
in the matter of: the Resource Management Act 1991

and

in the matter of: applications for resource consent by applicants in the lower Waitaki
River Catchment under the Waitaki Catchment Water Allocation
Regional Plan

Brief of evidence of **ROBERT JOHN POTTS**

Dated:

28 August 2008

QUALIFICATIONS AND EXPERIENCE

- 1 My full name is **Robert John Potts**.
- 2 I am the Regional Manager of the surveying, environmental science and engineering, and resource management consulting firm Duffill Watts & King Limited (formerly Glasson Potts Fowler Limited (GPF)) and have worked in the area of environmental engineering for over 25 years. I am authorised to give this evidence on behalf of Meridian Energy Limited (*Meridian*) who is a submitter to the resource consent applications being heard as a part of this hearing.
- 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), Member of the Institute of Professional Engineers NZ (MIPENZ), am a Chartered Professional Engineer (CPEng) and am on the International Professional Engineers Register (IntPE). I am a member of the New Zealand Water and Waste Association, 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, Lincoln University (NZAEI – now Lincoln Ventures), Lincoln International and Pattle Delamore Partners Limited. My roles have included: project management; assessing plant water requirements; assessing available water resources; feasibility design of irrigation schemes; and assessing the effects of irrigation development. Built projects include: Waimea East Scheme; Kerikeri Scheme; Earnsclough Scheme; Waimakariri Scheme; Northbank Scheme; North Otago Downlands Scheme; and Chashma Right Bank Scheme (Pakistan). Feasibility studies or projects not yet built include: ISCI Scheme; Waimea Basin Augmentation Scheme; Anama Dairy Development Scheme (Algeria); Opihi Catchment Water Resources Development; Oreti Scheme; Tukituki Scheme; North Canterbury Scheme; Ngaruroro Gorge Scheme and the Hunter Downs Irrigation Scheme.
- 5 I have read the Code of Conduct for Expert Witnesses and have complied with it in the preparation of this statement of evidence.
- 6 In preparing my evidence I have reviewed:
 - 6.1 All the relevant resources consent applications.
 - 6.2 Relevant parts of the Waitaki Catchment Water Allocation Regional Plan (WRP).

- 6.3 The South Canterbury Irrigation Trust and Meridian resource consent application for water-only consents for HDI.
- 6.4 Meridian's resource consent application for water-only consents and the Abstractive Users' Management Plan for NBTC.
- 6.5 Relevant evidence of others as quoted in my evidence.
- 6.6 The Irrigation New Zealand Irrigation Code of Practice and Irrigation Design Standards (2007).

SCOPE OF EVIDENCE

- 7 I have been asked by Meridian to prepare evidence in relation to:
 - 7.1 The existing and future allocation of water below the Waitaki Dam and how current allocations relate to the allocations provided in Tables 3 and 5 of the WRP;
 - 7.2 The reliability of all existing and future consents under various scenarios. This builds on the evidence I presented during NBTC and HDI and includes a number of possible flow regimes and the effects of possible flow bands on other users;
 - 7.3 The adoption of farm management plans and adherence to the relevant industry codes. This includes:
 - (a) Nutrient, soil, irrigation and animal effluent controls and the need to implement compliance/monitoring regimes for the various takes in the Lower Waitaki to mitigate any negative effects associated with irrigated agriculture; and
 - (b) The adoption of relevant industry codes (such as the Irrigation New Zealand Irrigation Code of Practice and Irrigation Design Standards) to promote best practice standards in the design and operation of any consented takes.

ALLOCATION OF WATER UNDER WRP AND A DISCUSSION OF TABLES 3 AND 5

- 8 During the HDI Hearing, I presented evidence in relation to water allocation under the WRP and the status of the HDI application in light of existing water take consents and those sought by other applicants below the Waitaki Dam in relation to Rule 2, Table 3, Line xvii (allocation rate limit) and Rule 6, Table 5, lines v and vi (annual allocation).
- 9 After presenting my primary evidence, I worked with Environment Canterbury and Mr Jeff Page on an agreed general methodology for assessing the take rates and the annual volumes for all the Lower Waitaki consents. Based on this update, Mr

Jeff Page and I issued a joint statement reflecting the revised status of Tables 3 and 5.

Rule 2 (Table 3)

- 10 As the Joint Statement with Mr Page reflected the then most recent position regarding the status of take rates and volumes for all the consents in the Lower Waitaki, I have since updated all values to reflect the points of agreement in the Joint Statement and any changes (such as the withdrawal of some applications) since the HDI hearing. The updated take rates and annual volumes available after all consent applications that are part of the current consenting process (including the HDI application) are summarised in Table 1 and Table 2 **Error! Reference source not found.** below.
- 11 The tables include updates that have occurred as a result of some amendments to the annual volume being sought by some applicants and further discussions with Ms Keri Johnston.
- 12 It is also noted that although some applicants initially proposed a greater annual volume based on a different assessment methodology, I now understand that these are not being sought and accordingly they have not been included in my analysis.

Table 1: Updated Water Take Consents Called-in, On-hold in Lower Waitaki (as at 19/08/08)

	No. Takes	Rate (L/s)	Annual Volume (Mm ³ /yr)
Total	38	24,086.53	285.79
Waitaki Main Stem	15	22,658.00	273.14
Hakataramea River	14	1,295.00	11.27
Maerewhenua River	2	29.00	0.32
Waikakahi	1	0.00	0.00
Other Tributaries	6	104.53	1.06

Table 2: Updated Summary of Main Stem Water Takes and Availability (As at 19/08/08)

Parameter	m ³ /s (Subset)	m ³ /s (Total)
Main Stem Allocation		90.000
Existing Agriculture and Horticulture		-51.891
Existing Other Users		-0.038
Water Available for Future Users		38.071
Total In-queue Applicants	22.658	
Less Waitaki Orchards	-0.094	
Net Called-in Consents	22.564	-22.564
Total remaining if HDI and other current applications are granted		15.507

- 13 Based on the estimates in Table 2, I conclude that, as of the 19th of August 2008, there is enough water within the allocation limit of 90 m³/s for all existing and proposed takes (including the HDI and Waihao Downs takes) being heard as a part of the current process. The amount of flow available is 15.507 m³/s which has been updated from the 14.4 m³/s in my HDI evidence.
- 14 It is further noted that this analysis does not take into account any future efficiency gains from existing irrigators.
- 15 Therefore, in summary, in relation to Rule 2 of the WRP, all existing and notified takes as at 19 August 2008 will be within the allocation limit of 90 m³/s in the WRP Table 3.

Rule 6 (Table 5)

- 16 Table 3 below provides the updated assessment for the Agriculture and Horticulture category for the WRP Rule 6 (Table 5) assessment. Attachment A gives a table showing the allocation to each individual take.

Table 3: Existing and Future Demand for Agriculture and Horticulture in Lower Waitaki (future based on that being heard as at 19/08/08)

	Main Stem and Tribes Approx. Area (ha)	Flow Main Stem Only (m ³ /s)	Flow – Tributaries and Waitaki Main Stem (m ³ /s)	Annual Volume (Million m ³ /year)
Existing Takes	71,269	51.89	57.88	932.20
Above BP	12,043	4.12	8.51	121.56
Below BP	59,226	47.77	49.37	810.6386
Future Currently in Processing	45,749	22.66	24.08	285.79
Above BP	5,499	2.07	3.44	33.61
Below BP	40,250	20.58	20.64	252.18
Total Takes	117,017	74.55	81.96	1,217.98
Above BP	17,542	6.20	11.95	155.17
Below BP	99,476	68.35	70.01	1,062.82

Note table has come from a spreadsheet, so some rounding is evident

- 17 From Table 3 above, and comparing with the allocation blocks in Rule 6 (Table 5) of the WRP, the allocation above Black Point is insufficient for all existing and future takes currently being processed, and below Black Point there is

approximately 37.18 million m³ that remains available after all existing and current applications takes are satisfied.

RELIABILITY ANALYSIS AND THIRD PARTY CONSENTS

- 18 In my HDI evidence I discussed the effect of the minimum river flow on the reliability of water for HDI and other abstractive users.
- 19 As a part of my evidence for this hearing I have also run the alternative MRNAG flow regime through Meridian's Plexos model to provide a valid and further comparison for my previous assessments.
- 20 Table 4 below provides a summary of the reliabilities of the three regimes under equal sharing:

Table 4: Summary of Reliability

Scenario	Average Reliability (% of Days without Restriction)	Average No. Days Restricted per Season	Max No. Days Restricted in Worst Season	Annual Volume Provided (% Annual Demand Volume Provided)
1. Min 100 Equal Share	95.2	11.6	71	98.5
2. Min 150 Equal Share	88.9	26.9	118	93.2
MRNAG 150 to 110	91	21.9	104	94.8

- 21 From Table 4 it is noted that:

21.1 The "*Average Reliability (% of Days without Restriction)*" is based on the long-term assessment period (73 irrigation seasons). The column shows the percentage of the irrigation season days that full demand is satisfied;

21.2 The "*Average No. Days Restricted per Season*" is the average number of days per season that irrigation would be restricted under each scenario (when full demand is not available, i.e. includes partial restrictions);

21.3 The "*Max No. Days Restricted in Worst Season*" is the maximum number of days that irrigation would be restricted in any one year (note that the irrigation season is calculated to comprise 242 days);

21.4 The "*Annual Volume Provided (% Annual Demand Volume Provided)*" shows the percentage of volume demand that is provided on average over

the 73 irrigation seasons and thus shows to some extent the degree of restrictions received.

- 22 For the MRNAG alternative regime, the reliability is less than the 100 cumecs minimum flow and greater than the 150 cumecs minimum flow.
- 23 It is also noted that were the MRNAG applicants granted with a 150 to 110 cumec minimum flow, then the reliability of those with a 100 cumec minimum flow would be improved.
- 24 Scenarios 1 and 2 are shown graphically in Attachment B.

Details of Applications Being Heard

- 25 I have assessed and summarised all the applications at this hearing. The purpose of this was to assess their consistency with the evidence presented in respect of NBTC and HDI and also to comment more generally on each application.
- 26 I have grouped the takes into two categories. These are:
- 26.1 Surface Water takes; and,
- 26.2 Groundwater takes.
- 27 Appendix B summarises the key details for these applications.
- 28 In discussing the applications I have also suggested issues for Commissioners to consider in deciding whether or not to grant these consents.
- 29 Common conditions sought by Meridian (for all applications) are to meter all flows (detailed directly below) and the adoption of farm management plans and other mitigation techniques to avoid or mitigate any adverse affects on the environment.
- 30 The use of Farm Management Plans was the subject of significant evidence presented in support of Hunter Downs Irrigation. A similar approach has now been proposed by some (but not all) applicants in respect of the current hearing process. If appropriate plans are adopted and appropriately recognised in consent conditions then this will also provide a level of regulatory control to ensure best practice methods on farm and throughout the wider lower Waitaki catchment.
- 31 In terms of water metering, the water measuring device should meet at least one of the following common standards:

- (a) The Water measuring devices National Environmental Standard (NES); or,
- (b) The generally accepted international standards on water measuring devices. Table 5 below gives a summary of the standards that I suggest should be used for water measuring devices.

Table 5: ISO – International Standards for Water Measuring Devices

Standard Number	Description
ISO 3454:1983	Direct depth sounding and suspension equipment
ISO 4359:1983	Rectangular, trapezoidal and U-shaped flumes
ISO 7178:1983	Velocity area methods
ISO 1977 (referred to in 1983)	Weirs and flumes
ISO 1100/1-1981	Measurement of liquid flow in open channels

32 I now discuss any particular matters raised by each individual application.

Clarkefield Holdings (1996) Limited (CRC061919 and CRC061931)

32.1 Meridian has reviewed and conditionally supports the two applications by Clarkefield Holdings for:

- (a) Taking and using water at a maximum combined rate not exceeding 39.5 L/s from a channel and/or a bore with a combined annual volume not exceeding 1,053,920 cubic metres per year, for spray irrigation of 188.2 ha of crops and pasture (CRC061919).
- (b) Taking and using water a maximum rate not exceeding 5.5 L/s with an annual volume not exceeding 66,080 cubic metres from a bore, for the spray irrigation of 11.8 ha of crops and pasture (CRC061931).

32.2 Of specific relevance I note:

- (i) Ms Johnston and Ms Anthony's evidence states in Paragraph 129 that "*A combined annual allocation of 633,300 m³/year is proposed for these allocations*" and during the hearing Ms Johnston revised this to a combined total of 628,580 (562,500 and 66,080 m³). In Table 5 above I have adopted this later figure of 628,580 m³.
- (ii) Meridian supports the 100 cumec minimum flow originally sought by the applicant.

Hakataramea Station 1990 Limited (CRC950464.2)

32.3 This application seeks to add the wording “into storage dams” to consent CRC950464.1 so that water can also be taken and stored before use.

32.4 When reviewing the file in more detail, I noted that the consent will be operated concurrently with the existing consent CRC950464.1 and the new applications CRC040999 and CRC981376:

- (a) Existing consent CRC950464.1 is to take and use 15 L/s at a rate from McKay Stream with a volume not exceeding 9,100 cubic metres in any seven consecutive day period. I have in previous studies estimated the irrigation season under spray irrigation to be 158 days of peak pumping over the 242 day season in the Lower Waitaki. This gives an annual volume of 205,400 cubic metres for the take;
- (b) New application CRC040999 is to dam 413,000 cubic metres in four storage dams and to take and use the water from the dams at a rate of 75 L/s, with an annual volume not exceeding 577,500 cubic metres for the irrigation of 105 ha;
- (c) New application CRC981736 is to divert surface water with an annual volume not exceeding 1,148,180 cubic metres from McKay’s stream to water races flowing to the four dams in CRC040999.

32.5 The application details and the relationship between these consents has changed a number of times over the years, for example, the dammed volumes, the take rates and from being non-concurrent to concurrent. The following is my understanding of the current situation from the consent application file:

- (a) Correspondence to ECan in October 2004 and February 2007, the applicant’s consultant RJ Hall states that:
 - (i) the applicant wanted to operate CRC981376 and CRC950464.1 concurrently;
 - (ii) water diverted under CRC950464.2 and CRC981376 would be discharged to one of the proposed four storage dams under CRC040999;
 - (iii) CRC950464.2 would also cover the taking of water from the dams; and,

- (iv) as the takes are used concurrently, 15 L/s would be diverted and/or taken under CRC950464.1 (or CRC950464.2) and 60 L/s will be diverted under CRC981376 (as summarised in the February 2007 letter to ECan by Ms Johnston). This gave a combined take rate of 75 L/s either under CRC950464.1 (or CRC950464.2) and CRC040999 with a combined annual volume of 1,148,180 cubic metres.
- (b) The details of the annual volume shown on consent CR981376 of 1,148,180 cubic metres are broken down in the February 2007 letter by Ms Johnston to ECan as follows:
 - (i) Total volume dammed = 413,000 cubic metres;
 - (ii) Volume of water used from the dams for irrigation purposes = 577,500 cubic metres;
 - (iii) Stockwater requirements = 157,680 cubic metres based on 5 L/s per day over 365 days.

32.6 I have discussed (28/08/2008) the latest status of the application with Ms Johnston and I believe the applicant no longer wants to use CRC950464.2 concurrently with the new applications and the breakdown above still applies.

32.7 In light of this new information, I have now allocated 735,180 cubic metres (577,500 + 157,680) to new applications CRC040999 and CRC981376 under the new Hakataramea River applications. Ms Johnston has allocated 1,148,180 cubic metres, which includes the dammed volume.

Hakataramea Valley Irrigation Inc (CRC032177)

32.8 Hakataramea Valley Irrigation Inc wants to take and use water at a maximum rate not exceeding 1000 L/s, with an annual volume not exceeding 11,142,000 m³ to irrigate 1,857 ha.

32.9 I have reviewed the evidence of Ms Johnston and Ms Anthony and I agree with the rates and volumes.

32.10 In paragraph 190, Ms Johnston and Ms Anthony state that "*It is also noted that there is overlap between the area to be irrigated by the scheme and consents held by individuals*". I have assumed that there is no overlap of irrigated areas from the existing consent with this new application.

32.11 I therefore suggest that appropriate consent conditions (e.g. reference to concurrent use) be adopted to ensure that:

- (a) water is used efficiently from the different sources; and/or
- (b) the extra area is not incorporated and irrigated with water from the existing consents.

Mr & Mrs R G & Z L Pringle (CRC050940 and CRC050957)

32.12 Mr & Mrs Pringle seek two consents to:

- (a) divert water into a diversion channel at a rate of 40 L/s (under CRC050957) and a combined (with CRC050940) annual volume not exceeding 612,000 cubic metres and to use 35 L/s to spray irrigate 120 ha; and,
- (b) take and use surface water (under CRC050940) at a maximum rate not exceeding 14 litres per second, with a combined (with CRC050957) annual volume not exceeding 612,000 cubic metres, for the spray irrigation of 120 hectares of crops and pasture.

32.13 Paragraph 404 of the joint evidence of Ms Johnston and Ms Anthony states that a lower annual volume of 528,000 cubic metres is now being sought. I have adopted this figure and we are in agreement.

Mr N J Small (CRC040988 and CRC051766)

32.14 Meridian conditionally supports the applications by Mr N J Small to:

- (a) Dam 2,600,000 cubic metres of water (CRC040988); and,
- (b) To take and use surface water at a maximum rate of 200 L/s, with an annual volume not exceeding 1,540,000 cubic metres from a storage dam to irrigate 275ha (CRC051766).

32.15 The figures in my assessment and Ms Johnston's are the same.

Mr W N Cameron (CRC041002 and CRC041003)

32.16 CRC041002 is for taking surface water from a gallery at a maximum rate of 53 L/ and an annual volume not exceeding 647,700 cubic metres for the spray irrigation of 102 ha. The combined total irrigated area with the groundwater consent CRC041003 is 162 ha.

32.17 CRC041003 is a consent to take and use water from the Waitaki River and/or various unnamed tributaries of the Wainui Stream at a maximum rate of 30 L/s and an annual volume not exceeding 381,000 cubic metres to spray irrigate 60 ha of pasture and feed crops.

- 32.18 The figures in my assessment and Ms Johnston's are again the same.
- 32.19 I have read Mrs Cameron's evidence and she states in Paragraph 9 that "*I have not, and do not, propose the consent conditions outlined at the Hunter Downs hearing*". If this statement includes farm management plans and other environmental mitigation, it would be difficult to support this application – however, I assume this is not the case and that Mrs Cameron's comments were primarily aimed at the proposed flow sharing discussed during the Hunter Downs Irrigation process.
- 32.20 With suitable conditions and farm management plans it might be possible for these applications to address the other aspects raised in Meridian's submission.

Padkins Creek Community Race (CRC011989)

- 32.21 Padkins Creek Community Race (PCCR) is seeking consent to take 110 L/s with a volume not exceeding 756,000 cubic metres per year to irrigate 130 ha and for domestic and stock water supply.
- 32.22 I have read the evidence of Ms Keri Johnston and it states in Paragraph 9 that the applicant "*no longer wishes to pursue the use of water for irrigation purposes*" as this water is more important for domestic and stock purposes.
- 32.23 Paragraph 43 states that there are 23,130 ewes/hoggets, 8,625 beef cattle and 2,200 deer. The evidence states that it has relied on Schedule WQN11 of the NRRP for guidelines on stock water requirements to arrive a total annual volume of 534,515 cubic metres (Paragraph 43). Paragraph 51 states that "*The water from the scheme supplies essential drinking water to 16 households and 8 properties and of huge value to the community*".
- 32.24 I have endeavoured to reconcile the stock and domestic water requirements with the annual volume provided in Ms Johnston's evidence. Using the stock numbers in paragraph 42 of Ms Johnston's evidence and assuming 16 households (within 8 properties) each with 5 people and an allowance of 300 L/person/day the annual volume is 82,344 m³. I have added on conveyance losses to this to give 98,813 m³/year.
- 32.25 I have summarised the data in Ms Johnston's evidence in the Table 6 below. It is apparent that Ms Johnston has taken the stock numbers and multiplied these by the stock unit per animal type and then multiplied this by the L/h/d for that type of animal. However, this is incorrect. The L/h/d for the animal accounts for that animal type (e.g. 45 L/h/d for cattle). The

stock unit assessment is to enable comparisons to be made about the stock carrying capacity of a farm for varying animal types.

Table 6: Stockwater Requirements

Stock Type and numbers	Rate/day (L/h/day)	Volume for 365 days (m ³ /year)
32.25 Sheep/Hoggets 21,950	3	24,035
32.26 Beef Cattle 1,500	45	24,638
32.27 Deer 1,950	35	24,911
32.28 Houses/People 16 @ 5 = 80	300	8,760
32.29 Race Losses	20%	16,469
32.30 TOTAL		98,813 m³/year

32.31 There is a lack of information over how the water is conveyed and over what sort of distances. In discussion with Ms Johnston, she says it is all open channel, covers a large area but should be reasonably sealed due to time. I have added in 20% losses to account for this. She has said she will re-look at this as it is possible a mathematical error has occurred.

32.32 If the use is just domestic and stock water I suggest that the take rate be re-evaluated as taking the proposed volume of 534,515 cubic metres at the proposed peak rate will last only 56 days assuming daily abstraction over 24 hours. For example, if the 534,515 cubic metres is to be taken over a 365 day period, the net take rate would be 17 L/s. There are obviously losses and perhaps minimum conveyance rates to make the system work properly. I think this needs to be looked at as it is not currently an efficient and reasonable use of water.

32.33 In the mean time, I have used Ms Johnston's figure of 534,515 m³/year.

RH Robertson (CRC032220 and CRC031592)

32.34 CRC032220 is an application to take 320 L/s from a dam for the irrigation of 690 ha of crops and pasture and CRC031592 is an application to take 26 L/s for the irrigation of 65 ha of crops and pastures.

32.35 I note that there seems to be a difference in opinion between the Investigating Officer and the Applicant regarding the annual volume. The Investigating Officer estimates the annual volume to be 269,750 cubic metres based on an average PAW of 75 – 110 mm. The applicant assuming an average PAW of less than 75 mm has estimated the annual volume to be 354,250 cubic metres.

32.36 The annual volume used in my own analysis is the same as that used by Ms Johnston based on more specific soil information. I consider this reasonable approach.

RPNZ Properties Limited (CRC051767, CRC051768 and CRC051769)

32.37 RPNZ Properties proposes to:

- (a) Take and use 30 L/s and a volume not exceeding 252,000 cubic metres per year for the irrigation of 48 ha (CRC051767);
- (b) Take and use 26 L/s and a volume not exceeding 212,000 cubic metres per year, for the spray irrigation of 40 ha (CRC051768); and
- (c) Take and use 20 L/s and a volume not exceeding 216,000 for the spray irrigation of 40 ha (CRC051769).

32.38 The volumes used in my analysis are consistent with those used by Ms Johnston.

33 *Star Holdings Limited (CRC072756)*

33.1 Star Holdings Limited application CRC072756 is to take and use 434 L/s from a dam at an annual volume not exceeding 3,240,000 cubic metres for the irrigation of 600 ha.

33.2 Ms Johnston had 3,240,000 m³ allocated to this but it appears that it has been crossed out of her table. I have included it in my analysis.

Station Peak Partnership & Wainui Farm Limited (CRC051795)

33.3 CRC051795 is an application to divert 720 L/s and an annual volume not exceeding 7,933,260 cubic metres per year from the Waitaki River. This will provide the required flow to ensure that water taken under CRC960030.1 will be sufficient for the spray irrigation of 502 ha of pasture and feed crops.

33.4 I note however, the existing take is a combination of border dyke and spray irrigation. This application is applied for as a Divert, however, this is the

amount actually taken and is a consumptive divert because it leaks to groundwater is only a small component, if any (not quantified) is bywashed. This is an increase of 150 L/s over the existing consent. I understand from Ms Johnston, that Station Peak no longer wish to be part of this process and the 823,087 m³/year in Ms Johnston's table is solely for Wainui Farm. I have adopted this number.

Sunny Downs Limited (CRC073249)

33.5 CRC073249 seeks to take 45 L/s with a volume not exceeding 490,500 cubic metres per year to spray irrigate 115 ha of crops and pasture excluding milking dairy cows and beef feedlot.

33.6 Paragraph 1060 in Ms Johnston and Ms Anthony's evidence suggests the applicant now seeks to reduce the annual volume under this consent from 490,500 cubic metres to 324,000 cubic metres. I have adjusted my table accordingly.

Mr & Mrs RW & ME Sutton (CRC071114)

33.7 This application seeks to divert water from an unnamed stream at a rate of 50 L/s and an annual volume of 500,000 cubic metres per year to a storage dam.

33.8 The use of water is authorised by the take and use permit CRC980513.1.

33.9 Ms Johnston and I are in agreement on volume.

Torach Farm Limited (CRC073237)

33.10 The applicant proposes to take and use water at a maximum rate of 100 L/s and a volume not exceeding 1,225,000 cubic metres per year from a gallery to spray irrigate 250 ha of crops and pasture.

33.11 I am in agreement with Ms Johnston on this annual volume.

33.12 However, Meridian's submission opposed the application and sought that it be declined. The original proposal was the point of take would be from a gallery on land owned by Meridian. Meridian was concerned about access and interference effects.

33.13 I understand that since notification the Canterbury Regional Council has granted Torach Farm consent on a non-notified basis for a new gallery. However, the location of this gallery is still on Meridian land.

33.14 Meridian is considering access arrangements in respect of the new location separate to this process.

33.15 Meridian also has an interest or concern around the minimum flow being sought by Torach (150 cumecs) and similarly made reference to the flow in its submission.

Waihao Downs Irrigation Limited (CRC040428)

33.16 Meridian conditionally supports the application by Waihao Downs Irrigation Limited to take and use water from the Waitaki River at a rate not exceeding 3.06 cubic metres per second and a volume not exceeding 38 million cubic metres per year for the irrigation of 6,800 ha of crops and pasture for grazing of stock including milking dairy cattle in the Upper Waihao River catchment.

33.17 I agree with the annual volume in the application and Mr Attewell's evidence.

Waitaki Orchards Limited (CRC061399)

33.18 Meridian conditionally supports the application by Waitaki Orchards Limited to take surface water from a spring fed pond at a rate not exceeding 98 L/s, with an annual volume not exceeding 111,810 cubic metres to irrigate 7.6 ha of horticultural crops.

33.19 Meridian asks that the application be accorded a minimum flow consistent with any current or future flow regime for the Waitaki River.

33.20 In this regard, the applicant agrees to a 150 cumec minimum flow for irrigation, but has also requested that a minimum flow should not be specified for frost protection.

33.21 The applicant's argument is that frost protection would usually be during the shoulder periods of the irrigation season or during the winter months when flows in the river are higher and other abstractive users are not likely to be exercising their consents in full.

33.22 While I appreciate the applicant's desire not to have minimum flows for frost protection, I believe it would be difficult for the consent authority to make a distinction between the two. Rather than advocate for no minimum flow condition for frost protection, I believe a more beneficial outcome for Waitaki Orchards (and all other applicants) would be a lower minimum flow of 100 cubic metres per second.

33.23 This would also be consistent with Meridian's submission and other evidence around a 150 cumec minimum flow.

33.24 I also note that the proposed annual volume in Ms Johnston's evidence is now 105,304 m³. I have adjusted my calculations to reflect this.

Warnbro Enterprises Limited (CRC062068)

33.25 The evidence of Ms Johnston and Ms Anthony states that Consent CRC062068 has been withdrawn as of 3 July 2008.

33.26 I have removed this from my calculations.

Maerewhenua District Water Resource Company Limited (CRC41004)

33.27 Maerewhenua District Water Resource Company Limited has made an application to take and use water from a bore at a rate not exceeding 468 L/s and a volume not exceeding 5,868,270 m³ for the irrigation of 936 ha.

33.28 Meridian supports the originally proposed minimum flow of 100 cubic metres per second but not the associated request that water be released from Waitaki Dam to ensure 100% reliability.

33.29 The annual volume proposed is considered reasonable and within the range of my previous analysis.

Mr & Mrs D D & V J Chalmers (CRC042124)

33.30 This application is for taking groundwater at 34 L/s and an annual volume of 522,000 cubic metres for the spray irrigation of 90 ha of dairy pasture. Environment Canterbury has assessed that the stream depletion effect of this take on the Waitaki River would be 25 L/s.

33.31 Paragraph 1160 of Ms Johnston and Ms Anthony's evidence states that:

"The annual volume of 522,000 cubic metres per year provided on 15 December 2006, was amended to 464,141 cubic metres per year following consultation with ECan over system capacity. This is now being amended to 488,800 cubic metres"

33.32 For the purpose of my allocation tables, I have also adjusted the figure to 488,800 cubic metres per annum.

33.33 I also note my previous concern around the consistency in the minimum flow regime between this application and all the other applications subject to this hearing.

33.34 The applicant is in support of a minimum flow of 100 cubic metres per second (as stated in Paragraph 1185 of Ms Johnston and Ms Anthony's evidence) but I note that at the time the application was notified the Applicant was seeking 150 cumecs which if applied is higher than other applicants.

33.35 If granted on this basis the reliability of this abstraction would be lower than what it would be with a 100 cumec minimum flow.

Mr & Mrs RJ & JM Meikle (CRC040446)

33.36 Mr & Mrs RJ & JM Meikle have made application CRC040446 to take water at rate not exceeding 12 L/s with an annual volume not exceeding 144,300 cubic metres per year to irrigate 26 ha of crops.

33.37 I note from ECan's latest allocation tables that this take is not considered to be connected to the Waitaki and the take rate is therefore not included in the allocation. I have amended my allocation table to reflect this and this is consistent with Ms Johnston.

Mr E R Rutherford (CRC063815)

33.38 Mr E R Rutherford seeks consent to take and use 81 L/s with a volume not exceeding 706,250 cubic metres per year to spray irrigate 125 ha.

33.39 Meridian again supports the originally proposed minimum flow of 100 cubic metres per second in the Waitaki River but disagrees with the requirement to release water to ensure 100% reliability.

33.40 I do however agree with the annual volume in Ms Johnston's table.

Waitaki Valley Vineyard Limited (CRC070328)

33.41 This consent application was notified as a consent to take and use water from an unnamed tributary of Malcoms Creek for the spray irrigation of 90 ha of crops and pasture (excluding milking dairy and intensive crops) at a maximum rate of 45 L/s with a volume not exceeding 490,500 cubic metres

33.42 This application has now been withdrawn (ECan letter of 21.08.08) and thus I have deleted it from my assessment. It is however, still in Ms Johnston's table as the notice of withdrawal is very recent.

Waitaki Vineyard Estates Ltd (CRC082321)

33.43 This is a consent application to take and use water from two bores at a combined rate not exceeding 5.25 L/s and a combined annual volume not exceeding 165,665 cubic metres per year for the irrigation of 32.6 ha.

33.44 I have updated my allocation table to include the annual volume for this take. ECan consider this take to be unconnected groundwater and for that reason the take rate is has not been included. I agree with Ms Johnston's assessment.

Westmere Estate Limited (CRC012051)

33.45 Westmere Estate Limited has made application CRC012051 to divert water from Kurow River and to take and use water at a rate of 48 L/s with an annual volume not exceeding:

- (a) 410,400 cubic metres for irrigation of 197 ha of pasture and crops;
- (b) 49,492 cubic metres for domestic and stockwater.

33.46 As stated in the evidence of Ms Johnston and Ms Anthony (paragraph 987), the application was amended on the 1st of July 2008 so that it is now a take of 48 L/s with a volume of 459,892 cubic metres for irrigation of a much reduced 76 ha.

33.47 I have checked the ECan Consent Database and it is yet to be amended to reflect the latest amendment.

33.48 The applicant also has mining permits CRC062352, CRC062343, CRC062341 and CRC062339 with a combined take and annual volume of 151 L/s and 4,761,936 cubic metres respectively. Paragraphs 987 and 1007 in Ms Johnston and Ms Anthony's evidence states that the applicant also advised that water taken under CRC012051 and the mining permits CRC062352, CRC062343, CRC062341 and CRC062339 would not exceed 4,761,936 cubic metres per year. This is also confirmed by the proposed consent conditions for this take.

33.49 I have now updated my allocation tables to reflect the changes by reducing the annual volume for CRC012051 to zero cubic metres.

M. S. Gillingham (CRC070820 and CRC070826)

33.50 Mr M S Gillingham has applied for the following consents:

- (a) CRC070820 – To abstract groundwater from a bore at a rate of 22 L/s for the irrigation of 29 ha of crops and pasture;
- (b) CRC070826 – To divert water from Maerewhenua River at a rate of 120 L/s to a storage dam for the irrigation of 29 ha for crops and pasture.

33.51 The annual volume for the take consent is 175,000 cubic metres. Ms Johnston has not added in the annual volume. My interpretation of Rules 2 and 6 of the WRP is that the take rate (Rule 2) can be left out but the annual volume should be included in the allocation block analysis.

FARM MANAGEMENT PLANS

- 34 I now discuss the importance of Farm Management Plans in ensuring equitable distribution of the water resource and its sustainable management in the Lower Waitaki catchment.
- 35 This part of my evidence is mainly based on using the proposed plans for the Hunter Downs Irrigation Scheme. The majority of applicants have proposed similar plans in respect of their own consents.
- 36 During HDI the proposed Scheme and Farm Management Plans were presented by Ms Claire Mulcock. Ms Mulcock suggested that these should cover the following on-farm environmental management issues:
 - 36.1 Irrigation management;
 - 36.2 Soils management;
 - 36.3 Nutrient management;
 - 36.4 Collected animal effluent management;
 - 36.5 Biodiversity & ecosystem management; and,
 - 36.6 Waterway and riparian management.
- 37 These same strategies should be adopted for all future takes from the Lower Waitaki to ensure the equitable distribution of the water resources and compliance with the policies and objective in the WRP for the sustainable management of the water resource.
- 38 Details of these proposed strategies are discussed in the following paragraphs.

Scheme and Farm Management Plan

- 39 The Scheme and Farm Management Plans for HDI list a number issues that will be implemented to achieve irrigation best practices standards. These include:
- 39.1 Proper design and construction of the irrigation off-farm and on-farm structures through certified designers using the Irrigation Code of Practice and Irrigation Design Standards (2007);
 - 39.2 Proper management of water allocation;
 - 39.3 Use of proven irrigation scheduling methods and soil moisture monitoring;
 - 39.4 Audits of irrigation system design and management;
 - 39.5 Minimisation of losses between the off takes and the farms;
 - 39.6 Centralised management and training programs such as development and/or demonstration of best management practices (BMPs);
 - 39.7 Communication and education of the BMPs; and,
 - 39.8 Training programs to educate irrigators about the benefits of sustainable irrigation practices before the scheme is operational.
 - 39.9 The adoption of Irrigation Code of Practice and Design Standards (2007) by the Irrigation New Zealand.
 - 39.10 Irrigation system capacities being based on site specific soil and climatic information and crop factors;
 - 39.11 All new applications and future takes installing efficient irrigation systems. Efficient irrigation systems will ensure that;
 - (a) There is enough water for all the users from the lower Waitaki River. Further gains will be achieved as old consents come up for renewal;
 - (b) There is uniform application of water thus minimising deep percolation; and,
 - (c) Farmers will get the best return for water used resulting in less pumping and associated conveyance costs.
 - 39.12 All irrigation systems should also be designed to achieve high efficiencies. For HDI, for example, the following parameters are proposed to be used:

- (a) 90 % off-farm efficiency (piped, canal and possibly river supply); and,
- (b) 80 % on farm efficiency (centre pivot, with K-line fill in and Rotorainers).

39.13 To ensure an adequate supply for on-farm activities, losses between the off take and the farms should also be minimised through:

- (a) A high standard of construction of the supply canals; and,
- (b) Regular maintenance of the conveyance infrastructure such as canals to ensure they are as close to the design standard as possible.

39.14 Pipe systems should be appropriately sized and the correct velocities and pressure limits should be applied.

- 40 The on-farm irrigation systems should generally be designed to provide the 1 in 10 year dry month water requirements (usually January). The system flow rate, irrigator speed, application depth and return period are all based on this peak requirement.
- 41 Operation and management of the systems should be based on irrigation schedules. This will assist with the decision of when and how much water to apply. The schedule will take into account variations in climate and land use patterns. The principle aim will be to minimise the amount of water applied, both to reduce leaching and to conserve the resource.
- 42 The cumulative volume of water pumped by the irrigation system should be recorded continuously and potentially reported as required by ECAN.
- 43 Soil moisture monitoring devices should be installed within the area to measure moisture content thus help determine irrigation scheduling to meet crop demands.
- 44 I also recommend that the farm management plans should have a provision for the ongoing evaluation of the irrigation systems. Evaluations could be done once in every five years based on the methodologies set out by Irrigation New Zealand in the Irrigation Evaluation Code of Practice (2006). This Code of Practice sets out methods for evaluating several different types of irrigation systems.
- 45 I also recommend that the irrigation system designs associated with the proposed takes be undertaken by qualified and experience personnel to ensure adherence with the best practices outline in Irrigation Code of Practice and Irrigation Design Standards (2007).

Soils Management

- 46 Best practice soil management practices if adopted will minimise:
- 46.1 Soil compaction / pugging;
 - 46.2 Soil erosion;
 - 46.3 Soil health problems; and,
 - 46.4 Soil contamination.
- 47 A number of the industry codes and practices I will discuss in the next section promote best practice soil management strategies.
- 48 From my experience, most farmers appreciate the importance of good soil management practices and appreciate how this directly relates to productivity and profitability.
- 49 I am, therefore confident that farming practices associated with these new consents will adopt the best possible soil management practices - similar to those planned for HDI.

Nutrient Management

- 50 I believe farm management plans and water use associated with the new takes should be encouraged to promote best practice nutrient management.
- 51 Nutrient management is a fundamental requirement to sustainable farming, helping to achieve production efficiency, soil fertility and minimal adverse effects on the environment.
- 52 A number of industry codes exist which provide frameworks for implementing strategies that encompass best practice nutrient budgets. I will highlight some of the most common ones below:
- 52.1 The Dairy Industry Strategy for Sustainable Environmental Management identifies nutrient losses to waterways as a major issue facing livestock agriculture. This incorporates the Dairying and Clean Streams Accord. The five broad elements of the accord are that dairy cattle be excluded from larger streams, that regular dairy crossings are bridged or culverted, that all dairy farmers comply with resource consents or permitted activity standards, that all dairy farmers carry out nutrient budgeting, and that all regionally significant wetlands on dairy farms be fenced off. These have been formulated to promote sustainable dairy farming and are already

being implemented with success in the Waikakahi Catchment¹ near the Waitaki Valley.

- 52.2 The Fertiliser Manufacturers Research Association has developed the Code of Practice for Fertiliser Use as a guide on the best practices in fertiliser use. This code provides useful and practical information on the safe and responsible use of fertilisers and nutrient management.
- 52.3 The code of practice at the individual fertiliser-user level embraces the two fertiliser quality assurance schemes, FERTMARK and SPREADMARK, recommended by the Fertiliser Code of Practice. Progress towards meeting the code's best practice strategies is evaluated using the Framework for the Evaluation of Sustainable Land Management's five guiding principles of (i) progress towards protection of natural resources, (ii) enhancement of production, (iii) degree of social acceptability, (iv) reduction of production risk, and (v) economic viability.
- 52.4 New Zealand Standard NZS8409:2004 "Management of Agrichemicals". This is the basis on which the GROWSAFE ® Training Programme for agrichemical users and suppliers.
- 52.5 I also encourage the use of proven models such as OVERSEER ® and NLE. Nutrient budgets compare fertiliser in puts versus losses from the farm system and are used as a basis for deciding the correct level of fertiliser use and management.
- 53 The above codes of practice and requirements will individually and collectively address or highlight the following:
- 53.1 Farmers wintering dairy cows off-farm, i.e. taking animals to winter grazing blocks during the winter months, thus reducing the amount of animal excreta on the area used for dairy farming during the low N uptake months. This also reduces the potential for muddy grassless areas within the irrigated area and thus reduces the potential for P losses in runoff;
- 53.2 Encouraging low-N feed supplements to reduce the N in animal excreta;
- 53.3 Irrigating during summer months has been shown to increase N uptake and thus minimise leaching (Menneer, et. al., 20042);

¹ Ministry for the Environment. Dairying and Clean Streams Accord. Snapshot of Progress. 2004/2005.

² Menneer, J.C., Ledgard, S.F., Gillingham, A.G., June 2004. Land Use Impacts on Nitrogen and Phosphorous Loss and Management Options for Intervention. Report prepared for Environment Bay of Plenty by AgResearch Ltd.
EVIDENCE OF ROB POTTS.DOC

- 53.4 Matching N and P fertiliser application to meet plant demand;
 - 53.5 The use of Nitrification inhibitors which can improve the soil N cycle efficiency and reduce nitrate leaching losses;
 - 53.6 Encourage farmers to set realistic crop yield goals in order to provide an accurate account of plant nitrogen needs;
 - 53.7 Cropping farms to have a winter cover crop;
 - 53.8 Cropping farms to delay soil cultivation until soil temperatures have decreased below 10oC;
 - 53.9 Minimising irrigation erosion and run-off thus reducing soil bound P moving off the site;
 - 53.10 Adopting strategies that maintain soil structure and protect the soil surface to minimise P losses;
 - 53.11 Riparian strategies that will include the planting of trees next to waterways and fencing off streams;
 - 53.12 Correctly manage the application of dairy effluent onto the land; and
 - 53.13 Education and training in techniques to minimise nutrient losses, via courses and field days.
- 54 The codes discussed above are some of the available standards that I recommend be adopted for use for the new consent applications. These have already been recommended for adoption as part of the HDI. By ensuring that all irrigated agriculture adheres to best practices in relation to nutrient management, the likely cumulative effects on the environment will be minimised.

Animal Effluent Management

- 55 Each take that is associated with dairy farming, or other use that results in collected farm wastewater, should be encouraged to have an effluent management strategy. The primary goal of the animal management plan is to manage the animal treatment and dispersal systems in a way that complies with industry standards and outputs and meets the requirements of the Resource Management Act in regards to environmental effects.
- 56 I note that in many instances farmers may also require other consents specific to effluent collection and discharge. I have not made any attempt to identify the extent to which any such consents might be required for each farm – however, the control of effluent is relevant to wider farm management and irrigation.

- 57 Adoption of the codes discussed above will also provide for the best practice management of animal effluent. By adopting strategies required for nutrient management, the farms on which the new takes will operate will by default also meet goals of effluent management.
- 58 In addition to the codes discussed above, the new take owners should adopt other codes and practices that are specific to their industries. Other examples of industry specific codes include:
- 58.1 Code of Practice for the Design and Operation of Farm Dairies;
 - 58.2 Code of Practice for Minimisation of Stock Effluent Spillage from Trucks on Roads;
 - 58.3 The Code of Animal Welfare (CAW) which is the code of recommendations and minimum standards for the Welfare of Animals Transported within New Zealand
 - 58.4 New Zealand Pork Industry Board Code of Practice.

Fencing and Wetland Planting Management

- 59 There are a number of wetlands in the project area. Most of these have been documented in the NBTC Assessment of Environmental Effects. For all concerned, these should be protected through strategies such as fencing and enhancement through plantings.
- 60 The Clean Stream Accord discussed above provides details strategies of how to protect waterways/wetlands through fencing.
- 61 By keeping stock out of drains, seeps and wetlands the farm will profit from reduced stock losses from bogging and it also improves stock management.
- 62 Wetlands can further act as pollutant traps by trapping sediment and phosphorus suspended in water and filtering bacteria and nitrogen from runoff. Peak rainfall flows can also be attenuated in the wetlands reducing the amount of runoff and contamination across the farm and the valley.
- 63 I therefore recommend that for the good of the catchment as a whole, the new applications be issued with a requirement ensure that wetlands and waterways are fenced and that wetlands be managed ensuring that they have adequate plantings.

Biodiversity and Ecosystem Management

- 64 In her HDI Evidence, Ms Claire Mulcock noted that the objective of a farm management plan is to include biodiversity and ecosystem management as an integral part in avoiding, remedying or mitigating the following:
- 64.1 Loss of native plants and native animals and their habitats;
 - 64.2 Loss of ecosystem diversity;
 - 64.3 Soil health problems;
 - 64.4 Loss of habitat for pollinators, beneficial birds, insects etc; and,
 - 64.5 Loss of shelter for stock and crops.
- 65 Implementing the strategies recommended in many of the industry codes described earlier will go a long way in addressing biodiversity and ecosystem management issues.
- 66 I appreciate that this cost can be a burden on land owners. The Ministry for the Environment lists a number of initiatives to assist with biodiversity and ecosystem management on private land. These include:
- 66.1 The Biodiversity Condition Fund and the Biodiversity Advisory Service Funds – funding for projects on private land aimed at improving or maintaining the condition of indigenous vegetation, species and habitats;
 - 66.2 A biodiversity on private land guidance work programme being undertaken by the Ministry for the Environment and the Department of Conservation, including the issuing of a Statement of National Priorities for protecting rare and threatened native biodiversity on private land;
 - 66.3 Ongoing funding for formal voluntary protection of biodiversity on private lands (for example, covenants):
 - (a) Queen Elizabeth II Trust – to protect “open space” and indigenous habitat on private land;
 - (b) Nga Whenua Rahui – to help tangata whenua to protect Maori land and the full range of ecosystems that were once found in New Zealand; and
 - (c) Nature Heritage Fund – to protect the full range of ecosystems that were once found in New Zealand.
 - 66.4 All of these could potentially be explored by applicants.

REBUTTAL OF THIRD PARTY APPLICANT'S EVIDENCE

- 67 I have endeavoured to incorporate comments on the Applicants' evidence as I have traversed through each application above.
- 68 However, I consider it necessary to make a number of more general comments on some of the evidence where the issues are relevant to a number of applicants.

Mr David Stewart

- 69 In Paragraphs 45 - 50 of Mr Stewart's evidence he comments on irrigation reliability. He has based his assessment on flows in the river and irrigation demand for seasons from 1992/93 to 2007/08 and demand based on the Morven Glenavy and Lower Waitaki Irrigation scheme recorded flow. He shows that the up to 90 m³/s demand would not be met during this period for about 4 days/season and this is only in the last reach between Bells Pond and the sea. If inflows between the dam and Blackpoint are taken into account, then this reduces to less than 2 days/season. He comments that the flows to make up the shortfall are minimal when compared to the overall flows in the Waitaki River.
- 70 The 73 years modelled under Plexos shows a very different result. The average number of days restricted is 11.6 days/season (3 times greater). This is consistent with the observation that the inflows to the upper catchment lakes have been greater in the last 20 years in comparison to the last 73 years. It is risky to assess reliability over such a short time frame.

Mr Matthew Fraser Ross

- 71 I agree with the comments Mr Ross makes on reliability of supply and design of system capacity. The high reliability of the Lower Waitaki schemes is such that the systems can be designed on a lower areal capacity as the need to "catch-up" is not as great as other schemes and thus systems can be designed and managed more efficiently.
- 72 However, Mr Ross implies that new applicants' reliability should be based on Policy 46, which is the policy behind Rule 7 for the Waitaki Dam consent holder to release an enhanced flow regime. It is my view that this policy is not about setting reliability for new irrigators but about setting a flow release of **up to 95%** of the peak rate of take (i.e. an upper release level), that in combination with existing irrigators and other users, is **up to a maximum of 80 m³/s** (once again an upper level for the period October to March).
- 73 From the reliability evidence I presented at the HDI hearing, and again above, it is my view that Mr Ross will not get 9.5 L/s of each 10 L/s all the time but rather he should get 10 L/s of 10 L/s for 95.2% of the days based on past flows (based on 100 m³/s minimum flow and existing irrigators and new irrigators having equal

priority) and 98.5% of his annual demand provided. On average there will be 11.6 days/season when he will not get his full demand and in some seasons he may get prolonged periods of restriction.

CONCLUSIONS

- 74 Based on evidence I prepared for the HDI hearing and the Joint Statement with Mr Jeff Page, it is my conclusion that all future consents currently in processing can be accommodated within the Table 5 allocation blocks of the WRP below Black Point but the allocation above Black Point is insufficient.
- 75 With the equal water user flow sharing arrangement (Scenario 1), the reliability of existing and new users, will be approximately 95% of the time satisfied, with 98.5% of the volume provided if 100 cumecs is adopted as the minimum flow cut-off.
- 76 I have reviewed the consent applications subject to this hearing. I have stated any issues in respect to each application and I have suggested conditions and/or measures that the applicants should undertake to address the concerns raised.
- 77 Most of the new applications I reviewed propose a condition for water metering with varying degrees of reference to standards. For consistency, I recommend that reference be made to specific water metering standards similar to the one I have tabulated in Paragraph 31.
- 78 I would like to see the farm management strategies proposed for the HDI be adopted for all future takes from the Lower Waitaki to ensure equitable distribution of the water resources and compliance with the policies and objective in the WRP for the sustainable management of the water resource.
- 79 The existing and most common industry codes and standards, if adopted will provide best practice across the six environmental management classes proposed for the HDI. These will need to be supported by a comprehensive set of conditions.

Dated: 2008

Robert John Potts