IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF resource consent applications by Killermont Station Ltd and Williamson Holdings Ltd to take and use water in the Upper Waitaki Catchment.

RIGHT OF REPLY OF IAN MCINDOE

INTRODUCTION

Scope of evidence

1. I have prepared this right of reply at the request of Killermont Station Ltd (KSL), Williamson Holdings Ltd, Five Rivers Ltd and Southdown Holdings Ltd (WHL).

2. This evidence responds to evidence given by CRC officers in S42a reports and evidence given by submitters.

3. My evidence covers issues raised by the CRC Officers and other submitters on the following matters:

    - The effects of weir maintenance & construction on the Ahuriri River.
    - Fish screening.
    - Total allocation.
    - Effluent application.
    - Glen Eyrie Downs pump noise.
    - Gallery construction in Lake Ohau.
    - Gallery maintenance.
    - Irricalc – reasonable use.
    - Manuka Creek.
    - Frosty Gully.
    - Ahuriri Conservation Order.
    - Killermont Station river protection works
    - Stockwater

4. I have also included an example of implementing the lock-step approach for groundwater monitoring.

Evidence in reply

Effects of weir maintenance & construction on Ahuriri River

5. Webb (Para 194) states that during maintenance of the weir for CRC073115, work in the channel will cause discoloration and affect trout embryo and fry development.

6. Dr Ryder will comment on the trout development and trout embryo/ fry development. What I can say that reinstatement of weirs is a common occurrence in many braided Canterbury rivers. It will almost always occur immediately after floods in the irrigation season if the weir has been damaged. Floods large enough to damage a weir would clearly discolour the water and disturb the bed, so the maintenance of the weir will in a very small way cause similar conditions to those seen in floods. The duration of works will be of short duration. I would expect it to be at the most a few hours. It needs to be noted that some large weirs made of gravel are designed to fail. An example is the Coleridge intake on the Wilberforce and Harper rivers – not dissimilar to the Ahuriri situation.

Fish Screening

7. Webb (Para 196) states that no details have been supplied of recommended fish screen conditions, other than 2 mm mesh size for Killermont Station's Pebbly Block intake in the Tara Hills race.

8. For the Pebbly Block take, Killermont Station has agreed to abide by the NIWA fish screen guidelines; (para 118 in my main evidence). The proposed intake point is in the main race above the Tara Hills and Omarama Station fish screens. The race at the proposed take point is about 2.5-3.0 m wide and 0.8 m deep, with approximately 1100 l/s flow. Velocity in the race will be about 0.8 m/s.

9. Details of a screen of the type typically used in these circumstances are given at the end of this reply. Assuming a KS90 model with a No10 mesh, approach velocity 100 mm from the screen would be about 0.05 m/s and velocity through the mesh 0.13 m/s, assuming a take of 100 l/s. This shows that meeting the NIWA fish screen guidelines is feasible.

10. Rodrigo (Addendum para 174, 175) is not satisfied that the proposed gallery intake for Killermont Station Woolshed Block will meet the NIWA fish screening guidelines.

11. As I stated in my main evidence (para 168), the gallery will be engineered to meet specific aims. These include:

    - Invisible to fish
    - Low approach velocity (0.005-0.1 m/s).
    - Depth of 0.5 m to the top of the collector pipe/screen.
    - Bed material to form the natural cover.
    - Have no impact on flood carrying capacity of the stream.

12. Although the NIWA guidelines are not directly applicable, it will meet those requirements by default.

13. With respect to buried gallery construction in general, there is no way that fish will be 'sucked' into a gallery of this type as entrance velocities are so low (0.005-0.1 m/s).

Total Allocation

14. Scarf (Para 10-18) has raised issues about total allocation in the Upper Waitaki catchment.

15. I have addressed these issues in my MWRL right of reply.

Effluent application

16. Claire Penman (Addendum para 275) questions how irrigation over water bodies would work in combination with effluent applications.

17. The effluent will not be applied to the land through the pivot irrigation system. The worst that will happen is that water will be applied to water where pivots pass over water bodies. In my view, irrigating the riparian margins will be beneficial, especially during the plant establishment phase.

18. The technology for controlling individual sprinklers on pivots has been established in New Zealand over the last year and is currently being fitted to pivots at several locations. If situations arise where sprinklers need to be turned off, that can be easily arranged.

Glen Eyrie Downs pump noise

19. Claire Penman (Addendum para 276, 300) and Blue (supplementary evidence) have expressed concern about pump noise for the proposed GED intake in Maori Bay. Penman requires a condition be included to limit noise levels.

20. Members of the Blue family state that they camp and picnic about 50 m from the proposed pump station (assuming that the pump station is on the Sheldon Downs boundary fence).

21. The layout for the proposed gallery screens for Glen Eyrie Downs are shown in Figure 39 in my evidence in chief. Water will be taken from the middle of the gallery about 85 m from the boundary fence. The pump station will be located about 20 m from the lake frontage and will be about 100 m from the Blue family picnic area.

22. Large pump stations can be noisy, up to 90-110 db. Noise is generated from a combination of fluid noise and mechanical noise. The Black Point pump station referred to in the Blue evidence is an example of a noisy system, but my understanding is that the problem has been addressed.

23. Fortunately, control of pump noise is well understood by pump engineers and it is relatively straight forward to mitigate the effects of noise and vibration. Many engineering solutions exist. There are several measures that can easily be taken to control pump noise. Good pump selection and pump design will reduce mechanical and fluid noise substantially. Buildings with good insulation and double wall construction will reduce noise by up to 70%. Vibration isolators will reduce both noise and the effect of vibration. Further to that, the pumps are planned to be housed underground, further reducing noise.

24. In addition, measures such as keeping the pump station as far as possible from the Blue picnic area and maintaining trees between the station and picnic area will also control noise. There is a 6db reduction in sound level when doubling the distance from the source.

25. I support Ms Penman's view that a condition be included that limits noise levels for the proposed Glen Eyrie Downs intake. The Waitaki District Plan specifies an allowable noise level outside of normal working hours of 40 db L_{Aeq}, which can be thought of as an average sound level of 40 decibels. Given that pumps generally produce a steady sound, it is an appropriate measure to use for environmental noise.

26. I propose that at the Sheldon Down boundary, which I understand is 50 m away from the Blue camping site, the maximum level of noise generated by the pump station shall not exceed:

    - 55dB LA_{eq} during the daytime (7am to 9pm Monday to Saturday),

    - 40dB LA_{eq} at night-time (being the period between the hours of 9pm on any night and 7am the following day and includes 24 hours on Sundays and statutory holidays).

27. Because the pumps will sometimes be running continuously day and night, the noise limits at the Sheldon Down boundary are effectively 40dB LA_{eq} at all times.

28. Other councils such as Dunedin City Council apply similar limits (40db L_{10}) in rural areas at night time at a notional boundary. They define a notional boundary for rural areas as being 50 m from a dwelling.

29. The applicant will check noise levels with an L_{eq} meter.

30. Mrs Blue suggests that a sound level of even 20db would be too loud in her circumstances. That is a very low sound level. The limit of hearing (a very quiet whisper) is about 10db. 22-30 db is a typical level of sound for a rural area at night. Bird calls are 40 db. The wind blowing through trees, should the wind be blowing from the NW, will significantly exceed those sound levels.

Gallery construction in Lake Ohau

31. There have been several submissions related to the effects of the proposed gallery construction for Glen Eyrie Downs and Ohau Downs (e.g. Penman Addendum para 273, 282, 300, 301; Meredith Addendum para 78; Vesey Addendum para 86).

32. The Ohau Downs gallery construction has already been addressed in detail in resource consent application CRC100225 by Five Rivers Ltd to install a gallery in Lake Ohau.

33. Site testing to determine permeability of sediments will be carried out to determine final design, placement of the gallery and required location of a temporary bund.

34. I have corresponded with Brent Woods of Rooney Construction regarding techniques used to construct the galleries. He advised that a small temporary bund will be placed along the edge of the lake to prevent contamination of disturbed trench water entering the lake.

35. Forming bunds or walls in waterways is very common in Canterbury according to Mr Woods. ECan themselves have machinery regularly used for forming bunds in waterways.

36. Working from one end, a bulldozer or excavator will be used to push up natural lake bed material to form the bund. The material will contain natural lake bed sediments. Although sediment will be disturbed during construction, Mr Woods expects it to settle out quite quickly, based on his experience in other areas. If the bund is likely to cause an on-going sediment problem due to wave action, material to line the outside of the bud will be brought in. However, it is unlikely to be required.

37. The trench for the gallery will be located behind this bund. The excavated material will be shingle together with a large amount of water so additional excavators may be required to swing the wet excavated material well back from the edge of the trench.

38. The trenching will be carried out in water behind the bund and no pumping is envisaged for dewatering the trench. Depth masters will be used on the excavators to ensure the trench invert is correct. The gallery pipe will be laid in the water and submerged to trench invert. The tee connection from the gallery and link to a main valve and manhole will be laid at the same time.

39. The selected backfill around the gallery pipe will be sourced and screened from the excavated trench material. This will be placed carefully over the gallery pipe. The gravel will be placed over the top of the pipe so that it runs down both sides preventing lateral movement of the pipe. The remaining natural lake bed material will then be placed over the screened backfill. The site will be tidied up and left in natural state with excess material carted away or lost into the lake foreshore.

40. It is anticipated that that trenching laying and backfilling for each site will be completed in 10-15 working days. There will be stockpiles of material on the shoreline during trenching and screening.

41. Noise levels will be elevated due to construction machinery and screening plant. Dust should not be a problem as material will be wet. If it dries out, water will be applied to the material during screening.

42. The bund on the shoreline will prevent contamination and movement of dirty surface water entering the lake during construction. The bund will need to be wide enough to prevent significant amounts of water filtering through the bund. A minimum of 4 m wide is suggested.

43. During construction, water will be filtering from the lake into the trench. Generally the trench water level will be lower than the lake water level due to the excavation, so the hydraulic gradient will ensure clean water moves from

the lake to the trench. The lake will need to be checked periodically to ensure that dirty trench water is not moving in the reverse direction i.e. from the trench into the lake resulting in cloudy water on the foreshore. If this is occurring then a small amount of water will need to be pumped from the gallery to maintain a hydraulic gradient from the lake to the trench.

44. Construction vehicles are tracked or capable of running on 4WD roads, so they can easily access the site. An existing farm track will be used for access. The track may be graded to improve it and it may be realigned over a short distance. Roading material will not be brought in to construct roads.

45. Photographic evidence of gallery construction (Adrian Meredith, Addendum para 76), can easily be provided.

Gallery maintenance

46. Galleries are proposed for water supplies for Killermont Station, Williamson Holdings (Killermont), Southdown Holdings and Five Rivers. Gallery maintenance has been raised as an issue in particular by Adrian Meredith (Addendum para 73), who states that their structural and operational integrity is unknown.

47. Galleries have been used for water supplies for many years. Most operate without problems or maintenance requirements. Usually, supply issues, if they arise, are related to unusual conditions, or proximity to water supplies. The most reliable galleries in terms of supply reliability are those that are close to a free water surface.

48. Maintenance will depend on how well the galleries are designed and operated. If gallery maintenance is required, it will become apparent over several weeks or months through monitoring of gallery water level drawdown versus pumping rate. Galleries do not 'suddenly block'. That means that maintenance will be able to be scheduled to coincide with appropriate conditions.

49. Their structural integrity or their ability to act as a filter is not threatened. They will continue to act as a very effective fish barrier regardless of how blocked they become.

50. If galleries do block (and I am aware that problems with that have arisen in the Awatere River for example), and if they have been designed without a method for cleaning, they could suffer from permanent yield reductions.

51. Galleries should be conservatively designed with very low entrance velocities to minimise the need for maintenance. Pipelines can be installed in galleries so that compressed air can be used to clean them, if necessary. The logical time to carry out cleaning is during turbulent conditions in the lake or rivers. It is unlikely that the disturbance will be more significant than the effects of turbulence caused by natural action in those water bodies.

Irricalc – reasonable use

52. Claire Penman (Addendum para 285, 308) requests that a favourable comparison of the Irricalc input parameters against field measurements is undertaken prior to granting of consent, to be satisfied that the proposed volume is reasonable for the property.

53. Irricalc is a soil water balance model that has been calibrated against field measurements on the Canterbury Plains. The method is a well-recognised technique for determining irrigation demand. Neither Irricalc nor the WQN9 method has been specifically calibrated against soil moisture measurements from the Mackenzie Basin, because such data does not yet exist.

54. It is unrealistic to compare Irricalc parameters against field measurements for specific farms before they are irrigated. They would need to be irrigated to do that.

55. When the consents are being exercised, water use and soil moisture measurement will occur, and checks for reasonable and efficient use will be able to be made. Conditions have been proposed (eg Kyle evidence Killermont (WHL) use conditions 3, 20-22) to ensure good irrigation practices and efficient application of water.

Manuka Creek

56. The Commissioners in questions to me and to other experts have wished to establish whether Manuka Creek on Killermont Station re-emerges into Omarama Stream after it goes underground several kilometers up from Omarama Stream. This issue relates to whether the Ahuriri River WCO (Omarama Stream) minimum flows should be applied.

57. Dave Stewart (Addendum para 30-32) states that there is no resurfacing of Manuka Creek at its bottom end (near Omarama Stream) and that there is no point applying the NWCO minimum flows for Omarama Stream. Mr Stewart's views are consistent with my own. I agree with Mr Stewart that Manuka Creek water does not appear to resurface in its lower reaches and that there is no point in applying the WCO minimum flows.

Frosty Gully

58. Rodrigo (Addendum para 163, 164) expresses concern about fish passage to and from the Frosty Gully dam outlet.

59. The existing structure (dam and inlet/ outlet) has been in place for several decades. It is part of the existing environment. Given that there are reportedly trout in the upper catchment, fish have adapted to the current infrastructure.

60. There is no flowing water in the lower reaches below the dam most of the time and especially during the irrigation season (see my main evidence Figure 21). Water only flows to Manuka Creek during times of floods or after extended periods of heavy rain.

Ahuriri Conservation Order

61. Scarf (para 94, 99-107), Rodrigo (Addendum para 183), Vesey (Addendum para 67(f), 71, 77(d)), Webb (Para 189-190) and Penman (Addendum para 24-27) have all expressed concern or comment about issues related to the Ahuriri WCO.

62. The issues are:

- The interpretation of the WCO, minimum flows and allocation limits.
- The impact of the proposed diversion by Williamson Holding Ltd and its impact on minimum flows.
- The proposed consent conditions relating to the WCO and how the proposed conditions will meet the minimum flow condition taking existing users into account.

63. Penman (Addendum para 27) states that the WCO requires the minimum flow in the river be sustained along its whole length, not at a discrete point on the river.

64. Scarf treats the allowable reduction in flow as an allocation limit, and notes that if the proposed 0.2 m^3/s divert by Southdown Holdings for CRC073115 is included, the total allocation is 3.2 m^3/s and exceeds the allocation limit.

65. It appears that Mr Scarf has not realised that Williamson Holdings will use either CRC041788 *or* CRC073115, so his comments in Para 106 are not relevant.

66. Webb agrees with ECan that the allocation available under the WCO is exceeded if the 0.2 m^3/s is included. However, he disagrees with ECan that the proposed bypass is not an activity related to the management and enhancement of fish and indigenous wildlife.

67. I agree that the total amount of water allocated for existing and proposed consents is approximately 3.2 m^3/s, if diverts are included. However, because the WCO requires specific flows to be maintained relative to South Diadem flows, the fact that the total exceeds 3.0 m^3/s does not violate the WCO if the minimum flows are maintained, as explained by Mr Whata.

68. The Southdown Holdings 0.2 m^3/s divert is the first on the river and will not cause the minimum flow to be violated, as the water is returned to the river within a short distance of the divert point and well before any other takes occur. The next takes are several kilometres downstream of the proposed Southdown Holdings intake.

69. With respect to the proposed bypass for CRC073115, I agree with Mr Webb in part. In my view, the bypass is an activity related to the management and enhancement of fish and indigenous wildlife. That is its purpose and for that reason I don't think it should be included in the WCO allocation.

70. Given that a priority order for abstraction has already been established for existing takes, the worst-case situation is that the managers of the proposed

new consents operate as though the existing takes are being exercised. That way, the WCO minimum flows will be maintained, regardless of whether the 0.2 m^3/s divert is included or not.

71. Penman (Addendum para 26) states that the conditions proposed by Mr Kyle (Condition 7) do not show how the Ahuriri minimum flows will be maintained taking into account existing users. Penman (Addendum para 27) states that there is no way of identifying when water is available at Gorge flows of less than 25 m^3/s.

72. Should the existing consents not be fully exercised, there is opportunity for the proposed consent holders to take water at lower minimum flows. In order for that to happen, they would have to reach an agreement with existing consent holders, probably through a water users group, to be able to manage the takes to ensure that the WCO is not violated. This can be done through monitoring and good communication between the various parties.

73. A simple approach initially is to form a water users group and through telemetry, monitor actual water abstraction and determine water availability. The group would then allocate that water on a priority or agreed basis to abstractors.

74. Also available to the applicants is the option to monitor river flows at various points, and take into account locations of diversions and takes, tributary inflows and other factors that impact on Ahuriri River flows to determine flow availability.

75. I disagree with Ms Penman's statement that there is no way of identifying when water is available at Gorge flows of less than 25 m^3/s.

Killermont Station River Protection Works

76. Rodrigo (Addendum para 178(a), 180) is not convinced that the construction of the proposed gallery will not impact on existing rock walls that have been installed by Transit NZ for river protection.

77. As I stated in my main evidence (para 99), the rock walls are about 50 m apart and only protrude into the river by 10-15 m. The proposed gallery will be approximately mid-way between the rock walls and extend further out into the river. Allowing 10 m for gallery construction, the rock walls will be 20 m away. After construction has been completed, the gallery will not be visible.

78. The applicant is happy to accept a condition that states that works will be undertaken to ensure no disturbance of the existing river bank protection structures occurs. In terms of compliance, there is no reason to have any doubt that such a condition cannot be complied with.

Stockwater

79. Rodrigo (Addendum para 176) notes that the allocation for stockwater for CRC041777 (the Killermont Woolshed block) has not been withdrawn.

80. There was not a separate allocation for stockwater in the application, as the annual volume applied for (1,680,000 m^3/y) was based on the MIC allocation of 6000 m^3/ha/y, which as described in my main evidence (para 85) is less than could be used for irrigation. There is nothing to withdraw.

Conclusion

81. With respect to the issues I have commented on, none of the evidence that I have reviewed has caused me to change my opinion on those matters.

Lock-step approach for groundwater monitoring

82. Dr Bright's evidence in reply for MWRL described the proposed lock-step approach for the groundwater sub-catchments in the upper Waitaki Basin. That evidence was largely generic. I now describe the approach in more detail, using the SHL Glen Eyrie Downs property as an example. The process follows the lock-step adaptive management process flow diagram in Figure 8 of Dr Bright's evidence. I have followed the same numbering system.

83. The Glen Eyrie property shares a boundary with the Quail Burn and Wairepo groundwater sub-catchments. The location of the sub-catchment boundary is a key issue as it affects the NDA allowances for the property overall. Similarly, the Killermont Station and the WHL (Killermont) properties share boundaries with the Omarama Stream and Ahuriri River groundwater sub-catchments. However, in the case of the Killermont properties, the issue is groundwater flow paths rather than potential changes to the NDA allowances.

Step 1 –Monitoring requirements

1.1 Identify baseline assumptions

These are:

(1) The location of the groundwater divide between the Quail Burn and Wairepo catchments, and

(2) Whether groundwater re-enters the Quail Burn.

1.2 Groundwater and surface water monitoring programme for (1) above

Propose:

(1) Installing 12 shallow piezometers at a 2 km grid spacing (6 each side of the boundary).

(2) Installing 1 deep bore mid-way along the boundary to determine the existence or otherwise of multiple aquifers

(3) Surveying in the bores.

(4) Completing two aquifer tests on the monitoring bores.

(5) Measuring water levels and taking samples for water quality testing.

1.3 Independent review of programme and variances

(1) Propose minor variance of 0.5 km and significant variance of 1.5 km for distance of flow divide from the WQS boundary location.

(2) Propose methodology for determining flow divide (hydraulic gradients).

(3) Have programme independently assessed.

If (3) is OK, proceed to *Step 2 - initial monitoring phase*. If not OK, revise monitoring programme until (3) is OK.

Step 2 – Monitoring phase

(1) Install all bores, survey the bores and carry out aquifer tests.

(2) Complete initial monitoring (groundwater levels and groundwater samples).

(3) Analyse water levels to determine hydraulic gradients.

(4) Determine position of groundwater divide based on hydraulic gradients.

(5) Compare results to variance.

If (5) is negligible (<0.5 km), proceed to *2.5- submit monitoring report to ECan* and move to Step 3.

If (5) is minor variance > 0.5 km but < 1.5 km, proceed to *2.2 - assess effects of minor variance on NDA* and adjust NDA if necessary until a minor variance is achieved. (The NDA limits for the Quail Burn versus the Wairepo are different).

After the NDA's have been adjusted, proceed to *2.5- submit monitoring report to ECan* and move to Step 3.

If (5) is > 1.5 km, i.e. a significant variance, proceed to *2.3- refer to review panel* for recommendation on whether variance changes conclusions of WQS.

If the conclusions of the WQS are not changed, proceed to *2.2 - assess effects of minor variance on NDA* and adjust NDA until a minor variance is achieved.

After the NDA's have been adjusted, proceed to *2.5 Submit monitoring report to ECan* and move to Step 3.

If the conclusions of the WQS are changed, proceed to *2.4 – technical work to determine if changes to the WQS can be addressed through revisions to NDA's/FEMP's*

If the changes can be addressed, proceed to *2.5 - submit monitoring report to ECan.*

If the changes cannot be addressed, proceed to *2.6 applicant decides whether to stop (lock-step) or return to 1.2.*

The applicant may decide to do more investigation to see if further information can resolve the situation. This may involve drilling additional bores to obtain more information on hydraulic gradients, which could result in a smaller movement of the groundwater catchment boundary and less effect on the NDA's.

Step 3 – Ongoing monitoring and adaptive management

3.1 Consents are exercised

The consents are exercised according to the consent conditions and FEMP's.

3.2 On-going monitoring and adaptive management

With respect to the sub-catchment boundary position, this will involve measurement of groundwater levels on an agreed basis as specified in the FEMP's or consent conditions.

Although it would not be expected to move significantly, based on water level measurements, the position of the groundwater boundary is reviewed at an agreed frequency.

If the assumptions are still confirmed, i.e the variance is <0.5 km, or the adjustments to the NDA's still maintain the variance in the negligible category, proceed to *3.3 Submit compliance report to ECan* and then to *3.1 Consents exercised.*

If the variance is minor (<1.5 km), return to *2.2 - assess effects of minor variance on NDA* and adjust NDA until a minor variance is achieved.

If the variance is significant (>1.5 km), return to *2.3 refer to review panel* for recommendation on whether the variance changes the conclusions of the WQS and continue as before.

Ian McIndoe
29 April 2010

Fish Screen Example

MODEL	Maximum Flow (20 mesh) (10 mesh x 1.15, 30 mesh x 0.8)				Outlet Pipe Table E	Backwash Flow @ 40m head	Screen Diameter	Overall Length
	L/s	m^3/hr	IGPM	USGPM	mm	L/s	mm	mm
KS25	25	90	330	397	150	0.9	470	415
KS35	35	126	463	556	150	1.0	470	535
KS50	50	180	661	794	200	1.2	470	660
KS65	65	234	859	1032	200	1.3	470	780
KS90	90	324	1189	1429	250	2.1	470	1030
KS115	115	414	1520	1825	250	2.3	470	1275
KS140	140	504	1850	2222	250	2.5	470	1520

- Please use maximum system flow to select appropriate model of screen.
- For higher flow rates, two or more KleenScreens can be manifolded.
- Standard screen is 20 mesh.