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Attention: Todd Whittaker
Consultant Consents Officer
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Project Name: General Geothermal and Groundwater Consent Technical Reviews
Project Number: IZ113600

Subject: RM20-0862 AFFCO Peer Review

1. Introduction

AFFCO (the Applicant) have applied to the Bay of Plenty Regional Council (BOPRC) to replace their existing resource consent (02 40194/1) to take and use groundwater from bore BN-4037 for use in an abattoir at the AFFCO Rangiuru Meat Processing Plant located at 1562 Te Puke Highway, Paengaroa.

The Applicant proposes the following water take from BN-4037:

- A maximum instantaneous rate of take of 20.4 L/s; and
- A maximum daily take volume of 1,763 m^3/day.
- No maximum annual volume was specified in the consent application, but assuming 365-day use at the maximum daily volume, this would be 643,334 m^3/year.

The AFFCO groundwater take consent application was originally reviewed by PDP on 4 February 2021. However due to a potential conflict of interest, BOPRC have now requested Jacobs undertake a technical review of the application, including a peer review of the PDP technical review, and the response to further information request provided by the Applicant's consultant.

To support the technical review, Jacobs have reviewed the following documents:

- AFFCO Rangiuru Processing Plant, Kaituna River and Bore Water Takes Resource Consent Application, Assessment of Environmental Effects, prepared by Agro Environmental Ltd, dated December 2020;
- RM20-0862: AFFCO Rangiuru Consent Review, prepared by PDP, dated 4 February 2021;
- RM20-0862 AFFCO Rangiuru Consent Review, response to Section 92 Request, prepared by Terra Aqua Consultants Limited, dated 9 February 2021 (updated following a clarification question from Jacobs, received 4 March 2021).

2. Background

Limited information is available regarding BN-4037, with the bore depth, casing and screen information unknown. The only information that is known is that the pump is set at a depth of 45.5 m bgl. The water temperature is stated as being 27 -28 °C, which the Applicant's consultant has concluded means that the bore is deeper than 100 m bgl; stating it is likely between 120 and 130 m in depth.

The assumed depth of BN-4037 indicates that it would be screened across the Pokai Formation/Chimp Formation/ Pokopoko Formation[1]. Jacobs completed a review of neighbouring bores to aid in the determination of the potential depth and geology of BN-4037. Within a 1 km radius of BN-4037, there are only four bores which have borelog information available (BN-1532, BN-1531, BN-11391 and BN-10931).

The depths of these bores are between 84 and 128 m bgl, with the borelogs indicating alternating layers of silts, pumice and clays above gravel layers of varying depths. For example, the closest neighbouring bore with a detailed borelog (BN-11391) indicates gravels layers to 26 m bgl, silt, clay, pumice between 26 and 75 m bgl, and water bearing gravels between 74 and 84 m bgl. Given the thickness of the silt and clay layers above the gravels, this target aquifer would be confined. This finding is consistent with the aquifer test results completed on BN-4037.

The Applicant's consultant has stated that as the water temperature at BN-4037 is not cold (by their definition) and neighbouring bores have been assigned as "cold water" in the BOPRC database, this indicates that bore BN-4037 is deeper than the surrounding bores. This point is incorrect as BOPRC assign the term "cold water" to any groundwater take with a known groundwater temperature of less than 30 degrees (based on the definition of geothermal water outlined in the Bay of Plenty Regional Water and Land Plan, Version 3.2). In addition, it should be noted that the water temperature of BN-11391 has been stated as 28 degrees, which is consistent with the temperature of BN-4037. As such, it is possible that BN-4037 could be less than 100 m in depth, which is taken into consideration in the assessment of effects on neighbouring bores in Section 4 below.

BN-4037 is located in the Lower Kaituna (Plains) groundwater catchment within the Kaituna, Maketu and Pongakawa Water Management Area.

The allocation status of the Lower Kaituna (Plains) groundwater catchment[2] is as follows:

- Available allocation: 5,651,251 m^3/year;
- Allocated groundwater: 4,488,815 m^3/year (79.4%); and
- Allocation remaining: 1,162,436 m^3/year (although as there is a queue for the remaining allocation, no further allocation is currently available).

[1] GNS – Geological Model Profile (https://data.gns.cri.nz/ebof/findLocation.jsp, accessed 26 February 2021).
[2] BOPRC Indicative Groundwater Allocation Tool (https://maps.boprc.govt.nz/app/7a2ff1e0b0454bdb89498f0e019a23dd, accessed 26 February 2021).

There are 11 bores within 1,000 m of BN-4037[3]. Of these bores:

- One bore (BN-4017) has an unknown depth;
- Four bores have depths less than 30 m, while a further three bores have depths between 54.8 and 91.4 m;
- Three of the bores were drilled to greater than 100m, with the deepest bore drilled to a depth of 128 m. In the majority of cases, the screened depth is unknown for these bores.

The closest surface water body is the Kaituna River, which is located approximately 350 m southwest of BN-4037 at its closest point. The coastline is approximately 5.8 km from BN-4037.

3. Summary of PDP Assessment

PDP completed their review on the AFFCO consent application on 4 February 2021 and concluded the following:

- The aquifer parameters calculated from the 72-hour pump test were conservative and representative of confined aquifer conditions, and as such were appropriate for use within an assessment of effects for the proposed abstraction;
- The Applicant did not provide an appropriate quantitative assessment of potential drawdown effects on neighbouring bores, including a comparison of available drawdown in these bores. As such, it was recommended that BOPRC seek further information from the Applicant to provide this assessment;
- The Applicant's assessment on the potential effects on the Kaituna River used an appropriate method for the target aquifer and reasonable input parameters in this method. In addition, PDP concluded that the calculated stream depletion effect of 0.3 L/s after 100 days of pumping would be considered less than minor;
- Saline intrusion effects because of the abstraction would be less than minor given the distance to the coast.

4. Assessment

Having reviewed the relevant information, Jacobs provides the following responses.

4.1 Do Jacobs concur with the PDP review previously undertaken.

Jacobs have completed an assessment of the consent application submitted by AFFCO, and also reviewed the PDP technical review letter dated 4 February 2021. Jacobs concur with all of the conclusions made in the PDP technical review, although we note that the PDP review did not review the assumed depth of bore BN-4037. It is unknown whether a discussion on this assumption would have occurred once the requested further information was received regarding

[3] BOPRC Well and Bore Locations (https://gis.boprc.govt.nz/BayMaps/?appid=71d9f95a684f4e77bdebe0147fbd7f7e, accessed 26 February 2021).

the neighbouring bores. Jacobs have completed this review, with the discussion outlined in Section 2.

Jacobs agrees with the PDP recommendation that further quantitative analysis was required from the Applicant with regards to assessing the potential effects on neighbouring groundwater users.

4.2 Review of additional information from Applicant.

The Applicant's consultant provided additional information regarding the potential effects on neighbouring bores in a letter dated 9 February 2021, which was then updated following a point of clarification question from Jacobs (updated letter received on 4 March 2021). In this letter, the Applicant's consultant stated that it is difficult to make an accurate assessment of the potential impacts on neighbouring bores given the limited information on the neighbouring bores.

However, they did complete an assessment on potential drawdown effects at set distances from Bn-4037 using a simple model called GWFlow. The input parameters used within this model differed from those obtained from the pump test and also used within the streamflow depletion assessment as follows:

- The transmissivity used within the drawdown effects assessment appears to be that calculated for the early time data of the pump test (300 m^2/day) rather than the late time data transmissivity of 152.6 m^2/day. The late time data transmissivity was used within the streamflow depletion assessment and was stated in the pump test report as "being more representative of the actual aquifer transmissivity". The Applicant's consultant does not explain why the transmissivity has been changed for this assessment.

- The Applicant's consultant stated that the storativity used within the drawdown effects assessment was adjusted until the model calculated drawdown after 72-hours within BN-4037 to that recorded during the pump test. The Applicant's consultant has stated that the storativity was adjusted to 0.009. This value of storativity is considerably higher than the 0.000069 previously calculated from the pump test and used during the streamflow depletion assessment. In addition, this storativity is not representative of a confined aquifer and its use in the distance drawdown assessment has the effect of reducing drawdown in the aquifer.

The Applicant's consultant calculated drawdown in neighbouring bores for the worst case scenario of abstracting continuously for 365 days. Drawdown was calculated as being between 2.6 m (at a distance of 250 m) and 1.4 m (at a distance of 1,078 m).

The Applicant further states that since most of the neighbouring bores are shallower than BN-4037, it is likely that the drawdown would be less than calculated based on drawdown being attenuated by various intervening low permeability layers. As such, it was concluded that the proposed abstraction would not have any more than minor effect on any neighbouring bore.

Jacobs undertook an assessment of the potential drawdown on neighbouring bores using the Theis distance drawdown method and using the calculated aquifer parameters used for the stream depletion assessment. The results of this assessment are shown in the Table below. It

should be noted that this assessment did not assess drawdown in three neighbouring bores which are less than 30 m (BN-4063, BN-4422 and BN-4035) as it is considered that these bores are not abstracting from the confined aquifer that BN-4037 is screened within.

Neighbouring Bore ID	Depth (m)	Distance from BN-4037	Calculated Drawdown after 365 days
BN-4017	Unknown	447	8.4
BN-4074	54.8	707	7.6
BN-10931	122.0	711	7.5
BN-11391	84.0	722	7.5
BN-1466	91.4	825	7.3
BN-1532	128.0	943	7.0
BN-1531	103.6	981	7.0

The calculated drawdown, between 7.0 and 8.4 m, is considerably greater than that calculated by the Applicant's consultant. Given the limited information available on the current static water levels, casing, screen and pump depths of these neighbouring bores, it is not possible to assess what level of effect this drawdown would have on the available drawdown within the bores.

The missing information on neighbouring bores could be obtained through the Applicant undertaking visits to the affected bore locations to investigate whether this information is available. However, if the Applicant does not wish to undertake these visits, then it is recommended that the owners of these bores are included within the limited notification process for this application.

Yours sincerely

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