BEFORE THE COMMISSIONERS ON BEHALF OF THE OTAGO REGIONAL COUNCIL

Consent No. RM16.093.01

BETWEEN	**CRIFFEL WATER LIMITED**
	Applicant
AND	**OTAGO REGIONAL COUNCIL**
	Consent Authority

BRIEF OF EVIDENCE OF ROGER JOHN SIMPSON

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BRIEF OF EVIDENCE OF ROGER JOHN SIMPSON

1. My name is Roger John Simpson. I am a Director and Shareholder of Irritech Otago Limited which is based in Cromwell. I have 15 years' experience in operating and maintaining pumping and irrigation systems for the agricultural and industrial sector. I have been involved in the design, construction and operation of irrigation schemes throughout Canterbury and Otago regions including developments on numerous high profile country stations, horticulture developments, rural subdivision developments, high pressure water transfer projects, piped and open channel water meter development and implementation and rural sector automation systems for efficiency, compliance and environmental protection.

2. My involvement within the Luggate catchment is supplying irrigation design and equipment for the purpose of water efficiency and production

3. I am a trade qualified electrician and hold currency a current NZ practicing certificate

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

5. I have been engaged by Criffel Water Limited to provide advice on:

   (a) Water demand for the existing spray infrastructure within the scheme;

   (b) the options available to the scheme to improve water use efficiency;

   (c) Identify opportunities for development further infrastructure utilising supplementary water.

6. This information was utilised by CWL to develop its amended proposal now being put forward for consent.

EXISTING SCHEME

7. The existing scheme is fairly typical for its age. Consisting of an intake system to direct water from Luggate creek into a pipeline to transfer to a location where the water is metered and split. Consumers have their water supplied via a race network where they direct into pipes and/or pumps or sub-race networks for application

8. Current spray irrigation in place is mostly via Kline Pods and Pivots resulting in the most efficient form of water application available to market.

9. In my investigation I have been advised of 619ha of existing spray irrigation infrastructure which is identified in green on the plan attached at Appendix 1.

10. Current estimation of costs of spray infrastructure to date installed on landowner blocks is as below

Current Costs for Areas Developed (Estimate)			
Landowner	Cost $	Cost/$ha	Components
Corbridge	$ 179,800.00	$ 6,200.00	Hardhose, Mainline, Install, Pumping
Allen	$ 349,600.00	$ 3,800.00	Kline, Mainline, Install, Pumping
Cooper	$ 288,000.00	$ 4,800.00	Pivots, Mainline, Install, Pumping
Wallis	$ 312,000.00	$ 4,800.00	Pivots, Mainline, Install, Pumping
JBIL	$ 932,880.00	$ 3,120.00	Kline, Mainline, Install,
Morris	$ 216,000.00	$ 4,800.00	Pivots, Mainline, Install, Pumping
Feint	$ 90,480.00	$ 3,120.00	Kline, Mainline, Install,
MacDonald	-	-	
Cameron	-	-	
Wallis	-	-	
Lucas	-	-	
Nyhon	-	-	
Young	-	-	
Total Investment	$ 2,368,760.00		

WATER DEMAND

11. Having identified the existing irrigation area I was asked to assess the water demand for that area. There are various tools for doing this such as Aqualinc guidance and recommendations from regional farm consultants/agronomists as well as personal experience from many farm irrigation developments under my company brand.

12. From the guidance above I have selected an appropriate application rate for this area is 5mm/day. I have calculated the water demand figures on this basis. My breakdown of these calculations is attached at Appendix 2.

13. I understand that CWL are now seeking to apply for 358l/s of primary allocation which will support irrigation on the existing areas identified in Column 2 of Appendix 1. CWL are then also seeking 170l/s of the first supplementary allocation block and 80l/s of the second supplementary block (equating to 250l/s). As you will note that does not equate to the 264l/s I have calculated as being the necessary instantaneous rate required to irrigate the areas identified for future irrigation. This is not material in the context of the supplementary takes as it will be necessary for storage to be available to support water availability from the supplementary block during the irrigation season. The supplementary water can be taken at any time of the year (subject to the minimum flows) and water stored to provide supply as natural flows recede during the irrigation season. The proposed take rates provide ample capacity for the necessary volumes to be harvested to irrigate the identified areas.

FUTURE EFFICIENCY GAINS

14. CWL Scheme is at an advantage where because water is collected and distributed at elevation there is the ability to supply irrigation infrastructure via pipes to the irrigable areas under gravity pressure. This provides the maximum of water efficiency and eliminates the need for any pumping infrastructure on lower areas.

15. I have undertaken a preliminary assessment of the costs associated with these works which I set out as follows: See also appendix 3.

CWL Infastructure Upgrade Costings (Estimates)		
Project	Costs $	Components
Upgrade Infrastructure to Splitter	$ 291,000.00	Intake, Pipeline, Metering, Install
Convert East Race Branch to Pipe	$ 265,000.00	Pipeline, Materials, Install
Convert West Race Branch to Pipe	$ 640,000.00	Pipeline, Materials, Install
Gravity Pipeline to West Consumers	$ 192,000.00	Pipeline, Materials, Install
Gravity Pipeline to East Consumers	$ 435,000.00	Pipeline, Materials, Install
Consumer Offtakes and Metering	$ 125,000.00	Valving, Metering, Install
Total Investment	$ 1,948,000.00	

FUTURE IRRIGATION AREAS

16. Whilst the efficiency gains I identify above will have some economic benefits on their own, they also come at a significant capital cost. To support this expenditure CWL shareholders have identified the need to enable opportunities for some future irrigation. The potential future irrigation areas are identified in red on the Plan attached in Appendix 1.

17. These areas have all previously been used for flood irrigation to varying degrees since the scheme was developed. There are opportunities for some water users (such as Corbridge) to establish storage to support spray irrigation infrastructure utilising supplementary water now being applied for. Options and planning for this development are in their early stages and as such it is not entirely clear yet the extent of it. The first consideration in the development of spray irrigation is of course water availability and its reliability. Once the maximum available flow rate is obtained, I then calculate how much land this will irrigate. This then becomes the benchmark for maximum area that can be irrigated. This can vary depending on the users pasture or crop requirements. I then use the water reliability and calculate how much land can be irrigated under flow restrictions, how much storage is required to sustain some irrigation during periods of restriction and what type of irrigation best suits the reliability of the available water.

18. As reliability drops then I would usually start to move away from more expensive spray systems (pivot and fixed grid sprinklers) to more flexible systems such as k-line and hard hose. The lowest ranking of the options is to develop some border dyke or contour flood if reliability is too low to justify any expenditure on spray irrigation infrastructure.

19. To install centre pivot irrigators and fixed grid sprinklers I would usually want to see reliability over 90%, with 94 - 100% being preferred and 80-90% for hard hose and k-line systems, with overland flow methods such as border dyke and contour flood for surety of supply less than 80%. This is for two reasons:

    (a) Because pivot/fixed grid systems are the most expensive and so require a greater return to justify the investment, and

    (b) Because these systems use the least amount of water to irrigate a given area (i.e. their water use efficiency is the highest), the consequences of restrictions (i.e. missing an irrigation day) for the crop underneath are the greatest. In simple terms, crops under pivot suffer drought stress much sooner than say crops under border dyke and so the water application reliability needs to be higher to avoid production losses.

20. Once the reliability has been determined we might either: reduce the area irrigated to increase the reliability; or change the type of irrigation to limit capital expenditure to suit the reliability.

21. As you can see there are a lot of variables to consider. It is also necessary to work with each individual landowner to understand their operational requirements, appetite or capacity to take on debt to fund the infrastructure and so on.

22. For the purposes of understanding the potential future extent I have undertaken a preliminary assessment of the costs of developing the full future irrigation area identified in Appendix 1 as follows. Obviously I have had to make a number of assumptions about what will occur, but this offers some insight into the potential capital upgrade costs by CWL

shareholders for their future areas. _The costings below are based on the infrastructure upgrades outlined in 14. above to have taken place_

Future Areas To Spray Development Costings			
Landowner	Cost $	Cost/$ha	Components
Corbridge	$ 1,055,340.00	$ 4,290.00	Pivots, Kline, Mainline, Install
Allen	$ 53,040.00	$ 3,120.00	Kline, Mainline, Install
Cooper	-	-	-
Wallis	$ 14,750.00	$ 2,950.00	Kline, Mainline, Install
JBIL	$ 303,960.00	$ 5,960.00	Kline, Pumping, Mainline, Install
Morris	$ 69,750.00	$ 4,650.00	Kline, Pumping, Mainline, Install
Feint	$ 51,150.00	$ 4,650.00	Kline, Pumping, Mainline, Install
MacDonald	$ 59,280.00	$ 3,120.00	Kline, Mainline, Install
Cameron	$ 56,160.00	$ 3,120.00	Kline, Mainline, Install
Wallis	$ 62,400.00	$ 3,120.00	Kline, Mainline, Install
Lucas	$ 56,160.00	$ 3,120.00	Kline, Mainline, Install
Nyhon	$ 59,280.00	$ 3,120.00	Kline, Mainline, Install
Young	$ 59,280.00	$ 3,120.00	Kline, Mainline, Install
Total Investment	$ 1,900,550.00		

FLOW SHARING

23. I understand that there have been some discussions about how low flow sharing should be managed. In my view it is important to enable water users flexibility to manage water use during periods of low flow. Irrigation infrastructure is designed to optimise efficiency. Therefore it is not as simple as 'turning down' your pivot to 25%. Instead, irrigators will tend to have peripheral areas or areas of drought resistant crop that they turn off in their entirety as flows drop. These peripheral systems are generally border, k-line or hard hose gun systems that can apply water at higher rates allowing rostering of their use, so water users may move to day on day off to reduce flows. Once again a simple percentage reduction can make this more difficult to do and results in greater production losses with no ecological upside.

24. In my experience water user groups are highly motivated to work together to manage flows in this way as they all see the mutual benefit in proactively doing so.

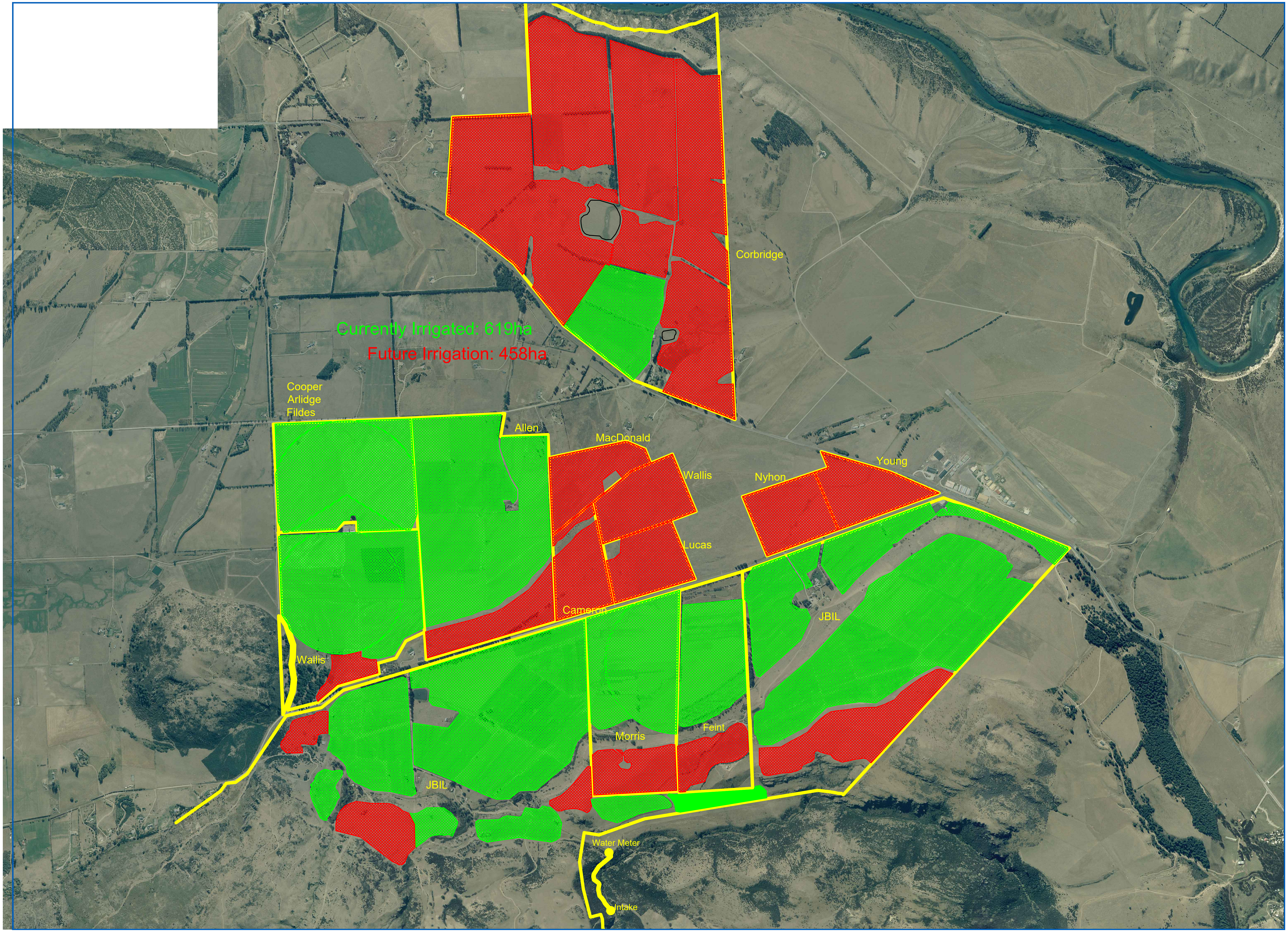
Date: 07-10-19

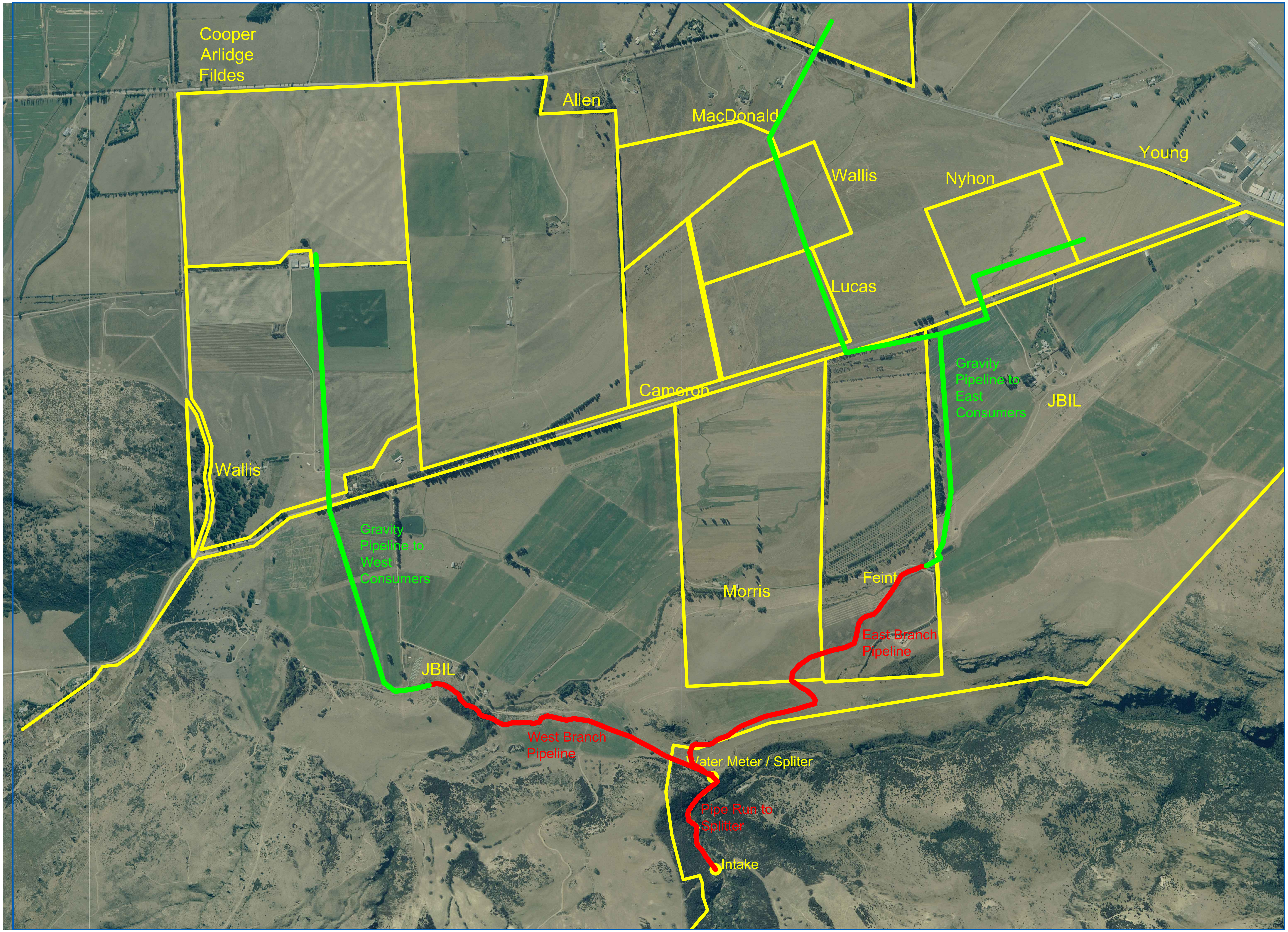
Roger John Simpson

CWL 23/08/2019

5.0mm Application Chart

Shareholder	**Currently Irrigated**	**Flow @ 5.0mm/day**	**Future Irrigated**	**Flow @ 5.0mm/day**	**Flow Totals**
Corbridge	29ha	16.7l/s	246ha	142l/s	158.7l/s
Allen	92ha	53.2l/s	17ha	9.8l/s	63.0l/s
Cooper	60ha	34.7l/s	-	-	34.7l/s
Wallis	65ha	37.6l/s	5ha	2.9l/s	40.5l/s
JBIL	299ha	173l/s	51ha	29.5l/s	202.5l/s
Morris	45ha	26.0l/s	15ha	8.6l/s	34.6l/s
Feint	29ha	16.7l/s	11ha	6.3l/s	23.0l/s
MacDonald	-	-	19ha	10.9l/s	10.9l/s
Cameron	-	-	18ha	10.4l/s	10.4l/s
Wallis	-	-	20ha	11.5l/s	11.5l/s
Lucas	-	-	18ha	10.4l/s	10.4l/s
Nyhon	-	-	19ha	10.9l/s	10.9l/s
Young	-	-	19ha	10.9l/s	10.9l/s
Totals	619ha	357.9l/s	458ha	264.1l/s	622l/s


Currently Irrigated: 619ha
Future Irrigation: 458ha
Corbridge
Cooper
Arlidge
Fildes
Allen
MacDonald
Wallis
Nyhon
Young
Lucas
Cameron
JBIL
Wallis
Morris
Feint
JBIL
Water Meter
Intake


Cooper
Arlidge
Fildes
Allen
MacDonald
Young
Wallis
Nyhon
Lucas
Cameron
Gravity
Pipeline to
East
Consumers
JBIL
Wallis
Gravity
Pipeline to
West
Consumers
Feint
Morris
East Branch
Pipeline
JBIL
West Branch
Pipeline
Water Meter / Spliter
Pipe Run to
Splitter
Intake