

IN THE MATTER of the Resource Management Act 1991
AND
IN THE MATTER of the hearing of submissions on Proposed
Plan Change 5 (Nutrient Management and
Waitaki Sub-region) to the Canterbury Land
and Water Regional Plan

BY **WALTER CAMERON**

AND **SANDRA CAMERON**

Submitters

TO **CANTERBURY REGIONAL COUNCIL**

Local authority

**STATEMENT OF EVIDENCE OF KERI JOY JOHNSTON ON BEHALF OF WALTER AND
SANDRA CAMERON**

Dated: 22 JULY 2016

Prudence Steven QC
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INTRODUCTION

- 1 My name is Keri Johnston. I hold a Bachelor of Engineering in Natural Resources Engineering from the University of Canterbury. I am a Professional Member of the Institute of Professional Engineers New Zealand (MPIENZ) and a Chartered Professional Engineer (CPEng).
- 2 I also hold a certificate from Massey University for Farm Dairy Effluent Design and Management, and a national certificate (level 4) in irrigation evaluation.
- 3 Upon completion of my degree, I worked for Meridian Energy Limited as a graduate engineer, based in Manapouri and Twizel. After twelve months, I accepted a position with Environment Canterbury ("ECan") as a Consents Investigating Officer before taking on the role of Environmental Management Systems Engineer with the River Engineering Section of ECan. During my three and a half years with ECan, I was the Consents Investigating Officer for the applications associated with the Canterbury Regional Landfill at Kate Valley, and developed environmental management systems in accordance with ISO 14001 for several units within ECan.
- 4 I left ECan to join RJ Hall Civil and Environmental Consulting Limited as an Environmental Engineering Consultant. I was employed in this position for three and a half years. Work mainly involved the preparation of resource consent applications for all land and water activities, dairy conversions and engineering related works, as well as being a contract Consents Investigating Officer for applications associated with the Central Plains Water Trust and the Ashburton Community Water Trust.
- 5 Since 2007, I have been a director and principal of Irricon Resource Solutions Limited, a resource management and environmental engineering consultancy.
- 6 In preparing this evidence, I have reviewed the following material:
 - 6.1 Plan Change 5.
 - 6.2 The Section 32 report for Plan Change 5.
 - 6.3 Supporting technical documents for Plan Change 5.
 - 6.4 Submissions on Plan Change 5.
 - 6.5 The Section 42A report for Plan Change 5.

CODE OF CONDUCT

- 7 I have read the Code of Conduct for Expert Witnesses within the Environment Court Consolidated Practice Note 2014 and I agree to comply with that Code. This evidence is within my area of expertise, except where I state I am relying on what I have been told by another person. To the best of my knowledge I have not omitted to consider any material facts known to me that might alter or detract from the opinions I express.

SCOPE OF EVIDENCE

- 8 My evidence will provide background information on the Penticotico Stream and groundwater resources of the North Bank of the Waitaki River, as they relate to Tables 15B(c) and 15B(e) of Section 15 of Plan Change 5 (PC5), and the changes sought in the submission of Walter and Sandy Cameron.

WAINUI STATION – BACKGROUND

- 9 Wainui Station has 500 hectares of flats, which can be irrigated by way of 2 existing resource consents. The land is vital to the Cameron's business and acts as a good balance to their south facing hills.
- 10 The Camerons were granted a groundwater consent to irrigate 450 hectares in 2002 (CRC020744.1). However, the replacement of their surface water consent (CRC041003) was caught up in the "Ministerial Call-in" and was eventually part of the 2008 Lower Waitaki Hearings.
- 11 Because the Waitaki Catchment Water Allocation Regional Plan (WCWARP) did not address renewal applications (in terms of acknowledging their priority over those seeking to take new water), the hearings and subsequent appeals were a long, complicated process.
- 12 CRC041003 contains conditions which overlap with the groundwater consent, CRC020744.1. These relate specifically to the use of a hard hosed gun on the same area of land (to minimise damage to crops instead of K-Line).
- 13 CRC041003 is subject to a comprehensive suite of water quality conditions and because of the overlap conditions with CRC020744.1, these conditions extend to that consent as well. Conditions include:

- 13.1 Implementing a Farm Environment Plan, which is audited on an annual basis, and must implement Mandatory Good Agricultural Practices (MGAP's)¹ across the property.
- 13.2 Undertaking OVERSEER nutrient budgeting and management.
- 13.3 Fertiliser timing restrictions.
- 13.4 The requirement for fertiliser to be applied in accordance with the Code of Practice for Nutrient Management.
- 13.5 Any new irrigation infrastructure is designed and certified by a suitably qualified independent expert.
- 13.6 All irrigation infrastructure is to be tested on a regular basis in accordance with the Code of Practice for Irrigation Evaluation.
- 13.7 Developing or maintaining riparian margins and shelter belts.
- 13.8 Fencing of waterways.
- 13.9 Other forms of riparian management.
- 14 Conditions of the consents were appealed by the Camerons and others. The particular conditions were the minimum flow that the consents were subject too. Appeals took some time to resolve, with this not occurring until January of 2012.
- 15 The Camerons were also caught up with the North Bank Tunnel Concept (NBTC) proposal by Meridian Energy Ltd (MEL) who wished to secure a 3.5 kilometre corridor through their flat land to convey water through an open canal. It was December 2012 before MEL advised they were abandoning the project and 2013 before the Heads of Agreement/Option Agreement was abandoned. The Camerons therefore had put any further development of their irrigation on hold and are only giving effect to CRC041003 this coming season.
- 16 The Camerons are committed to 'doing things right' and in order to ensure that all of their environmental obligations are met, set out to convert their K-Line and hard hose gun irrigation to centre pivot irrigation, all of which takes time and considerable financial investment.
- 17 They have 168 hectares under centre pivot irrigation completed as at the 2014/15 season. To date 370 hectares has been developed. Therefore, the irrigation

¹ The term MGAP has been replaced with GMP, but it is the same concept.

development is still on-going. All the flat paddocks now have a reticulated stock water scheme. Fencing is ongoing given that there are 45 km to be completed. Most waterways now have a permanent fence on one side and semi-permanent electric fencing on the other side to prevent access by stock into the waterways. A riparian planting program (ongoing) commenced in 2014.

- 18 The Camerons have also done OVERSEER modelling for their property. Their N lost to water is only 5 kg/ha/year.

PENTICOTICO STREAM

- 19 The Penticotico Stream rises in the ranges flanking the northern boundary of the Waitaki River mid-way between Kurow and the Stone Wall on SH82. The stream is characterised by steep, confined valleys upstream for most of its length until it emerges onto a broad fan surface over its final 2 km above SH82, with another 1km to the Waitaki River.

- 20 The stream is ephemeral in nature on the fan surface but maintains good stream flows for most of the year above the fan.

- 21 The mean flow of the Penticotico Stream is 130 l/s. This is assumed to be the mean flow before the stream enters the Waitaki River valley. Only when the stream flows are in excess of 300 l/s does the balance flow as surface water in the Penticotico stream bed. The maximum loss to the groundwater is 300 l/s with a mean loss of 6 l/s.

- 22 Heavy rain in the Penticotico catchment in March 1986 culminated in a major flood event estimated to have a return frequency in excess of 100 years. This caused significant damage to river protection plantings and stop banks, with thousands of cubic metres of shingle being deposited in the reach from the mouth of the Penticotico gorge to the Waitaki River (approximately 3 km).

- 23 The Penticotico Stream is the largest of the intermittent streams that are located in the vicinity of Wainui Station, the property owned by the Camerons. In a natural state, the Penticotico Stream would have likely discharged its flow on the alluvial flats, possibly into an area of wetland/swamp. In large flood events the flow may have inundated the low lying alluvial flat, draining into remnant channels, wetlands, before infiltrating to ground and/or flowing to the Waitaki River. There is evidence of a large alluvial fan that has formed on the alluvial flats which indicates that in the past the Penticotico Stream was unlikely to be confined as it is today.

- 24 The Penticotico Stream is the end point of a series of drains that interconnect on the Wainui Station property. The stream system has been created via a combination of

natural and human actions, with the drains essentially acting to reduce groundwater levels in the area for the purpose of draining swamp land. It is understood that formation of these drains primarily occurred during the early stages of farming the land in the early 20th century.

- 25 The flow in the stream is sourced from springs that emerge from depressions in the alluvial deposits on Wainui Station, with some of the springs fed by groundwater sourced from flow losses from the Waitaki River, rainfall, and irrigation recharge, and others fed by springs emerging from the base of the hill country, or a mixture of sources. A number of large springs that contribute flow to the Wainui Stream system have been identified on the Wainui Station property, with some located up to 4km upstream from the confluence with the Penticotico Stream.
- 26 In addition, the drains receive direct groundwater inflow through the bed, and are essentially gaining streams. Over the years the drains have been maintained by the land owners to maximise productive land area and to ensure the effectiveness of the drainage system.
- 27 The drains require maintenance every year to ensure drainage efficiency and to minimise the clogging of the drain system with waterborne weeds. This is done in consultation and advice from the engineering team at Environment Canterbury who administer the works undertaken in the Penticotico Catchment.
- 28 The path that the Penticotico Stream currently takes across the alluvial flats has been modified significantly over more than 100 years. This modification is in the form of channel realignment, riverbank planting, removal of gravel from the bed to prevent breakout, and other remedial works which prevent the flooding of the low lying farm land on Wainui Station and the neighbouring properties. Evidence of these modifications is provided by historical documents of the Waitaki River Catchment Board in the 1980s.
- 29 In 1985, the area was fenced into a conservation area by the Waitaki Catchment Commission and to this day, three land owners voluntarily contribute to earth works on a regular basis to remove the build-up of shingle from the mouth of the gorge and to where it flows under the Penticotico Bridge at SH82 to the Waitaki River.
- 30 The Canterbury Regional Council describes the Penticotico Stream as having characteristics of both a hill-fed and spring-fed river. Under normal conditions the stream is spring-fed, and water quality generally reflects this. However, the stream receives flushing flows and morphology is like that of a hill-fed river, while periphyton

and macrophytes are both present.² The “spring-fed” classification is only appropriate for the very lower reach of the stream, below the point at which it receives inflows from the farm drainage system on Wainui Station. Upstream of this point, the Penticotico is a vastly different stream, being steep, confined valleys.

- 31 Water quality samples have been taken from the Penticotico Stream by the Regional Council at the State Highway 82 Bridge between 1983 and 2016 (CRC Water Quality Site SQ10174). This is downstream of the confluence of the drainage system and the Penticotico Stream. The site has been monitored monthly since April 2013. Therefore, there is only two full years (2014 and 2015), which is a short duration of continual monitoring on which to base a limit in a plan.
- 32 The results of the water quality testing undertaken to date indicate that water quality is generally good given the surrounding land use, with nitrate-nitrogen levels ranging from 0.39 mg/L to 4 mg/L with an average of 1.39 mg/L. The water quality results are attached to this evidence in Appendix One. It is noted that no mention is made of the flow conditions at the time of sampling, and therefore, it is difficult to put context around the results.
- 33 Table 15B(c) of Section 15 of PC5 sets an annual median nitrate-nitrogen concentration of 1.21 mg/L, which is current state plus a small (8%) increase intended to align with the proposed future land use scenario proposed by the Council. The Camerons consider that the streams classification as “spring-fed plains” is incorrect given the contrast that exists between the its upper and lower reaches, and subsequently that proposed nitrate-nitrogen limit for the stream could potentially restrict Wainui Station to optimise its existing resource consents.
- 34 Therefore, the Camerons' submission seeks to amend the nitrate-nitrogen limit in Table 15B(c) to be the same as that specified in Schedule 8 of the Land and Water Regional Plan, being 3.8 mg/L.
- 35 In Appendix G of the S42a report, the comment is made that if the nitrate-nitrogen concentrations were to increase to this level, it is unlikely that other parameters (dissolved reactive phosphorus (DRP) and ammonia) would remain at current levels as intended in PC5, and therefore, ECan do not support increasing the nitrate limit for the Penticotico Stream.
- 36 Upstream of the Camerons' property, the predominant land use is dairy farming and dairy support, of which has occurred in recent years. There has also been a shift away from border dyke irrigation to spray irrigation. While conversion from border dyke to spray irrigation has many positives, coupled with intensification of land use, it

² Lower Waitaki rivers and streams: scenario assessment Surface water quality and ecology

can lead to higher concentrations of N in groundwater as a result of reduced dilution. There will be a time-lag before any evidence of this shows in the water quality sampling being undertaken on the Penticotico Stream.

- 37 The Camerons have also identified a number of mistakes in the land use inventory used by the Council to form the basis of the modelling undertaken for PC5. As alluded to in the preceding paragraph, the land use reference inventory (current and consented as at 1 January 2015), has the area immediately upstream of Wainui as dairy-border dyke. This 400-hectare area has been converted from border dyke irrigation to spray irrigation over a period of years. There is also 103 hectares previously owned by the Camerons immediately adjacent to Waitaki River. This has been converted from border dyke irrigation to spray irrigation, and from sheep and beef to dairy support. Downstream of Wainui is a farm labelled in the land use inventory as being a spray irrigated sheep and beef farm. It has been a dairy farm for at least ten years.
- 38 These mistakes have been identified from one person reviewing the land use inventory, and there are bound to be more. I understand that the modelling is done at a large scale, and minor mistakes possibly have little influence on the results of the modelling. However, from a farmer's perspective, it reduces the confidence in any of the modelling undertaken and therefore, limits that have been set. And, it could be that multiple mistakes together, will have a more than minor influence on the modelling results.
- 39 The Camerons want to continue to implement their consents with certainty. They are guardians of their land, and in no way want to see the overall water quality of the Penticotico Stream deteriorate. The environmental mitigation that they are subject to will ensure that whatever they do on farm will be sustainable long term.
- 40 The Camerons' concerns that the nitrate-nitrogen limit for the Pentcotico Stream in Table 15B(c) of PC5 set could potentially restrict Wainui Station's ability to optimise its existing resource consents are valid and the limit should be changed to reflect that. This is because of the short duration of continual monitoring upon which the levels have been set, coupled with known mistakes in the land use inventory used in the modelling for PC5, and the uncertainty around the time lag between intensification in the catchment occurring upstream of the Cameron's property and the effects of this showing in the Penticotico Stream.

NORTH BANK GROUNDWATER

- 41 Groundwater is found at shallow depths on Wainui Station, with a number of monitoring wells installed by MEL as part of the Project Aqua pre-consenting

investigations and subsequently the NBTC. The depth to groundwater typically ranges between 0.5 m and 2.0 m below ground level (Fraser, 2008).

42 The interaction between surface water and groundwater is complex in this area. However, what we do know is that the stream system is essentially sustained by groundwater inflows.

43 The Camerons also submitted on Table 15B(e) which sets water quality limits for groundwater. The Mid-Waitaki North Bank annual average concentration for nitrate-nitrogen has been set at 2.3 mg/L. This appears to be an arbitrary value, and while it is greater than current measured values, the number of groundwater quality monitoring points on the North Bank is very limited, and water quality sampling has been sporadic.

44 There is no discussion at all on this in the S42a report. Until further information through a sustained monitoring programme is sustained, the Cameron's seek to set this value at 5.65 mg/L, which is that specified in Schedule 8 of the LWRP. The reasons for seeking this are the same as for the relief sought for the Penticotico Stream, in that the stream flow is sustained by groundwater inflows, therefore groundwater quality ultimately affects water quality in the stream as well.

CONCLUSIONS

45 The reclassification of the Penticotico Stream as a spring fed stream does not reflect the true nature of the entire stream system. The Council has identified it as having characteristics of both a "hill-fed lower" and "spring-fed plains" river system.

46 The classification of the Penticotico Stream as "spring-fed plains" in Table 15B(c) only reflects the point at which the it receives inflows from the farm drainage system on Wainui Station, and does not accurately reflect the system as a whole.

47 While the water quality monitoring data collected at SH82 Bridge is downstream of the confluence of the drains and the main-stem of the Penticotico Stream, the reclassification and corresponding limits should more properly reflect the contrasting characteristics of the stream that have been described in my evidence.

48 The Camerons want to continue to implement their consents with certainty. Given this, they are concerned that because the annual average nitrate-nitrogen concentrations set for the Penticotico Stream and Mid-Waitaki North Bank Groundwater have been determined off short term or limited data, and a land use inventory that many identified mistakes, then the limits in Tables 15B(c) and Table 15B(e) will not enable them to do this.

49 Therefore, the relief sought is to amend the average annual nitrate-nitrogen concentration for the Penticotoco Stream to 3.8 mg/L (Table 15B(c)) and for the Mid-Waitaki North Bank Groundwater to 5.65 mg/L (Table 15B(e)).

A handwritten signature in black ink, appearing to read 'Keri Johnston', is positioned above the typed name.

Keri Johnston

22 July 2016

APPENDIX ONE – PENTICOTICO STREAM WATER QUALITY DATA

Date	Time	Dissolved Reactive Phosphorus	Nitrate and Nitrite Nitrogen	Field Notes
		mg/L	mg/L	
23-Jan-13	720	< 0.004	1.48	
23-Apr-13	858	< 0.004	1.04	
28-May-13	1314	0.008	1.03	
10-Jun-13	1005	0.012	1.38	
18-Jul-13	907	0.01	3.9	
26-Aug-13	1005	0.004	4	
19-Sep-13	910	0.003	2.2	
17-Oct-13	750	0.003	1.26	
12-Nov-13	800	0.0084	0.97	digger operating cleaning bed of stream flowing through farm paddocks. Bed at sample site has been deepened.
4-Dec-13	753	0.0056	1	bed excavated in November
16-Jan-14	755	0.0025	0.98	
14-Feb-14	800	0.0031	0.84	
12-Mar-14	730	0.0021	1.04	
22-Apr-14	905	0.0071	1.37	high flow following recent heavy rain
21-May-14	850	0.0066	1.77	
12-Jun-14	855	0.0051	1.1	
15-Jul-14	1231	0.0049	1.95	
12-Aug-14	1251	0.0049	1.57	
25-Sep-14	918	< 0.0010	1.01	
15-Oct-14	810	0.0012	1.06	
21-Nov-14	816	0.0021	1.11	DO done using d22
10-Dec-14	818	0.0034	0.96	assessment done just below bridge due to braiding downstream
22-Jan-15	805	< 0.0010	0.92	machinery working upstream
10-Feb-15	812	0.0039	0.97	
12-Mar-15	825	0.0028	1.03	
22-Apr-15	915	0.0043	1.05	below bridge stream is 25m wide due to weed buildup. assessment done above bridge where channel is more defined
18-May-15	916	0.004	0.92	
15-Jun-15	900	0.0046	0.75	samples not collect by Courier - processed up to 36 hours after sampling
16-Jul-15	930	0.004	0.7	
11-Aug-15	906	0.0034	0.54	
11-Sep-15	916	0.0022	0.43	
14-Oct-15	757	0.0013	0.39	
18-Nov-15	757	0.003	0.6	very weedy
8-Dec-15	746	0.0046	0.89	
20-Jan-16	755	0.0047	1.52	assessment site changed to above bridge as downstream site no good
16-Feb-16	748	0.0025	1.97	
11-Mar-16	757	0.001	1.95	
14-Apr-16	839	0.0014	2.2	
12-May-16	853	0.0015	1.66	stock have been in waterway
8-Jun-16	852	0.0039	1.61	

Note:

ECan does not measure nitrate nitrogen. Typically, most of the nitrate-nitrite nitrogen (NNN) is nitrate because the nitrite is not stable and converts to nitrate. So the NNN is a good indication of the nitrate concentration at a site.