
in the matter of: the Resource Management Act 1991

and

in the matter of: a number of applications to take and use water from
the Upper Waitaki catchment

Brief of evidence of Robert John Potts on water allocation matters

Dated: 16 September 2009

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BRIEF OF EVIDENCE OF ROBERT JOHN POTTS

INTRODUCTION

- 1 My full name is **Robert John Potts**.
- 2 I am the National Environmental Science Leader of the multidisciplinary consulting firm CPG New Zealand Limited (CPG) (which was formerly Duffill Watts Limited and Glasson Potts Fowler Limited before that) and have worked in the area of water resources and environmental engineering for over 30 years.
- 3 I have the following qualifications: New Zealand Certificate in Engineering (Civil); Bachelor of Engineering (Honours) Agricultural (University of Canterbury); Graduate Diploma in Hydrology (Groundwater) (University of New South Wales), MIPENZ and am a Chartered Professional Engineer (CPEng). I am a member of Water New Zealand, New Zealand Irrigation Association, and New Zealand Land Treatment Collective.
- 4 I have been involved in numerous irrigation scheme development projects and water resource investigations in New Zealand and overseas in my current employment and previous employment with Ministry of Agriculture and Fisheries (MAF), Lincoln University (NZAEI – now Lincoln Ventures), Lincoln International, Pattle Delamore Partners Limited and Glasson Potts Fowler. My roles have included: project management; assessing plant water requirements; assessing groundwater resources; assessing soils; designing on and off-farm irrigation infrastructure; measuring and modelling nutrient losses; and assessing the effects of irrigation development.
- 5 I confirm that I have read the Environment Court's Code of Conduct for expert witnesses and this evidence has been prepared in accordance with that code. I agree to comply with the code's terms. In that regard, I confirm that the statements made in this evidence are within my area of expertise (unless I state otherwise) and I also confirm that I have not omitted to consider material facts which might alter the opinions stated in this evidence.
- 6 In preparing my evidence I have reviewed:
 - 6.1 The evidence I presented at the Waitaki Catchment Water Allocation Board (WAB) hearing, the North Bank Tunnel Concept Hearing (Council and Environment Court hearings) the Hunter Downs Irrigation Scheme hearing and have prepared a number of other reports that are referenced throughout this evidence;
 - 6.2 The evidence of **Mr McIndoe** for MWRL; and
 - 6.3 The section 42A Report of **Ms Bartlett**.

SCOPE OF EVIDENCE

- 7 In this evidence I outline:

- 7.1 The WAB process and my involvement in terms of assessing water requirements and allocation blocks for the Waitaki Catchment;
- 7.2 The allocation blocks for the Upper Waitaki Catchment in the Waitaki Catchment Water Allocation Regional Plan (WRP), including a discussion on the methodologies used for estimating consented water allocation in the Upper Waitaki Catchment; and
- 7.3 My assessment of the volume allocated to existing consents, replacement consent applications, and new consent applications for agricultural and horticultural activities.

WAB EVIDENCE

- 8 Paragraph 9¹ of my evidence to the WAB set out the wider scope on irrigation issues in the entire Waitaki Catchment which I was asked to consider as a result of various issues arising from the Draft Waitaki Catchment Water Allocation Regional Plan (the Draft Plan).

Existing Irrigated and Consented Areas Demand

- 9 In my evidence to the WAB, I outlined the existing irrigated and consented areas based on my analysis of the Environment Canterbury (ECan) consents database. At the time, there were 67 consented takes for irrigation in the Upper Waitaki Catchment (the area above the Waitaki Dam), including the Upper Waitaki Community Irrigation Scheme (UWCIC) as its take point is above the Waitaki Dam. These abstractions totalled 15.616 m³/s. The Draft Plan stated (Page 16, Chapter 4) that there was an estimated current demand of 77 million m³/yr upstream of the Waitaki Dam. It was my understanding that this volume of 77 million m³/yr was based on an irrigated area of 10,602 ha that was provided by Aqualinc Research Ltd (Report L05112²). The 77 million m³/yr was lower than my original estimate of 174.3 million m³/yr for 9,680 ha of irrigation, but my estimate also included stock water and an allocation for the UWCIC of 19.4 million m³ per annum.
- 10 The Aqualinc Report² shows how the "Consented Annual Volumes" and "Assessed Annual Volumes" were calculated. The "Assessed Annual Volume" is also referred to as the "Reasonable Use" or volume of water that is supposedly actually used during an irrigation season. This is the 77 million m³/yr reported to (by **Mr McIndoe** of Aqualinc) and adopted by the WAB (Page 16, Chapter 4). The "Consented Annual Volume" or "Entitlement" estimate of 148.9 million m³/yr was based on the assumption that the consented peak rate was taken over a 150 day season. The report then provides a justification for adopting the 77 million m³/yr by stating that:

"...consented peak takes and volumes do not provide a realistic assessment of allocation as they assume water is taken continuously, with all takes being exercised at the same time. Because of the change in the way water is used, for example the use of spray irrigation rather than border-strip irrigation, it is no longer realistic to use peak rates of take as a method of assessing use. Volumes of water taken or used per season must be considered"

¹ Potts, R. J. (2005) "Brief of evidence of Robert John Potts in the matter of the Resource Management (Waitaki Catchment) Amendment Act 2004 and in the matter of a Submission on the Waitaki Catchment Water Allocation Regional Plan to Waitaki Catchment Water Allocation Board". Unpublished.

² McIndoe, I. (2004) "Mackenzie basin irrigation takes – consent review". Report prepared for Mackenzie Farmers Group by Aqualinc Research Ltd. Report no. L05112. Unpublished.

- 11 My annual consented volume estimate of 174.3 million m³ discussed above was still higher than Aqualinc's "Consented Annual Volume" of 148.9 million m³. The reason for this is that I based my calculations on application rates of 614 mm/yr for spray irrigation and 1,500 mm/yr for border dyke irrigation systems whereas Aqualinc used rates of 600 mm/yr for spray and 900 mm/yr for border dyke systems. In addition to the different application rates, there was a minor difference in the irrigated areas.
- 12 Some of the 67 irrigation takes also included water for stock that was not separately defined in the consents. In addition, there were a further six takes solely for stockwater totalling 0.871 m³/s (27.45 million m³/year). This volume also contributes to the total in the Agriculture and Horticulture category in Table 5 of the WRP.
- 13 To establish the irrigated area, I assessed that the existing irrigated area was 5,420 ha, based on a LANDSAT remote sensing imagery taken in February 2002. At the time a number of takes had been consented but had not yet been exercised. The largest of these consents was the Benmore Irrigation Company of approximately 4,000 ha. When these were taken into account, the total existing consented area was calculated as 9,680 ha.
- 14 As I discussed in paragraph 18 of my evidence to the WAB, I adopted the Aqualinc annual use volume of 77 Mm³/yr (details of which I have outlined in Paragraphs 9 and 10 above) as representing the current annual use volume for agricultural and horticultural activities upstream of Waitaki Dam. In addition to this, I made an allowance for the UWCIC (1.45 m³/s) of 19.4 million m³/yr and stockwater schemes (0.871 m³/s) of 27.45 million m³/year making the total annual volume of 123.85 million m³.

Possible Future Potential Irrigation Demand

- 15 As a part of my WAB evidence I also analysed the potential for future irrigation development in the catchment based on soil types, distance from water source, required pump lift, likely consentability, calculated scheme costs and affordability.
- 16 The potential irrigable area in the Upper Waitaki Catchment was in the order of 88,000 ha. However, when costs, likely consentability and affordability of these schemes, were determined the viable area in the Upper Waitaki Catchment was reduced to 33,843 ha. This area included the then "currently irrigated/consented" area of 9,680 ha, leaving approximately 24,200 ha that was considered viable for future development. While the 24,200 ha was considered viable on the basis of technical feasibility, consentability and financial/capital costs at the time, it is possible that some of these areas may not be economically viable to develop under current market values. As economic viability is always changing depending on commodity prices, input prices and technological advancements, I did not include an economic feasibility in my assessments.
- 17 My assessment was provided to Meridian and I note that the agreement between Meridian and the Mackenzie Irrigation Company (MIC) refers to 25,000 ha being irrigated in the future, which approximates my analysis as presented during the WAB process.

Summary of Existing and Future Requirements Presented to the WAB

18 Table 1 below summarises my WAB evidence assessment for existing and future water requirements for the Upper Waitaki Catchment.

Table 1: Water Requirements for Agriculture and Horticulture in Upper Waitaki

	Approximate Area (ha)	Flow (m ³ /s)	Annual Volume (Million m ³ /year)
Existing Takes (all takes)	9,680	15.616+0.871 = 16.487 ^b	77+19.4+27.45 = 123.85 ^a
Future Takes	25,000	14.7	150
Total Takes	34,680	31.187	273.85^c

- a. The 123.8 M m³/yr is calculated from: 77 M m³/yr for existing consented irrigation (Aqualinc Report L05112²); 19.4 M m³/yr for the Upper Waitaki Irrigation Scheme; and 27.45 M m³/yr for stockwater.
- b. All existing takes including the UWIC and Benmore Irrigation Co. were 15.616 m³/s, allowance for stockwater was 0.871 m³/s;
- c. Meridian Energy Limited (Meridian) asked for the existing 123.8 million m³/yr to be provided for in Table 5 and the allocation to MIC of 150 million m³/yr to be dealt with by a separate rule in the Plan.

WAITAKI CATCHMENT WATER ALLOCATION REGIONAL PLAN (WRP) ALLOCATION BLOCKS

19 Under **Rule 6 (Table 5)** of the WRP, quantities of water are allocated to different use classes. The table is expressed in an annual volume of millions of cubic metres/year.

20 In my evidence to the WAB, I included an assessment of **Rule 6, Table 5**. The table below (Table 2) has been extracted from my WAB evidence and represents the **Rule 6 (Table 5)** that I provided to the WAB. It gives the then current consented allocation (apart from the agricultural and horticultural activities category, where the value of 123.8 million m³ is based on Aqualinc's assessment of reasonable use rather than consented use) at the time of the WAB in brackets, along with the volumes I suggested were required to meet reasonable future requirements - the figures above the values in brackets.

Table 2 - Rule 6 Table 5 Annual Volume Presented at the WAB (Values in ()) are what "currently existed", as calculated from Environment Canterbury Databases)

	Town & Community Water Supplies	Industrial and Commercial Activities(outside Municipal or Town Supply areas)	Tourism and Recreational Facilities	Agricultural and Horticultural Activities	Any Other Activities	Hydro-electricity Generation
Upstream of Lake Tekapo outlet	0 (0) ^a	0	0.6 (0.6) ^b	2.0 (2.0) ^c	0 (0)	4,100 (4,100)
Upstream of Lake Pukaki outlet	1.15 (1.15) ^d	0.32 (0.315) ^e	0 (0)	0.37 (0.37) ^f	0 (0)	17,660 (17,660)
Upstream of lake Ohau outlet	0.07 (0.07)	0	0.11 (0.11) ^g	0 (0)	0 (0)	6,307 (6,307)
Upstream of Waitaki Dam but downstream	10.22 (10.22)	2.38 (2.38) ^h	0 (0)	123.8 ⁱ (123.8) + 150 in	13.15 (13.15) ^j	22,390 (22,390)

	Town & Community Water Supplies	Industrial and Commercial Activities (outside Municipal or Town Supply areas)	Tourism and Recreational Facilities	Agricultural and Horticultural Activities	Any Other Activities	Hydro-electricity Generation
of glacial lakes				separate rule		

Note: units = millions of m³ per year

- 21 The reasoning behind the values I recommended in the table above was included in my WAB evidence. I have included these in Appendix 1.
- 22 Table 3 below shows the WAB's final decision on Rule 6 Table 5 annual allocations for the Upper Waitaki in the WRP.

Table 3: Summary of the Final Table 5 in WRP for the upper Waitaki

	Town & Community Water Supplies	Industrial and Commercial Activities (outside Municipal or Town Supply areas)	Tourism and Recreational Facilities	Agricultural and Horticultural Activities	Any Other Activities	Hydro-electricity Generation
Upstream of Lake Tekapo outlet	1.6	0	0.6	275 ^{23A} except that: a. no more than 8 can be taken upstream of Lake Tekapo outlet. b. no more than 8 can be taken upstream of Lake Pūkaki outlet. c. no more than 12 can be taken upstream of Lake Ōhau outlet.	0	All other inflows
Upstream of Lake Pūkaki outlet	2.2	0.1	0.6		0	All other inflows
Upstream of lake Ohau outlet	1.6	0	0.6		0	All other flows except the flows that must be provided into the Ohau River pursuant to the <u>environmental flow regime</u> .
Upstream of Waitaki Dam but downstream of glacial lakes	16	6.3	9.5		6.3	All other inflows

Note: units = millions of m³ per year

- 23 Clearly there are some differences between the values I recommended (Table 2) and those that were finally adopted by the WAB (Table 3). Some of the differences appear to be the result of putting takes into different categories (i.e. town and community for all water supplies regardless of whether the supply has a semi-tourism purpose). However, it is not explained how the actual values adopted by the WAB were arrived at. The most critical number for this hearing, being agricultural and horticultural activities, is nevertheless very similar.
- 24 During my recent assessments, I noted that with respect to agricultural and horticultural activities, the allocation limit provided in Rule 6 Table 5 "Upstream of Lake Ohau Outlet" and "Upstream of Lake Pūkaki Outlet" of "not more than 12" and "not more than 8" respectively is exceeded when the current allocations are taken into account. For example, in the "Upstream of Lake Ohau Outlet" catchment, the new

applications by Southdown Holdings Limited, Five Rivers and Mr & Mrs Dennis add up to approximately 24 million cubic metres which is almost twice the allocation limit in the WRP. After taking into account the priority dates of the applications, those that fall outside the WRP limit will need to be treated as non-complying activities. I will discuss this further in paragraph 35.

UPDATED ANNUAL VOLUMES FOR AGRICULTURE & HORTICULTURE

- 25 Since the WRP hearing, a number of changes have occurred with regard to ECan's understanding of its consents to suggest the accumulated total within some of the allocation blocks might be reached sooner. These include:
- 25.1 Changes to the database (e.g. expiry of some consents; withdrawal of new applications; changes to existing consent conditions or to activities proposed on new applications);
 - 25.2 Better understanding of existing and proposed activities as a result of the further information supplied by the consent holders or applicants;
 - 25.3 A recent understanding that the 77 million m³/yr in the Aqualinc 2004 Report was based on reasonable use and not consented entitlement and as this was the basis of existing use in the WRP allocation, it becomes apparent that the allocation in Table 5 of the WRP may not be sufficient for all future use to be classified as discretionary activities unless significant efficiency gains are made;
 - 25.4 The recent North Bank Tunnel decision³ has indicated how the Council (through its delegated Commissioners) "diverts"⁴ in the Waitaki Catchment should be dealt with (this aspect of the NBTC decision was not appealed); and
 - 25.5 Refinements to the methodologies for estimating consented annual volume allocations.
- 26 I have worked closely with ECan staff (**Ms Bartlett** and **Ms Ensor**) on an agreed general methodology for assessing the take rates and the annual volumes for all the consents in the Upper Waitaki Catchment and updated all values to reflect the points of agreement with ECan and any changes (such as the withdrawal of some applications) since the WRP hearing.
- 27 The assessment itself involved a line-by-line checking of each consent on the database. The annual volume estimates were based on one of the following:
- 27.1 The volume specified in Meridian's derogation approval or consented annual volume where this was given on a consent. However, the majority of the consents do not have a specified annual volume associated with them. This then required the methods given below;
 - 27.2 Using the divert rate (as per the North Bank Tunnel Project decision). This was used where the consent was for a divert or had an element of divert. The diverted volume was estimated by multiplying the rate of divert by the number

³ North Bank Tunnel Project Interim Decision May 2008.

⁴ A "divert" is a consent to divert water from a water course. It usually is associated with a "take" consent to take and use the water. It is not usually a consumptive use. Examples are diverting water into an uncontrolled race to a point where the water can be controlled via gates and weirs where excess water is diverted back to the water course.

of days over which the diversion takes place. For example, a stockwater diversion was assumed to occur 365 days a year;

- 27.3 Where there was no diversion and the irrigated area was known, we used 600 mm/yr for spray systems and 1,300 mm/yr for border dyke systems; or,
- 27.4 Where there was no diversion and the irrigated area was unknown, we used the peak consented rates over 118 days for spray and 155 days for border dyke irrigation systems.
- 28 The following is a brief background to the source of the values (irrigation depths and days) in Paragraph 27 above:
- 28.1 The use of 118 days for spray and 155 days for border dyke systems is based on previous assessments of climate and pump hours. It is the number of days at peak use within a full irrigation season of some 210 - 240 days. The assessment was peer reviewed and documented by Dr Paul Sullivan *et al*⁵ in a memo to ECan on 16 August 2006. The method was subsequently accepted and recommended for use by Commissioner Peter Skelton on 22 June 2007.
- 28.2 The use of 600 mm/yr for spray systems is generally accepted for the Upper Waitaki Catchment and very close to my water balance assessment of 614 mm/yr. The agreement between Meridian and MIC for all new allocations is based on 600 mm/yr.
- 28.3 As I explained in Paragraph 10 above, I used 1,500 mm/yr for border dyke systems. This was derived from water balance assessments that I carried out and assumptions on irrigation efficiencies. In April 2007, I visited a number of farms in the Upper Waitaki Catchment. Generally, most farmers are making some major improvements to their border dyke irrigation systems as a result of:
- (a) a recognition by the irrigators that water is a scarce resource and needs to be used more efficiently through better management practices and improvements to the conveyance systems and/or the border dykes; and
 - (b) ECan's push to encourage the more efficient use of water. For example, some consents now have target dates by which irrigators need to reduce their water use.
- 28.4 A good example of this is the Omarama Station Limited and Tara Hills Station Limited consent (CRC010728.1) and the Omarama Station Limited consent (CRC011354), where the annual allocation is reduced by an average of 40% over a 5 - 10 year period. As a result of these improvements, I am of the opinion that general efficiencies have improved and an average annual gross application depth of 1,300 mm for water allocation purposes would be appropriate for existing systems.
- 28.5 I have also noted that in the MacKenzie Water Research Limited (MWRL) Water Quality study⁶, Aqualinc have changed from the original 900 mm/year for border

⁵ Sullivan, P. Sullivan, B., Page, J. (2007). "Implementation of Waitaki catchment water allocation regional plan: current annual allocation". Report to commissioner, 16 March 2007. Unpublished.

⁶ Irrigation & Drainage Modelling of Upper Waitaki Basin - Aqualinc Groundwater Report - GHD

dyke irrigation in their 2004 Report² (the basis for the existing 77 million m³/year as discussed in Paragraphs 9 to 11 above) to 1,200 mm/year. In essence, my original 1,500 mm has reduced to 1300 mm/yr and Aqualinc's 900 mm/yr has increased to 1,200 mm/year. The two application depths are well within the margins of error of each other and represent realistic application depths for border dyke systems given the field operational conditions and improvements over the years.

- 29 A number of consents, consent descriptions and consent applications were ambiguous on the exact nature of their activities. Examples of such ambiguities include:
- the allowances for stockwater;
 - the irrigated areas;
 - the irrigation method; and
 - allowances for augmentation, diverts, etc.
- 30 As ECan has direct and regular interactions with the applicants and consent holders, either through consent compliance monitoring (for existing consents), or request for further information (for new applications), I was able to rely on ECan for further information and interpretations of the consented or proposed activities.
- 31 Using the methods described above, I arrived at the final consented entitlement annual volume allocations presented in Table 4 below. These estimates are correct based on the ECan database as at 28 August 2009 and are slightly lower than the total volume of 274.4 million cubic metres I (in collaboration with ECan) assessed as at 25 May 2009. I was advised by ECan of a number of changes to some of the new applications that had taken place between 25 May 2009 (initial assessment) and 28 August 2009 and Table 4 reflects these changes. The full list of consents and the corresponding annual volumes are given in Appendix 2.
- 32 As ECan and I adopted the same procedures for estimating the annual volumes and the interpretation of the consents, there is full agreement on the final results.

Table 4 – Summary of the Consented Annual Volume Allocations and Approximate Irrigated Areas for the Upper Waitaki Catchment for Ag & Hort. as at 28/08/2009

TYPE	ECan and Potts (m³/yr)	Area (ha)
EXISTING	128,001,996	8,432
REPLACEMENTS	48,358,484	4,357
NEW	95,795,360	15,684
TOTAL	272,155,840	28,472

- 33 At a meeting (on 24 April 2009 at Aqualinc) of the technical experts involved in water allocation assessments for the Upper Waitaki Catchment, **Mr McIndoe** of Aqualinc commented that he generally agreed with the methodology in quantifying the volume of water allocated in the catchment, provided it was only used for assessing estimates for the Upper Waitaki Catchment as a whole and not used as a basis for individual consent allocations. For the latter estimates, **Mr McIndoe** preferred the use of IrriCalc; an in-house computer programme, developed by Aqualinc.

- 34 In Table 5 below, I have presented the annual allocation volumes in the same format as Rule 6 (Table 5).

Table 5 – Existing, Replacements and New Agricultural and Horticulture Annual Volumes as at 28/08/09 Presented in Rule 6 Table 5 Format

		Agricultural and Horticultural Activities			
		Existing	Replacements	New	Total Allocation and (WRP Limit)
I	Upstream of Lake Tekapo outlet	0.9	1.2	4.0	6.1 (8)
ii	Upstream of Lake Pukaki outlet	0.17	0	30.2	30.2 (8)
iii	Upstream of lake Ohau outlet	0	0	23.8	23.8 (12)
iv	Upstream of Waitaki Dam but downstream of glacial lakes	126.9	47.2	37.8	212.1 (247)
Totals		128	48.4	95.9	272.2 (275)

Note: units = millions of m³ per year

- 35 In all my other previous assessments prior to the NBTC decision, I had undertaken my assessments from a practical point of view. In this respect, where a divert also included a take, and the diverted water is returned to the river in close proximity to where it was diverted, I used the take rate and volume in my assessment. Where a divert did not include a take, then I used the divert rate and volume. Where the water was diverted but never left the river margins or is non-consumptive, then it was not included at all.
- 36 I note that in Table 5 above, the Ohau and Pukaki catchment allocations provided in the WRP have been exceeded. This means that some of the applications within these sub-catchments will be assessed as non-complying (all of the new applications in the Ohau and Pukaki catchments are part of this hearing).
- 37 Two of the consents that have been applied for under the "Upstream of Lake Pukaki outlet" sub-catchment belong to Simons Hill Station (CRC082304) and Simons Pass Station (CRC082311) and they are for 14.4 million cubic metres each. I am however informed by Meridian that they have been provided derogation approval to take from the Tekapo Canal or Lake Pukaki. Footnote 23 under Rule 6, Table 5 states that:

For the purposes of Rule 6, the annual volumes for taking, using or diverting water from the canals leading from the glacial lakes, and those from the Ahuriri catchment, are considered downstream of the lake outlets and are covered in row iv of Table 5.

Therefore, the allocation "Upstream of Lake Pukaki outlet" and the allocation "Upstream of Waitaki Dam but downstream of glacial lakes" which will change depending on where Simons Pass and Simons Hill decide to take water

- 38 I also note that future resource consent applications by MIC shareholders to take up the balance of the 25,000 ha provided for in the MIC agreement will inevitably be classified as non-complying activities given that they will breach the 275 million m³ set

out in Table 5 of the WRP. According to **Mr McIndoe**⁷, 15,707 MIC Shares had been issued as at March 2008, leaving 9,293 ha of the 25,000 ha. The 15,707 ha taken under MIC shares is approximately equal to the area of new applications (15,684 ha) I estimated in Table 4.

- 39 In summary, when the allocation block is considered as a single large block of 275 million cubic metres, there appears to be sufficient allocation to enable the current resource consent applications to be considered as discretionary activities. However, as the WRP specifies allocations for individual catchments, it is clear from my assessment that the 12 million cubic metres allocated for "Upstream of Lake Ohau" and the 8 million cubic metres allocated for the "Upstream of Lake Pukaki" catchment are exceeded when new applications are tallied. Therefore, the applications in excess of the allocation limit will not comply with Rule 6, Table 5.
- 40 Should MIC shareholders decide to apply for resource consent for the remaining 9,000 ha available, then these applications will be classified as non-complying because the allocation limit of 275 million cubic metres will be exceeded.

COMMENTS ON THE EVIDENCE PRESENTED ON BEHALF OF MWRL

Mr McIndoe's Evidence⁸

- 41 In paragraphs 19 – 23, Mr McIndoe confirms the historical context of the water allocation in the Upper Waitaki and how the 77 million cubic metres adopted by the WAB was arrived at. This is consistent with the evidence I have presented in paragraphs 9 - 12 above. However, as I noted in paragraphs 10 and 11 above, the 77 million cubic metres was based on what **Mr McIndoe** calls "reasonable and efficient" (paragraph 38 of his evidence), which is different to entitled requirements as has been mandated by the NBTC Decision³ with the treatment of diverts.
- 42 In paragraph 45, **Mr McIndoe** correctly points out that the WAB allocation allowed the UWCIC an allocation of 19.4 million cubic metres and that more recently Meridian had given derogation approval for the scheme for 26.3 million cubic metres.
- 43 Paragraph 46 of **Mr McIndoe's** evidence estimates that the derogation approval equates to an application depth of 1,366 mm/yr over 1,925 ha. Paragraphs 47 and 48 then conclude that the allocation of 26.3 million cubic metres would fail to meet the intent of the WAB and suggested that a prudent allocation for the scheme would be between 18 and 19 million cubic metres.
- 44 I would like to note a few points with respect to the calculation of the 26.3 million cubic metres. This figure was estimated using a border dyke irrigation season of 206 days as detailed in Sullivan (2007)⁵ and taking into account a number of efficiency and operational factors. For example, (i) the UWCIC scheme has an unusually long canal and as such the conveyance efficiencies are lower than usual; and (ii) the scheme requires operational by-washes of water on a continuous basis. The operational by-washes are required to produce sufficient water pressure to get the required water through the scheme siphons. However, for derogation purposes, it was agreed that the

⁷ *McIndoe, I. 2008. Upper Waitaki Allocations – Memorandum to Mr Gavin Kemble. 16 March, 2009.*

⁸ *McIndoe, Ian. 2009. Evidence of Ian McIndoe. Prepared for MWRL. In a Matter of Resource Consent Applications by Various Parties to Take and Use Water from Rivers, Streams, Canals and Lakes in the Upper Waitaki Catchment.*

operational by-washes would only be required 50% of the time in times of drought. The 18 - 19 million cubic metres stated in **Mr McIndoe's** evidence would be for the on-farm requirement only and not cover the conveyance and operational requirements.

- 45 **Mr McIndoe** has taken the total annual volume allocation to be 266 million cubic metres based on "The Sullivan" method as assessed by ECan. As I collaborated with ECan during the assessments, I am aware that ECan's annual volume as at 25 May 2009 was 274.4 million cubic metres. Further e-mail correspondence with **Ms Bartlett** (ECan) suggested that further changes to the consent database occurred after 25 May 2009 and at one time the allocated volume had gone down to 266 million cubic metres. The latest (as at 28 August 2009) ECan database from **Ms Bartlett** shows that the total annual volume allocated for the Upper Waitaki catchment is now approximately 272.2 million cubic metres. Therefore, the numbers presented by **Mr McIndoe** will be similar to those I have presented in Table 4 above.
- 46 In paragraph 28 above, I discussed the application depths that I used for both spray and border dyke irrigation systems, both at the WAB hearing and in this most recent assessment. Therefore, while an application depth of 1,500 mm was used in previous assessments and by Sullivan (2007) as stated in paragraph 55 of **Mr McIndoe's** evidence, I have since revised the border dyke value to 1,300 mm (paragraph 28.3). This new value was discussed and generally agreed to by various experts representing ECan (**Ms Bartlett** and **Ms Ensor**), MWRL (**Mr McIndoe**) and Meridian at a meeting held at Aqualinc on 24 April 2009. I would also like to point out that the new value of 1,300 mm/yr is reasonably close to the value of approximately 1,200 mm/yr (for a soil with a PAW of 30 under a mean annual rainfall of 500 mm) assessed by Aqualinc and presented in Table 4 of **Mr McIndoe's** evidence.
- 47 **Mr McIndoe** concludes:
- 47.1 In paragraph 69 that "*my view is that the WWAP allocation limit of 275 M³/yr specified in Table 5 of the WWAP will not be exceeded*". While I agree that the total allocation for existing, replacements and new consents as at 28/08/2009 is less than 275 million cubic metres, some individual sub-catchments have exceeded their allocations and applications above the allocation limits will be treated as non-complying as I discussed in paragraphs 24 and 35. In addition, some of the remaining applications up to the agreed MIC area of 25,000 ha will be assessed on a non-complying basis as soon as the WRP allocation limit is exceeded.
- 47.2 With respect to the comments made in paragraphs 72 and 73 of **Mr McIndoe's** evidence, it is my experience that when changes are made from border-dyke to spray, irrigators usually try to make most of the water savings derived from such changes by increasing the irrigated area rather than give up the water. A case in point is Otamatapaio Station Limited which, instead of giving up the water, has increased the irrigated area from 73 ha to 200 ha or the Morven Glenavy Irrigation Scheme in the Lower Waitaki Catchment where the irrigators have applied to increase the irrigated area to make the most of the 25% savings in water from changing to more efficient irrigation methods. I therefore think a more conservative approach is not to rely too much on water that will be come available through such savings.

COMMENTS ON THE OFFICERS SECTION 42A REPORT

- 48 I have read the Section 42A Report of **Ms Bartlett** and my relevant comments are set out below.
- 49 In paragraph 27 above I described the multi-tiered approach I used to estimate the annual allocations. In paragraphs 26 - 27, of her section 42a Report, **Ms Bartlett** also describes a similar process and further confirms the collaboration between ECan and myself in paragraphs 29 – 32 during this process.
- 50 Paragraph 33 and Table 1 of **Ms Bartlett's** report summarises the allocations across the Upper Waitaki sub-catchments. The values I presented in my paragraph 34 and Table 5 above agree with Ms Bartlett's values in her Table 1. She states:

"26. The tiered approach identified in the Report to Commissioner is as follows:

- i. where a resource consent is subject to an explicit instantaneous rate and/or annual volume, these are used in the calculation;*
- ii. if the above does not apply, where an instantaneous rate and/or annual volume can be implied for a resource consent from the material lodged by an applicant in support of the resource consent application, these are used in the calculation; and*
- iii. if neither of the above applies, an estimate of effective' instantaneous rate and/or annual volume is made of the actual take, use, divert or dam of water. These estimates are then used in the calculation."*

- 51 I confirmed earlier that this methodology was agreed upon and the assessed annual volume estimates are summarised in Table 4 above. Based on this assessment the total annual volume allocation for the upper Waitaki is 272.2 million cubic metres.
- 52 In summary, I agree with the s42A report by **Ms Bartlett**.

Dated: 16 September 2009

Robert John Potts

APPENDIX 1

Explanations for the Values I Proposed in My WAB Evidence

- (a) Set at zero as Tekapo Town and NZ Defence takes are from Forks stream which is below the Tekapo Outlet;
- (b) The 38 L/s used by Roundhill ski field for snowmaking is assumed to be 24 hrs/day from May to October only;
- (c) There is currently 302 L/s of irrigation (230 L/s of border dyke but limited by consent to 1.26 M m³/yr and 72 L/s of spray irrigation which calculates to 0.734 M m³/yr) above the dam outlet. Table 5 needs to allow 2 Million m³/yr for irrigation to reflect and maintain status quo.
- (d) This allocation calculation includes Mt Cook village and Glentanner Station public water supplies – these could alternatively be included under tourism and recreational facilities.
- (e) This allocation includes a consented take for water bottling, which may not be currently occurring.
- (f) There is currently 0.347 M m³/year for spray irrigation from Boltons Gulley (upstream of Pukaki Outlet) at a peak rate of 34 L/s. Therefore, Table 5 needs to allow 0.35 Million m³/yr for irrigation to reflect and maintain status quo.
- (g) This allocation includes snowmaking and water supply for the Ohau Ski area and lodge.
- (h) The allocation includes gravel washing which is assumed to be 300 days per year and 12 hrs/day.
- (I) An extra allocation allowance above that currently allocated is NOT required in Table 5 as Meridian have an agreement to provide shareholders in Mackenzie Irrigation Company with 14.7 m³/s (150 M m³/year) for irrigation of 25,000 ha And have asked for the agreement to be reflected in a new Rule 6(5). Note that the allocation is based on Aqualinc Report L05112 of 77 Million m³ for existing irrigation above the dam, plus requirement of UWCIC of 19.4 M m³ and stockwater of 27.4 M m³/year.
- (j) Allocation is for consents mainly held be Department of Conservation for maintaining wetlands.
- (k) Community water supply is only expected to increase by 2 L/s up to the year 2025. This increase is equivalent to a population increase of 700 people.

(l) This allocation is the value in the Draft Plan for both above and below Black Point. I have not assessed future requirements for commercial and recreational activities above and below Blackpoint and hence have left the Plan allocations unamended in those categories.

(m) This allocation is for a take by Tokarahi Golf Club.

(n) The assessment of likely future demand gives an extra 103.7 M m³/yr by Year 2025 (includes 4.7 million m³/yr for stockwater). Irrigation development allocation equates to approx 15,840 ha. These values are based on a total main stem allocation block of 13 m³/s (11.8 for Agriculture and Horticulture and 1.2 m³/s for others). This leaves a further 34.3 million m³/yr for further groundwater and tributary development, which is equivalent to a further 5,580 ha, from 2.5 m³/s.

(o) The existing volume includes 13.4 M m³/yr from groundwater and 50.34 M m³/yr from tributaries.

(p) Community water supply is only expected to increase by 8 L/s up to the year 2025. This increase is equivalent to a population increase of 2,600 people.

(q) Assessment of likely future demand gives an extra 320.4 M m³/yr of irrigation and stockwater demand by Year 2025. This is slightly less than that allowed for as there is likely to be resources made available through efficiency gains. The volume gives allowance for approximately 49,000 ha from mainly main stem development.

(r) Volume includes tributaries of 7.216 M m³/yr and groundwater of 2.55 M m³/yr.

(s) The hydro generation allocation has been taken from the High Court Declaration on Meridians existing consents. This is explained in more detail in Mr Andrew Robertson's evidence.

(s) The allocations provided in this category are actually for above Aviemore Dam rather than Waitaki Dam. This is explained in more detail in Mr Andrew Robertson's evidence.