

IN THE MATTER OF **the Resource Management Act 1991**

AND

IN THE MATTER OF **A submission in opposition to the
M.S.Gillingham resource consent
applications CRC 070820 and CRC
070826 to variously take, store and use
water from within the Maerewhenua
River Catchment**

BETWEEN **MAEREWHENUA WATER USERS GROUP
Submitter**

AND **CANTERBURY REGIONAL COUNCIL
Consenting Authority**

**STATEMENT OF EVIDENCE OF ROBERT JAMES HALL
ON BEHALF OF
THE MAEREWHENUA WATER USERS GROUP MEMBERS
[S.R.& M.E.FENWICK, DES CONLAN FAMILY TRUST, MAEREWHENUA
COMMUNITY IRRIGATION SCHEME, MAEREWHENUA DISTRICT WATER
RESOURCE CO.LTD., PUKERARO TRUST, HOPEFIELD FARM 1995 LTD. AND M.F.
MOYNIHAN, AS THE MAEREWHENUA WATER USERS GROUP] (SUBMITTER)**

**THE 28
DAY OF July 2008**

1. My full name is Robert James Hall. I am a Chartered Engineer [Civil & Geomechanical], a Member of the Institution of Professional Engineers of NZ, and the NZ Hydrological Society. I hold a Masters Degree in Engineering , [Natural Resources], A Bachelors Degree in Civil Engineering, a NZ Certificate in Engineering [Civil] and I have completed the Graduate Course in Surface Water, University of New South Wales, Kensington Australia. I am presently employed by GHD Ltd. and I reside in Timaru.

Experience

2. I have 33 years experience in water resource engineering , 25 of which have been associated with the Waitaki Catchment, in employment with the Waitaki Catchment Commission and Regional Water Board, The South Canterbury Catchment Board, Environment Canterbury and more recently as a Consultant Engineer.

Introduction

3. I have been engaged by the members of the Maerewhenua Water Users Group [the MWUG] to assist them in their submission in opposition to the M.S.Gillingham resource consent applications CRC 070820 (to take and use groundwater water) and CRC 070826 (to take, store, use and discharge surface water) from within the Maerewhenua River catchment.
4. I have prepared my evidence in compliance with the Code of Conduct for expert witnesses set out in the Environment Courts consolidated practice note of 31 July 2006. I confirm that my evidence is within my area of expertise and that I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

5. In preparing my evidence I have relied on hydrological work associated with both river and irrigation flows in the Maerewhenua River catchment at and upstream of SH 83 undertaken on behalf of the MWUG by D.Boraman of Boraman Consultants Ltd. of Timaru. This work comprises stream flow gaugings at the Kellys Gully hydrometric site, at SH 83 and at a site approximately 800m upstream of SH 83. Measurements were also made on those occasions of each of the MWUG irrigation flows that were operating at that time. I have also used D.Boraman Consulting Ltd. Flow duration curves derived from the Kellys Gully hydrometric site record March 1970 to April 2005 for a notional irrigation season October through to April inclusive.
6. This work provided a basis for me to establish the scale of natural losses from the bed of the Maerewhenua River between Kellys Gully and SH 83. It also provided me with a basis to assess both incrementally and accumulatively, the volumes of water that is currently being extracted under
 - (a) is currently able to be taken in total under the various MWUG consents in an average irrigation season [c.f. Table 3 MWUG consents summary schedule] and
 - (b) that which could be taken the various MWUG members under the Waitaki Catchment Water Allocation Regional Plan [WCWARP] – September 2005, Rule 2, Table 3 [xx], once the MWUG consents are reviewed in accordance with Rule 25 i.e. in 2012.

I have summarised the above analysis on Figs 2 (a) and (b) for a range of daily mean flows on the Maerewhenua River at SH 83 from zero up to 3000 litres per second (l / s).

In addition to the above I have attached a graph, Fig 1. which for the same SH 83 daily mean flow shows the average MWUG combined irrigation abstraction rates available under the current consent restrictions and in addition a similar plot showing the abstraction rates permitted under the regime set down in Rule 2, table 3 [xx] of the WCRWAP.

The M.S.Gillingham applications

7. The M.S.Gillingham applications are as follows

CRC070820 - To take and use groundwater from bore I41/0045, 1200 millimeters diameter and 7 metres deep, at or about map reference I41: 2178 – 8549, at a rate of 22 litres per second with a volume not exceeding 18,220 cubic metres in any period of ten days, and a volume combined with consent application CRC070826 not exceeding 175,000 cubic metres per year, for irrigation of crops and pasture at West Maerewhenua Road, North Otago. A 35 year duration is sought.

CRC070826 – To take, store and use water from the Maerewhenua River when the flow is greater than two cubic metres per second, at a rate not exceeding 120 litres per second and a maximum volume combined with consent application CRC070820 of 175,000 cubic metres per year, at or about map reference I41: 2136 – 8462, to store for irrigation purposes of crops and pasture at West Maerewhenua Road, North Otago. A 35 year duration is sought.

Analysis of MWUG Current Consented Allocations

8. I have examined the operative water consents held by the members of the MWUG as noted above and summarised those findings on Fig 2. attached. I have then considered what allocations would be available to them

alternatively in a volumetric sense under Rule 2 Table 3 [xx] of the WCRWAP. The result of that analysis is also shown on Fig 2. On the basis of that analysis I make the following observations

- a. That the irrigation volumes currently used by the MWUG in an average irrigation season October to April inclusive for SH 83 daily mean flows up to 2000 l/s is in the order of 5.67 million cubic metres [Mm³]. Refer Table 2.1., and
- b. That under the allocation regime of Rule 2, Table [xx] of the WCWARP than average irrigation season as for 7 (a) above, the seasonal abstraction volume is of the order of 5.53 Mm³. Refer table 2.2., and,
- c. That the volume available within the 400 l/s allocation limit [flows 400 to 800 l/s at SH 83] for the average irrigation season is estimated at 0.79 Mm³, and the volume available in the flow sharing band [800 to 2000 l/s at SH 83] is in the order of 4.74 Mm., and,
- d. That the accumulated volumes for an average irrigation season October through to April inclusive for the current and WCWARP regime once the current MWUG consents are reviewed to bring them into line with Rule 2, match when the daily mean flow of the Maerewhenua River at SH 83 in an average season reaches about 1980 l/s [fig 2 (b)], and,
- e. That from the Boraman Consultants Ltd. gauging work I estimate that the natural loss of surface flow in the Maerewhenua River in the reach extending from the SH 83 bridge upstream some 800 is in the range of 60 to 70 l/s. This work indicates that little if any loss occurs between the point 800 m upstream of the SH 83 bridge and the Kellys Gully hydrometric site, and,
- f. That on this basis I assess the un-modified daily mean flow at SH 83 site to be of the order, Kellys Gully less 70 l/s, and,

- g. That the volumetric allocations specified on the resource consents
- CRC030840.3 [S.R. & M.E.Fenwick]
 - CRC9902096.2 [Des Conlann Trust]
 - CRC991295.2 [Maerewhenua Community Irrigation]
 - CRC991000.1 [Pukeraro Trust]
 - CRC020415.1 [S.R. & M.E.Fenwick]
 - CRC952200.1 [Hopefield Farm 1995 Ltd.]
 - CRC011714 M.F.Moynihan
 - CRC981495 [R.Mckenzie]
- and,

when expressed as daily volumes and then summed over 14 consecutive days total some 498,666 cubic metres. This value reduced to 75% and converted to a mean irrigation rate for these users over the 14 days becomes 309 l/s. Under Rule 2 Table 3 [xx] of the WCWARP, this level of abstraction would require a SH 83 flow of 709 l/s. If we add in a 13 l/s allowance to cover the hydraulic connection contribution of CRC98130 (Tokorahi Gulf Club), CRC982133 (Waitaki DC water supply) and CRC960857 (Waitaki D.C. Tokorahi water supply) plus 70 l/s natural losses the unmodified flow at Kellys Gully becomes 792 l/s. Note: the Kellys Gully hydrometric site is situated upstream of all of the Maerewhenua River consented takes so that record is for all intents and purposes an unmodified flow, and,

- h. That based on a month by month assessment of the flow duration series for the Maerewhenua River at Kellys Gully for an average irrigation season October to April inclusive daily mean

flows at Kellys Gully will be less than the 890 l/s calculated in (g) above throughout each of the months October (3 %), November (7 %), December (17 %), January (22%), February (32 %), March (37 %), and April (30 %). This suggests to me that the reliability threshold of Policy 26 (a) is unlikely to be met for the first priority band for these MWUG consent holders and that the first priority band will be set by Policy 26 (b), i.e. that the existing reliability is to be maintained.

- i. That the situation as it stands at present is that the water allocation provided under Rule 2 Table 3 [xx] between a daily mean flow of 400 l/s at SH 83 through to the 2175 l/s level referred to in (d) above [allocation limit, plus 100 % of the flow sharing regime, plus a further 175 l/s] is required to accommodate the MWUG current consents, and,
- j. That if M.S.Gillinghams resource consent applications were to be granted a further 175,000 cubic meters of water needs to be allocated. This volume represents the maximum annual volume M.S.Gillingham proposes to source from the combined takes sought for CRC070820 (groundwater) and CRC070826 (surface water). If all the water were sourced from groundwater allowing for hydraulic connection the effect on the Maerewhenua River surface flow would be approximately 87,500 cubic metres. Alternatively if it were all to be sourced from surface water then the annual volume would be 87,500 cubic metres. It is assumed that given the limited storage proposed [50,000 m³] that the greater part of the annual volume of 175,000 cubic metres is most likely to be required during the irrigation season, and
- k. That the effect of granting the M.S.Gillingham consents when the unmodified daily mean flow in the Maerewhenua River at SH 83 is at or about 1990 l/s or less in an average season would

therefore result in a derogation of the water consents identified in (g) above, presently held by the members of the MWUG, and,

- l. That it follows from (i) above that if that situation is to be avoided I estimate that a minimum flow would need to be set for the M.S. Gillingham consents at or about 2293 l/s. This figure is derived off Fig's 2 (a) and (b) which indicates that the 175,000 m³ allocation sought by M.S.Gillingham moves the threshold to about 2280 l/s, to which an additional 13 l/s needs to be added to account for the effects of hydraulic connection estimated for the combined takes CRC960857, CRC982130, and CRC982133 not included in the MWUG volumes at the intersection point of 2175 l/s evident on the two curves, Fig's 2(a) and (b), and,
- m. That the trigger flow of 1444 l/s proposed in the M.S.Gillingham application AEE, Table 2. Irricon Consulting (June 2006) does not satisfy this requirement.
- n. As far as I can establish the calculations undertaken in that M.S.Gillingham AEE has not fully accounted for the operational constraints which exist and arise as a consequence of conditions on the MWUG current consents, which remain until these consents are either reviewed under the WCWARP or expire and require replacement under the WCWARP, and the influence temporal characteristics have on accessible irrigation volumes evident from the average irrigation season [October – April inc.] flow duration curves for this river.

Conclusion

9. On the basis of the analysis above it is concluded that the M.S.Gillingham resource consent applications CRC070820 and CRC070826, if granted as sought would result in

a derogation of the aggregate of the current water allocations held by the MWAUG members.

Recommendation

10. That resource consent applications CRC070820 and CRC070826 lodged by M.S.Gillingham be declined.

R.J.Hall

MIPENZ (Civil, Geotechnical) CPeng, Int PE (NZ).

GHD Ltd.

28 July 2008

Appendix 1.

Methodology

Fig 1. Maerewhenua River Abstraction Regimes.

- I have plotted flow duration curves off the Boraman Consultants Ltd. flow duration tables developed for a notional irrigation season October – April inc. for both the Kellys Gully site [Fig 3 (a)] and the SH 83 site (Fig 3 (b)]. Fig 3 (b) is simply the daily mean flows on Fig 3 (a) reduced by 70 l/s to account for the natural losses estimated between the two sites.
- There is a rather complex interrelationship expressed between some of the MWUG consents conditions which control the amount of water each consent holder may take at particular times depending on what other users are doing. I have worked systematically through this in discrete flow blocks and using the Kellys Gully flow duration series shown on Fig 3 (a) to establish abstraction volumes for each of the MWUG consents (surface water and groundwater hydraulic connection component). This is shown on Table 1. From the summed volume from each block and an estimate of the number of days are likely to be present in each block in an average irrigation season, I compute an average flow rate for each block for the current MWUG operations [blue line on Fig 1.
- I then plot the daily mean flow at SH 83 and the abstraction rates provided from Rule 2 Table 3 (xx) on Fig 1. (red line).

Fig 2 (a) and (b)

- Using Fig 1. and Fig 3 (b) I calculate incremental volumes for the MWUG and WCRWAP abstraction regimes and then calculate accumulative volumes for daily mean flows at the SH 83 site extending from zero to

3130 l/s (MWUG Regime) and 3000 l/s (WCRWAP Regime), Tables 2.1 and 2.2. I then plot the accumulative curves for these two cases on Fig 2 (a).

- I have enlarged the that section of Fig 2 (a) near the intersection point of the MWUG (green curve) and WCRWAP (red curve) curves in order to determine the SH 83 un-modified flow that the intersection occurs at, viz 2175 l/s. At this point the abstraction opportunity lost to the MWUG members for SH 83 flows below about 1100 l / s with the introduction of Rule 2 Table 3 (xx) regime, is recovered in full.
- I have then superimposed the proposed 175,000 m³ allocation sought by M.S.Gillingham on Fig 2 (b) and added in a further 13 l/s for the hydraulic connection component of the rural water supply and Tokorahi Golf Club consents to establish the threshold below which derogation from the M.S. Gillingham applications would be avoided. I estimate this threshold to be an un-modified daily mean flow at the SH 83 site to be 2293 l / s. For practical purposes a trigger value of 2300 l /s might be appropriate.

Appendix 2.

Boraman Consultants Ltd. correspondence to R.J.Hall Civil & Environmental Consulting Ltd. dated 2 May 2007 which summarises the results of stream gaugings and irrigation abstraction flow measurements used to determine the scale of net natural losses in the reach of the Maerwhenua River between the Kellys Gully hydrometric site and the SH 83 site. Note: On 1 March 2007 it was necessary to estimate D.Conlans rate, and likewise M.Moynihan's on 23 April 2007. Any errors associated with these estimations are not considered likely to materially alter the results obtained. Boraman Consultings Ltd assessment show a net loss between Kellys Gully and SH 83 to range between 61 and 66 l/s. I have adopted a net average loss rate of 70 l/s on the basis that at higher flows the loss rate might increase as flow depth and width increases.

Schedule of Attachments

Figures

- Fig 1. Maerewhenua River Abstraction Rates Regime
- Fig 2 (a) Maerewhenua River Abstraction Volumes
- Fig 2 (b) Intersection Point MWUG & WCARP Plots from Fig 2 (a)
- Fig 3 (a) Flow Duration Curve Maerewhenua at Kellys Gully, October – April [March 1970 – April 2008]
- Fig 3 (b) Flow Duration Curve Maerewhenua at SH 8, October – April [March 1970 – April 2008]

Tables

- Table 1. Maerewhenua Water Users Group Estimate of Average Rates of Use from October to April Average Season Volumes
- Table 2.1 Current MWUG Consents Volumetric Allocations
- Table 2.2 WCWARP Volumetric Allocation
- Table 3. Maerewhenua Water Users Group Members Current Water Consent Details