begins to decrease markedly below 35 - 45 m^3/s.

Conclusions

46. The macro-invertebrate fauna is adapted to a naturally unstable flow regime and species that are found are those resilient to disturbance. Minor braids and seepages that are less severely disturbed by floods may contain comparatively high densities of invertebrates after floods. Maintenance of the flow regime and other river processes (e.g. sediment transport) that contribute to the braided channel structure will be important in retaining these species at levels of biomass production to provide adequate food for birds and fish.

47. Water temperatures under the current regime are likely to reach the lethal limit for macro-invertebrates from time to time. Further abstractions could exacerbate this.

48. Mosley and Hughey both recommend a minimum flow of 35 m^3/s during spring/summer months to maximise biomass production of macro-invertebrates as a food source, especially for birds. We concur with Ryder's view that, with current understanding, it is not possible to conclude that biomass production would be reduced by extended minimum flows of about 20 m^3/s.

Rafting and kayaking

49. The outstanding rafting and kayaking is provided by the water (depth, amount of white water, holes, waves etc) and the wild and scenic character. Even with periodic water releases for recreational uses, a dam at the gorge would degrade the experience. Keenan told us that controlled releases would be "sterile". Alternative experiences might be provided but these would not compensate for losses, and would probably no longer be outstanding. The quality range of grades on one river is also out of the ordinary, making not only the gorge important for these activities.

50. Rankin (New Zealand Recreational Canoeing Association) concluded that the following would be needed to maintain the outstanding rafting and kayaking in the Rangitata River :
    - prohibition of damming / impoundment
    - retention, as much as possible, of natural flows
    - maintenance of water quality

51. Gualter (manager of Rangitata Rafts) noted that the best flows for rafting are in the range 80 - 180 m^3/s, but that the natural fluctuations are important. He noted that the gorge never becomes too low to navigate and only occasionally becomes too high. Rankin noted that the gorge can be kayaked in flows from 40 – 350 m^3/s, but that 80 –120 m^3/s offer the easiest kayaking. From Klondyke to Peel Forest the preferred flows are in the range 80 – 150 m^3/s.

52. Rankin noted that the minimum flows for recreation recommended by Mosley: December – March 50 m^3/s; April – July 20 m^3/s; and August – November 35 m^3/s would better meet the needs of canoeists than the current minimums. He noted that below 50 m^3/s in the reach below the RDR the river becomes too small to be interesting, except perhaps for beginners.

Conclusions

53. The sustained and demanding nature of the rafting and kayaking in the gorge, the range of other quality canoeing water, and the wild and scenic environment are in large part outstanding because of the natural flows, high water quality and the high amenity values. Damming and changes to the natural regime in the gorge and upper river would be detrimental to the outstanding nature of the rafting and kayaking.

54. A higher minimum flow below the RDR intake would benefit the canoeing experience.

Tikanga Māori / Braided river character/ Spiritual and Cultural purposes / Wild, scenic and other natural characteristics / amenity and intrinsic values

55. The features that give the river its outstanding braided river character, wild, scenic and other natural characteristics and its spiritual and cultural values are similar to those that make the river of outstanding significance to Ngāi Tahu.

56. A dam would alter the Rangitata River's unusual flow regime that is a result of its glacial origins. It would break the connection of the lower river with glacial origins, and would alter habitats for native fish, macro-invertebrates and birds. The sediment regime would change. A dam would adversely affect the mauri of the Rangitata River in several ways including by interrupting the continuity of flow from the mountains to the sea. This would conflict with the Ngāi Tahu mountains to the sea philosophy - "Ki uta ki tai". Habitat and passage for mahinga kai species would also be affected.

57. Modifications to the character of the headwater tributaries, the upper Rangitata, or the gorge could be caused by changes in the flow patterns or deterioration of the quality of the water, including all tributaries and the main stem, and diversion or dewatering of the tributaries.

58. Ngāi Tahu noted that the status quo already adversely affects the mauri of the Rangitata River, especially in the lower reaches and that no further reductions in water quality should be allowed.

59. Although we determined that it would be unreasonable to apply "preservation" status to the upper Rangitata and the gorge, these waters should still be retained, as far as possible, in their natural state, while making some provision for industry and the community.

Conclusions

60. The "mountains to the sea" attributes can only be maintained if the flow regime in the mainstem and the tributaries is kept as natural as possible; there are no structures that act as barriers to the flow of water or the passage of mahinga kai and other species. Maintaining an open river mouth and high water quality are also necessary.

Historical purposes

61. We found that the upper Rangitata River has outstanding historical attributes. We consider that it is because the river and its landscapes are largely in a natural state that the historical values remain. That is, the natural form and flow of the river enable present generations to vividly imagine what Butler and other early Europeans encountered in the Rangitata valley.

Conclusions

62. Measures to protect the outstanding amenity and intrinsic values, and wild and scenic and braided river characteristics will also protect the historical values, insofar as the water conservation order provisions are able to.

Scientific and ecological values: indigenous plants

63. The outstanding indigenous plant communities in the riverbeds of the upper Rangitata and the gorge have developed as a result of the river flows and form. A water conservation order can assist to protect them by maintaining the natural

flow patterns and minimising adverse effects of activities in the river bed. Managing impacts such as invasion by exotic plants is outside the scope of a water conservation order.

Conclusions

64. Measures to protect the outstanding amenity and intrinsic values, and wild and scenic and braided river characteristics will also protect the indigenous plant communities in the riverbeds of the upper Rangitata River and the gorge.

Restrictions and prohibitions to protect outstanding features and qualities

Introduction

65. We have determined the outstanding features and values of the Rangitata River (Part III) and the requirements to retain their "outstandingness" (Part VII). We have also reviewed the needs of industry and the community (Part IV) and plans and policies (Part V). In this section we evaluate whether or not a water conservation order is required to protect or preserve the outstanding characteristics identified (Part III), and what degree of protection or preservation is appropriate, taking into account the needs of industry and the community and having regard to existing plans and policies.

Water quality

66. Many of the outstanding features including salmon fishery, macro-invertebrate species, rafting and kayaking, angling, spiritual and cultural values, and importance to Ngāi Tahu depend on high water quality to remain outstanding. Water temperature, clarity and potential adverse effects of abstractions, damming, discharges (point source and diffuse) and river works are key water quality issues.

67. ECan (Hayward and Meredith 2000) reported on the results of periodic water quality testing at three sites between 1993 and 2000. The results from the limited programme provide an indication of the quality. Low nutrient concentrations and moderate levels of indicator bacteria were found. Some of the measurements suggest downstream deterioration of chemical and bacteriological water quality. Chemical and bacteriological water quality is good, but not necessarily excellent. Tests indicated probable non-point source and/or point source contamination.

68. Discharge of sediment from the sand trap on the RDR is the only authorised discharge that may affect water quality, in particular clarity. Consent conditions and current practice mean that this sediment is only released in high flows, above those preferred for fishing, when sediment levels are already high.

69. Water clarity issues in the Rangitata River centre around the relatively low natural clarity in the river at flows other than (but including) flood flows, due to the presence of fine glacial flour. Expert witnesses measured and described the clarity of the Rangitata River water using various techniques, including turbidity (NTUs) and suspended sediment. Comparisons were made with black disc measurements in the Waitaki River (clarity in metres). There was disagreement amongst expert witnesses as to whether or not abstractions reduced the clarity downstream more rapidly than under the natural flow regime. Ryder questioned the methodology used by Jowett for concluding that additional abstraction will increase downstream clarity and disagreed with the conclusion that abstraction results in an increase in water clarity.

70. We agree with Ryder that measuring clarity as turbidity with turbidimeters (NTUs) is not satisfactory for defining clarity requirements because of the high variability in the results and hence the difficulties in determining a useful relationship between NTUs and flow. We cannot determine from the evidence whether or not further abstractions are likely to increase water clarity for a particular flow in the lower river.

71. To retain the natural turbidity patterns any discharges that increase turbidity should be permitted only if they are carried out at times when the turbidity is already high (i.e. during floods).

72. Jowett modelled temperature changes with changes in flow. He concluded that additional abstractions would increase daily maximum water temperatures and that temperatures would be above 20°C more often. Ryder discussed temperature data collected by RDR Management and concluded that, with current abstractions, the temperature increase during the study did not exceed that considered acceptable under the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council (ANZECC) 2001). Water temperatures in the lower river appear to reach levels that cause thermal stress to fish and invertebrates from time to time, but are unlikely to have lethal effects.

Conclusions

73. The quality of the water in the Rangitata River and its tributaries must be maintained to standards suitable for recreation, fish habitat and/or fish spawning depending on the reach or tributary. This will require limits on any discharges into the Rangitata River or tributaries. Setting appropriate standards for water quality should assist in determining what water uses can be allowed. As there are currently no standards set for the Rangitata River, we find that a water conservation order is required to set appropriate standards.

74. While the water quality classes given in the third schedule to the RMA are relevant, we consider that, rather than use these directly, it is more appropriate to set out those criteria that are relevant for protecting the outstanding features and qualities of the Rangitata River.

75. We conclude that any uses, especially discharges, should not:
- allow the water temperature to rise over 20°C;

- the pH to go beyond its natural range;
- encourage undesirable biological growths;
- put contaminants in the water that affect human consumption of fish or other aquatic organisms;
- make the water unsuitable for contact recreation;
- reduce the instream habitat quality by reducing dissolved oxygen below 80% of saturation.

76. Maintaining high water quality does not conflict with existing uses. Future uses would need to meet the water quality standards set, but we consider that this not unreasonable. Depending on the standards set, this would be consistent with the water quality objectives and rules in the ECan draft NRRP.

77. We note that deterioration of water quality (especially bacteriological contamination) in the lower reaches is probably a result of land use intensification (e.g. in the McKinnons Creek area). There is little that a water conservation order can do to address this problem.

Flows

78. The key attributes of the flow regime that need to be considered are: the hydrograph shape (i.e. the pattern of flows), mouth closure, freshes, floods, and minimum flows. We note that current abstractions do not significantly alter the overall shape of the flow hydrograph .

Mouth closure

79. Keeping the river mouth open is necessary for salmon and other fish species to migrate. Jellyman (RDR) commented that, although access to the sea at all times is highly desirable, intermittent mouth closure for a few days would not seriously impact on fish recruitment.

80. In a report to ECan (U98/01), Tonkin and Taylor stated that the mouth could close during a southerly storm at a river flow of less than 30 m^3/s, and would close at 10 m^3/s. Under the present regime, the mouth may have closed from time to time, but never for more that 1 or 2 tide cycles (Scarf and others). A flow of 20 m^3/s is exceeded 94% of time below RDR intake (Mosley).

81. Scarf (applicant) expressed the view that a flow of not less than 20 m^3/s is necessary to maintain the river mouth open.

Freshes and Floods

82. Many witnesses commented on the importance of freshes and floods to maintain both instream species and their habitat, as well as habitat for birds, and to maintain other characteristics and values including wild and scenic, spiritual and cultural etc.

83. Freshes (up to 200 m^3/s) are important for cooling water and appear to provide a trigger for salmon to move upstream. Regular freshes also reduce the risk of periphyton growths reaching nuisance levels.

84. Vegetation clearance of the gravel riverbed mostly occurs at much larger flows. Mosley reported that flows >250 m^3/s are capable of flushing weeds. He noted that there are, on average, 10 of these events per year. The annual average maximum flow is 900 m^3/s. Periodically, floods greater than 1000 m^3/s occur, and will rework braids and move vegetation from larger areas.

85. Increased abstraction, especially with no flow sharing, would have the greatest impact on reducing the number of freshes that exceed 250 m^3/s.

Minimum flows

86. Because the Rangitata is different from most other New Zealand rivers, with its lowest flows in the winter, not the summer, setting minimum flows in Rangitata River is also different. The usual approach is to set a single summer minimum flow, but this is not appropriate for Rangitata River. Minimum flows specific to different outstanding characteristics are discussed below. We note that the 1:100 year return period 7 day low flow has been calculated as 31 m^3/s (ECan), indicating that naturally the flow would only drop below 30 m^3/s on rare occasions.

87. The mean annual low flow (MALF) in the Rangitata River at Klondyke is 40 m^3/s. In their written submissions, the Director General of Conservation (DoC) and Forest and Bird, while generally supporting the applicant, sought a minimum flow equal to the MALF i.e. 40 m^3/s. Both parties modified this request in their presentations to the tribunal. DoC sought a minimum flow of

- September – January 40 m^3/s
- February – April 30 m^3/s
- May – July 20 m^3/s
- August 35 m^3/s

and Forest and Bird sought:

- September – January 50 m^3/s
- February – August 35 m^3/s

Both parties also sought flow-sharing above the minimum flows.

88. Desirable minimum flows for different attributes that we found outstanding ranged up to 70 m^3/s for part of the year, with several parties requesting a minimum flow of 40 m^3/s or higher. Bright (MAF) assessed how different minimum flows and allocation rules would affect the ability to meet long term consumptive needs for water in Canterbury. He concluded that if the minimum flow in the Rangitata River is raised to 40 m^3/s it would reduce the irrigated areas that could be reliably supplied to 82% of the area that is potentially irrigable. His analysis assumes that all irrigation abstraction is removed from the Ashburton River to restore its flow, but that storage is developed which includes using water harvested from the Potts River.

89. Robb (for ECan) presented results from modelling 7 different flow regimes, comparing them with the existing rules, and analysing the differences. The results showed that the higher minimum flows, as expected, improved indicators for recreation, fish passage and angling and decreased the availability of water for irrigation. The detailed results were made available in a report published by ECan.

90. We note that under the present regime the summer minimum flow of 20 m^3/s is not reached very frequently, nor does this flow persist for long periods. However, it does provide the run of river takes with significantly higher reliability than would occur with a higher minimum. The minimum flow has been 20 m^3/s since 1986, and the outstanding features have been retained.

91. The present winter minimum of 15 m^3/s is lower than sought by a number of parties. We note that at present winter abstraction through the RDR passes into the Rakaia River through the Highbank power station.

92. We also note that although salmon angling was found to have the highest desirable minimum flow (70 m^3/s for November and December), the applicant was not seeking a higher minimum flow in this regard.

93. The flow sharing regime requested by the applicant is hydrologically the same as the 1986 Plan. Both retain the natural variability of the river. The flow sharing regimes proposed by Environment Canterbury, Mosley and Department of Conservation, although similar in hydrological terms, result in the residual river flow receding to the minimum flows more rapidly and more often, and result in increased periods of prolonged constant flow and would be less like the natural flow pattern than the 1986 Plan regime.

94. ECan wanted to have a minimum flow during the summer of 30 m^3/s, but have this increase to 50 m^3/s when the flow at Klondyke is between 90 and 120 m^3/s. We agree with Scarf (applicant) and Stewart (DoC) that increasing the minimum flow like this when river is in the range 90-120 m^3/s would not be practical to implement.

Conclusions

95. A higher minimum flow would be highly desirable to reduce the impacts of low flows on in-stream values including fish passage, macro-invertebrate production and the number of suitable fishing days, but this would have adverse impacts on the established industry and the associated communities. The present regime with minimum flows of 15 m^3/s in winter and 20 m^3/s in summer with flow-sharing above this level takes account of the needs of industry, and when combined with other provisions should be adequate to protect the outstanding attributes of the river. These minimum flows should also keep the mouth open, except for short periods.

96. Changing between summer and winter regimes on September 15 and May 15 appears to be acceptable to both irrigators and fisheries advocates, but is different from the recommendations of ECan and some others.

97. In conjunction with a minimum flow the most important flows for protecting the outstanding features are those below about 100 m^3/s, providing these are complemented with appropriate flow variability and floods. This is the flow range most affected by the current abstractions, which are primarily below the gorge. We do not consider that further abstraction can be allowed in this range without serious adverse effects on the outstanding features.

98. We consider that higher minimum flows would potentially affect the reliability of run of the river takes to a point where the economic benefits are severely reduced. We note that the Ashburton District, although opposed to a water conservation order, supported the flow regime proposed by the applicant, which is similar to our recommendations.

99. Therefore, we recommend a cap on abstraction of 33 m^3/s and maintenance of a 1:1 flow sharing regime between in and out of river uses. We note that 33 m^3/s is a significant proportion of the mean flow (95 m^3/s).

100. Above 100 m^3/s there is a need to ensure that the number and sizes of freshes and floods are not significantly reduced. However we also accept that there is significant potential to develop further irrigation using Rangitata River water. We consider that when the flow in the Rangitata River is above 110 m^3/s at Klondyke that an additional 20 m^3/s can be made available for abstraction. The rates of rise in the river are extremely rapid, and this places a limitation on the ability to abstract significant amounts of water from the rising limb of the fresh or flood. It is not uncommon for the river to rise at rates in excess of 150 m^3/s per hour during northwesterly rainfall, especially when that rainfall also produces snowmelt.

101. Therefore we consider that a 1:1 flow sharing regime would not be practical. We recommend a two step allocation: 10 m^3/s when the natural river flow is between 111 m^3/s and 120 m^3/s, and 20 m^3/s when the river is above this.

102. Our conclusions on flow regimes are consistent with the RPS, but somewhat different to the regime proposed in the draft NRRP. We conclude that a water conservation order is necessary to protect the outstanding features, as we consider that the provisions in the draft NRRP will not necessarily protect the outstanding features as there is no cap on total abstraction and no flow sharing.

Disturbances in the riverbed

103. Because of the unstable nature of the gravel river bed, abstraction points in the main river will require ongoing maintenance so that they can continue to operate. Such river works adversely affect salmon and bird habitats and angling.

Conclusions

104. There are currently three abstraction points on the main river. Each of these requires varying levels of in-stream works to keep them operating. As the outstanding features have been maintained with these abstraction points, there is no justification for reducing the number. However, increased abstraction points

will require additional ongoing works at each point. There will be cumulative effects of additional works in the riverbed. It is not possible to determine the actual effects of additional disturbances. Therefore, we apply the precautionary principle to recommend that no further points be allowed, i.e. three is the maximum number allowed.

105. We do not, however, conclude that there is any reason why the abstraction points cannot be changed. For example a new intake further upstream could replace the existing abstraction on the south bank. Additional abstraction points from some tributaries will also be possible.

106. The upper river (from Clyde / Havelock confluence to below the gorge) is in a very natural state, although there are river protection works and farming operations. We conclude that any abstractions from the main river in this reach will adversely impact on the outstanding characteristics of the river. Therefore the three abstractions points on the main stem will be restricted to downstream of the gorge.

107. Consents for other river works, including construction and maintenance of roads, bridges and network utility operations, as well as soil conservation and river protection works undertaken under the Soil Conservation and Rivers Control Act 1941 could still be granted. However, we do note that the timing of such works for outside the bird nesting and salmon migration months would be beneficial to these outstanding attributes.

Effects of damming

108. The special tribunal was presented with evidence that a dam in the gorge would be technically feasible. Few groups supported a dam. Many submissions expressed a view that a dam was highly undesirable and should be prohibited. Federated Farmers submitted that the negative effects associated with dam construction could be avoided or mitigated and that there are significant ecological, economic and social benefits that can be derived from the construction of a dam and water storage reservoir. However, they noted that they do not suggest that a dam should be built in the Rangitata River, only that the option be left available for future generations.

109. Mosley described how the impact of a dam on the hydrological regime would depend on the operating rules adopted, but a number of environmental impacts would be unavoidable, including inundation of the riverbed upstream to the confluence of Forest Creek, creation of a delta/wetland at the head of the impoundment, significant reduction of the amenity value of the gorge, changes to water clarity, reduction of bedload transport through the gorge and consequent changes in channel morphology, and closure of the gorge for migratory fish. Several impacts are largely negative; others could, with appropriate management, have positive benefits.

110. This issue does not appear to have been addressed by existing plans and policies, and we conclude that a water conservation order is needed to manage

the effects of abstractions on the outstanding aquatic bird habitat and the salmon fishery in the main stem of the Rangitata River.

Conclusions

111. Although a dam in the gorge would clearly provide additional irrigation capacity, and more certainty than run of the river takes, we conclude that any dam on the main stem of the Rangitata River would unacceptably impact a number of outstanding characteristics.

112. The free-flowing nature of this glacial fed river is an attribute of many outstanding features. A dam in the gorge, as described to us, would adversely affect the following outstanding features:

- aquatic bird habitat
- salmon fishery and fishing
- wild, scenic and other natural characteristics
- braided river characteristics
- macro-invertebrates
- indigenous plant communities
- rafting and kayaking
- spiritual, cultural and historical values
- value to Ngāi Tahu

113. Likely mitigation works and practices, such as fish passes or recreational flow releases would not be sufficient to retain the outstanding characteristics of the river. However, we accept that there are significant economic benefits from increased abstraction. Damming of the main stem, but not all tributaries, will be prohibited.

114. Prohibition of a dam in the mainstem of the Rangitata River is consistent with the draft NRRP and the RPS. It is not inconsistent with any specific objective or policy of either the Timaru or Ashburton District Plans, but could be inconsistent with objectives to provide more irrigation. While it is probable that the NRRP will protect the river from damming, this plan is still at a discussion draft stage, so there is no certainty that the operative plan will include this provision. Therefore prohibition of damming should be included in a water conservation order.

RDR abstractions

115. Even the current levels of abstraction have some adverse effects on the outstanding features of the Rangitata River. However, the nature of the RDR with its (almost) continuous flow provides a range of mitigating features. We do not consider that the RDR replaces the reduction in habitats or other features, but it does provide a self-sustaining trout fishery, macro-invertebrate and native fish habitat, and recreational opportunities. These features could not be achieved where abstraction is seasonal only, such as irrigation alone. Therefore we consider that a large proportion of the flow abstraction allowed must be as a

flow that continues year-round (except for maintenance periods) to enable mitigating environmental effects to be maintained.

116. We agree that the RDR is firmly embedded in the bio-physical, economic and social environments of the Canterbury Plains, and we also note that RDR management has demonstrated that they are very willingly to meet environmental requirements, and have developed a positive working relationship with the Fish and Game Council. The validity of making special provision for the RDR was questioned by counsel for ECan. We note that other water conservation orders have specifically mentioned particular consents (Kawarau - Clyde dam and power station; and Buller - Maruia Thermal Springs), although not in the manner in which the applicant has suggested for the RDR.

Conclusions

117. In terms of protecting the outstanding features as we have determined them for the Rangitata River, we conclude that neither the exact position of any intake, nor any particular consent holder is relevant. However, we do find that increasing the number of abstraction points above three is likely to have adverse effects on several outstanding characteristics or qualities. We also find that the continuous nature of the RDR flow mitigates some of the adverse effects of abstraction.

118. However, the existing RDR consents are not inconsistent with protection of the outstanding qualities and characteristics that we have determined, providing that a satisfactory means of deflecting fish from the intake is installed. Nothing that we propose in our draft water conservation order is incompatible with granting new consents to RDR with similar terms and conditions to the present.

119. In order to protect the mitigating effects of the significant continuous flow of the RDR we conclude that of the maximum of 33 m^3/s that we propose should be allowed for abstraction, at least one take should be of significant size and, as far as possible, continuous. We note the need to retain a certain amount of flexibility for future reallocation to other users, especially those within the catchment. A figure of 11 m^3/s was given to us as the amount of water that could potentially be used within the catchment for new irrigation. We consider that the single continuous flow could, if required, provide half of that, therefore we conclude that at least 28 m^3/s should be allocated to one continuous abstraction, leaving 5 m^3/s, that may be allocated to this or to other users. This does not preclude more than 28 m^3/s being allocated to the RDR, but is left for ECan to determine.

Groundwater

120. In the 1986 Plan, wells up to 15m deep and within 400m of the river or 50m of a tributary were considered to be directly connected to the river, and consents were therefore subject to the same minimum flow rules as surface water consents.

121. ECan (Aitcheson-Earl; report U01/76) estimated that the existing wells cause 817 l/s of stream depletion. This is about 4% of the summer low flow of 20 m^3/s in the lower river. This is based on a desk study rather than from an assessment of each bore.

122. The applicant (Scarf) considered that all shallow groundwater associated with the Rangitata River should be included in a cap on abstraction of 33 m^3/s. In its draft water conservation order they defined this as all groundwater within 15 m below ground and less than 1000 m on either side of the river.

123. ECan prefer to use a calculation method to determine whether or not the groundwater is hydraulically connected, and sought to define this as: "Hydraulically connected groundwater means groundwater that is laterally connected to a river, with a stream depletion factor less than 100 days calculated using the method published by Jenkins, C T (1977) Computation of rate and volume of stream depletion by wells, in Techniques of Water Resources Investigation of the United States Geological Survey, Chapter D1, Book 4, 3rd printing."

124. Examining the ECan data suggests that the applicant's proposed "rule of thumb" is reasonable, as most wells more than 1000m from the river have a stream depeletion factor (sdf) of greater than 100days. However, there is at least anecdotal evidence that some wells on higher terraces close to the river are not directly connected.

Conclusions

125. We conclude that there is shallow groundwater (<15 m deep) that is hydraulically connected to the Rangitata River and tributaries, including McKinnons Creek, but exactly which groundwater is hydraulically connected and which is not is not well-defined.

126. However, hydraulically connected groundwater must be managed in the same way as surface water in terms of restrictions on total abstraction, and restrictions to meet low flow rules in the main river and tributaries.

127. From the evidence presented we conclude that beyond about 1 km, and deeper than 15m, there is a low probability that groundwater is hydraulically connected to the river. Therefore we conclude that all groundwater within 1000m of the river and tributaries, and less than 15 m will be considered to be hydraulically connected and abstractions from this groundwater will be subject to the same conditions as surface water abstractions, unless it can be shown that the water is not likely to be connected.

128. It is not appropriate for this tribunal to determine what methodology, either theoretical or experimental, is used to determine hydraulic connection. We leave this to ECan or to applicants for resource consents.

129. Our conclusion is not inconsistent with the NRRP, which also seeks to treat hydraulically connected groundwater in the same manner as the surface water to which it is connected.

Necessity for a water conservation order

130. Having determined the management requirements to preserve or protect outstanding features and qualities, considered the needs of primary and secondary industry, we then evaluated what restrictions and prohibitions are required to protect the outstanding characteristics, taking into account the needs of industry and the community.

131. We also assessed to what extent existing policies and plans will achieve the protection that we seek. We do not consider that the existing plans and policy statements (including the draft Natural Resources Regional Plan) adequately meet the needs as we have determined them.

132. Therefore we recommend that a water conservation order is made to achieve preservation of waters in a natural state or for protection of outstanding features. The following sections summarise the outstanding features and qualities, and our proposed protection measures.

Headwaters

133. The headwaters (Clyde and Havelock Rivers and their tributaries) have outstanding: amenity and intrinsic values, significance for Ngāi Tahu, wild and scenic and other natural characteristics, scientific and ecological values of indigenous plant communities in riverbed and braided river characteristics. The waters are in their natural state.

134. These waters should be preserved, as far as possible, in their natural state.

Upper Rangitata main stem

135. The upper Rangitata River has outstanding: amenity and intrinsic values, significance to Ngāi Tahu, wild and scenic and other natural characteristics, spiritual, cultural, recreational and historical values, salmon fishery, scientific and ecological values: indigenous plant communities in riverbed; braided river characteristics. The waters are in their natural state

136. Given the needs of industry and the community, preservation in this reach is not considered appropriate, but very high levels of protection are needed to protect the outstanding features, with some limited opportunities for water use.

137. Protection in this section of the river will include:

- Setting standards to maintain high water quality particularly to protect the needs of salmon and salmon spawning, values important to Ngāi Tahu, and for recreation.

- Minimising human disturbance of the river form, the river bed and the natural flows by prohibiting both damming and abstractions in main stem, especially to protect aquatic bird habitat, spiritual and cultural values, Ngāi Tahu values, wild and scenic and other natural characteristics, and recreation.

- Managing the flow regime to retain natural flow patterns by limiting the amount of abstraction from the tributaries, and requiring that sediment transport is maintained. This is particularly to protect values important to Ngāi Tahu, aquatic bird habitat, spiritual, cultural, historical and recreational values, wild and scenic and other natural characteristics, scientific and ecological values: indigenous plant communities and braided river characteristics.

- Protecting salmon spawning streams through water quality standards and restrictions on abstractions.

Tributaries of the upper Rangitata River and gorge, except for salmon spawning tributaries listed below

138. The tributaries of the upper Rangitata River and the gorge contribute to the outstanding aquatic bird habitat; braided river characteristics, salmon spawning & juvenile habitat, rafting and canoeing, aquatic macro-invertebrates and the significance to Ngāi Tahu.

139. Protection of the outstanding values requires that these tributaries retain sufficient water of high quality to retain their contribution to the main stem.

140. Protection measures include:

- Setting standards to maintain high water quality particularly to protect the needs of salmon and salmon spawning, values important to Ngāi Tahu, and for recreation.

- Managing the flow regime to retain natural flow patterns by limiting the amount of abstraction that can be permitted from the tributaries, and requiring that sediment transport is maintained. This is particularly to protect values important to Ngāi Tahu, aquatic bird habitat, spiritual, cultural, historical and recreational values, wild and scenic and other natural characteristics, scientific and ecological values: indigenous plant communities and braided river characteristics.

- Managing damming so that sediment transport is maintained.

Gorge

141. The gorge is outstanding for amenity and intrinsic values, wild, scenic and other natural characteristics, indigenous plant communities, rafting, canoeing, and significance to Ngāi Tahu. It contributes to the outstanding salmon fishery and has waters in their natural state.

142. Protection in this section of the river will include:

- Setting standards to maintain high water quality particularly to protect the needs of salmon and salmon spawning, values important to Ngāi Tahu, and for recreation.

- Minimising human disturbance of the river form, the river bed and the natural flows by prohibiting both damming and abstractions in main stem, to protect aquatic bird habitat up and downstream, spiritual and cultural values, Ngāi Tahu values, wild and scenic and other natural characteristics, recreation.

- Managing the flow regime to retain natural flow patterns by limiting the amount of abstraction from the tributaries and requiring that sediment transport is maintained. This is particularly to protect values to Ngāi Tahu, spiritual and cultural values, wild and scenic and other natural characteristics, recreation; scientific and ecological values: indigenous plant communities, braided river characteristics, salmon fishery and aquatic bird habitat.

Main stem Rangitata River from below the gorge to Arundel; and

Main stem Rangitata River from Arundel to the sea

143. The Rangitata River main stem from below the gorge to Arundel is outstanding for salmon fishing, salmon passage, water-based recreation, significance to Ngāi Tahu. It contributes to aquatic bird habitat.

144. The Rangitata River main stem from Arundel to the sea is outstanding for aquatic bird habitat, salmon passage, salmon fishing, spiritual and cultural values, and significance to Ngāi Tahu.

145. Protection in these two sections of the river will include:

- Setting standards to maintain high water quality particularly to protect the needs of salmon, values important to Ngāi Tahu, and for recreation.

- Minimising human disturbance of the river form, the river bed and the natural flows by: capping total abstraction at a maximum of 33 m^3/s except during flood flows; limiting the number of abstractions points from the main river in these reaches to three, setting a minimum flow of 20 m^3/s in summer and 15 m^3/s in winter, prohibiting damming in main stem, to protect aquatic bird habitat, spiritual and cultural values, Ngāi Tahu values, salmon passage, salmon fishing and recreation (gorge to Arundel section).

- Managing the flow regime to retain natural flow patterns by limiting the amount of abstraction that can be permitted, and requiring that sediment transport is maintained. This is particularly to protect values to Ngāi Tahu, spiritual and cultural values, salmon passage, salmon fishing and scientific and ecological values: braided river characteristics, aquatic bird habitat Arundel to sea, contribution to aquatic bird habitat (gorge to Arundel).

Tributaries of the Rangitata River from below the gorge to the sea except for salmon spawning tributaries listed below

146. The tributaries of the Rangitata River from below the gorge to the sea (except for salmon spawning tributaries listed below) contribute to the outstanding aquatic bird habitat; braided river characteristics, salmon spawning & juvenile habitat, rafting and canoeing, aquatic macro-invertebrates and significance to Ngāi Tahu.

147. Protection measures include:

- Setting standards to maintain high water quality particularly to protect the needs of salmon and salmon spawning, values important to Ngāi Tahu, and for recreation.

- Managing the flow regime to retain natural flow patterns in the main stem by limiting the amount of abstraction that can be permitted from the tributaries, and requiring that sediment transport is maintained. This is particularly to protect values important to Ngāi Tahu, aquatic bird habitat, spiritual, cultural historical and recreational values, wild and scenic and other natural characteristics, salmon passage, salmon fishing, scientific and ecological values: indigenous plant communities and braided river characteristics.

- Managing damming so that sediment transport is maintained

Ealing Springs Stream and McKinnons Creek

148. Ealing Springs and McKinnons Creek are salmon spawning tributaries that contribute to the outstanding salmon fishery. They also contribute to the significance of the Rangitata River to Ngāi Tahu, including the eel fishery.

149. Protection measures include:

- Setting standards to maintain high water quality particularly to protect the needs of salmon and salmon spawning, and the values important to Ngāi Tahu.

- Prohibiting abstractions from Ealing Springs Stream and setting a minimum flow in McKinnons Creek.

Brabazon Fan, Black Mountain Stream Deep Creek (Mt Potts), Deep Stream (Mesopotamia)

150. Brabazon Fan, Black Mountain Stream, Deep Creek (Mt Potts), and Deep Stream (Mesopotamia) are all salmon spawning tributaries of the upper Rangitata River and contribute to the outstanding salmon fishery.

151. Protection measures include:

- Setting standards to maintain high water quality particularly to protect the needs of salmon and salmon spawning, and the values important to Ngāi Tahu

- Prohibiting damming and abstractions

Shallow groundwater

152. Shallow groundwater within 15 m below the ground and less than 1000 m either side of the main river downstream from Klondyke, McKinnons Creek and Ealing Springs Stream that is hydraulically connected to the Rangitata River or its tributaries contributes to the outstanding features and qualities of the river.

153. Protection measures include all hydraulically connected groundwater being subject to the same flow management rules as the surface water, including the cap on abstraction, and the minimum flow rules.

Part VIII Conclusions and Recommendations

Conclusions

We have determined that the Rangitata River has

- Outstanding amenity and intrinsic values afforded by waters in their natural state, and
- Outstanding features and qualities of the river, and
- Parts of the river that contribute to outstanding features and qualities.

We have determined that a water conservation order is required to preserve or protect these outstanding attributes.

Preservation in natural state

We have found that the Clyde and Havelock Rivers and their tributaries ("the headwaters") are waters in a natural state. They have outstanding amenity and intrinsic values as well as outstanding wild, scenic and other natural characteristics. We note that the headwaters have been studied less than other reaches of the river and information was provided on fewer topics. There are likely to be other features that are outstanding, but we were not provided with enough information to assess these.

The attributes that contribute to the outstanding values include:

- Aesthetic coherence
- High legibility of water and ice processes shaping rock and landscape
- Visual amenity
- Ecosystem values
- Wild and scenic characteristics
- Natural characteristics

We acknowledge that there is some farming activity in the lower reaches of both the Clyde and the Havelock, but note that this does not detract from the outstanding characteristics we have found. We conclude that these waters should be preserved as far as possible in their natural state. This would not stop reasonable use for stock and domestic water.

We found other parts of the river to have outstanding amenity and intrinsic values as waters in a natural state (see Part II). However, we have determined that the needs of industry and the community are such that preservation of these waters in a natural state is overly restrictive. Protection of the outstanding features of these sections is part of our draft water conservation order.

Protection of outstanding features and characteristics

We have found outstanding characteristics in other parts of the Rangitata River. These include (see Part III for details):

- Aquatic bird habitat
- Salmon fishery
- Salmon fishing
- Wild & scenic, and other natural characteristics
- Scientific and ecological values for braided river characteristics, indigenous riverbed plants and aquatic macro-invertebrates
- Water-based recreation
- Spiritual, cultural and historical values
- Significance for Tikanga Māori
- Amenity and intrinsic values

We conclude that a water conservation order is needed to protect these. We recommend that the conditions required to protect the outstanding features include:

- Maintaining the main stem of the Rangitata River as a free-flowing river
- Retaining freshes and floods
- Maintaining a flow hydrograph that is as close as practical to the natural regime
- Setting minimum flows below which no abstractions are permitted
- Maintaining high water quality
- Minimizing disturbances in the bed of the river
- Protecting salmon spawning waters and access to them
- Maintaining the waters of the upper Rangitata and the gorge, as far as is practical, in their present highly natural state by minimising abstraction and discharges.
- Maintaining the mitigating environmental effects of a large continuous abstraction.

In determining our recommended flow regime we have taken into account the needs of industry and the community.

We recommend a river management regime consisting of:

- A minimum flow of 20 m^3/s in summer and 15 m^3/s in winter;
- Changes between summer and winter minimum flows on 15 September and 15 May;
- A 1:1 sharing of a maximum of 33 m^3/s abstraction according to a workable schedule;
- Additional abstraction of up to 20 m^3/s in two steps when the river is above 110 m^3/s;
- At least 28 m^3/s being allocated to one continuous abstraction;
- No damming of the main stem of the Rangitata River;
- Restriction on the number of points where water may be abstracted from the main stem to three locations (not specified), all below the gorge.

- Abstractions may be permitted from tributaries, subject to appropriate conditions.
- Water quality standards to protect salmon, salmon spawning, recreation, and macro-invertebrates, including requirements relating to temperature.

This will produce a flow regime that resembles the shape of the natural flow hydrograph. Major flood events (400 m^3/s or greater) will be maintained, as will freshes and minor floods, although these will be reduced in size by the abstractions.

Landholders within the catchment noted their concerns that much of the abstracted water was used outside the catchment, and if a cap is applied they may be denied access to even small amounts of water for future irrigation opportunities. We considered this matter, but concluded that the outstanding features will not be affected to any significant extent by where the abstracted water is used. Therefore, allocation amongst users is a role for ECan, within the constraints of measures that we have determined are necessary to protect the river's outstanding features and values.

We believe that the water conservation order that we propose is not in conflict with any rules in either the Timaru or Ashburton district plans, nor is it in conflict with either the National Coastal Policy, the RCEP or the RPS. We accept that it does place constraints on the development of further irrigation, and may, therefore, be inconsistent with some aspects of the district plans. However, we consider this necessary to protect the outstanding features. The regime that we propose is significantly different from that set out by ECan in its draft Natural Resources Plan, although both proposals seek to balance water use for primary industry with protection of natural features and recreational and other values.

We consider that without a cap on total abstraction, or restriction on the number of takes in the main stem the outstanding values etc would not necessarily be preserved / protected.

Draft order attached

We recommend that a water conservation order be made for the Rangitata River.

Our draft water conservation order is set out in Appendix 1.