Before the Independent Hearing Panel
Appointed by the Central Otago District Council

Under	the Resource Management Act 1991
In the matter of	Private Plan Change 14 to the Central Otago District Plan

Second supplementary evidence of Ricky Paul Larsen

8 June 2020

Applicant's solicitors:
Sarah Eveleigh
Anderson Lloyd
Level 3, 70 Gloucester Street, Christchurch 8013
PO Box 13831, Armagh, Christchurch 8141
DX Box WX10009
p + 64 3 379 0037 | f + 64 3 379 0039
sarah.eveleigh@al.nz

anderson lloyd.

Introduction

1 My name is Ricky Paul Larsen.

2 I have prepared a statement of evidence dated 13 May 2020. My qualifications and experience are set out in that statement. I have also prepared a supplementary statement of evidence dated 25 May 2020.

3 This statement of evidence, together with the evidence of Tom Heller and Ben McCarthy, addresses matters raised in the evidence of Mr James Dicey for Residents for Responsible Development Cromwell, in relation to the availability of additional water to support productive land use. In particular, this statement addresses:

(a) The Ripponvale Irrigation Company Limited scheme; and

(b) The Waterforce assessment of water use requirements and summary of differences between this assessment and the assessment undertaken by Mr Dicey.

Executive summary

4 NZ Cherry Corp is a significant shareholder in Ripponvale Irrigation Company Limited (**RICL**) and currently uses RICL water for irrigation and frost fighting of its existing orchard. NZ Cherry Corp has identified a number of issues in reliability of the scheme, in terms of both water quantity and quality.

5 I understand that provision of additional water during peak demand periods is not possible given the current capacity of the races, and that reflects NZ Cherry Corp's experience during peak times. Based on my knowledge of the way in which the RICL scheme is operated and the content of the Water User Agreement, I consider it very unlikely that RICL would take any action in the immediate term to upgrade the race network to address the reliability issues or increase capacity.

6 Reliance on the RICL supply is an existing risk to the NZ Cherry Corp business. Increasing the area of orchard that relies on RICL water would further increase this risk, not only for the new orchard area, but also the existing orchard area, as the increase in total demand on the scheme at peak times would further reduce reliability for the existing orchard. Retaining the additional RICL water as a contingency goes some way towards mitigating the existing risk.

7 The assessment of water use by Waterforce finds that the current bore supply, combined with a proposed 20,000m^3 storage facility, is sufficient to irrigate the proposed 22ha cherry orchard extension and provide frost fighting supply for up to four consecutive days. Given the scale of the NZ Cherry Corp operation and the

potentially catastrophic effect on an entire season's production if a frost event is not managed, I consider that this is an appropriate level of reliability.

8 The assessment by Waterforce also finds that if an additional 15L/s (identified by Mr Heller) could be obtained, this would be sufficient to provide irrigation and frost fighting water supply to an additional cherry orchard area of 11 hectares, allowing for an additional 10,000m^3 of storage and a pond refilling time of 7.7 days.

9 I have identified a number of differences in the water use assessments for cherry orchards provided by Mr James Dicey and Waterforce. In summary, I consider Mr Dicey's assessment significantly under-estimates water demand at peak times (particularly for frost fighting), and over-estimates available water within the months water is used.

Ripponvale Irrigation Company Limited (RICL)

10 NZ Cherry Corp holds 300 shares (15.62%) in RICL via two different entities and is the second largest individual shareholder. One of the NZ Cherry Corp directors is also one of six directors of RICL. There are 58 other RICL shareholders.

11 RICL operates pursuant to a resource consent from Otago Regional Council. The current consent is Consent No. 2009.068, a copy of which is attached as **Appendix 1**.

12 RICL takes water from the Kawarau River, near the intersection of Pearson Road and State Highway 6. The take is subject to abstraction limits including an instantaneous rate, and monthly and yearly allocation limits. A greater volume of water is available in September, October and November, reflecting the higher demand for water for frost fighting in these months.

13 Water is distributed through an open race network. The race supplies water to the flats and foothills in the Ripponvale area, between the Kawarau River and the NZ Cherry Corp property, as shown in Appendix 1 of the consent document. There are two races which are called Race A and Race B. NZ Cherry Corp only has access to water via the Race B network, which terminates at the current NZ Cherry Corp orchard. A copy of the race network map is attached as **Appendix 2**. Coming off the main races there are distribution boxes, which divert the flow of the race water to the individual property supply channel.

14 All RICL water users must hold a Water User Agreement (**WUA**). The current WUAs expired on 30 April 2020. I understand that new WUAs are imminent. The expired WUA provided that water would be supplied in accordance with a roster provided at the commencement of the irrigation season, however in practice this has not occurred in recent times. I understand that the new WUA will simply provide that water users may take water at such times as authorised by RICL. The expired

WUA provides that, where supply is diminished, there is no right of action against RICL and available water will be divided amongst users on a pro-rata basis.

15 In NZ Cherry Corp's experience, and particularly given its location at the end of the race network, there can be issues with reliability of supply during high demand periods. The RIC scheme is managed by two operators (one manages the river pumps and Race A and the other manages the Race B). Although there is supposed to be a delivery roster, the scheme operates in a very 'hands on' practical daily assessment basis.

16 In the past, the wide mix of summerfruit varieties spread seasonal and daily water load based on a mix of different fruit season water supply requirements. However the majority of summerfruit (apricot, peach, nectarine, pear and plum) orchards have now been pulled out and virtually totally replaced with cherry orchards. The intensification of cherry growing in Ripponvale means in peak demand periods (eg. run of frost events in September and October or a long dry spell / drought in summer) the operators are trying to satisfy all shareholders, who could be running low on supply. Demands from other activities, particularly grazing areas at the Racecourse, contribute to pressures during dry summer conditions.

17 Accessing RICL water has become more difficult and frustrating over recent years and with NZ Cherry Corp situated at the very end of the B race we are often having to wait a few days to get our turn at 'topping up' our storage pond. There have been occasions where individual orchardists have accessed supply themselves, just to be sure their ponds are full as a contingency to fight forecasted future frost events or an oncoming dry spell, leaving orchards down the race with very low pond levels and risk of running out of water.

18 As noted above, water is supplied through an open race network. I am aware that there have been issues with excess vegetation, accumulation of debris, and stock grazing and defecation within the races. There has been a prolonged period spanning a number of months with a number of rain events where sediment runoff from earthworks impacted the race. Overland flow from the Pisa Range generally terminates within the races, which creates further potential for sedimentation and introduction of contaminants. Some parts of the race are also in poor condition. Examples of these issues are provided in the images in **Appendix 3**, which show the current state of the races.

19 These issues create uncertainty regarding the quality of water supplied. In particular, the earthworks resulting in sediment laden water negatively impacted on spray irrigation infrastructure within the cherry orchard and created the very real risk of contaminant getting on the trees and fruit. I am aware that a number of orchardists had to drain their ponds a number of times to ensure clear, safe water. The expired WUA provides that RICL makes no undertaking as to the condition or

quality of the water supplied. It also provides that RICL is under no obligation to construct or replace any irrigation works.

20 I understand that RICL may not currently take its full consented allocation. However the key issue from an operator's perspective is whether more water could be supplied at critical, high demand times. I understand that this is not possible within the existing race capacity, and that reflects NZ Cherry Corp's experience in high demand periods. Based on my knowledge of the way in which the scheme is managed and the direction given in the WUA, I consider it very unlikely the RICL would take any action in the immediate term to upgrade the race network to address the issues discussed above or increase capacity.

21 Reliance on RICL water is an existing risk to NZ Cherry Corp's business. Increasing the area of orchard that relies on RICL water would further increase this risk, not only for the new orchard area, but also the existing orchard area as the total demand on the scheme at peak times would further impact on reliability. Retaining the additional RICL water as a contingency goes some way towards mitigating the existing risk.

Waterforce assessment of water use requirements

22 NZ Cherry Corp engaged Waterforce to confirm water use requirements on the cherry orchard. Waterforce's assessment is based on water use parameters from the existing cherry orchard.

23 A copy of the Waterforce assessment is attached as **Appendix 3**. It concludes that the bore provides sufficient water for irrigation, and when combined with 20,000m^3 storage, provides sufficient water for four consecutive nights frost fighting, with a pond refilling time of 7.5 days. This meets NZ Cherry Corp's requirements for frost fighting reliability. The larger the storage is the greater the area of orchard that can reliably be supplied with water for 4 consecutive days of frost fighting *from full storage.* However refilling the storage takes longer and reliability is decreased later in the season where storage is not completely refilled between events. Another way to assess the reliability is to allow for 20 frost events over a two month period (September and October) as equating to approximately one event every three days. With a daily supply of 2,592m^3 and frost fighting requirements of 7,040m^3 per 8 hour event,[1] the water supply is sufficient to meet approximately one event every three days, with storage providing for some of these events to occur consecutively.

24 More recently, NZ Cherry Corp has asked Waterforce to update their assessment to consider the area of land that could be irrigated by an additional 15L/s sourced on the PC14 site. This is the quantity of water identified by Mr Heller as reasonably

---

[1] 4mm water per m^2 of orchard equates to 40m^3 per hour per hectare. 40m^3 x 22 ha x 8 hours = 7,040m^3

expected at the site, noting that a consenting process must be followed to secure the allocation, and drilling and testing would be required to confirm the yield. This assessment has been undertaken on the assumption that the additional area would be managed in the same way as the existing orchard.

25 Waterforce concludes that an additional 15L/s could support an additional 3.5 hectares of cherry orchard utilising the storage already proposed; 11 hectares with an additional 10,000m^3 of storage and a pond refilling time of 7.7 days; or up to 15 hectares with an additional 15,000m^3 of storage and a pond refilling time of 9 days. I consider the an acceptable level of reliability is provided for 11 hectares with 10,000m^3 of storage, having regard to both the consecutive days of frost fighting and the pond refilling time. This scenario also provides sufficient water to frost fight one in three days[2] during September and October. By comparison, there is only sufficient water to frost fight approximately one out of four days[3] during September and October if the orchard area is extended to 15 hectares.

26 The water use assessment undertaken by Waterforce incorporates NZ Cherry Corp criteria for reliability of water supplied by the bore. NZ Cherry Corp has also chosen to retain water supplied by RICL as a back-up, rather than rely on use of that water as a primary supply. It could be argued that this is a conservative approach. In this section of my evidence I address the reasons for this (in addition to the concerns regarding RICL water set out above).

27 As discussed in my earlier statements of evidence, cherries are a volatile and high risk crop. Even with careful management, yield can vary significantly from year to year – for example in the 2017/18 season the combined yield from NZ Cherry Corp and Judare orchards was 768 metric tonnes, while in the 2019/20 season yield was only 320 metric tonnes. A single frost event where water is not available for frost fighting could have a catastrophic effect on an entire season's production. Central Otago will generally encounter 15 to 20 frost events during September and October each year (2018 = 18, 2019 = 20) and can regularly push temperatures down to -2 to -3 degrees. Cherry trees become more susceptible to frost damage as the fruit moves from ‘first swelling’ (withstand down to -5 degrees and 90% fruit kill below -15 degrees), through ‘green tip’ (withstand -4 degrees and 90% fruit kill below -10 degrees), onto ‘open cluster’ (withstand down to -2 degrees and 90% fruit kill below -6 degrees) and eventually ‘full flower bloom’ (withstand down to -1.7 degrees and 90% fruit kill below -4 degrees). It is the open cluster and full flower bloom phases that NZ Cherry Corp is particularly concerned to manage as this is when the most significant crop losses are likely to occur. For these reasons, NZ

---

[2] 3,520m^3 required per 8 hour event / 1,296m^3 daily volume available

[3] 4,800m^3 required per 8 hour event / 1,296m^3 daily volume available

Cherry Corp requires sufficient reliability of water for four consecutive days frost fighting.

28 NZ Cherry Corp's decision to retain the RICL water as a back-up supply is primarily to provide greater reliability to the existing and expanded cherry orchard. I have also commented above on issues regarding reliability of the RICL water supply. I note that of the properties supplied with RICL water, four operate larger scale commercial operations (45 South, NZ Cherry Corp, Jones, and Sarita), and with the exception of NZ Cherry Corp are all located on the A Race. Other properties supplied are smaller and generally comprise a home and orchard, where occupiers hold other employment additional to the orchard operation.

29 NZ Cherry Corp is the largest netted cherry orchard in New Zealand, and in recent years has accounted for approximately 9.5% of the total export cherry production in New Zealand[4]. The scale of NZ Cherry Corp's operation and investment means that an unmanaged frost event cannot be sustained. Levels of reliability and risk that might be acceptable to other smaller operations, and the resources that they might apply to address those risks, are not directly transferrable to NZ Cherry Corp's operation. In my experience as a commercial orchard manager, I consider that NZ Cherry Corp has applied prudent criteria for water reliability.

30 The water use assessment undertaken for NZ Cherry Corp differs from assessments presented in the evidence of Mr James Dicey at Appendix 16. I note the following key differences:

(a) Mr Dicey's assessment is based on calculating irrigation demand per hectare within the months October – March, and then calculating "Hectares to plant" by dividing the total available supply by his calculated demand per hectare per season. The Waterforce assessment is based on ability to meet daily water demand having regarding to instantaneous, daily and monthly abstraction limits and storage. In summary, Mr Dicey's assessment significantly under-estimates water demand at peak times, and over-estimates available water within the months water is used.

In relation to calculation of water demand:

(b) Mr Dicey's allocation of 60,000 litres per hectare per day (or 6mm per day) is acceptable for basic tree irrigation from November through to March. I note that he has only allowed 30,000 litres per hectare per day for February and March. Although irrigation demands start to reduce during this period as trees move into hibernation and winter, this level of irrigation is too light.

---

[4] Averaged over the last seven years, based on export value

(c) However, his assessment ignores frost fighting requirements which create the greatest demand for water. Frost fighting occurs in the period September – October. It should be noted that Mr Dicey's water use calculation does not provide any water requirement in the month of September, which is the very month where the maximum daily use of water for frost fighting is at the highest monthly level.

(d) Frost fighting requires 4mm / hour per square metre, which equates to 40,000 litres per hectare per hour (compared to Mr Dicey's 60,000 litres per hectare per day allowance). If we have an 8-hour frost event that equates to a requirement for 320,000 litres per hectare, or for the 22 hectare extension 7,040,000 litres per event (or 7,040m^3). Mr Dicey's provision of 60,000 litres per hectare per day therefore only represents 19% of what would be required per hectare to service an 8 hour frost event.

(e) The two assessments of water demand are compared below

Month	**Dicey assessment (litres per hectare per day)**	**NZ Cherry Corp assessment (litres per hectare per day)**
September	0	Up to 320,000
October	60,000	Up to 320,000
November - January	60,000	60,000
February - March	30,000	60,000 (reducing irrigation from 2 hours per day by 30 minutes per day over the last 2 weeks in March)
April - August	0	0

In relation to the supply of water:

(f) Mr Dicey has assumed that any quantity within the annual allocation can be accessed as required. However, because NZ Cherry Corp only irrigates over

7 months of the year, its practical allocation from the bore is limited by the maximum monthly allocation to approximately 544,320m^3.[5]

(g) The Waterforce assessment demonstrates that the maximum consented flow rate and daily volume constrain the area over which frost fighting can occur, even where this is enhanced by storage. I note that the water required for a single 8 hour frost event is the equivalent of 2.7 times the maximum daily volume that can be taken from the bore[6], and that once the dam is empty it would take 8 days of continuous pumping from the bore to refill it.[7]

31 NZ Cherry Corp has not obtained an assessment of water demand for viticulture. I rely on Mr Edwards' assessment that the site characteristics do not compare favourably to other sites in the Cromwell basin for viticultural use, and accordingly the site is unlikely to be chosen for this form of development.

Ricky Paul Larsen
8 June 2020

---

[5] Maximum consented monthly allocation of 77,760m^3 x 7 months = 544,320m^3. Small quantities of additional water may be stored outside of the irrigation season.

[6] An 8 hour frost event requires 7,040m^3, maximum daily volume from the bore is 2,592m^3

[7] 20,000m^3 dam capacity / 2,592m^3 daily volume

Appendix 1 – RICL groundwater permit

Our reference A317460

Consent No. 2009.068

WATER PERMIT

Pursuant to Section 104 B of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Ripponvale Irrigation Company Limited

Address: c/-Mead Stark 29 The Mall Cromwell

To take and use water for the purpose of irrigation.

For a term expiring 9 August 2046

Location of Point of Abstraction: Kawarau River approximately 650 metres east northeast of the intersection of Pearson Road and Kawarau Gorge Road (State Highway 6) Cromwell

Legal Description of land at point of abstraction: Section 1 SO23357

Legal Description of lands where water is to be used: see Appendix 1 and other land as advised in writing to the Consent Authority

Map Reference at point of abstraction: NZTM E1295754 N5003250 F41:057-650

Conditions

Specific

1. If this consent is not given effect to within a period of two years from the date of commencement of this consent, this consent shall lapse under section 125 of the Resource Management Act 1991.
2. The rate of abstraction shall not exceed
   (a) 445 litres per second;
   (b) 616,827 cubic metres per month
   (c) 4,085,858 cubic metres per year
   (d) in addition to (b) above the amount of 729,600 cubic metres can be added to the monthly amount during the months of September, October and November when water is used for frost fighting purposes.
3. The intake shall be screened so as to prevent the ingress of small fish and elvers.

Performance Monitoring

4. (a) The consent holder shall install a water meter to record the water take, within an error accuracy range of +/- 5% over the meter's nominal flow range, and a datalogger with at least 12 months data storage to record the rate and volume of take, and the date and time this water was taken. (All practicable steps shall be taken to ensure that the meter's nominal flow range coincides with required pumping rates. An error accuracy of +/- 10% shall apply to meters when

pumping rates are below the nominal flow range.)

(b) The datalogger shall record the date and time of each increment of 10,000 litres of water.

(c) The installation and maintenance of the water meter and datalogger shall be performed in accordance with manufacturer's specifications and for the water meter only, to New Zealand Quality Standard ISO 4064 and subject to condition 4(d).

(d) The water meter shall be installed in a straight length of pipe, before any diversion of water occurs. The straight length of pipe shall be part of the pump outlet plumbing, easily accessible, have no fittings and obstructions in it, and be of a length that is at least 15 times the diameter of the pipe. The water meter shall be installed at least 10 times the diameter of the pipe from the pump and at least 5 times the diameter of the pipe from the diversion of any water.

(e) The consent holder shall ensure the full operation of the water meter and datalogger at all times during the exercise of this consent. All malfunctions of the water meter and/or datalogger during the exercise of this consent shall be reported to the Consent Authority within 5 working days of observation and appropriate repairs shall be performed within 5 working days.

(f) The installation of the water meter and datalogger shall be completed to full and accurate operation within 1 month of the exercise of the consent. The consent holder shall forward a copy of the installation certificate to the Consent Authority within one month of installing the water meter and datalogger.

(g) (i) If a mechanical insert water meter is installed it shall be serviced each and every year from the first exercise of this consent.

(ii) Any datalogger and an electromagnetic or ultrasonic flow meter shall be serviced every five years from the first exercise of this consent.

(iii) Each service shall be undertaken by a suitably qualified operator and receipts of service shall be supplied to the Consent Authority by 31 July each year, and upon request.

(h) The consent holder shall provide records from the datalogger to the Consent Authority by 31 July each year and at any other time on request. Data shall be available electronically giving date, time and flow rates in no more than 15 minute increments, via a datalogger approved by the Consent Authority.

Note: the water meter and datalogger should be safely accessible by the Consent Authority and its contractors at all times.

5. Copies of the results of any water quality analyses performed on the water used for irrigation shall be forwarded to the Consent Authority within two weeks of the analysis being undertaken.

General

6. For areas that are spray and flood irrigated, the consent holder shall take all practicable steps to ensure that:

(a) the irrigation does not cause surface runoff that would discharge into natural waterbodies;

(b) there is no leakage from pipes and structures;

(c) the use of water is confined to targeted areas, as shown on the attached plan

(d) irrigation induced soil erosion and soil pugging does not occur;

(e) soil quality is not degraded as a consequence of irrigation; and

(f) loss of water, nutrients, and agrichemicals by percolation to groundwater is minimised.

Review

7. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent within 3 months of each anniversary of the commencement of this consent for the purpose of:
(a) adjusting the consented rate or volume of water under condition 2, should monitoring under condition 4 or future changes in water use indicate that the consented rate or volume is not able to be fully utilised; or
(b) determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; or
(c) ensuring the conditions of this consent are consistent with any National Environmental Standards; or
(d) adjusting or altering the method of water take data recording and transmission.

Notes to Consent Holder

1. *If you require a replacement water permit upon the expiry date of this water permit, any new application should be lodged at least 6 months prior to the expiry date of this water permit. Applying at least 6 months before the expiry date may enable you to continue to exercise this permit until a decision is made on the replacement application. Failure to apply at least 3 months in advance of the expiry date will result in any primary allocation status being lost. A late application will result in the application being treated as supplementary allocation if any such allocation is available.*

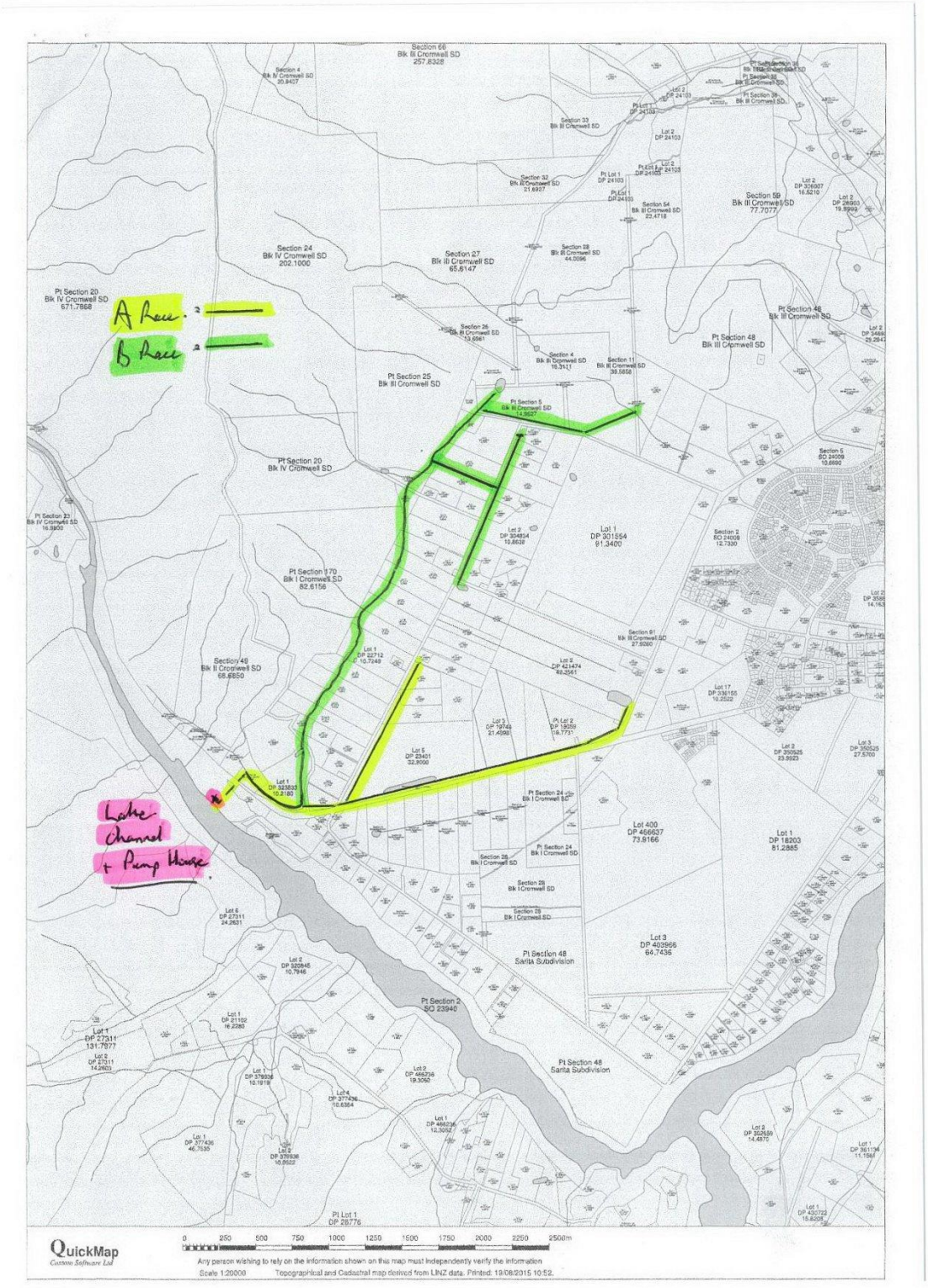
Issued at Dunedin this 9th day of August 2011

Christopher P. Shaw
Manager Consents

Appendix 1 Consent 2009.068

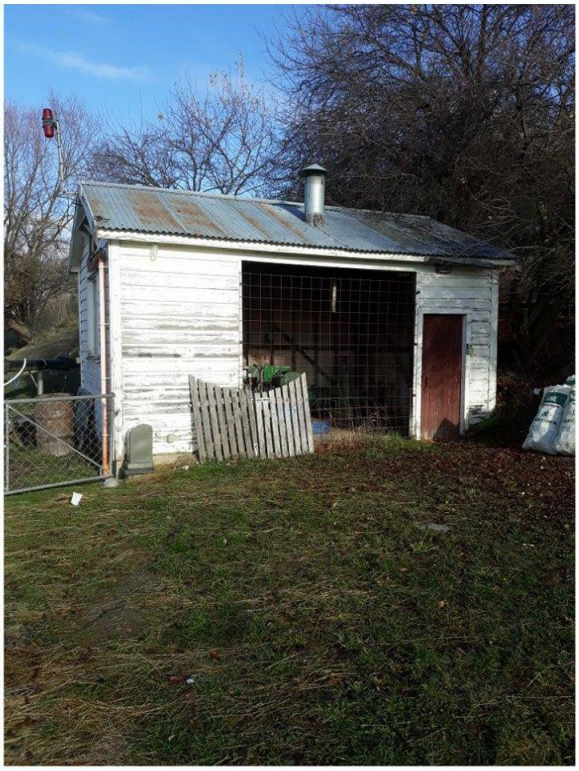
Ripponvale Irrigation Company Area currently being irrigated

Appendix 2 – RICL race network



Appendix 3 – RICL races

to NZCC supply channel



B Race pump shed unsecured (vermin and bird encroachment possible)

Stock grazing race side vegetation and defecating in the basin of the B race

Stock fenced in feeding in area with open exposed race in background

Boundary fencing to stop stock moving between properties through the race

Race running through paddocks with no fencing, accepts flow off hillside

Damage to the main A and B race junction

Appendix 4 – Waterforce assessment

144 Ripponvale Road – NZ Cherry Corp

Water Supply Assessment

8th June 2020

WaterForce
wise with water

Branches throughout New Zealand

www.waterforce.co.nz

Introduction

This report assesses the ability of the existing water supply at 144 Ripponvale Road, Cromwell to provide both irrigation and frost fighting requirements for a new proposed 22 Ha orchard for NZ Cherry Corp. This is intended to assist with decision making for future land development.

This report is based on a 4mm/h application rate for frost fighting protection. The intention is to match the application rate of existing orchard sprinklers. The frost protection window as requested has been set at 4 days.

Water Supplies

There are two existing water supplies to this property:

1) Existing Bore (RM13.375)

Consent conditions

Water take consent: RM14.291.01

Max consented flow rate: 30 l/s

Max consented volume: 2,592 m^3 per day, 77,760 m^3 per month & 699,840 Annually (1st July to 30th June)

Irrigation is only permitted from 31st August through to the 1st May the following year.

Performance monitoring is required and is provided by an existing WaterCheck telemetry system.

Other consent conditions apply and should be reviewed before commencing with any development on this property.

Existing pump

Pump model: Lowara Z895 5-L8W 37kW

Pump duty: 30l/s @ 640 kPa

Daily volume capacity: 2,592 m^3

The pump is able to extract the full consented volume of 30 l/s with a max lift of approx. 64m from the bore location to any future storage dam location.

2) Ripponvale Irrigation Scheme

The Ripponvale scheme allows an annual take of 213,000m3 between 1st September and 30th April. As there is no fixed schedule for this supply the following volumes will be used to assess its irrigation and frost fighting capacity.

Annual: 213,000m^3

Per month: 26, 625m^3

Per day: 858m^3

Water Storage

There are two existing storage dams on the property and a proposed new dam to be built in the future.

The dam closest to Ripponvale Rd is supplied by the Ripponvale irrigation scheme and we are told from a recent survey holds approximately 4000m3.

The top dam is supplied by the existing bore (RM13.375) and is to be replaced with a new 20,000m^3 dam at the North Western boundary and is what we have used for the below frost fighting calculations.

Proposed Orchard Development

Area Proposed for Orchard Development

Winter Frost Fighting Requirements

Proposed frost fighting schedule

All irrigation zones in the proposed 22Ha block would need to run simultaneously to provide frost protection with under tree watering. The following figures are based on an 8-hour frost event per night and an application rate of 4mm/h.

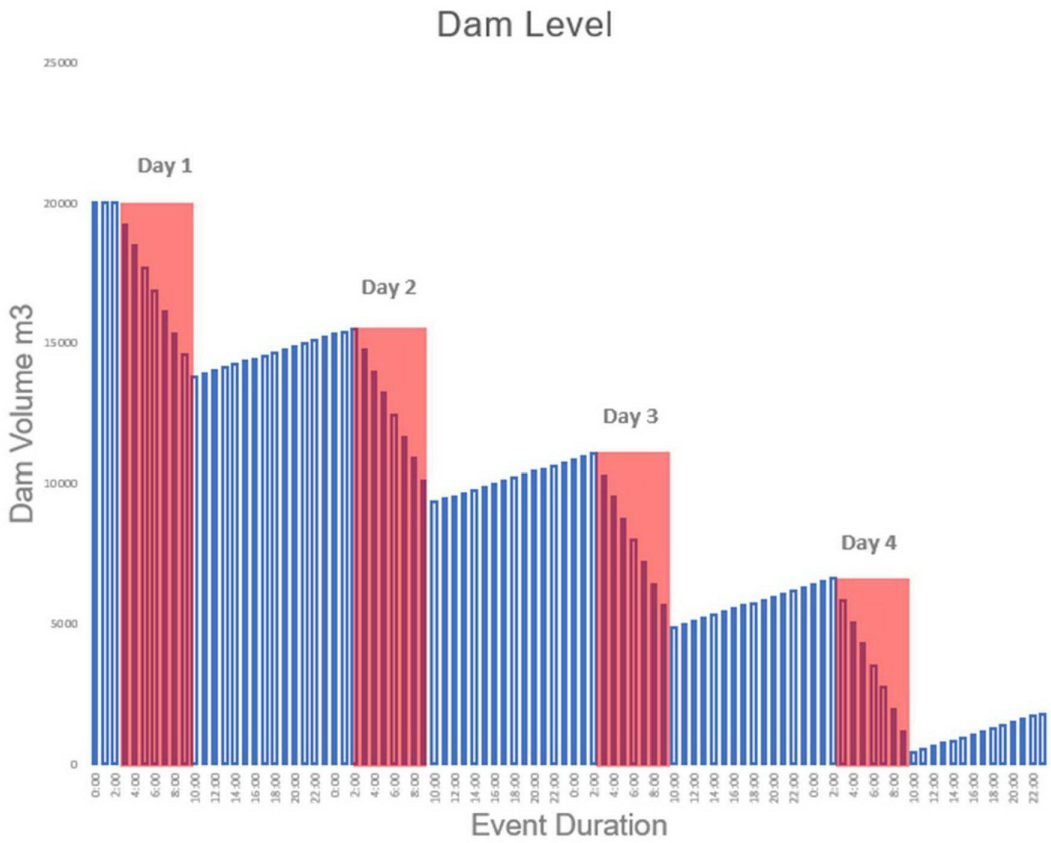
System flow rate: 245 l/s
Daily frost fighting volume: 7,056 m^3 (8 hours)
Daily re-charge from bore: 2,592 m^3 (24 hours)
Dam capacity: 20,000 m^3
Max consecutive frost events: 4 Days
Re-fill period: 7.5 Days *(7 Days, 13.3 hours)*

Considerations

A storage dam is required to provide any level of frost protection. With the proposed 20,000 m3 storage dam, the pump system will be able to provide the 22Ha with frost protection for a maximum of 4 consecutive nights with a suitable re-charge time of 7.5 days.

The ability of the Ripponvale scheme to provide frost protection is limited to 1st September – 30th April. Without a guaranteed water supply schedule for this we can only speculate as to what actual frost protection this dam can provide. Provided the scheme supplied the existing 4000m^3 dam with a volume of 858m3 per day the dam would provide the same level of frost protection as above to a maximum of 5.1Ha. If supplying a 20,000m^3 dam the scheme could provide frost protection 17.5Ha but with a much longer dam re-fill time of 22.8 days. This is not a suitable re-fill time for frost protection. To achieve a re-fill time of less than a week the system could only use an effective 6000m^3 of the 20,000m^3 dam, reducing the provided orchard area to 6.5Ha.

Frost fighting water use



Effect of Additional Consented Volume

It has been proposed that an additional 15l/s may be applied for in relation to this consent. Below is an indication of the effect this could have on the potential irrigated area for frost protection based on above calculations and an application rate of 4mm/h with the entire system running for 8 hours per day.

These calculations do not consider the existing bore pump which would require upgrading or another bore installed.

The dam storage size has a significant effect on these calculations and so three options are proposed below to demonstrate this effect.

A) No additional dam storage
   The additional 15l/s would supply the dam with an extra 5,184m^3 over the proposed 4-day frost protection period. This would provide for an additional 3.5Ha of cherry orchard frost protection, bringing the total potential irrigated area from 22Ha to 25.5Ha. *(Dam re-fill time of 5.2 days)*
B) 10,000m^3 additional storage
   An extra 10,000m3 of storage would increase the potential irrigated area by 11Ha to a total of 33Ha. *(Dam re-fill time of 7.7 days)*
C) 15,000m3 additional storage
   An extra 15,000m3 of storage would increase the potential irrigated area by 15Ha to a total of 37Ha. *(Dam re-fill time of 9 days)*

Conclusion

Option B would provide the best outcome. This will increase the orchard area by 11Ha while allowing the dam to refill in an acceptable 7.7 days.

Summer Irrigation Requirements

Proposed irrigation schedule

It has been proposed that the 22Ha orchard be split into zones able to be supplied directly from the bore. At an application rate of 4mm/h and considering the topography, this could be covered with 12 zones and an average flow rate of 20l/s with the existing pump.

With a sprinkler spacing of 5x3m (every tree) an application rate of approx. 4mm/hr will be provided with under tree sprinklers.

To provide 6mm per day (42mm/week) to the 22Ha orchard, this system would require approx. 1,310m3 per day. If run directly off the bore pump it would run for 18 hours per day. The run time of the bore will be significantly reduced when pumping into a storage dam. (Approx. 12 hours per day)

Considerations

The existing bore pump has the capacity to irrigate the 22Ha block directly. A storage dam will provide redundancy should the pump require service & repair during the season and will provide additional scheduling flexibility with reduced watering times.

Conclusion

The existing bore pump with a 20,000L storage dam could provide irrigation to the proposed 22Ha orchard. This system will also provide consecutive 4-day frost protection to a maximum of 22Ha via the irrigation system. Additional measures may be required such as frost fans in heavy frost conditions. The Ripponvale scheme is best served as only a backup for a short period and based on the above figures would not be able to provide either irrigation or frost fighting requirements for the proposed 22Ha orchard. With an additional 15l/s (total 45l/s) the system would have potential to provide frost fighting for a total of 25.5Ha. As above calculations demonstrate, an increase in dam size will add to this increase however the dam re-fill time needs to be considered. Option B is the most sensible option for both area gain and acceptable dam refill time.

For further information on these recommendations please contact Ben McCarthy or Hannah Meehan at WaterForce Cromwell.

WaterForce
wise with water

15 Rogers St. Cromwell
PO Box 71, Cromwell 9342
Ph. (03) 445 4008