In the matter of	the Resource Management Act 1991
And	
In the matter of	The Rangitata Diversion Race Management Limited Consents

Before the Canterbury Regional Council and the Ashburton District Council

Statement of Evidence of Douglas Rankin for and on behalf of Whitewater NZ Incorporated, the Whitewater Canoe Club Incorporated, the New Zealand Rivers Association Incorporated, Hidden Valleys (NZ) Ltd, Geraldine High School and the University of Canterbury Canoe Club Incorporated

Dated: 17 April 2018

QUALIFICATIONS AND EXPERIENCE

- 1. My name is Douglas Alexander Rankin and I am 65 years old.
- 2. I live in Christchurch and am semi-retired, having worked all my professional life as a research scientist in wool science at AgResearch Limited (and its predecessors Canesis Network Ltd and the Wool Research Organisation of New Zealand Inc), where I was last a Senior Scientist in the Textile Science and Technology Division. I have a BSc (Hons) and PhD in Chemistry from the University of Canterbury.
- 3. I have been a keen kayaker and river runner (also including river bugging, catarafting and rafting) for the past 47 years. I am a life member of the University of Canterbury Canoe Club (UCCC) and have been an officer bearer in various roles in that Club, the Whitewater Canoe Club (WWCC) and the BugSports Club (BSC).
- 4. I have been the Conservation Officer for the New Zealand Canoeing Association Inc, the predecessor of the New Zealand Recreational Canoeing Association Inc, which recently became Whitewater NZ Inc (Whitewater NZ). I am currently the Conservation Officer (having been so since 2012) for, and on the Board of, Whitewater NZ. I was awarded the Canard Cup in 2001 by the New Zealand Canoeing Federation for my efforts in assisting the NZCA to secure a Water Conservation Order for the Buller River and again in 2011 by Whitewater NZ for services to river conservation in New Zealand.
- 5. I have kayaked (and river bugged and catarafted) extensively on rivers throughout Canterbury and the South Island of New Zealand (and some in the North Island) including a number of trips on rivers in remote areas eg, the Motu, Rangitikei, Ngaruroro, Clarence, Hokitika, Whitcombe, Whataroa, Karamea, Mokihinui, Waiatoto and Landsborough. Many of these rivers are considered amongst the best and most challenging white water rivers in New Zealand. I have kayaked, rafted, and catarafted various runs on the Rangitata River catchment on a number of occasions, including the Rangitata Gorge and Klondyke to Arundel Bridge reach.
- 6. As well, I have kayaked in Europe on some of the well-known white water rivers including the Rivers Inn, Isel, Leiser, Möll and Sanna in Austria, a number of other rivers in Germany and France, the Olympic white water slalom courses at Augsburg in Germany and at Penrith in Sydney, and also in the USA on the Grand Canyon section of the Colorado River. I have paddled down the Franklin River in Tasmania, which is a remote river in a wilderness area in a World Heritage Park. More recently I have catarafted the Grand Canyon and a number of other Class III-IV+ classic wild and scenic river runs in Oregon and Washington in the USA, and last year rowed an eighteen foot raft down the Grand Canyon.
- 7. As a result of my scientific knowledge and professional and river experience and conservation interests, I have acquired a considerable amount of knowledge and expertise on the hydrology, geomorphology and hydraulic features of rivers, and the water (flow and water quality) needs of recreational boaters.

- 8. I have presented evidence on such matters to various Catchment Board, Regional Council and Special Tribunal Hearings, and Planning Tribunal and Environment Court Hearings and made a number of submissions in a number of forums. This included presenting evidence to the original Special Tribunal Hearing on the Rangitata River Water Conservation Order (WCO) application and at the subsequent Environment Court appeal. Recently I presented evidence to the Environment Canterbury Hearing Panels on the resource consent applications by Ngāi Tahu Forest Estates for water and land use consents to dairy farm on the Balmoral Plains and Silver Fern Farms to discharge waste in emergencies to the Waimakariri River.
- 9. I also have a strong personal connection to and knowledge of the Rangitata River. The run from Klondyke Intake down to Cracroft Intake in 1971 was my second ever kayaking white water river trip and was in a canvas canoe¹. It was somewhat eventful for me, as I was flipped twice in the powerful bouncy white water in the second and third rapids on the river, and had two unpleasant frightening swims (at that stage I was a poor swimmer) before being reunited with my gear. However, I haven't looked back since.
- 10. I have since returned to the river over 25 times to run that reach or the Rangitata Gorge, either with the UCCC in the earlier years, and with family or friends and the WWCC and BSC in the latter years. I completed a grade 2 rafting guide training course on the Rangitata Gorge about 10 years ago. I last ran the Klondyke Intake down to the wool shed above Peel Forest on Saturday 17 and Sunday 18 February 2018 accompanying beginner kayakers from the WWCC² on their first trip to the Rangitata River. The flows at the Klondyke gauge were about 72 cumecs and 135 cumecs when we launched, meaning that the residual flows in the river when we launched would have been about 41 and 102 cumecs, respectively, once the takes from the RDR were removed. The river on the 17th of February was straight forward for the beginners we paddled with and had a few smaller white water features in it. In contrast, the much higher flow on the Sunday produced a significantly more powerful and challenging river for the beginner paddlers. It was their first experience of 'big' water (see later text) and the waves in the river were over a metre high in a number of places. This was quite intimidating for many of the beginners and a number were clearly tense on the water (which is not surprising) and some had a few swims when they missed their attempts at rolling up after capsizing in the white water. All in all they managed the trip very well considering their level of experience and the high river conditions.

¹ Statement of evidence of Douglas Alexander Rankin on behalf of New Zealand Recreational Canoeing Association, New Zealand Rafting Association and Wayne Keenan, Peel Forest Outdoor Pursuits Centre, Inquiry into the draft National Water Conservation (Rangitata River) Order 2002, before the Environment Court in Christchurch , RMA 807/02, 808/02, 809/02, 810/02, 815/02, 811/02, circa 2004 (undated).

² The larger group on Sunday first starting kayaking with the club in October 2107 at a beginner introductory course run by the WWCC.

- 11. I have read much of the background reports and evidence relevant to our concerns and interests. I have read a number of additional documents to help clarify areas where I have had concerns, and cited these where relevant in this evidence, and have spoken to other experts where I have needed advice.
- 12. I confirm that I have read and have complied with the Code of Conduct for Expert Witnesses. This evidence is within my areas of expertise, as an experienced kayaker and river runner and scientist, except where I state that I am relying on facts or information provided by another person or referred to in the literature. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

SCOPE OF EVIDENCE

- 13. My evidence will briefly cover kayaking and rafting values on the Rangitata Klondyke to Arundel Bridge reach, and paddler flow requirements and preferences. Background on natural and existing flows and then consideration of the impacts of the proposed takes and their appropriateness, in the light of the applicant's views, will then be discussed.
- 14. I will then touch on the planning and policy framework and the requirements of the WCO. Finally I conclude that the consent cannot be granted as it is contrary to the WCO and a number of other policy and planning requirements. I then close with some comments on the possibility of granting a modified consent if that is considered possible, and the proposed white water course, at present to be built as an integral part of the Klondyke Water Storage Pond.

SUMMARY

- 15. The Rangitata Diversion Race Management Limited (RDRML) wishes to obtain a suite of consents to construct, maintain and operate a large water storage facility on the north bank of the Rangitata River. The water is required for improved irrigation reliability and additional capacity in the region, and possibly for targeted stream or groundwater augmentation.
- 16. The reach from the RDR intake (Klondyke) down to Peel Forest and/or the Arundel Bridge in the Rangitata River contains outstanding white water kayaking and rafting recreation values, which are recognised and protected in the Water Conservation (Rangitata River) Order 2006.
- 17. Key flows and bed features need to be retained in the river to provide for and maintain the outstanding kayaking and rafting values.
- 18. However, the proposed 10 cumec take will significantly reduce the availability of valued high flows around 100 cumecs and above in the river. High flows are pivotal to maintaining the intermediate kayaking and advanced/expert kayaking or rafting 'big' water experience and white water recreation resource. Reducing the availability of these high flows will reduce the use of the waters for rafting or canoeing.

- 19. In addition, the take will exacerbate morphological changes to the bed of the river, which have already led to a decline in the white water resource in the river.
- 20. The morphological changes and reduction in kayaking and rafting amenity are contrary to the purpose of the WCO. The take is effectively contrary to a number of other planning instruments such as the National Policy Statement for Freshwater Management (NPSFM), the Canterbury Regional Policy Statement (CRPS or RPS), the Canterbury Land and Water Regional Plan (CLWRP) and the Canterbury Water Management Strategy (CWMS) for a variety of reasons. Therefore, the proposed consent in its current form cannot be granted.

EVIDENCE

INTRODUCTION

- 21. The Rangitata Diversion Race Management Limited (RDRML) wishes to obtain a suite of consents to construct, maintain and operate a large water storage facility on the north bank of the Rangitata River. The water is required for improved irrigation reliability and additional capacity in the region, and possibly for targeted stream or groundwater augmentation.
- 22. Resource consent is sought for the take of up to 10 cumecs of fresh and/or flood flows from the Rangitata River at the Rangitata Diversion Race (RDR) intake starting when the flow at Klondyke is 132.6 cumecs. Consent is also sought to expand the carrying capacity of part of the RDR to allow this additional water to be taken. The proposed take is a very large quantity of water.
- 23. The proposal will impact negatively on the white water kayaking and rafting values downstream in the Rangitata River from the RDR intake (Klondyke) down to Peel Forest and/or the Arundel Bridge, and particularly by further reducing valued higher flows used by white water users. This is the reach of river that our evidence addresses.
- 24. Whitewater NZ Incorporated (Whitewater NZ), the Whitewater Canoe Club Incorporated (WWCC), the New Zealand Rivers Association Incorporated (NZRA), Peel Forest Outdoor Centre (Charitable Trust; PFOC), Hidden Valleys (NZ) Ltd (HVL), Geraldine High School (GHS) and the University of Canterbury Canoe Club Incorporated (UCCC) all opposed the granting of these consents in a joint submission³. These organisations⁴ have members with an interest in and who in many cases use or provide services to facilitate the use of this river section. The Peel Forest Outdoor Centre has just decided to withdraw (11 April 2018) from this process. Thus this evidence is presented for and on behalf of the remaining six joint submitters.
- 25. Whitewater NZ (its predecessors were the New Zealand Recreational Canoeing Association (NZRCA) and the New Zealand Canoeing Association) represents more

³ Whitewater NZ *et al.*, Submission on the RDRML KSP Application, September 2016.

⁴ And a number of others from Dunedin to Christchurch and the West Coast.

than 1,000 kayak and canoe club members, a number of whom also raft, and individual members from around New Zealand. The national body helps to look after the interests of paddlers with respect to access, safety, and river conservation among other matters.

- 26. The WWCC is based in Christchurch and has about 250 members who mainly participate in white water kayaking. It has been in existence for about 30 years.
- 27. The NZRA (formerly the New Zealand Rafting Association) is the professional body that trains and registers commercial rafting guides, and looks after the interests of commercial rafters, throughout New Zealand. It has been in existence for about 40 years.
- 28. Hidden Valleys (NZ) Ltd is an adventure tourism company established in 1999 and based at Peel Forest near the Rangitata River. It specialises in rafting many of the more remote rivers around New Zealand and largely with a focus on multi day trips.
- 29. Geraldine High School runs an active outdoor education programme including kayaking and rafting programmes that are carried out on the Rangitata River.
- 30. The UCCC is based in Christchurch and has about 300 members, who mainly participate in white water kayaking, and has been in existence for about 43 years. The WWCC and UCCC are affiliated to Whitewater NZ.
- 31. The Rangitata Gorge and the reach from Klondyke to the Arundel Bridge on the Rangitata River have a national (and the gorge an international) reputation for white water kayaking and are used extensively by kayakers and rafters from within New Zealand and overseas each year. The outstanding white water rafting and kayaking values of both reaches were recognised in the gazetting of the Water Conservation (Rangitata River) Order 2006⁵ (WCO) based on evidence presented to a Special Tribunal Hearing by the NZRCA and other river users⁶ and subsequent hearings.
- 32. When the WCO application was lodged in December 1999 white water users were aware that the Klondyke to the Arundel Bridge reach of the river was already a compromised white water amenity due to the size of the RDR takes from the river. However, the river was still outstanding at that time when sufficient flows were present, and kayakers and rafters were interested in retaining what they could of the remaining resource. Our outstanding values were subsequently recognised and 'protected'⁷ in the draft WCO. It was recognised at the time that further degradation of the river from intensification of farming and associated water takes could occur in the future. No flow band information for kayakers and rafters was presented to the Special Tribunal because at the time we did not have it.

⁵ Water Conservation (Rangitata River) Order 2006, New Zealand Gazette, 65, 1545-1563, 2006.

⁶ Rangitata River Water Conservation Order Application, Report by the Special Tribunal, October 2002, pp 1-139 and additional Appendices.

⁷ In reality the 'protection' of white water recreation values provided by the WCO is possibly somewhat limited. With more takes possibly permitted in the future, further degradation of the white water resource could occur if these takes occurred at the RDR intake.

- 33. The draft WCO⁸ set flow regimes and permitted takes to provide for the identified outstanding values and foreseeable needs of industry and the community (primarily farming and electricity generation). This included a very low minimum flow of 20 cumecs during the irrigation/recreation season, a block take of up to 20 cumecs up to natural flows of 40 cumecs at the Klondyke gauge, and a 1:1 flow sharing regime between instream retention and water abstraction permitting up to a further 13 cumecs (up to a total of 33 cumecs) to be taken between natural flows of 40 to 110 cumecs at Klondyke.
- 34. Above 110 cumecs block takes (no flow sharing) of up to 10 cumecs between natural flows of 110 to 120 cumecs at Klondyke (up to a total of 43 cumecs) and between natural flows of 120 to 130 cumecs at Klondyke (up to a total of 53 cumecs) were permitted. However, these regimes were not necessarily protective of the outstanding values, as very low minimum flows and large high flow takes were suggested as being possible⁹.
- 35. The draft WCO was appealed by industry interests, who suggested the flow sharing regime be changed and that constraints on higher flow takes >110 cumecs in the draft order be removed. White water users presented evidence on our flow needs at the Environment Court appeal inquiry. However, we unfortunately did not respond to the Court at a key point in the inquiry¹⁰ on what higher flows were needed to protect recreation values. Thus constraints on higher flow takes >110 cumecs in the draft order were removed, leaving this according to Judge Jackson to be 'properly dealt with through a Regional Plan' (see the decision, footnote 10).
- 36. Since the WCO has been gazetted a further up to 20 cumec take from the river just above the Arundel Bridge at flows above 110 cumecs has been granted, and now RDRML wish to take a further 10 cumecs from the river. Although the applicant states the proposed flow changes comply with the WCO¹¹, I agree with Ms Marr¹² that the proposed take does not. Our organisations remain very concerned that this proposed take will only mean further degradation of the water based recreation values in the Klondyke to Arundel Bridge reach. We are particularly concerned that this is only taking us to a point, if we have not already reached it, where the river will be over allocated and will become significantly less suitable for water based recreation, bird and fish habitat, education and commercial activity.

⁸ Appendix 1, Rangitata River Water Conservation Order Application, Report by the Special Tribunal, October 2002, pp 1-139 and additional Appendices.

⁹ Neither the minimum flows or flow takes permitted, nor the lack of constraints on high flow takes, actually properly provide for the kayaking and rafting white water values and ensure that they will be retained. The limits were decided upon to in part provide for some retention of white water values and to provide for the present and foreseeable needs of industry.

¹⁰ Judge Jackson, Environment Court, Decision No. C 135/2005 (which arose out of the final stages of the WCO process).

¹¹ Mr Greenaway evidence in chief, paragraph 9.

¹² Ms Marr evidence in chief paragraphs, 60-64, 74.

- 37. Since we joint submitters wrote the submission we have become aware that some of the assumptions that we relied on do not hold true. We have therefore clarified and corrected these assumptions and included any corrected analysis in this (and other) evidence.
- 38. Evidence is also provided by Mr Grant South (Director, Hidden Valleys Ltd; previously on the executive of the New Zealand Rivers Association in various roles), who is a highly experienced Rangitata River user, for our joint submitters. I have read his evidence and agree with it.

KAYAKING AND RAFTING VALUES

- 39. The Klondyke to Arundel reach is an outstanding piece of Class II-III white water when sufficient flows are in the river.
- 40. The reach is widely used, primarily by beginner and intermediate kayakers and rafters, and particularly for instruction and education purposes by the Peel Forest Outdoor Centre and Geraldine High School. Users range from youths to adults, local high school students to others on local outdoor education courses, and local and regional recreational paddlers including paddlers from kayak clubs from Christchurch and Dunedin, and ARA (the Polytechnic Institute based in Timaru).
- 41. Particularly valued features are the large hydraulic features and big bouncy white water wave trains produced at higher flows, for which the river is renowned. These features provide an excellent resource for learner paddlers to start experiencing 'big' water¹³, or which more experienced paddlers seek out when the river is 'flowing', and which rafters particularly enjoy.
- 42. The river is a key nursery river¹⁴ in Canterbury for paddlers both within and outside the region. However, lack of river flow, because of the large irrigation offtake by the RDR, often means it is difficult to catch good flows to run the river.
- 43. The key elements that provide the outstanding white water in the Klondyke to Arundel reach are the combination of water flow, gradient in the river bed, and large boulders and bed/bank features and river bed morphology. When water flow is too low this white water is either absent or too small to be of interest to kayakers and rafters. It is pivotal that the right flows (and other features) are available and retained in order to retain the white water kayaking and rafting values of the river.

FLOW PREFERENCES OF KAYAKERS AND RAFTERS

Preferred flow ranges and distributions

¹³ 'Big' water is white water containing large hydraulic features and is normally found in rivers of suitable geomorphology and bed features and where flows are sufficiently high.

¹⁴ D A Rankin, N Earnshaw, I M G Fox and T Botterill, Kayaking on Canterbury Rivers: reaches, values and flow requirements, Report No. R14/31, Environment Canterbury, February 2014.

44. The respective in-river preferred flow bands¹⁵ for kayakers of different abilities and rafters using the Klondyke to Arundel reach have been confirmed using published literature¹⁶, and updated recently¹⁷ and finalised in this evidence (Table 1). Some flow bands have been updated in the light of changes to the river bed morphology, and others after copies of WCO evidence were re-examined. The changes made are particularly to the preferred flow ranges for intermediate kayakers and for rafters.

	Preferred in-river flow bands (cumecs)				
Paddler group	Prev	Updated			
	Range	Optimal range	Range		
Beginner kayaker	40-70	45-50 [°]	40-70		
Intermediate kayaker	45-125	80-85°	45-170		
Advanced/expert kayaker	55-250	-	55-250		
Rafting	55-250°	90-115°	55-250 ^b		

Table 1. Preferred flows for kayaking and rafting in the Klondyke to Arundel Bridge reach on the Rangitata River

^a From Statement of Evidence of Wayne Keenan on behalf of New Zealand Recreational Canoeing Association, New Zealand Rafting Association and Peel Forest Outdoor Pursuits Centre, Environment Court inquiry into the draft National Water Conservation (Rangitata River) Order 2002.

^b 420 cumecs is the maximum river flow acceptable for guided rafting conducted by PFOC. However, whereas the river can be run at this flow, flows up to 250 cumecs are preferable (as identified previously), as the river hydraulic features and run are more satisfying up to that flow.

- 45. Preferred flows normally show an inverted 'U' or bell shaped distribution (Figure 1; from Rankin *et al.*, footnote 16). The upper and lower limits or bounds of the flow ranges for kayakers or rafters in Table 1 correspond to the high and low marginal boundaries, respectively, between suitable flows and unsuitable flows shown in Figure 1.
- 46. The preferred flow ranges and distributions differ depending on users and the skill and abilities of the users. For example, beginner kayakers prefer a relatively narrow range of flows. They will find a marginal flow of 40 cumecs generates just enough white water to sufficiently interest or be suitable for them, whereas the white water generated above 70 cumecs will be too difficult and intimidating for them.

¹⁵ Note that the flows in these flow bands are <u>river flows in the Klondyke to Arundel reach</u>; if x cumecs of water is being taken off by the RDR then all these flows need to be increased by x cumecs to determine what flow at the Klondyke gauge will be needed to generate suitable paddling flows.

¹⁶ D A Rankin, N Earnshaw, I M G Fox and T Botterill, Kayaking on Canterbury Rivers: reaches, values and flow requirements, Report No. R14/31, Environment Canterbury, February 2014.

¹⁷ Page 9, Whitewater NZ *et al.*, Submission on RDRML Klondyke Storage Pond Application, 27 September 2016.

47. In contrast, the marginal low flow for advanced/expert kayakers and also for rafters would be 55 cumecs. Flows higher than the upper limit of 250 cumecs are likely to see a reduction in the size of the large hydraulic features in the reach, as they become drowned out or buried, and therefore are less likely to be of interest to such kayakers and rafters.



Figure 1. Hypothetical flow evaluation curve with characteristics labelled (after Whittaker and Shelby, 2002 (from Rankin *et al.*, footnote 14)¹⁸)

- 48. Simulated preferred flow distributions for kayakers of different skill levels (40-70, 45-170 and 55-250 cumecs) and rafters (55-250 cumecs) are shown in Figure 2. Intercepts on the horizontal axis correspond to the marginal boundaries of the updated flow ranges above. The distributions would be centred at about 55, 108 and 153 cumecs, respectively. This data shows clearly that some of the distributions overlap in places but not a lot in others.
- 49. The particularly valued hydraulic features and big bouncy white water wave trains are found at flows between 80 to 170 cumecs.
- 50. How well existing and modified flows would meet kayakers' needs is a function of the existing and modified flow distributions in the river, kayakers' abilities and flow preferences, what the flows were being used for, and the flow on the day. For example, for kayak instruction and training for developing intermediate kayakers lower flows in the range 45-125 cumecs would be preferred¹⁹, but for the

¹⁸ In this diagram flows are given in cfs, or cubic feet per second, a flow unit more commonly used in the USA.
¹⁹ Lower flows reflected in the preferred instruction flow band (45-125 cumecs) compared to the full flow band (45-170 cumecs) for intermediate kayakers, are preferred because in this state the river has a greater chance of producing more well defined eddy lines and hydraulics (such as standing waves) for instructing on. In higher flows eddy lines become less distinct and more 'pushy', turbulent and intimidating, and therefore not so good to instruct on. Standing waves become bigger and so more intimidating to catch and surf on. They are also

recreational big water experience higher flows up to 170 cumecs and beyond would be sought after by intermediate and other kayakers.



Figure 2. Simulated preferred flow distribution curves for beginner (green), intermediate (blue), and advanced/expert kayakers and rafters (red) in the Klondyke to Arundel Bridge reach

- 51. Variability of flows on the same river reach from day to day (not normally during a day) can be an important value, as this can offer paddlers different experiences on the same run on different days.
- 52. Higher flows are sought after by more experienced kayakers and rafters after freshes and floods. Kayakers and rafters do not normally seek higher flows on a rising river, as there is often considerable risk and uncertainty as to how quickly and to what levels the river will rise. For most paddlers very high flows can pose a serious safety hazard.

Updating rafting flow preferences

53. The information concerning rafting flows in our joint submission²⁰ requires correction. At the time our submission was made we did not have access to the evidence and flow data of Mr Wayne Keenan presented at the Environment Court Enquiry into the Draft WCO, and so we incorrectly listed the rafting flow requirements for the reach as 80-170 cumecs, although higher flows still were still noted as producing good white water. Rafting flows in Mr Keenan's evidence ranged

more difficult to catch and surf on, as the water moving through them increases in velocity at higher flows. Thus there is a tendency to get 'blown' off surfing waves (pushed off by the water), unless they are steep enough, and/or you are using a longer white water kayak and have the requisite skills. This said, such big water in high flows offers a great challenge for advanced/expert kayakers, to surf on waves over ten feet (3 metres) high and execute acrobatic tricks on appropriate features, and a roller coaster ride for beginner and more experienced rafters alike.

²⁰ Whitewater NZ *et al.*, Submission on RDRML Klondyke Storage Pond Application, 27 September 2016.

from 55 to 250 cumecs and these have been consequently changed and used in this evidence.

Changes in the river bed morphology and impacts on white water values and flow bands of value

- 54. I and others²¹ have witnessed and experienced changes in the river bed morphology and a decline in the quality of the white water in the river over the last 35 years, which have continued since the WCO was gazetted in 2006. Changes in bed morphology have included:
 - (a) a significantly widened flow channel(s) with smaller cobbles in the bed and less large boulders present in the stream flow
 - (b) a significantly reduced number of braids
 - (c) a more smoothed out and even gradient in the bed down the river, and
 - (d) a filling in of the previously more channelized and heavily armoured 'pooldrop' or 'run-drop' bed structure and gradient steps that have been more prevalent in the past, and which produced the outstanding white water in the river.
- 55. Changes in the white water in the river have included:
 - (a) A decline in the number of rapids in the river
 - (b) A decline in the quality of the white water and features in the rapids, such as reductions in the number of gradient steps, wave trains, eddy lines and surfing waves previously so typical of the reach, and
 - (c) A decline in the water clarity in the river when white water is present.
- 56. The previous bed structure present in the 1970's has not yet returned.
- 57. The river bed changes are likely due to the loss of power in the river, which could arise as a result of the clipping of fresh events by water takes preventing normal bed alteration processes subsequent to big flood events, which would normally change the bed back to the more channelized 'pool-drop' or 'run-drop' structure with time.

²¹ For example, see the evidence of Grant South, and that of Wayne Keenan to the Environment Court WCO enquiry. Wayne Keenan in paragraph 8.4 of his evidence to the Environment Court refers to dramatic changes in the river after 1994 floods and then later in paragraph 9.7 to changes '.... as floods, river work and the loss of features have altered the river from the pool drop type of section to more of a constant gradient with a wider shallower streambed and smaller boulders and features. It was only 9 years ago that there was a hydraulic that you could regularly surf a raft in.'.

- 58. Alternatively, or in addition, the changes could also be due to the injection of more gravel into this reach of the river taking its time to work out of this part of the system²².
- 59. The changes to the white water and decline in the number of rapids and their features are due to the changes in river morphology. The decline in water clarity is due to the large offtake of flow by the RDR. High fresh or flood flows are now needed in the river to generate white water of a reasonable size suitable for more competent beginner and intermediate kayakers, and with such flows the sediment levels or turbidity in the river water are higher.
- 60. As a result of these changes in river bed morphology the flow band preference of intermediate kayakers is extended to 170 cumecs (Table 1), as more competent intermediate paddlers are easily able to cope with the white water generated up to these flows. This data was presented in our joint submission²³.
- 61. Other changes have occurred too, such as the containment of the river channels through encroachment of irrigated farming paddocks into and tree planting on the bed of the river, where previously there were active braided river channels and white water rapids at those sites.

EXISTING AND MODIFIED FLOWS AVAILABLE IN THE KLONDYKE TO ARUNDEL BRIDGE REACH - SUITABILITY FOR KAYAKING AND RAFTING

- 62. Flows vary significantly in the Rangitata River throughout the year, and from year to year, and from the winter to summer seasons. Flows are dominated by high rainfall events in the headwaters and on the Main Divide, which can occur at any time during the year. Thus it is impossible to predict likely flows and the suitability of the river for kayaking at any time except on a short term basis, utilising current flow data and weather forecasts and permitted irrigation takes.
- 63. Data in Figure 3 show natural, existing and modified flows in each 5 cumec flow band for the period 1 November to 30 April, the paddling season used by the applicant²⁴, for the whole flow record using mean daily flow data provided by RDRML. The existing flows are those resulting from all the current permitted takes (but excluding those that would be permitted by CRC134808) and the modified flows are those resulting from the proposed 10 cumec take.
- 64. The existing and modified flows do not take into account all the extra up to 5 cumecs taken to operate the proposed rotary fish screen and so essentially refer to effects in the Klondyke to Arundel reach starting about 1.4 km downstream from the Klondyke intake, where a bypass channel returns that extra water to the river. The results of my calculations of the changes in the number of days in different flow bands as a

²² Dr Hicks evidence in chief.

²³ Whitewater NZ *et al.*, Submission on RDRML Klondyke Storage Pond Application, 27 September 2016.

²⁴ The actual paddling season is longer and, for example, in the WCO, the flow management regime for the main stem of the Rangitata River for the irrigation/paddling season is from 15 September to 14 May.

result of the take are essentially the same as those reported in the applicant's Recreation and Tourism Effects Assessment report (RTEA; e.g., Table 1, page 38²⁵) and the evidence of Mr Robert Greenaway²⁶.

Natural flow distribution

65. The natural flow distribution would most suit intermediate kayakers with 151.2 days on average (83.4%) out of 181.25 days falling into the 45-170 cumec preferred flow range. This is because the distribution has a mixture of suitable low, medium and high flows, similar to the simulated intermediate kayaker flow distribution curve (this can be seen by overlaying the natural flow distribution in Figure 3 on the simulated preferred flow distribution curves in Figure 2). Even so the natural flow distribution is still displaced (skewed) somewhat towards lower flows (e.g., the distribution is not symmetrical and is not centred about 108 cumecs as discussed in paragraph 48) and so the river might have been even better for intermediate kayakers if more higher flows were available. The river in its natural state would have provided a river less ideal for meeting beginner kayakers' flow requirements, with only 48.2 days (26.6%) being in the 40-70 cumec flow range.



Figure 3. Average number of days per year Rangitata River flows are in different flow bands for the whole flow record (Note: The polynomial curve fits for existing and modified flows at

²⁵ Table 1, Klondyke Water Storage Proposal Recreation and Tourism Effects Assessment, Rob Greenaway and Associates, page 38, July 2016; excluding corrections needed in the RTEA and noted in our joint submission.
²⁶ Mr Greenawav evidence in chief.

low flows should drop to zero and not continue upwards. This is an artefact of the curve fitting function used.)

- 66. It is essential to note that using the number of days in flow bands <u>alone</u> to determine the suitability of river flow distributions for kayakers and rafters in rivers, as has been applied by the applicant in their analysis, has to be treated with care. Without considering the nature of the flow distribution, incorrect conclusions may be drawn. For example, on average 149.5 days (82.5%) out of 181.25 days per kayaking season under natural flows fall into the 55-250 cumec preferred flow range for advanced/expert kayakers. On this basis alone (e.g., the number of days) it might be tempting to suggest that the natural flow distribution would also be suitable for such kayakers but this is clearly not the case.
- 67. As mentioned previously (paragraph 48) the preferred inverted 'U' or bell shaped flow distribution for advanced/expert paddlers or rafters (see Figure 2) would likely be centred at about 153 cumecs. However, the natural flow distribution has few flow days at this median level, and even fewer at higher flows, and so would not be at all suited for such paddlers²⁷.

Existing flow distribution

- 68. As a result of the significant RDR take up to 30.7 cumec and other existing takes, the skewed natural flow distribution moves very significantly to the left for the existing situation. The existing flow distribution has many more days with the river constrained to much lower flows, with many being lower than those occurring naturally. The number of days suitable for intermediate kayakers drops to 103.4 (a decrease of 31.6%), for advanced/experts to 93.1 (a decrease of 37.7%), and for beginners increases to 55.6 (an increase of 15.4%). The significant change in the flow distribution makes the river far less suited to intermediate paddlers and even more unsuited to advanced/expert paddlers.
- 69. The number of days that particularly valued big bouncy white water wave trains are found at flows between 80 to 170 cumecs reduces from 89.0 to 41.2 under the existing flow regime (a 53.8% loss). Alternatively the probability of experiencing such a valued high flow in this flow band on any day visit to the river drops by a large amount from at least half of 0.49 to at least half of 0.23²⁸. Such losses are very large and very significant.
- 70. The net result of the existing takes from the river is that the outstanding white water in the Klondyke to Arundel reach in the Rangitata River is now a shadow of its former self and that the rafting and kayaking resource is significantly changed and degraded

²⁷ In other words, to be well suited for advanced/expert paddlers the natural flow distribution would need to more closely resemble an inverted 'U' or bell shaped flow distribution centred at 153 cumecs and as illustrated in Figure 2.

²⁸ The probabilities of 0.49 and 0.23 refer to access to the river for 24 hours per day. The exact probability has not been determined but will be approximately less than half these values, as the river is only essentially useable during daylight hours.

as a result. This means that it is very difficult to find days when the flows are high enough to produce the outstanding white water and standing wave trains that the river was once renowned for when visiting the river.

71. In addition, a large number of days also result where flows remaining in the river after the RDR take are too low to provide a good white water resource. Under natural flows there were 1.1 days on average (0.6%) where the flows were less than 40 cumecs. With the existing takes this increases hugely to 52.5 days (28.9%). There is little white water resource at flows less than 40 cumecs (the beginner marginal low flow, see paragraph 45).

Modified flow distribution

- 72. The proposed 10 cumec take sees the skewed existing flow distribution moving slightly further to the left, with decreases in the number of days in the 5-cumec flow bands greater than 100 cumecs normally seen (Figure 3) and a large increase (spike) in the 95-100 cumec flow band compared with the existing flows. The modified flow distribution has more days with the river constrained to lower flows, again making it far less suited to intermediate kayakers and even more unsuited to advanced/expert kayakers and rafters compared with the natural and existing flow distributions. There are no changes in the number of flow days suitable for beginner kayakers.
- 73. The number of days in the 95-100 cumec flow band increases [relatively] hugely by 5.59 (5.6) days compared (165% change) with the number of days under the existing flow regime. This might seem counterintuitive at first. It arises because the up to 10 cumec take significantly <u>reduces</u> existing flows in the nearby higher flow bands (100 to 105 and 105 to 110 cumecs; because of the other 33 cumec takes that occur from existing takes and when proposed takes occur at 132.6 cumecs and beyond), thereby increasing the number of days modified flows are in the 95-100 cumec flow band.
- 74. It is essential to note that the 'increases' in the number of days flows will be in the 95-100 (or 98-110 cumec) flow range²⁹ are not 'gains' or of benefit, but are 'artefactual increases' or a response to the taking off of up to 10 cumecs of water from higher valued flows. There are no actual increases in such flows at all; just an increase in the number of days that the river <u>will be held or flat-lined</u> between 98-110 cumecs as a result of the take. Thus the 10 cumec take does not result in any actual increases in flows in the river, or benefit to river users, whenever a take is made flow is lost from the river.
- 75. Using annual data from Figures 9, 10 and 11 in our submission³⁰, one can see that for the average (2001/02), wet (1983/84) and dry (1977/78) years, that the number of days in the 95-100 cumec flow band increased by four (from 2 to 6 days), increased

²⁹ Mr Greenaway evidence in chief, paragraphs 29 and 53.

³⁰ Pages 23 and 24, Whitewater NZ *et al.*, Submission on RDRML Klondyke Storage Pond Application, 27 September 2016.

by twelve (from 5 to 17 days) and increased by two (from 4 to 6 days), respectively, over the paddling seasons as a result of the take.

76. There are normally significant reductions in the number of days that flows appear in the 5 cumec flow bands especially just above 100 cumecs (e.g., see Table 2). These losses are of particular importance to intermediate and advanced/expert kayakers and rafters as they relate to the high flow white water experiences sought on the river.

Table 2. Reduction in the number of days that valued flows occur in different fivecumec flow bands between 100 and 170 cumecs for intermediate kayakers, and thepercentage reductions, as a result of the proposed 10 cumec take by RDRML.

Flow band	No. of existing days	Reduction of days	Percentage reduction	Flow band	No. of existing days	Reduction of days	Percentage reduction
100-105	2.84	0.477	16.8	135-140	1.25	-0.205	-16.4
105-110	2.75	0.568	20.7	140-145	1.64	0.500	30.6
110-115	2.36	0.409	17.3	145-150	1.45	0.500	34.4
115-120	2.18	0.341	15.6	150-155	1.14	0.227	20.0
120-125	1.95	0.136	7.0	155-160	0.95	-0.068	-7.1
125-130	1.84	0.591	32.1	160-165	0.91	0.159	17.5
130-135	1.82	0.182	10.0	165-170	1.02	0.182	17.8

- 77. The number of days in the 135-140 and 155-160 cumec flow bands increase by a total of 0.273 days (Table 2) but reduce significantly by a total of 4.28 days for the rest of the 5 cumec flow bands from 100 to 170 cumecs range (Table 2).
- 78. The occasional increases in days in some flow bands occur because the data is averaged over the whole flow record. Sometimes the average decrease in days in some flow bands (Table 2) as a result of the 10 cumec take will be outweighed by the increase in days in that same flow band as a result of the 10 cumec take in the next plus one adjacent higher flow band, which then produces an overall increase. However, in general, decreases are expected and observed from the 10 cumec take (Table 2).
- 79. Using annual data from Figures 9, 10 and 11 in our submission³¹, one can see that for the average (2001/02), wet (1983/84) and dry (1977/78) years, that the number of days in the 135-140 cumec flow band increased by one (from 1 to 2 days), increased by one (from 2 to 3 days) and decreased by one (from 1 to 0 days), respectively, over the paddling season as a result of the take. Such an observation is consistent with a

³¹ Pages 23 and 24, Whitewater NZ *et al.*, Submission on RDRML Klondyke Storage Pond Application, 27 September 2016.

small increase being seen in this flow band on average over the flow record as a result of the take.

- 80. The percentage reductions in the flow bands in Table 2, where reductions in the number of days are observed, range from 7 to 34 %, and reflect a significant reduction in resource availability and access to higher flows, and are all much more than minor. Overall the nett total number of days that flows decrease over the whole 100-170 cumec flow range is 4.01 days. This overall 'average' reduction is a significant 16.6% reduction in valued high flows (from 24.1 days to 20.1 days), and again is far more than minor.
- 81. Similarly, for the high flow range of 100-250 cumecs, the nett total number of days that flows decrease over this flow range is 5.1 days (from 32.5 days to 27.4 days). This reduction is a significant 15.7%, and is far more than minor.

IMPACTS OF THE PROPOSED 10 CUMEC TAKE ON KAYAKING AND RAFTING FLOW NEEDS AND VALUES

Applicant's method

- 82. The applicant's method to show the impact of the takes³² determines how many days the river is in the existing state and the modified state for various broad flow bands of interest, and draws conclusions from these differences. Whereas I have also used this 'broad brush' approach and methodology to look at impacts of the existing takes on the natural flow regimes and white water values of the river (numbers of days flows are available in different flow bands) in preceding paragraphs 62-71, it can have limited utility and is not suitable to use in every instance (e.g., see paragraph 66) and the results do require careful interpretation as to what they mean.
- 83. For example, Mr Greenaway³³ calculates there are no changes to the days available for beginner kayakers as a result of the 10 cumec take, a 'gain' of 0.5 days for advanced/expert kayakers or rafters³⁴ in the 55-250 cumec flow band, and a 'gain' of 3.7 days for intermediate kayakers using the 45-125 cumec flow band (I calculate a 'gain' of 1.6 days for intermediate kayakers using the 45-170 cumec flow band used in this evidence).
- 84. A breakdown and summary of the changes in the number of days in different flow bands of relevance to kayakers and rafters from the proposed take is presented in Table 3.

³² Klondyke Water Storage Proposal Recreation and Tourism Effects Assessment, Rob Greenaway and Associates, July 2016.

³³ Mr Greenaway evidence in chief, Table 1, page 10. My calculations produce the same results, although in some cases I have used updated flow bands. For example, using the data in Table 2 above, adding the decrease in the number of days for the 100-125 cumec flow band (1.94 days) to the increase calculated for the range 45-100 cumecs (5.59 days, this work), the nett total increase in the number of days is 3.65 (rounded to 3.7), in agreement with 3.7 days calculated by the applicant.

³⁴ I use the 55-250 cumec flow band for rafters.

85. Mr Greenaway then assumes that the small increases in the overall number of days in overall flow bands of interest (as in paragraph 83 of this evidence; see the first, fifth and ninth rows in Table 3) indicate that no significant changes and/or that increases have occurred to the kayaking and rafting recreation values³⁵, or that changes in recreation amenity will be minor or less³⁶, as a result of the 10 cumec take. I disagree with the assumptions in this methodology and the conclusions drawn from this analysis. It hides or masks the reality of the situation. This is discussed further below.

lleer	Elow band	Number of days on average ^a		
User		Existing	Modified	Change
Beginner kayaker	Overall, 40-70 cumecs	55.6	55.6	0.0 (0.0)
	Partial, 45-95 cumecs	75.9	75.9	0.0 (0.0)
Intermediate kayaker	Partial, 95-100 cumecs	3.4	9.0	5.6 (165)
intermediate kayaker	Partial, 100-170 cumecs	24.1	20.1	-4.0 (-16.6)
	Overall, 45-170 cumecs	103.4	105.0	1.6 (1.6)
	Partial, 55-95 cumecs	57.2	57.2	0.0 (0.0)
Advanced/expert kayaker or	Partial, 95-100 cumecs	3.4	9.0	5.6 (165)
rafter	Partial, 100-250 cumecs	32.5	27.4	-5.1 (-15.7)
	Overall, 55-250 cumecs	93.1	93.6	0.5 (0.5)

Table 3. Changes (percentages in parentheses) in the number of days in flow bands of relevance to kayakers and rafters from the proposed 10 cumec take.

^a Negative changes correspond to reductions in availability.

86. Losses of days in overall flow bands of particular interest are one way in which impacts of takes might be evaluated. However, such a parameter does <u>not</u> <u>necessarily</u> reflect the impacts of takes, or the suitability of a recreation amenity, as illustrated earlier in paragraph 66 and discussed in preceding paragraphs. The same is the case here. Another way to look at the validity of this method is to consider the following case. Data from paragraph 29.2 of Mr Greenaway's evidence³⁷ show that a total of 5.6 days would be lost where flows were >100 cumecs in a summer season, and 5.6 days would be gained in the 95-100 cumec flow band as a result of the 10 cumec take. Using Mr Greenaway's analysis method (adding the losses and gains in days together) and argument would lead to the following conclusion. As there will be no overall change in the river, there will therefore be no impacts at all from the 10 cumec take. Of course this isn't the case, there are impacts, so this further illustrates the invalid nature of the applicant's methodology.

³⁵ Mr Greenaway evidence in chief, paragraphs 27, 53, 93.1 and Table 1.

³⁶ Mr Greenaway evidence in chief, paragraph 54.

³⁷ Mr Greenaway evidence in chief.

87. What is critical is the impact of the 10 cumec take on the flows in the river that provide and maintain or are critical to the recreation amenity. Critical flow losses of higher flows (rows four and eight of Table 3) and holding of flows in a narrow flow band (rows three and seven in Table 3) are not reflected in changes in the numbers of days that flows remain in key overall flow bands (rows five and nine in Table 3), and so the applicant's method for assessing impacts in this case is inappropriate.

Analysis of the impacts of the proposed take - what occurs during a take?

- 88. Mean hourly flow data under natural, existing and modified flow regimes³⁸ have been used to determine the actual impacts of the takes in real time on an hourly basis. An example of such an analysis is presented in Figure 4 for a recent flow period using hourly data obtained from the Environment Canterbury website.
- 89. Flow takes are triggered by the mean daily flow of the previous day measured at 12:00 pm (midday). When the mean flow is >142.6 cumecs, an additional 10 cumecs can be taken, when >132.6 cumecs a lesser amount may be taken, and when <132.6 cumecs no additional flow may be taken. The protocol means that any takes can be effectively taken for the following 24 hours³⁹, assuming a prior midday mean daily flow permits it.
- 90. For example, at 12:00 on 20 February (Figure 4) the mean daily natural flow for the previous day was 87.0 cumecs, up to 30.7 cumecs could be taken from the river, but no extra flow could be taken for the next 24 hours. However, at about 16:00 on 20 February a fresh started to raise the river flow, which then peaked at 312 cumecs about 14 hours later at 7:00 on 21 February. Therefore no 10-cumec take was made on the rising limb or at the peak of the fresh.
- 91. At 12:00 on 21 February the flow was 299 cumecs. The mean daily natural flow for the previous day was 222.0 cumecs. Therefore an additional 10 cumecs could be taken for the next 24 hours, leaving a modified flow of about 253 cumecs at 12:00.
- 92. Subsequently at 12:00 on 22 and 23 February, the mean daily natural flows for the two previous days were 222.5 and 153.7 cumecs, and the mean hourly flows were 177.4 and 143.3 cumecs, respectively. Again 10 cumecs could be taken from the river on these following two days (22 and 23 February), and particularly through to midday on 24 February.
- 93. However, at 20:00 on 23 February the river level had dropped to 128.8 cumecs, below the 132.6 cumec cut-off, and flows ranged between 132.2 and 127.1 cumecs from then through to 12:00 on 24 February. Thus for a period of 16

³⁸ With assistance of Mr Alasdair Keane, the hydrologist presenting evidence to this hearing on behalf of Central South Island Fish and Game. The existing flows have been calculated assuming a take of 30.7 cumecs by RDRML and up to 1.5 cumecs by Cumberland Dairy Farm Ltd (CDF; note the CDF take was calculated on an hourly basis), and the modified flows by subtracting up to 10 cumecs from the existing flows using the take protocol according to the proposed consent conditions.

³⁹ Mr Greaves evidence in chief, Condition 5, CRC170654, Annexure C Proposed Consent Conditions.



hours RDRML would take a 10 cumec take, even though the hourly mean flows were all below the cut-off flow.

Figure 4. Natural, existing and modified flows determined on an hourly basis under the proposed RDRML take regime

94. The 'permitted' 10 cumec takes identified in paragraph 93 when the river is below the cut-off flow raise an interesting situation. Presumably the 10 cumec take over 16 hours from 20:00 on 23 February through to 12:00 on 24 February, would not be appropriate or permitted if reciprocal consent CRC134808 had been surrendered according to consent condition 7⁴⁰. The take would be taking 10 cumecs from the river for sixteen hours (equivalent to 576,000 m³ or 0.576

⁴⁰ Mr Greaves evidence in chief, Condition 7, CRC170654, Annexure C Proposed Consent Conditions.

Mm³ of storage water) when the flow at Klondyke was less than 132.6 cumecs and to which RDRML would not necessarily be entitled, but which other parties such as Rangitata Water Ltd would.

- 95. Therefore a different and more appropriate trigger mechanism, such as interrogating mean hourly flows, and making decisions based on these should be used for determining the taking of flows, so that flows are only taken when they should be.
- 96. In summary, the effect of the 10 cumec take is to reduce a range of existing high flows greater than 100 cumecs, and also a number of existing flows less than 100 cumecs by up to 10 cumecs, whenever takes are possible.

The impacts of the proposed take - what does this mean for kayakers and rafters?

- 97. As can be seen from Figure 4, the proposed take will reduce the existing flows in the Klondyke to Arundel reach (ignoring the extra up to 5 cumec take for the fish pass, and which is returned to the river 1.4 km downstream of Klondyke) by 10 cumecs from 12:00 on 21 February through to 12:00 on 24 February, and taking 2.592 Mm³ of water for storage. This loss of water from the river is quite significant, adding to that taken already by the RDR.
- 98. The extra 10 cumec take, besides further reducing the availability of existing valued high flows > 100 cumecs, would also further reduce a number of valued existing flows less than 100 cumecs in the river. For example, for the 16 hours from 20:00 on 23 February through to 12:00 on 24 February, the existing takes would permit the river flows to be reduced by up to 31.8 cumecs⁴¹ to flows ranging from 100.4 to 96.4 cumecs. However, with a further take of 10 cumecs allowed, even though the natural flow is below the 132.6 cumec cut-off, the existing flows could be further reduced to flows ranging from 90.4 to 86.4 cumecs.
- 99. Thus, the range of existing flows of 253.1 cumecs at 13:00 on 21 February through to 111.1 cumecs at 12:00 on 23 February, and then through to 98.8 cumecs at 11:00 on 24 February, would all be reduced by 10 cumecs to modified flows of 243.1, 101.1 and 88.8 cumecs, respectively (as would all the intermediate flows between these values).
- 100. The flow changes would constitute losses in flows valued by intermediate and advanced/expert kayakers, and rafters, and do not reflect any 'gains in days of flows of value', or less than minor losses, as might be implied in the overall flow band analysis of impacts conducted by Mr Greenaway⁴². In many instances, and especially for existing flows in the 100 to about 170 cumec range, these 10 cumec flow reductions would be readily felt and noticed by experienced river users. Experienced paddlers will easily be able to discern a 10 cumec flow difference in hydraulic

⁴¹ From the takes of 30.7 and 1.1 cumecs by RDRML and CDF, respectively, the maximum total of which is at 5:00 on 24/02/2018, where the natural flow at Klondyke was 132.2 cumecs.

⁴² Mr Greenaway evidence in chief paragraph 27.

features on river runs they know. As a general rule of thumb this would be possible where flow differences were greater than 5% of the total flow. For example, a 10 cumec flow change would likely be seen as an observable difference in river hydraulic features up to flows of 200 cumecs (the 10 cumec change being 5% of 200 cumecs) whereas at flows above 200 cumecs such a take would not necessarily be so easy to discern. Such flow differences will mean some white water features may be totally absent; totally new ones will be present; sizes, profiles and power of hydraulic features will be very different; and the suitability of features for 'playing on' may be completely altered.

- 101. Such losses of kayaking and rafting flow amenity and values will occur in all situations where the up to 10 cumec flow take occurs.
- 102. As mentioned previously (paragraph 70) with the existing flow regime '... it is very difficult to find days when the flows are high enough to produce the outstanding white water and standing wave trains that the river was once renowned for, and ...'. By taking a further 10 cumecs this will be adding 'insult to injury' and only make matters worse by further reducing the chance of kayakers and rafters experiencing valued higher flows.
- 103. It is also clear from this flow example in Figure 4 that the only practical time when higher flows will able to be used by kayakers and rafters is during flood recessions. It is clear from hydrology evidence⁴³ these only occur on a limited number of occasions a year, after intense rain events in the headwaters. As Mr Greenaway points out⁴⁴ the chances of being able to paddle during one of these events at a particular desired flow (e.g., between 100-125 cumecs) is relatively low. However, such desired flows are still sought after and utilised by those able to when present. What is <u>not</u> necessarily made clear by Mr Greenaway is that the chances are further significantly reduced by the 10 cumec take, because it reduces the amount of time that such key flows are present and therefore able to be accessed and used⁴⁵. What is also important to point out is just because it is difficult to get access to 'high flow' days on the river does not mean that it is appropriate to further reduce this opportunity, or that in some manner this justifies the further 10 cumec take.
- 104. The data presented in paragraph 30 by Mr Greenaway are also incorrect⁴⁶. Although Mr Greenaway has updated the data for the 100-125 cumec flow band in Table 1, as we suggested was necessary in our joint submission, he has not done so for the discussion of this data in his paragraph 30.

⁴³ Mr Veendrick evidence in chief; Mr Keane evidence in chief.

⁴⁴ Mr Greenaway evidence in chief, paragraph 30.

⁴⁵ For example, the loss of 1.9 days corresponds to a significant 15.3% loss in accessibility in the 100-125 cumec flow band.

⁴⁶ The figures should read '12.4 days per summer season (6.8% of the time) between the RDR and Arundel, with a loss of 1.9 days' and other subsequent figures will also need to be changed.

Summary of impacts

- 105. The proposed take will result in a loss of up to 10 cumecs from all valued higher flows >100 cumecs and some just below 100 cumecs, and the number of days that they can be experienced at, whenever takes occur.
- 106. The occurrence of 5.6 additional flow days (a 165% increase, Table 3) in just one narrow flow band (95-100 cumecs) as a result of the take does not constitute any benefit, and <u>reflects further degradation of the paddling resource</u>. Paddlers especially prefer a variety in valued flows, not just flows held or flat-lined in one narrow flow band (paragraphs 73-75), and so this corresponds to a loss in flow variability. The 95-100 cumec flow band is also a sub-optimal flow band for a number of paddlers, such as those wanting higher flows in the 'big' water flow range.
- 107. The average annual reductions in the amount of time when valued flows greater than 100 cumecs will be found in the river are updated from what was summarised on page 39 of our joint submission (see Table 3 above) and what Mr Greenaway reports⁴⁷. The shifts are:
 - (a) 24.1 days per kayaking season existing to 20.1 days under the proposal a loss of 4.0 days or 16.6% for intermediate kayakers, for the 100-170 cumec flow range
 - (b) 32.5 days existing to 27.4 days a loss of 5.1 days or 15.7% for advanced/expert kayakers, or rafters, for the 100-250 cumec flow range
 - (c) 24.1 days existing to 20.1 days a loss of 4.0 days or 16.6% for rafters and intermediate and advanced/expert kayakers seeking the 'big' white water standing wave trains the RDR to Arundel reach is renowned for, for the 100-170 cumec flow range.
- 108. These losses in flow availability and variability are all very significant and far more than minor. In particular, as mentioned previously, the losses in high flows are not 'compensated' for by the increased number of days that flows remain constrained in the 95-100 cumec flow band where flow variability is lost.
- 109. It is incorrect for the applicant to offset the reductions in the number of high flow days lost by the increase in the number of days that flows are constrained in the single 95-100 cumec flow band (add the 'losses' to the 'gains'), as a result of the 10-cumec take. It is also incorrect to then conclude on that basis that there are somehow little or no impacts or reductions on kayaking and rafting flows of value, that the 'amenity for rafting and kayaking is [not] lost or modified in a meaningful way'⁴⁸, or benefits accruing on the basis of this flow band analysis alone, as stated in evidence and the AEEs⁴⁹. Significant reductions in valued higher flows will generally

⁴⁷ Mr Greenaway evidence in chief, paragraph 51.

⁴⁸ Mr Greenaway evidence in chief, paragraph 39.

⁴⁹ G Kemble *et al.*, Lake Klondyke: A Proposed Water Storage Facility, Prepared for: Rangitata Diversion Race Management Limited, Ryder Consulting, July 2016; D Greaves, Proposed Rangitata Diversion Race fishscreen and supplementary matters resource consent application, Ryder, November 2017.

occur, and flows will be constrained in one narrow flow band (a loss of variability), but will remain hidden by the applicant's method, whenever the proposed take is made in key flow band ranges. Thus loss of valued flows and in the number of days that such flows can be accessed, as well as an increase in the number of days that flows are constrained to one narrow flow band, will automatically follow.

ASSESSMENT OF ENVIRONMENTAL EFFECTS AND EFFECTS ON RECREATION AND TOURISM AND EVIDENCE OF MR ROBERT GREENAWAY

- 110. The AEE⁵⁰ provides a very limited analysis of the impacts of the proposed take on kayaking and rafting values recognised by the WCO. Drawing on an inappropriate methodology and results from the report on Recreation and Tourism Effects Assessment⁵¹ (RTEA), the AEE concludes that there are effectively no adverse issues concerning the kayaking and rafting values in the Klondyke to Arundel reach. My evidence shows very significant 10 cumec reductions in valued flows both above and below 100 cumecs result from the take. Much of the focus in the AEE, and especially in the conclusions, is on identifying impacts on recreation values (e.g., jet boating) that are not considered outstanding.
- 111. The second AEE⁵² and RDR Modified Fish Pass Recreation Effects Assessment⁵³ use a similar analysis methodology and draw similar conclusions when the impacts of additional flow takes required for operation of the fish screen are considered.
- 112. The applicant's recreation analysis is summarised in the evidence of Mr Greenaway⁵⁴. It likewise concludes that there are overall only positive impacts on kayakers and rafters in flow changes as a result of the proposed take. As discussed above (paragraphs 82-87, 100-109) the analysis does not properly identify or quantify the effects of the takes and so means the conclusions reached as to their impacts are incorrect.
- 113. Unfortunately there are also errors still present in the evidence that were pointed out in our joint submission, and which make reading and understanding the actual impacts rather difficult if not very confusing to discern. For example, preferred flows bands are reported for kayakers and rafters on the reach below the Arundel Bridge, whereas we stated in our submission that we have no knowledge of what flows would be suitable for these reaches, nor are aware of any such published data. We presume flow requirements for the reach above the Arundel Bridge have been simply applied to the reach below the Arundel Bridge,

 ⁵⁰ G Kemble *et al.*, Lake Klondyke: A Proposed Water Storage Facility, Prepared for: Rangitata Diversion Race
 Management Limited, Ryder Consulting, July 2016.
 ⁵¹ Klondyke Water Storage Proposal Recreation and Tourism Effects Assessment, Rob Greenaway and

⁵¹ Klondyke Water Storage Proposal Recreation and Tourism Effects Assessment, Rob Greenaway and Associates, July 2016.

⁵² D Greaves, Proposed Rangitata Diversion Race fishscreen and supplementary matters resource consent application, Ryder, November 2017.

⁵³ RDR Modified Fish Pass Recreation Effects Assessment, Rob Greenaway and Associates, 15 November 2017.

⁵⁴ Mr Greenaway evidence in chief.

but if this is the case this would be inappropriate in evidence because they would simply amount to guesses.

- 114. In paragraph 27⁵⁵ where it is stated '*There are increases in the availability of the preferred flow bands for all forms of kayaking (beginner, intermediate and advanced) ... as shown in my Table 1.*' this is clearly not true for the beginner flow band of 40-70 cumecs, where there is no change to the existing 55.6 days as a result of the take. This error is repeated again in paragraph 29.3. Paragraph 29.3 is particularly confusing reading, referring to on one hand some loss in availability of flows (paragraph 29) whereas no losses in flow availability are reported (only increases or remaining the same).
- 115. In paragraphs 39 to 40, 51 to 54 and 60 Mr Greenaway further discusses the losses we have identified in valued higher flows, and their significance in the light of the observed 'increases' in flow availability in overall flow bands of interest. Mr Greenaway incorrectly concludes the changes to recreation amenity will be minor or less, either singly or cumulatively. This evidence is analysed further in Appendix II for the interested reader. In part the analysis repeats what has already been presented earlier, although there are some new points that Mr Greenaway tries to make, but which I do not agree with.
- 116. I do not agree with the statement made in paragraph 58⁵⁶ that the majority of our joint submission compares the proposed take with natural flows. The bulk of the submission deals with the impacts of the take compared with the existing situation. I note Mr Greenaway does accept the existing take has diminished the recreation amenity values.
- 117. I do not agree with the view expressed in paragraph 61⁵⁷ that the joint submitters dismiss the proposed white water feature. We do not make such a statement. I discuss concerns on this matter later in this evidence. There was little appetite amongst the joint submitters for the single wave feature, which does not really constitute a White Water Course and which was not really what was discussed earlier by three Christchurch kayakers with the applicant. In the submission we did, however, question the applicant's intent to pay for the course given various conflicting statements in the application documents. We have since been assured that they will be paying for the full cost of building and maintaining the course, and that this is clearly embedded in the consent conditions. We also questioned the skill and knowledge of those both designing and commenting on the proposed course, based on our experience of some failed attempts to construct worthwhile courses and wave features in New Zealand in the recent past.

⁵⁵ Mr Greenaway evidence in chief.

⁵⁶ Mr Greenaway evidence in chief.

⁵⁷ Mr Greenaway evidence in chief.

- 118. I disagree with the conclusion in paragraph 93.1⁵⁸ that 'The availability of most of the flow bands desired for rafting and kayaking are increased, All these effects are, in my opinion and based especially on my conversations with Jet Boating NZ (Rob Gerard) minor or less'. This is in response to the requirement under the CWMS that 'modification of the Rangitata River is acceptable only if suitability of river conditions for jetboating and white water sports are maintained'⁵⁹. The availability of most flow bands is not increased and it is not appropriate to take an overall judgement approach or use an overall flow band analysis approach (as discussed previously, paragraph 109) when important high flows are adversely affected and masked by such an analysis method. As mentioned before the losses remain hidden when offset against the increased number of days that flows are constrained in the 95-100 cumec flow band as a result of the take.
- 119. For example, Mr Greenaway's method calculates a 'gain' of 1.6 days of flows (a 1.6% change out of 103.4 days, see Table 3) in the 45-170 cumec flow band as a result of the take, and Mr Greenaway would conclude the availability of flows in the flow band desired for intermediate kayakers has increased. However, none of the 5-cumec flow bands in the 45 to 95 cumecs range change at all and there is a large increase (165%) in the number of days (5.6) flows are constrained in the 95-100 cumec flow band. Furthermore significant losses (ranging from 7 to 34%) of days (0.14 to 0.59) occur in most of the 5-cumec flow bands between 100-170 cumecs, and a significant (16.6%) reduction overall in the number of days (4.0) flows are in the 100-170 cumecs range. A similar situation arises for advanced/expert kayakers and rafters when considering the impacts of the take on their 55-250 cumec flow band of interest.
- 120. In my opinion these losses are all significant and not minor or less as expressed by Mr Greenaway. In my opinion a minor gain or loss might be less than 5%, but some might argue it should be even less than that percentage. In addition, a less than minor change must be smaller still. Thus, valued high flows are consistently lost or constrained as a result of the proposed take, all at percentages higher than 5%, and this is clearly not maintaining the resource for white water sports.
- 121. I disagree with the conclusion in paragraph 97, subparagraph 97.1 where the loss of opportunity for those seeking high-flow kayaking and rafting opportunities is claimed to be minor. Unfortunately incorrect flow bands and incorrect data are used to show the losses. The actual losses in the 100 to 150 cumec flow band for the key outstanding Klondyke to Arundel Bridge WCO reach are 3.5 days (17.4%), which is not minor and not the 2 days quoted⁶⁰. [I do note that a loss of 2 days is calculated by Mr Greenaway below Arundel Bridge and he may be referring to this figure. However, even if this is the case, as we have pointed out in paragraph 113 of this evidence, we are not aware of any valid

⁵⁸ Mr Greenaway evidence in chief, paragraph 93.1.

⁵⁹ Mr Greenaway evidence in chief, paragraph 92.

⁶⁰ Mr Greenaway evidence in chief, second to last row, Table 1, page 10.

basis for the kayaking and rafting flow data reported below Arundel Bridge and therefore the meaning of this 'loss'.]

- 122. Using the intermediate kayaker and advanced/expert kayaker or rafter highflow ranges of 100-170 and 100-250 cumecs in this evidence, respectively, the losses overall in the Klondyke to Arundel Bridge reach are significant at 16.6% and 15.7%, for 4.0 and 5.1 days, respectively. As stated before, these losses are all far from minor.
- 123. Furthermore, such losses are comparable to a loss of 4.9 days (14%) available for adventure jet boaters between the Arundel Bridge and SH1, identified as a key residual adverse effect on recreation by Mr Greenaway⁶¹, even though the jet boating values in this reach are minimal and not recognised as outstanding in the WCO. The kayaking and rafting values are outstanding in the Klondyke to Arundel reach according to the WCO. Therefore, in my opinion the losses of the valued high flow days for kayakers and rafters as a result of the proposed take will take on even greater significance, especially because of the higher use and value of the Klondyke to Arundel Bridge run.

CANTERBURY REGIONAL COUNCIL SECTION 42A OFFICERS REPORT

- 124. Somewhat surprisingly the Canterbury Regional Council Section 42A Officers Report⁶² is silent on the effects of the flow takes on recreation amenity and the points raised in our submission, even though we wrote a detailed submission outlining our concerns about the impacts of the take on us.
- 125. The CLWRP states in Objective 3.15 'Those parts of lakes and rivers that are valued by the community for recreation are suitable for contact recreation.'⁶³ This objective is not mentioned in the Canterbury Regional Council Section 42A Officers Report but is in the evidence of Mr Greaves and Ms Marr. However, the objective is equally relevant to the discussion on the appropriateness of the proposed consent, as community amenity and recreation values are key elements recognised in Canterbury Regional Policy Statement (CRPS) and CLWRP objectives and policies, and the Canterbury Water Management Strategy (CWMS), and particularly because the Canterbury Regional Council is obliged to give effect to WCOs, and any provisions for any identified outstanding values, in the CLWRP.
- 126. The Officer's Report discussion should include the whole ambit of community values, including amenity and recreation values, and not just focus on irrigation development with respect to management of water in assessment of the proposal. Perhaps this omission is an oversight, or it may be a reflection of the applicant's view that amenity and recreation values are being provided for by the WCO flow allocations (when they are clearly not based on my evidence), or that there are no

⁶¹ Mr Greenaway evidence in chief, paragraph 98.

⁶² Natalia Ford, Section 42A Officer's Report, Canterbury Regional Council, 20 March 2018.

⁶³ Page 48, CLWRP, 22 August 2017.

negative impacts resulting from the proposed take (when there clearly are, again based on my evidence).

- 127. For the valued Klondyke to Arundel Bridge reach to remain suitable for contact recreation, such as kayaking and rafting, a full range of flows is needed, including high flows >100 cumecs. The 10 cumec take will reduce high flows and their availability, and constrain others and reduce flow variability, thus not retaining the suitability of the reach, and therefore not meeting Objective 3.15.
- 128. In addition, I agree with Ms Marr⁶⁴ when drawing her conclusion about avoiding over-allocation. Ms Marr concludes all freshwater objectives (not just some) need to be achieved in order to avoid over-allocation as required by Policy B5 of the NPSFM. I also agree with Ms Marr when she concludes ongoing and potentially exacerbated changes to river morphology and character are inconsistent with freshwater objectives of the CLWRP to protect the natural character of rivers⁶⁵, and is also inconsistent with the WCO direction to protect the water based recreation values of the river. Similarly not meeting Objective 3.15 of the CLWRP would likewise mean that over-allocation had not been avoided.
- 129. I do not agree with Mr Greaves view⁶⁶ that the proposal is consistent with Objective 3.15. Mr Greaves relies entirely on the evidence of Mr Greenaway in reaching this conclusion, including that the proposal will result only in the minor loss of opportunity for those seeking high flow kayaking and rafting opportunities. As the loss is more than minor, as determined in this evidence, I consider this to be inconsistent with meeting the Objective.

WATER CONSERVATION (RANGITATA RIVER) ORDER 2006 AND THE CANTERBURY LAND AND WATER REGIONAL PLAN (CLWRP)

- 130. The WCO outlines flow provisions in part⁶⁷ to provide for outstanding kayaking and rafting values from the RDR to Arundel Bridge by placing restrictions on takes from the river at different points and tributaries, and below the gauging site at Klondyke.
- 131. The flow takes (cumecs) permitted by the WCO for the period 15 September to the 14 May of the following year (essentially over an irrigation season and the kayaking season) are as follows⁶⁸:
 - (a) Minimum flow 20
 - (b) 20<flow at Klondyke<40; all flow above 20 cumecs at the Klondyke gauge can be taken
 - (c) 40< flow at Klondyke<66; half of the flow above 40 cumecs and up to 33 cumecs at the Klondyke gauge can be taken

⁶⁴ Ms Marr evidence in chief, paragraph 73.

⁶⁵ Ms Marr evidence in chief, paragraph 72.

⁶⁶ Mr Greaves evidence in chief, paragraph 6.42.

⁶⁷ In part only, as it also provides for the foreseeable needs of the farming community and the electricity generating industry.

⁶⁸ Clause 9(4), 9(3)(c).

- (d) 66< flow at Klondyke<110; only 33 cumecs can be taken
- (e) >110 cumecs; the WCO and CLWRP are silent on permissible flow takes
- 132. Unfortunately the WCO allows for takes that can result in very low flows in the river. These takes permit much lower flows in the river than were originally suggested by virtually all parties, including Environment Canterbury⁶⁹, involved in the WCO Hearing, and the really low flows (<40 cumecs) provide only a marginal white water resource and a potentially damaged river with respect to its ecological health⁷⁰. I understand this issue cannot be considered at this Hearing.
- 133. The CLWRP⁷¹ states the environmental flow and allocation limits are those of the WCO, and so provides no additional guidance on what is or is not permitted. It appears that no additional planning consideration has been undertaken by Environment Canterbury to provide for high flows needed to protect recreation values as recognised by the WCO, nor in recent consent processes (e.g., CRC134808). Therefore, there is no explicit protection in the CLWRP at present for the WCO values at flows >110 cumecs, other than what else in the WCO protects recognised values or what other planning instruments say.

PROTECTION OF THE OUTSTANDING RANGITATA RIVER

- 134. I agree with the policy analysis framework and conclusions outlined in the evidence of Ms Marr⁷² (paragraphs 37-46) where she concludes in paragraph 46 'the primary policy directive for the Rangitata River is to protect the significant or outstanding characteristics, features and values identified in the WCO for the Rangitata River. Where specific directions are given in the WCO these must be followed. Where no specific directions are given, management of the resource should result in the identified outstanding values being protected'.
- 135. Evidence on some of the outstanding water based recreation values is also given by Mr Grant South, particularly on the nature and use and flow needs of rafters and changes in the river bed morphology over time.
- 136. Our evidence indicates that particular flows and river bed features are pivotal to protecting the outstanding water based education and recreation values of the Rangitata River, as was discussed at the WCO hearings. Our evidence identifies that flow variability and particular bands of flows are needed to provide these resources for different types of uses and users. The white water resource in the reach is already under significant pressure from the takes by the RDR, both at high and low flows. This normally means that optimal flows for white water recreation activities and high flows for a good rafting experience only occur rarely, or conversely good flows are

⁶⁹ Rangitata River Water Conservation Order Application, Report by the Special Tribunal, October 2002, pp 1-139 and additional Appendices.

⁷⁰ See the evidence of Mr Grant South.

⁷¹ Environmental flow and allocation limits, Section 12.6.1, Alpine rivers, CLWRP, 22 August 2017, p 262.

⁷² Ms Marr evidence in chief, paragraphs 37-46, 52.

often not found in the river when they are needed and when a visit is made to the river.

- 137. Mr Mark Webb⁷³ also mentions the problem of excessive turbidity in the river as a result of the current and proposed takes and how it is not beneficial for salmon fishing. A similar effect occurs for white water users of the river. Rocks close to or at the river's surface are hard to see when stopping in eddies or at the river side because the 'grey' colour of turbid water is very similar to the colour of rocks in the river and makes reading⁷⁴ the white water much harder if not impossible. Thus paddlers' craft can easily collide with and get 'hung up' on rocks unexpectedly (I personally experienced this on my last trip down the Rangitata), causing a capsize of a kayak or stoppage of a raft in some situations. This is unexpected and unsettling and annoying for any paddler of any ability, and in the case of kayakers can result in hazardous 'pinning'⁷⁵ on rocks.
- 138. This higher turbidity occurs because, with the size of the river takes, the water is normally more turbid from fresh or flood like conditions when good higher flows in the preferred flow band ranges for kayakers and rafters are present in the river (paragraph 44). Higher turbidity will reduce the kayaking and rafting experience at flows around 100 cumecs and higher as a result of the proposed take. This would also mean that the suitability of the river was not being maintained for rafting and kayaking as it is supposed to be according to the CWMS regional implementation plan⁷⁶.
- 139. I have demonstrated that the 10 cumecs take significantly reduces the flows in the river over a number of valued flow bands for rafters (100-250 cumecs) and kayakers (100-170 and 100-250 cumecs) contrary to what is suggested by the flow band analysis conducted by Mr Greenaway for the applicant. The take also reduces the flow variability by increasing the number of days where flows are held in one particular flow band (95-100 cumecs). Reduced flows and reduced flow variability in the valued flow ranges will reduce and not maintain the outstanding white water amenity provided by the river.
- 140. I agree with the analysis of Ms Marr⁷⁷ concluding that the additional 10 cumec take will not preserve or protect the natural character of the Rangitata River. In particular she refers to the evidence of Dr Meredith and Dr Hicks that the Rangitata is already subject to a high degree of hydrological modification compared to its natural state

⁷³ Mr Webb evidence in chief paragraphs 61-66.

⁷⁴ In this case reading means looking at the white (grey) water surface and trying to understand what it is telling you about the presence of rocks near the surface that you might need to avoid. When the water is too turbid you can't see them and that creates the problem.

⁷⁵ Where if the paddler is tripped over upstream sideways, water pressure can hold them on the rock in their kayak. This can be a really serious situation if the paddler is upside down, and in the worst cases paddlers have drowned as a result.

⁷⁶ Mr Greenaway evidence in chief, paragraph 92.

⁷⁷ Ms Marr evidence in chief, paragraphs 53-56.

and that current water abstraction is adversely affecting morphological characteristics of the river.

- 141. Dr Hicks has provided a very clear description of the effects on bedload transport and channel morphology of the existing fresh and flood flow takes and anticipated changes with the additional take⁷⁸. Dr Hicks has stated his expectation that existing water abstractions should be significantly reducing the river's gravel transport capacity and should be resulting in the gradual reduction in the average size of the river bed surface material and lower relative relief of channels and braids⁷⁹, as we have observed (paragraph 54 this evidence). An additional 10 cumec take will exacerbate and continue this effect.
- 142. Kayakers and rafters know these morphological changes will have a detrimental effect on the quantity and quality of white water rapids and features and we have observed this over the years (paragraph 55 this evidence). I agree that this will not maintain the character and value of the braided river bed and its significance to white water users⁸⁰.
- 143. I have demonstrated (paragraphs 72 to 102) that the 10 cumec take will further add to the already significant existing adverse effects on the white water kayaking and rafting values. I agree with Ms Marr⁸¹ that if such cumulative effects are not assessed, appropriate management within limits to avoid significant adverse effects may not occur.
- 144. I have also outlined that the proposed take would be contrary to Objective 3.15 of the CLWRP (paragraphs 125 to 129) and so would amount to over-allocation within the catchment if granted. I also agree with the final assessment of Ms Marr⁸² that the proposal does not pass the s104D gateway and is inconsistent with the WCO, and so should not be granted in accordance with 104(3)(c)(i) and section 217(2), because of its adverse impacts on kayaking and rafting recreation values.
- 145. Therefore, the proposed 10 cumec take <u>wil</u>l reduce many of the valued flows in the river in more than a minor way, and therefore the use of the waters for rafting or canoeing. As this is contrary to the purpose of the WCO to recognise and protect and sustain such outstanding recreation values, the purpose of the RPS to protect outstanding water bodies, and the purpose of the NPSFM to avoid over-allocation, the proposed consent cannot be granted⁸³.

CONSENT CRC134808 AND ITS IMPACTS

146. In our joint submission issues were identified with the consented take CRC134808 granted as a non-notified consent in 2013. In particular it was not possible to

⁷⁸ Dr Hicks evidence in chief, paragraphs 50-63.

⁷⁹ Dr Hicks evidence in chief, paragraph 63.

⁸⁰ Ms Marr evidence in chief, paragraph 55.

⁸¹ Ms Marr evidence in chief, paragraph 76.

⁸² Ms Marr evidence in chief, paragraphs 109-111.

⁸³ S199 (1)(b) RMA.

measure the true impact of the proposed 10 cumec take on rafting and kayaking values without more information about what takes would be enabled by increasing the RDR capacity under the new consents (see Appendix 1).

- 147. RDRML has, however, decided to surrender resource consent CRC134808⁸⁴.
- 148. This surrender would address our concern that the full impacts of the proposed take cannot be evaluated unless this consent is removed from the mix (Appendix 1).
- 149. I would also submit that even if the full take requested by RDRML is not granted, but some modified consent is, that consent CRC134808 still must be surrendered and that this consent condition (or a modified version of it) must be retained. We would also request that this consent is surrendered immediately the first tranche of consents for the Klondyke Water Storage Facility are granted, so that CRC134808 cannot be activated and therefore inappropriately impact on the Klondyke to Arundel reach, in a related manner to the proposed 10 cumec take. It presumably cannot be enacted until the RDR capacity is expanded in any case, and such a change in surrender date will better reflect the intent and primacy of the WCO.

POSSIBLE GRANTING OF THE PROPOSED CONSENT AND MITIGATION

- 150. It may be possible to grant the consent in some modified form that does not see a reduction in the use and suitability of the river for rafting and kayaking and therefore is not contrary to the WCO, the CWMS, the NPSFM and the CRPS.
- 151. For example, kayaking and rafting is not normally carried out at night because it is not normally safe to do so in a white water environment, so it may be possible for the 10 cumec take to be done only during the hours of darkness.
- 152. If the trigger mechanism for the take was altered to one where the river flow was interrogated on an hourly mean flow basis and then decisions made for the following hour (or a limited number of hours), a more flexible arrangement might result giving more scope for RDRML to take water, such as during the rise and throughout a fresh, that they might not be able to currently do. This would also prevent the taking of flows that the applicant was not entitled to.
- 153. In order to ensure that the intent of the WCO was not contravened, no taking of up to 10 cumecs of water from the river at flows up to 290 cumecs (natural flow at Klondyke) during daylight hours could be made mandatory. This would ensure that existing flows up to 250 cumecs in the river, which were identified as the upper flow band bounds of value in the WCO process, would not be altered by the proposed scheme during daylight hours.

⁸⁴ Mr Greaves evidence in chief, Condition 7, CRC170654, Annexure C Proposed Consent Conditions.

- 154. Although flows higher than 250 cumecs in the river are used by river users and especially rafters, white water users may be prepared to 'give away' and permit the 10 cumec take to occur during daylight hours at flows above 290 cumecs (natural flow at Klondyke).
- 155. However, mitigation would be needed to allow for this take. Mitigation aimed at providing guaranteed access free of charge to river users⁸⁵ to the south bank of the river could be sufficient to permit high flow takes even though small reductions in high flows would occur.
- 156. On the other hand the Hearing Tribunal may not be persuaded by our arguments and those of other objectors and consider that the consent can be granted subject to conditions that provide mitigation for the loss in white water and other resources. If this is the case we would ask that mitigation of the form out lined above be used, and agree with Dr Hicks that monitoring and mitigation, by way of an adaptive management response, that he outlines⁸⁶ be adopted.

DISCUSSIONS WITH RDRML

- 157. As a group we have had spoken with RDRML about their scheme probably on about 5 or 6 occasions. We have listened to a presentation on their proposal and discussed:
 - (a) our general concerns about the impact of their proposed take on our kayaking and rafting values, and lack of mitigation, and preference for water to be left in the river to maintain our white water values
 - (b) the impact of the current takes on the river, and how these significantly impact on the kayaking and rafting values and the ecological health of the river, particularly when flows are low, as extremely low minimum flows are set in the WCO
 - (c) concerns that the river is already over allocated in terms of water takes, and meeting CRPS and CWMS recreation and amenity policies and targets, respectively, and that this additional take is exacerbating this situation
 - (d) concerns that with climate change and recession and melting of glaciers in the headwaters that base flows will be lower still in the future, and that with further permitted takes further impacts on our white water values and other river values will occur, including the river being held in artificially low flow conditions for more extended periods of time during dry periods and when there is no rainfall on the main divide lifting the river flows

⁸⁵ Private land is accessed and crossed to put in and take out on the south bank from river trips on the Rangitata River (e.g., at the put-in at Klondyke and the get-out at the wool shed near Peel Forest). River users rely on the generosity of such land owners and of course have to respect this access and the obligations that it entails (acknowledging this privilege, causing no damage to property, shutting gates as required, communicating with landowners when necessary, etc).

⁸⁶ Dr Hicks evidence in chief, paragraphs 64-66, 68-69.

- (e) how we felt their application does not fairly represent the value and current use of the Klondyke to Arundel Bridge reach of the river and the impacts of the scheme
- (f) and clarified that the proposed white water course included in the consent conditions is not provided as mitigation for the impact of the reduced flows on our kayaking and rafting resource.
- 158. As a group we have discussed the proposition that RDRML have embodied in the consent conditions, namely that a white water course (WWC; I note this has now has been potentially reduced to a one wave feature⁸⁷, although Mr Curry in conversation with me⁸⁸ has said RDRML want to produce a WWC of value that will be used by the wider community and therefore inclusion of other water features is on the table for discusion) be built as an integral part of the construction of the Klondyke Storage Pond. Although it is tempting to consider such a proposition there has been little appetite amongst our group of joint submitters to seriously consider such a proposal.
- 159. Amongst other matters, the proposed location of the site is remote from centres of population and so it is unclear how much it would be used, is likely to be quite limited in terms of what features might be built, has significant uncertainty as to flow and head and when it would be available, and there is significant risk associated with the build as such courses need very specialised design to be effective.
- 160. The overarching view of the wider paddling community has been that they would rather have a functioning river, and the far greater number of white water features and recreation opportunities that it offers in its natural or even modified state, so long as sufficient flow is present. However, others have expressed the view that it would be worth our while accepting the white water course, because if the consent is granted it might be all we get.
- 161. However, this said, depending on what was included in a WWC, such a facility could still be of value to the wider community, especially if it contained the right features. For example, if it contained a sheltered (from the wind) and landscaped course and a large safe and deep enough swimming area, well defined and large enough eddies for beginner kayakers and river users as well as swimmers to practise transitioning from stationary to moving water, as well as an outstanding wave feature, and sheltered picnic areas protected by trees from the sun, it could become a valued asset and destination for the wider community. This, for example, is the case for the Hawea Whitewater Park (HWP) built on the Hawea River, as mitigation for the loss of rivers to damming for in Central Otago. The HWP has two wave features and is widely used by the local and national community. The wave features work over a range of flows (30-200 cumecs) but such flows would not be available to the WWC. Only far smaller flows would be available (and how often is not clear) and so the white water

⁸⁷ Mr Greenaway evidence in chief, paragraph 34.

⁸⁸ Mr Curry, phone conversation on or about Monday 9 April 2018.

wave/feature would be far smaller in size and power compared with those in the HWP and the Rangitata River and therefore of limited utility.

162. If the WWC is to be built, we would ask that a number of members of our white water community, including Mr Hayden Titchener (Head of Outdoor Education, Geraldine High School), be involved in the planning of such a facility and also that appropriately qualified people be used to help with the design of the course. We have no confidence in local engineers and paddlers designing such a course. Local engineers in particular have had no experience in such matters and have created major problems in the past when attempting to design courses or features (e.g., the Tekapo White Water Course⁸⁹). We would request that only designers of the calibre of the internationally renowned Scott Shipley (hydrology engineer and ex USA and world kayak slalom champion), who designed and was involved in the build of the Hawea Whitewater Park, be involved in the design and build. Only then is there a chance that an appropriate fit-for-purpose facility will result. If the constructed white water course/facility was built with the above caveats in mind, and turns out to be an outstanding facility of value to the local and wider community, then it is likely a number of white water users, including members of Whitewater NZ, would support its construction and make use of it.

CONCLUSION

- 163. The proposed 10 cumec take cannot be granted in its current form as it will reduce the valued flows in the river, and therefore the use of the waters for rafting or canoeing, contrary to the purpose and protection provided by the WCO.
- 164. If the consent was to be granted, revised consent conditions to address matters discussed in paragraphs 151 to 156, would be required to ensure that it was consistent with the WCO. Also appropriate mitigation would need to be provided to mitigate reduced high flows if takes were to be permitted during daylight hours when the natural flow in the river was greater than 290 cumecs.

Doug Rankin Conservation Officer/Board Member Whitewater NZ

⁸⁹ The Tekapo White Water Course was designed by New Zealand hydrology engineers lacking the right knowledge and experience and was scoured and washed away and fell apart when first commissioned. In addition, the flows it was supposed to handle were far too large for the design used and a number of features did not 'work' as planned. As a result, it was never properly functional and had to be 'rescued', primarily by concreting much of the structure. However, to this day, even though a lot of work has been done on the course to significantly improve it and many of its white water features, the course is still very fragile, is limited in the number of good white water features it contains, is hazardous because of the rough concrete surface, and still continues to be eaten away through use. In contrast, the two wave features in the Hawea Whitewater Park on the Hawea River, designed by the internationally recognised hydrology engineer, white water course and park designer and kayaker, Scott Shipley, has worked as designed since building and commissioning, and has proved to be perfectly robust even under the high flood flows the river handles at times.

APPENDIX 1 - CONSENT CRC134808 AND ITS IMPACTS

- 165. RDRML has another consent (CRC134808), tied in with three consents of Rangitata Water Limited (RWL; CRC001229, CRC042094, CRC070924), which permit RWL to take up to 20 cumecs just above the Arundel Bridge to fill the large storage ponds for irrigation water nearby⁹⁰ when the Rangitata is flowing at >110 cumecs at the Klondyke gauge. RDRML consent CRC134808 is to allow <u>combined extraction of all</u> <u>four consents</u> to take up to 20 cumecs of water when the river is flowing at >110 cumecs. This has the effect of permitting RDRML to take whatever water it can <u>via</u> <u>the RDR</u> whenever RWL does not want to take its full entitlement.
- 166. RDRML was granted CRC134808 as a non-notifiable consent in 2013. It expires on 31 January 2042. RDRML has not been able to use this consent up until now, and its impacts have never been seen on the river, because they have no storage and the RDR does not have the capacity to take the additional flow. However, with the proposed 10 cumec take consent granted, and the RDR channel capacity upgraded and increased, CRC134808 could be exercised.
- 167. Such an additional take will reduce the flows and use of the Klondyke to Arundel Bridge run, and is contrary to the provisions of the WCO, and should never have been granted without a proper and correct assessment of the impacts⁹¹. Sadly as the consent has been granted, it now has legal standing.
- 168. It is my understanding that the flow takes from CRC134808 are not included in the hydrological model used to calculate the existing flows in the river ⁹². These takes are required to calculate the modified flows that will result from the proposed takes, and therefore any impacts from decreases in flows. It is probably reasonable to argue that, <u>as the proposed new take facilitates the takes by CRC134808</u> (by virtue of the increased RDR off-take capacity), the flow takes of the proposed 10 cumec take and those of CRC134808 should be added together and used as the 'modified' flows for the assessment of the impacts on river flows of the proposed KSP.

⁹⁰ The takes of flood flows between 110 to 130 cumecs down near Arundel by RWL don't essentially affect white water recreation users on the RDR to Peel Forest or Arundel run, as this occurs essentially at the <u>bottom</u> of the run. However, such takes do affect users of the river lower below such as jet boaters, and the natural biota and ecosystem, and river and coastal processes. However, when the flood flows in this range will be taken by RDRML, these takes <u>will have an impact</u> on the white water values in the RDR to Peel Forest or Arundel run, as the takes occur at the <u>top</u> of the run. Such takes are contrary to the purposes of the WCO.

⁹¹ An inadequate and incorrect analysis and assessment of impacts was carried out by Environment Canterbury in considering this reciprocal consent, and the ramifications of it are discussed further in pages 11 to 13 of the joint submitters' submission (Whitewater NZ *et al.*, Submission on the RDRML KSP Application, September 2016).

⁹² Confirmed in conversations with Mr Bas Veendrick, hydrologist for RDRML, at different times since the application and the Whitewater NZ *et al.* submission was lodged. Prior to the lodging of the submission from Whitewater NZ *et al.*, I was mistakenly under the impression that the flow takes from CRC134808 were included in the hydrological model used to calculate the existing flows in the river. Therefore the last few paragraphs on page 13 of the joint Whitewater NZ *et al.* submission dealing with this matter need to be corrected.

169. Of course this is necessary to determine the full impact of the proposed and consented takes. However, as this has not been done by RDRML in the analyses they have presented to Environment Canterbury to date. Thus, there remains significant uncertainty as to the full nature of the impacts on river flows, and therefore rafting and canoeing values, as a result of the proposed takes, and especially if CRC134808 remains in the mix.

APPENDIX II - FURTHER ANALYSIS OF MR GREENAWAY'S EVIDENCE

- 170. From my evidence presented in paragraphs 72 to 109 and Mr Greenaway's evidence⁹³ it is clear that the proposed 10 cumec take will result in significant reductions in the availability of flows above 100 cumecs (and also some below 100 cumecs) of value to kayakers and rafters. What is more, the size of these reductions in availability are significant and very definitely more than minor, and will lead to a significant reduction in the amenity value provided by the high flows, and the 'big' water experience they offer. Either singly or cumulatively they will further reduce the white water values of the river and not see a retention or protection of its current white water recreation amenity.
- 171. What is also clear is that the 10 cumec take results in a concomitant increase in the number of days that flows are held in the narrow 98-100 cumec flow band⁹⁴, which corresponds to a loss in flow variability. If the flow reductions or losses in higher flow days are added to the number of days flows are held in the 98-100 cumec flow band as a result of the takes, as done by Mr Greenaway, 'on average' small increases in the days in overall broad flow bands are taken to indicate that a tipping point⁹⁵ has not been reached and therefore the resource has been preserved and not degraded. However, I do not agree that this is an appropriate method by which to assess impacts on the white water resource. It is clear that the resource would not be maintained and would be reduced, as explained earlier in paragraphs 72 to 109 of my evidence.
- 172. The 'averaging' process hides the two separate impacts of the take; the loss of higher flow days, and the consequent artefactual 'gain' in flow days or holding of flows in just the one narrow 98-100 cumec flow band. In paragraph 53 Mr Greenaway calculates the changes in flow days over flow ranges from 98-170 and 98-250 cumecs⁹⁶, which of course produces (or should produce) the same average 'overall' changes in flow days for the intermediate kayaker 45-170 cumec and advanced kayaker/rafter 55-250 cumec flow bands, respectively, that we have both calculated (Table 3).
- 173. Mr Greenaway then tries to develop an argument⁹⁷ that the positive gains of
 5.8% in the 98-170 cumec flow band compared with losses of 16.6% in the 100-

⁹³ Mr Greenaway evidence in chief, paragraph 51.

⁹⁴ Mr Greenaway evidence in chief, paragraphs 28, 29. Note it is essential to remember that the 'increases' in flows in the 98-110 cumec flow range are not 'real increases' but 'artefactual increases', which arise as a result of the taking off of 10 cumecs of water from higher valued flows, and therefore a significant increase in the number of days that flows between 98-110 cumecs will be experienced in the river as a result. There are no actual increases in such flows at all, just an increase in the number of days that the river will be held at such flows as a result of the take.

⁹⁵ Mr Greenaway evidence in chief, paragraph 60.

⁹⁶ Mr Greenaway evidence in chief, paragraph 53. Note there is an error in the second bullet point, the flow range '98-120 m³/s' should read '98-250 m³/s' to be consistent with what is being discussed (flow range for advanced/expert kayakers). The gain in days should also be 0.5 rather than the 0.4 quoted to be consistent with other data in Mr Greenaway's evidence such as in Tables 1 & 2.

⁹⁷ Mr Greenaway evidence in chief, paragraph 54.

170 cumec flow band cannot be considered 'significant' or indeed relevant based on a 2 cumec difference in base (I do not know what 'base' means) flow. The argument seems to be based on research he has been involved in (not as a coauthor) where people estimated river flows in a study of the aesthetic value of river flows from examining photographs. I do not find any logic in this proposition, nor can I agree with his assertion that the 10 cumec take is on such a small scale that users will be able to discern any such losses. Experienced paddlers will easily be able to discern a 10 cumec flow difference in hydraulic features on river runs they know. Such flow differences will mean some white water features may be totally absent; totally new ones will be present; sizes, profiles and power of hydraulic features will be very different; and the suitability of features for 'playing on' may be completely altered (also see paragraphs 100 and 101).

- 174. Mr Greenaway then goes on to conclude⁹⁸ in paragraph 54 that utilising the flow ranges that he uses in his evidence 'recognising that the ability to raft and kayak the river are not diminished (and educational flow bands are increased in availability), I am confident that the changes to recreation amenity will be minor or less.' I disagree with this conclusion. Hiding or masking losses of, or decreases in, daily availability of valued high flows, by adding these to concomitant daily increases in flows constrained in a lower and narrow flow band as a result of a take, and so claiming overall increases in 'availability' or no losses of the resource, does not justify claims that changes to recreation amenity will be minor or less. Furthermore recognising that the ability to raft or kayak the river is not diminished is also somewhat misleading. Taking flows from a river may not mean the ability to raft or kayak the river is diminished but the key consideration is whether the kayaking or rafting <u>experience or amenity will be</u> diminished. If this experience is diminished, which it will be by the loss of valued higher flows, this means the recreation amenity is reduced.
- 175. Furthermore, no tipping point⁹⁹ would <u>ever be realised</u> using Mr Greenaway's methodology. For example, consider a hypothetical take of up to 30 cumecs to illustrate the situation, instead of the proposed 10 cumec take. Takes would start at 132.6 cumecs, with a full additional 30 cumecs being taken when flows at Klondyke reach 162.6 cumecs and above. Such a large take would make even bigger significant reductions in the availability of flows above 100 cumecs of value to kayakers and rafters, when compared with the 10 cumec take. In addition, the large takes would again massively increase the availability of flows in the narrow 98-100 cumec flow band, but again, on average, by adding the lost and 'gained' days together, small 'increases' in days in key overall flow bands (e.g., 45-170, 80-170, and 55-250) would still occur.

⁹⁸ Mr Greenaway evidence in chief, paragraph 54.

⁹⁹ Mr Greenaway evidence in chief, paragraph 60.

- 176. Using Mr Greenaway's argument no tipping point would have been reached, as the (average) small increases in key overall flow bands for kayakers and rafters from the take would again allow Mr Greenaway to claim that the recreation amenity had been preserved and retained, when that would clearly not be the case with such massive high flow losses and constraining of flows in the 98-100 cumec flow band.
- 177. For example, a whole lot of valued higher flows in the intermediate and advanced/expert kayaker and rafter ranges would have been severely reduced and a massive spike in flows constrained in just in the one 98-100 cumec flow band would have been produced. This modified flow distribution would clearly not have the normal 'inverted U' <u>spread and distribution</u> of preferred flows throughout the 45-170 and 55-250 cumec ranges for the intermediate and advanced/expert kayaker (and rafter) ranges, respectively (Figure 2).
- 178. In addition, the flow recession curve after a flood would contain a zone where flows were constrained (flat-lined) in the narrow 98-100 cumec range. Paddlers would not want the river flow often constrained to just a narrow flow band as a result of takes, they prefer a uniform variety in flows. Thus 'adding' the decreases and increases in flow availability produces a result that makes the resource appear to be the same¹⁰⁰, no matter how large the proposed take is, when in fact it would clearly not be the same.
- 179. Mr Greenaway¹⁰¹ expresses the view that he would be particularly concerned if the proposal would increase the availability of flows below 40 cumecs, because this would lead to the loss of educational opportunities, presumably for beginner kayakers. Of course the proposal does not result in such a loss of recreational opportunities as no increase in the days flows are below 40 cumecs arises from the proposal.
- 180. However, if the same logic was applied to the loss of valued high flows, say between 100-170 cumecs, and the loss in educational opportunities that would result for intermediate paddlers, Mr Greenaway might have reached the same conclusion as paddlers and river users have. The proposal <u>is</u> going to lead to valued flow reductions for us and an increased amount of time (and flat-lining) that flows will be in just one narrow flow band of 98-100 cumecs. This will reduce the opportunities for intermediate kayakers and rafters and others seeking a higher flow white water experience.
- 181. The applicant's analysis method is discussed further by Mr Greenaway¹⁰², with the added expectation that a discernible meaningful loss in kayaking and rafting opportunity that results in participant displacement is required before, in Mr Greenaway's opinion, an acceptable diminution in resource would be

¹⁰⁰ Mr Greenaway evidence in chief, paragraph 40.

¹⁰¹ Mr Greenaway evidence in chief, paragraph 39.

¹⁰² Mr Greenaway evidence in chief, paragraph 60.

demonstrated as a result of the proposal. Participant displacement would occur automatically, meaning that a discernible meaningful loss in the kayaking and rafting opportunity would occur, as there would be a lesser number of higher flows days available, or chance to use the resource under higher flows, as a result of the 10 cumec take.

182. Thus, for the various reasons discussed above, the applicant's assessment method is inappropriate. Mr Greenaway incorrectly concludes that there is a less than minor impact on the kayaker and rafter recreation amenity in the Klondyke to Arundel Bridge reach of the Rangitata River, as a result of the proposed 10 cumec take, when there clearly is not.