Ref: 20028.30
11 November 2020

Sarah Davidson
Senior Consents Officer
Otago Regional Council

By email: sarah.davidson@orc.govt.nz

Dear Sarah,

RE: RM20.360 Cromwell Certified Concrete Groundwater Take Effects Assessment Review

1 Introduction

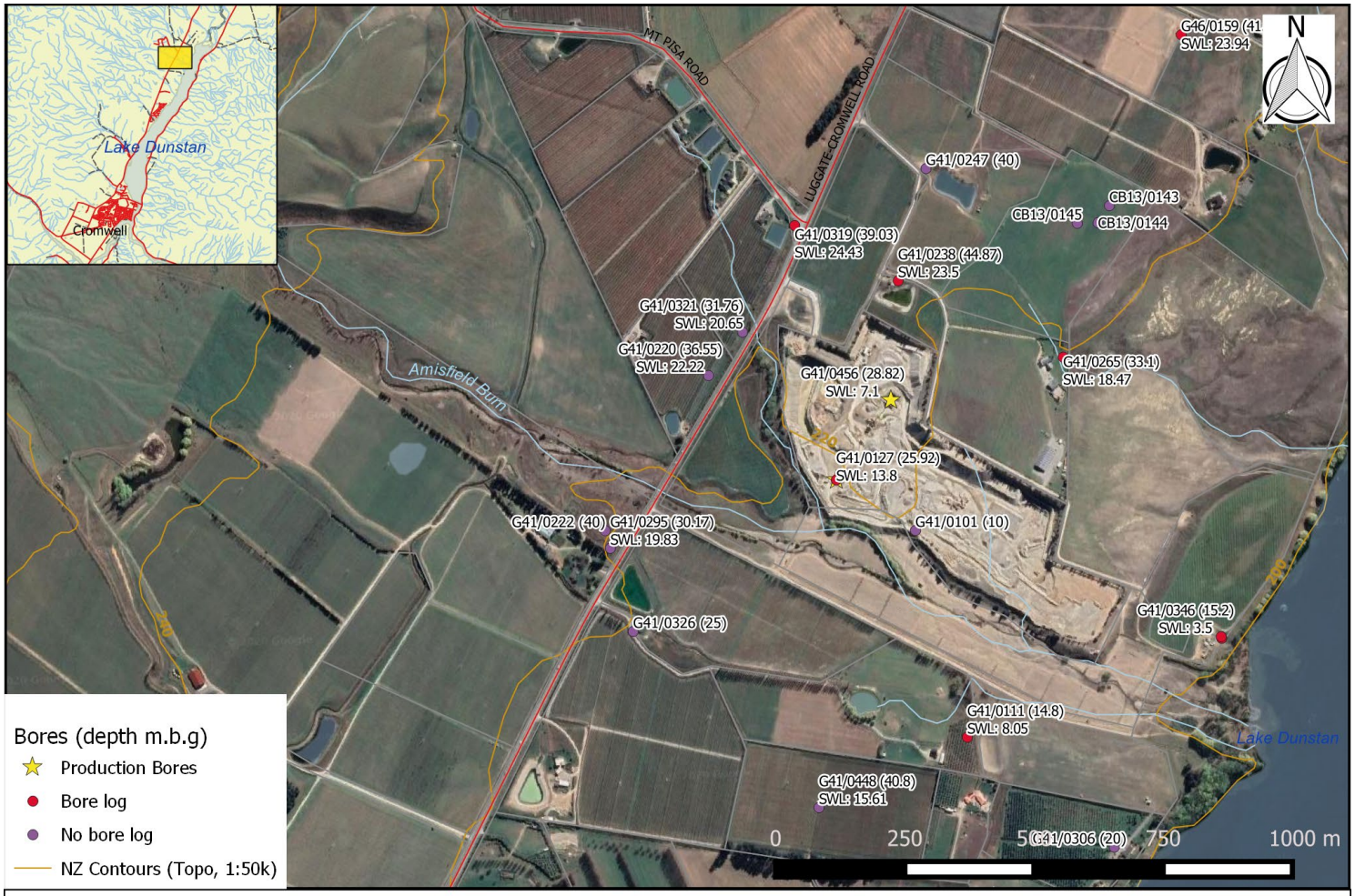
Cromwell Certified Concrete has applied for resource consent to take groundwater from an existing bores (G41/0127 and G41/0456) at 1248 Luggate-Cromwell Road, Cromwell (Figure 1) for the purpose of quarry operations (gravel washing, dust suppression and irrigation) at the following rate:

Maximum rate of take: 70 l/s
Maximum daily volume: 3024 m^3/day
Maximum annual volume: 846,720 m^3/year

The consent will replace water permit RM16.108.01 which is due to expire in 2036. The current consent allows for abstraction at a maximum rate of 46 L/s to a total of 453,600 m^3/year. The applicant has proposed a condition of consent limiting the rate of abstraction from bore G41/0127 to 23 l/s and 47 l/s from bore G41/0456.

The proposed groundwater take is from the Pisa Groundwater Management Zone.

Figure 1: Groundwater standing water levels and bore locations



NZ Contours, NZ Road Centre line (Electoral), NZ River Polygons (Topo, 1:50k), NZ Lake Polygons (Topo, 1:50k), NZ River Centrelines (Topo, 1:50k) sourced from the LINZ Data Service http://data.linz.govt.nz/ and licensed by LINZ for re-use under the Creative Commons Attribution 4.0 New Zealand licence.
Aerial Imagery sourced from the Google Satellite.

1.1 Scope of Work

The scope of this work is to provide an audit of the Assessment of Environmental Effect answering the following questions:

- Is the technical information provided in support of the application robust, including being clear about uncertainties and any assumptions? Yes, or no. If not, what are the flaws?
- Does the application appropriately identify affected water bodies? Yes/no.
- Is the description of the groundwater and surface water attributes potentially affected by the activity accurate (e.g. aquifer properties, depth to groundwater, groundwater flow direction)?
- Have the effects on groundwater quality, effects on neighbouring bores, effects on stream depletion been appropriately assessed? Please include details on the appropriateness of the method of assessment.
- Have the cumulative effects of the activity been appropriately assessed? Yes/no
- If granted, are there any specific conditions that should be included in the consent? Please outline recommendations for changes to standard conditions and/all non-standard conditions that may be relevant.
- If monitoring of water quality is required, where should monitoring be undertaken, what parameters should be monitored and how often? Yes/no
- Is there any groundwater reason the consent term should be shorter than applied for?

The scope does not include assessing reasonable and efficient use of water or historical water use.

Data reviewed to support this assessment includes:

- Landpro (2020). Assessment of the Effects of Increased Water Take at Amisfield Quarry.
- Henderson, R. (2016) ORC Staff Recommending report RM16.108.01-02. Dated 20/06/2016
- Bore logs in 2 km radius
- Bore construction data in 2 km radius

2 Aquifer characteristics

The applicant has identified the bores as being located within the Pisa Groundwater Management Zone. This zone was not identified in the current Regional Water Plan or any of its schedules, but has been identified in the draft/recommended aquifers on the ORC Water Allocation for Consultants webpage. Groundwater levels in the surrounding bores at the time of drilling are shown in Figure 1. Groundwater beneath the site flows east through the alluvial terraces towards Lake Dunstan.

e3s examined the bore logs from nearby bores to assess the likely aquifer thickness and permeability. No basement rock was found in nearby bores, however there was clay at the base of G41/0319 and claybound gravels at 30 m.b.g. in G41/0465 at 40 m.b.g., which may function as the base of the aquifer. This indicates the saturated thickness of the aquifer may be 10-15 m.

2.1 Pumping Test

An eight-hour pumping test was completed on bore G41/0455 in 2015, pumping at a rate of 25 l/s. This resulted in drawdown of 2.2 m within the pumping bore. PDP interpreted these results to indicate that the transmissivity was 1,100 m^2/day and the specific yield was 0.1 (Henderson, 2016).

Given that the proposed maximum pumping rate is now 70 l/s (average 35 l/s throughout the day), this pumping test does not comply with the ORC aquifer test requirements. ORC minimum aquifer test requirements to support the resource consent application, as specified in ORC Form 5 Groundwater Take Application, are a 48-hour constant rate pumping test at the maximum rate proposed for the consent for takes greater than 750 m^3/day, and static water levels should be monitored for 24 hours prior to the commencement of the test. In addition, a 4 x 1 hour step test should be completed.

The bore data obtained from ORC (see Table 1 in Section 3.3) indicates that G41/0456 was pumped at 37 l/s for an extended period resulting in a drawdown of 16.59 m. It is therefore possible that a complying pumping test was completed on the bore, however no description or interpretation of this test has been included in the assessment. Interpretation of this test should be included to provide appropriate aquifer parameters for this assessment.

2.2 Bore characteristics

The two bores are 25-30 m deep and located within the quarry pit.

3 Assessment of Environmental Effects

3.1 Return flows

The previous recommending report documented the assumption that only 30% of the water take was consumptive, and the rest of the take was non-consumptive as it was returned to the groundwater via the soakage pits. However, the stated water use is for gravel washing, dust suppression and irrigation, and potable use. There is no breakdown of the different uses in the assessment of effects, therefore it is difficult to verify the likely percentage of consumptive use. It is unknown what area is irrigated, or what the potable demand is for the site, or how much is used for the wash pad.

For example, Appendix 4, assessment of potential effects of dust discharges indicates that up to 8.3 l/s may be required for dust suppression (based on 1 L/m^2/hour on 3 ha of active working). It is unlikely that there would be a much return flow from this dust suppression as it would only be spread at a depth of 1 mm each hour.

In addition, it would be helpful to identify and describe the operation of the soakage pits more clearly, as evaporative losses from the pits may be significant, especially during the summer season.

3.2 Depletion of Nearby Watercourses

The applicant has identified the Amisfield Burn (130 m) and one of its tributaries (50 m) as the closest surface water courses, with Lake Dunstan situated 800 m to the east.

Landpro (2020) state that the Amisfield Burn is approximately 20 m above the groundwater table, and therefore disconnected from groundwater. The groundwater standing levels are presented in Figure 1. The standing water levels

demonstrate that the Amisfield Burn is likely to be disconnected from groundwater at its closest point to the monitoring bores, however, as the Burn flows towards Lake Dunstan, the depth to groundwater decreases and it may become connected to groundwater. The Amisfield Burn is identified in Schedule 1A of the Regional Water Plan as providing habitat to koaro which has a threat status of 'declining'. Given that the Burn has been identified as important spawning habitat, it is important to maintain connectivity between the Burn and the Lake. The applicant should provide further assessment of the potential for the increased groundwater take to impact the flow further downstream in the Burn.

Lake Dunstan is connected to the Pisa Groundwater Management Zone. The applicant has observed that water levels in the mine pit pond fluctuate in response to changes in the water level in Lake Dunstan. The taking of up to 1000 m^3/day, at a maximum rate of take of 100 l/s from Lake Dunstan is a permitted activity according to Rule 12.1.2.2 of the Regional Water Plan (ORC, 2016). Given that the pumping rate will be less than 100 l/s, the take cannot exceed this amount, however, it could be possible for the daily limit to be exceeded, and this therefore needs to be assessed.

3.3 Bore Interference

The Regional Water Plan specifies information required to be submitted in conjunction with the resource consent (16.3.1) specific to the taking of groundwater, which includes calculation of bore interference according to Schedule 5B. This schedule states that the method presented is for calculating bore interference for new[i] groundwater takes.

Landpro (2020) provided an assessment of bore interference based on two scenarios a) where only 37% of the take is consumptive, and 63% is returned to the aquifer through soakage pits; and b) the worst case scenario whereby no water is returned to the aquifer. They also noted that Lake Dunstan would provide a recharge boundary, but did not quantitatively assess the likely effect of that boundary.

[i] The previous effects of the groundwater take may be considered part of the existing landscape, however any additional drawdown caused by the increase in groundwater take cannot be considered as such.

As the aquifer is unconfined, interference is considered significant if the groundwater take induces 0.2 m of drawdown in a neighbouring bore (ORC, 2016) as per Schedule 5B.

Landpro (2020) assessed drawdown caused by the take using the aquifer parameters used in the previous recommending report from the short duration pumping test on G41/0455. Results from this assessment indicated that bore interference may be in excess of the significance criteria determined by ORC. However, they made a case for the drawdown not being significant due to the available drawdown in the neighbouring wells and using the approach currently used in Canterbury that requires the protection of available drawdown i.e. drawdown is significant if it exceeds 20% of the available drawdown. They have assumed that the drawdown may only be 4% of the available drawdown and this should therefore be considered acceptable.

The neighbouring bores (within a radius closer than the Lake) and their available drawdown are provided in Table 1. It should also be noted that many of the bores have groundwater takes associated, and it is unclear what the cumulative effect of these drawdowns may be on the available drawdown. Regardless of this, the significance of bore interference must be determined based on the provisions of the current Regional Water Plan for Otago, and therefore if there is significant interference likely, affected party approval should be obtained.

Table 1: Neighbouring Bores

Well Number	Owner	Take Consent	Depth	SWL (m.b.g.)	DrillDate	Drawdown	PumpRate	Pump Duration	ScreenFrom	ScreenTo	Available Drawdown (m)	Distance to G41/0127 (m)	Distance to G41/0465 (m)
G41/0101	Cromwell Certified Concrete Limited	2004.294.V1	10	0	1/09/1994		1296					182	257
G41/0111	MCTAINSH D		14.8	8.05	22/08/1995		114.9				3.75	559	669
G41/0127	Cromwell Certified Concrete Limited	RM16.108.01	25.92	13.8	16/09/1995		1296				9.12	0	187
G41/0220	Montero, J	2010.152.V1	36.55	22.22	17/11/2000	6.29	864	360	33.54	36.55	11.32	319	356
G41/0222	Hay R J Hay G J		40	0	12/01/2000		864					458	608
G41/0238	Prophets Rock Vineyard	2001.831	44.87	23.5	30/07/2001	1.75	13	330	41.76	44.76	18.26	404	231
G41/0265	Walnut Ridge Ltd		33.1	18.47	25/05/2002	0.33	112.32				11.63	499	344
G41/0295	Amisfield Farm Ltd	2003.363	30.17	19.83	20/09/2004	1.83	1771				7.34	457	614
G41/0321	Winslow Properties Ltd	RM14.211.02	31.76	20.65	6/03/2007	5.32	1641.6	150			8.11	339	316
G41/0326	Amisfield Road Partnership	RM12.514.01.V	25	0	1/10/2004		121					491	670
G41/0340	Stevinson D		15.2	3.5	15/12/2005	0.28	475				8.7	806	789
G41/0346	Dean Stevenson NZ Ventures LLC	2006.036	15.2	3.5	15/12/2005	0.28	475.2	90			8.7	804	787
G41/0456	Cromwell Certified Concrete Limited	RM16.108.01	28.82	7.1	19/11/2015	16.59	2203.2	4800	27.82	38.82	20.72	187	0

* The available drawdown doesn't include the depth required for a pump above the screen, and simply assumes a 3 m screen where it is not specified i.e . the available drawdown may be 1 – 2 m less.

3.4 Potential for contamination

The applicant holds Discharge permit RM16.108.02 to discharge contaminants to land for the purpose of gravel washing and dust suppression. The AEE (Section 5.9) states that quarterly monitoring of suspended sediment will continue to be completed in bores G41/0455 and G41/0101 to monitor effects of soakage pit. It states that the monitoring data from these bores indicates that the soakage pits are adequately filtering sediment, however bore G41/0455 is not present in the ORC database or on any of the Landpro maps showing groundwater bores, and Landpro (2020) states in their Appendix 7 groundwater assessment that bore G41/0101 was never drilled and that they have asked ORC to remove it from their database. If the applicant intends to continue monitoring these bores, the existence of these bores and the historical monitoring data should be verified.

The neighbouring site 0.68 km to the south (30 Smiths Way) is listed on the ORC mapping resource as having an verified HAIL site (HAIL.01976.01) due to storage tanks for fuel, chemicals or liquid waste being present on the property (https://maps.orc.govt.nz/portal/apps/MapSeries/index.html?appid=052ba04547d74dc4bf070e8d97fd6819, accessed 11/11/2020).

As there is no known contamination at the site and groundwater is more than 15 m below ground level, contamination movement via groundwater abstraction due to the HAIL site is considered unlikely.

3.5 Allocation availability

The ORC Local Water Allocation - Consultants page (https://maps.orc.govt.nz/OtagoViewer/?map=1c59ff71893d4613a169806198eedafd, accessed 11/11/2020) states that the recommended water allocation for the aquifer is 6,500,000 m^3 and that there is currently 2,215,094 m^3 year available. As the change in requested take is 393,120 m^3/year, the increase will account for 18% of the remaining available allocation. The take will therefore not impact on the sustainability of the aquifer.

4 Summary and Conclusions

The audit of the assessment of effects for the Amisfield Quarry groundwater take in Cromwell can be summarised with the following points:

- There is uncertainty regarding the adequacy of the pumping test data, and the pumping test completed on G41/0456 should be described and interpreted accordingly. This will impact on the assessment of stream depletion and bore interference effects.
- The assessment has identified the closest waterbodies and determined that there will not be an impact. However, there may be connection between the Amisfield Burn and groundwater closer towards Lake Dunstan, which could impact on spawning fish species.
- The impact on Lake Dunstan could possibly exceed the daily permitted take and should be further assessed.
- There is available groundwater allocation to support the groundwater take and therefore the take will not affect aquifer sustainability;
- Aquifer contamination due to the groundwater take is unlikely; however, the return of water through soakage pits may cause some increases to turbidity. The applicant states that monitoring is occurring, but it is unclear if this is actually the case.
- The assessment of bore interference is based on the likelihood of the take only being partially consumptive. It would be helpful to clarify the water demand for the different uses across the site to estimate a realistic return to groundwater from the site.
- The groundwater take may significantly impact on the closest neighbouring groundwater users according to the current Regional Water Plan for Otago criteria.

If you have any questions regarding the information provided in this letter, please contact Alexandra Badenhop on 03 409 8664 or via email at alexandra.badenhop@e3scientific.co.nz

Yours sincerely,

Alexandra Badenhop
Principal Hydrogeologist

5 References

ORC. (2016). *Regional Water Plan: Water for Otago.* Otago Regional Council.