Fast Track Application – 531 and 535 Mill Road, Ōhoka – Dewatering and Dust Suppression Assessment of Environmental Effects

Prepared for

Carter Group Limited

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Limitations:

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Executive Summary

Carter Group Limited (Carter Group) is proposing to subdivide a 154.4 ha area of land at 531 and 535 Mill Road, Ōhoka, for residential and commercial use. Dewatering of shallow excavations will be required during construction of the subdivision to allow for the installation of Stormwater Management Areas and the associated underground stormwater pipe network, in addition to shallow subsoil drains, underground wastewater services and for stream realignment purposes.

Dust suppression will also be required during the development and Carter Group propose to take groundwater from existing irrigation bore M35/0367 which is located at the site. Groundwater abstraction is currently authorised from four onsite irrigation bores via resource consents CRC991022 and CRC991827.

It is intended that irrigation consents CRC991022 and CRC991827 will not be exercised concurrently during dewatering or dust suppression activities carried out onsite which will significantly reduce the consumptive groundwater abstraction at the site in comparison to what is currently consented.

Due to the requirement for dewatering and dust suppression, Carter Group is applying for resource consents to take, use and discharge groundwater for dewatering purposes and to take and use groundwater for dust suppression. Pattle Delamore Partners Limited (PDP) has carried out technical assessments to confirm the potential effects of the proposal.

Available groundwater level monitoring data shows that the water table is shallow at the site. Dewatering is required during construction of Stormwater Management Areas, installation of pipework and associated infrastructure and for realignment of some streams. However, the depth of dewatering is relatively shallow with the deepest excavations requiring dewatering to around 3 m below ground level (during trenching for stormwater pipework installation) and to approximately 4 m below ground level for a single localised manhole installation within Stage 2 of the development.

Dewatering flows of up to 75 L/s are sought, while instantaneous rates for dust suppression will be the same as the current irrigation take rates, although only for very brief periods during the filling of water carts. The actual volumes required for dust suppression are very low in comparison to those authorised for irrigation at the site. The combined take of groundwater for both dewatering and dust suppression will also be lower than that currently authorised for irrigation.

Some soil contamination (generally low level) is present in localised areas of the property and therefore shallow groundwater quality sampling was carried out in a number of groundwater monitoring bores installed recently at the site. The results of that sampling showed some bores with concentrations of various dissolved metals above the Canterbury Land and Water Regional Plan Schedule 5 surface water receiving standards after reasonable mixing. As a result, discharge of dewatering flows will need to occur back to ground. However, it is possible in some local areas of the site the shallow groundwater may be suitable for discharging dewatering flows to surface water and therefore consent conditions are proposed that would allow this to occur, but only once localised groundwater level sampling has confirmed that the Schedule 5 limits will be met.

The proposed dewatering activity does not meet all the conditions of Land and Water Regional Plan permitted activity Rule 5.119 and therefore resource consent is required as a discretionary activity under Rule 5.120 of the plan. As a result, relevant effects assessments have been carried out as required by the matters of discretion under Rule 5.120. The results of these assessments indicate that with appropriate management and consent conditions, including the proposed condition that the existing irrigation consents are not exercised during the works, the potential effects of the proposal will be less than minor.

The taking and use of water for dust suppression purposes is considered to be assessed under Rule 8.5.12 of the Land and Water Regional Plan with a status of restricted discretionary. Assessments carried out indicate the proposal for dust suppression meets all the conditions of Rule 8.5.12 and effects assessments against the matters of discretion for this rule indicate there is groundwater available for allocation within the Eyre Groundwater Allocation Zone (GAZ) and the effects will be less than minor.

The majority of groundwater that will be taken at the site during the development will be for dewatering purposes, however given this groundwater will be discharged back to ground at the site or possibly back to hydraulically connected surface water in some instances, the proposal represents a significant reduction in consumptive groundwater abstraction at the site compared to what occurs currently via the consented irrigation takes. Therefore, effects including stream depletion and drawdown interference can be expected to be less than those that are currently consented.

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1.0 Introduction

Carter Group Limited (Carter Group) is applying for a Fast-track Application, under the Fast Track Approvals Act 2024,[1] for a proposed development at Ōhoka. Pattle Delamore Partners (PDP) has been engaged by Carter Group to undertake a technical groundwater assessment relating to resource consent applications for:

- The take and use of groundwater and the associated discharge of groundwater for dewatering purposes.
- The take and use of groundwater for dust suppression purposes.

It is proposed to subdivide a 154.4 ha area at 531 and 535 Mill Road, Ōhoka, for residential and commercial use. Dewatering and dust suppression will be required during the construction phase of the subdivision. The development area is located immediately south-west of the existing Ōhoka settlement. The site is bordered by Bradleys Road to the west, Mill Road to the north and Whites Road to the east. The site currently consists predominantly of dry land and irrigated pasture that is mostly used for dairy farming. The topography of the site is generally flat, with a gentle slope towards the east.

Ōhoka Stream crosses the northern area of the site, and various branches of South Ōhoka Stream as well as open drains and channels cross the central and southern parts of the site. Two springs are mapped within the development area (Environment Canterbury (ECan) references M35/7485 and M35/7487) and a further spring (historically referred to as a seep) is also present on the site. A long-term ECan shallow groundwater level monitoring bore (M35/0596) is situated near Bradleys Road in the central region of the site.

The Waimakariri District Council (WDC) Ōhoka township community water supply is sourced via deep bore BW24/0262 (84.7 m deep) located near the northern boundary of the site at the intersection of Mill and Bradleys Roads. WDC also has an emergency backup shallow bore (M35/5609, 18.8 m deep) that is located on neighbouring land immediately adjacent to the northern site boundary.

There are four existing shallow abstraction bores located on the site which are authorised to take groundwater for irrigation purposes via ECan resource consents CRC991022 and CRC991827. Consent CRC991022 allows for abstraction via bores M35/9423 (30 m deep), M35/3064 (12.5 m deep) and M35/3065 (12 m deep), while consent CRC991827 authorises abstraction via bores M35/0326 (13.7 m deep) and M35/0367 (9.4 m deep). We understand that bore M35/9423 was never drilled and therefore consent CRC991022 is exercised via two bores and not three.

[1] Fast Track Approvals Act 2024. https://www.legislation.govt.nz/bill/government/2024/0031/6.0/whole.html

The location of the proposed subdivision area is shown in Figure 1, Appendix A, along with the locations of existing WDC community water supply bores BW24/0262 and M35/5609, the existing onsite irrigation bores, ECan groundwater level monitoring bore M35/0596, existing surface water bodies, in addition to the mapped springs (M35/7485 and M35/7487) and the onsite seep.

This report has been prepared to provide supporting technical information to the main planning assessment and associated application documents being prepared by Inovo Projects Limited (Inovo) and Novo Group. PDP's scope of work is:

- To assess the proposed dewatering activities against the individual conditions of Canterbury Land and Water Regional Plan (LWRP)[2] permitted activity rule 5.119 and matters of discretion under Rule 5.120.
- Assess the effects of taking and use of groundwater for dust suppression against the conditions and matters of discretion under Rule 8.5.12 of the LWRP.

Relevant background information and subsequent technical assessments are provided in the following sections of this report.

Curricula Vitae for the PDP staff that prepared this report are provided in Appendix B.

Proposed resource consent conditions are provided by Inovo and included within the full set of application documents.

2.0 Site and Development Details

The proposed development includes:

- 752 'standard' residential size lots;
- 123 'large' residential lots;
- 250 Retirement Village units;
- A 1.49 ha commercial zoned area; and
- A 4.8 ha Polo field will also be developed within the subdivision area.

Stormwater attenuation and flood storage are to be provided by basins (e.g., first flush or attenuation basins) and treatment via wetland storage.

The proposed lot layout is shown in Figure 2, Appendix A.

Figure 2 also shows the development stage boundaries (eleven stages are currently proposed). Development will start in the north of the property and Stage 1 in the north-east area of the site includes the proposed commercial

[2] Environment Canterbury. https://www.ecan.govt.nz/your-region/plans-strategies-and-bylaws/canterbury-land-and-water-regional-plan/

development. The proposed retirement village represents the Stage 3 development, while Stage 5 consists of the polo field.

3.0 Geology and Hydrogeology

3.1 Geology

The site is located on the northern Canterbury Plains (i.e. the Waimakariri – Ashley Plains). The Canterbury Plains comprise a series of large coalescing fluvio-glacial fans built by large, braided rivers (e.g. the Rangitata, Rakaia and Waimakariri) that transported detritus (gravel with sand and silt) eastwards from rapidly rising and eroding mountains in the west. Most of the gravel deposition occurred during successive glaciations, when glaciers partly occupied the inland valleys and extended to the eastern foothills (Brown, 2001[3]). The GNS geological map of the area (Forsyth *et al.*, 2008[4]) maps the near-surface geology of the site as late Pleistocene brownish-grey river alluvium (Q2a).

Geotechnical investigations at the site carried out by Tetra Tech Coffey generally encountered silt and clayey silt from the ground surface to depths of 0.6 to 1.5 m below ground level (bgl), underlain by sandy gravel (Tetra Tech Coffey, 2025[5]).

The borelog for the existing Ōhoka drinking water supply bore BW24/0262 (adjacent to the site) is provided in Appendix C. The log shows gravel dominated strata from near ground level to 21.7 m bgl. However, the matrix of the gravel strata is highly variable, ranging from clayey through silty and sandy, or a mix of finer grain sizes. Therefore, the permeability of the shallow gravel strata may be considerably variable. From 21.7 m bgl, dominantly clay is described in the log to 26.6 m bgl, underlain by clayey gravel to 69.4 m bgl (with a zone of sandy gravel logged from 41.6 m to 44.2 bgl). From 69.4 m bgl, more permeable sandy gravel and gravel deposits are described to the base of the borehole at 84.7 m bgl.

3.2 Hydrogeology

On the Waimakariri-Ashley Plains, groundwater is dominantly sourced from infiltrating rainwater (i.e., land surface recharge) across the inland plains (to the north-west (upgradient) of the site), together with some seepage losses from the Ashley and Waimakariri rivers. A map showing the location of the site and the underlying geology within the context of the northern Canterbury Plains is provided in Figure 3, Appendix A.

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[3] Brown, L. J. (2001). Canterbury. In M. Rosen, & P. White (eds), *Groundwaters of New Zealand* (pp. 441-459). New Zealand Hydrological Society Inc., Wellington.
[4] Forsyth, P., Barrell, D., & Jongens, R. (2008). *Geology of the Christchurch area.* 1:250 000 geological map 16, Institute of Geological & Nuclear Sciences, Lower Hutt.
[5] Tetra Tech Coffey. (2025). *Ōhoka Development - Geotechnical Assessment Report – Fast Track Application.* Report reference number 773-CHCGE288040AB prepared for Carter Group Ltd. 16 June 2025.

It should be noted that the strata referred to in Figure 3 as QIS2 represents the same strata referred to in the map by Forsyth *et al.*, 2008[4] as Q2a. This Figure also shows the regional direction of groundwater movement in the area, indicating that groundwater generally flows to the east and south-east, towards the coast. Some of the groundwater throughflow also discharges into spring fed streams, including Ōhoka Stream at the site and the Cam River/Ruataniwha to the north-west. Springs in the area (including the onsite springs) represent regional groundwater discharge points and the source of water to the springs is expected to be from a spatially large groundwater catchment that extends a significant distance upgradient from the site.

3.2.1 Groundwater Levels

As per Figure 1, long-term shallow groundwater level monitoring bore M35/0596 (2.9 m deep) is situated in the central part of the site near Bradleys Road. The full groundwater level record in this bore is shown in Figure 4, Appendix A. This bore has a groundwater level record dating from September 1977 through to present. However, between 1977 and 1986 there are only between one and two measurements per year and there is a gap in the record between 1987 and 1999, with measurements starting again in July 1999. Mostly monthly recordings were made thereafter, until December 2009 when the monitoring frequency changed to daily (likely automated transducer measurements). From May 2012, the frequency changed back to generally monthly measurements. PDP installed telemetry in this bore on 4 June 2025 and therefore there will be a continuous record going forward. This telemetry data is included (up until 14 April 2026) in Figure 4.

The record in M35/0596 indicates the water table at the site is shallow, varying between 1.5 m and only 0.22 m bgl at the location of the bore. A seasonal pattern of generally higher levels in late winter and early spring versus lower levels in late summer and early autumn is evident in the data.

In late March 2025, 23 shallow boreholes were drilled at the site by McMillan Drilling Group and groundwater monitoring bores were installed in all 23 of these boreholes. The monitoring bores (P1 through P23) were generally sited at the locations of proposed Stormwater Management Areas (SMA's) (proposed stormwater basins and wetlands) to provide local groundwater level data to aid in design of these features.

The monitoring bores are typically around 3 m deep, however two of the monitoring bores, P5 and P16, are only 0.65 m and 0.75 m deep respectively. These shallower bores were installed to measure relative levels at different depth zones within the near surface strata. Since installation of the monitoring bores, a number of manual groundwater level monitoring rounds have been carried out and pressure transducers were installed in seven of the monitoring bores in early June 2025. In addition, a further pressure transducer was installed in ECan monitoring bore M35/0596 at the same time, and as noted above groundwater level telemetry was also set up in the ECan bore. Furthermore, a barometric pressure transducer was installed at the site to record atmospheric pressure fluctuations to allow for compensation of the submerged transducer records.

The locations of the monitoring bores are shown in Figure 5, Appendix A. This figure also shows the locations of the bores fitted with transducers.

The manually measured groundwater level data from the monitoring bores is shown in Figure 6a, Appendix A, along with corresponding manual groundwater level measurements taken in ECan monitoring bore M35/0596. Since the start of the monitoring, groundwater levels in the monitoring bores have varied between very close to ground level (0.01 m bgl) to around 1.4 m bgl, with the exception of the initial measurement from bore P18 on 24 March 2025 where a deeper measurement of 2.28 m bgl was recorded. Subsequent groundwater level measurements in P18 have been more consistent with the range of groundwater level measurements from the remaining bores across the site. To date, the highest manually measured groundwater levels were typically in May 2025, recorded following a large rainfall event.

Figure 6b shows the records to date (up to mid-April 2026) in the bores where transducer monitoring has occurred. The transducer records start from 3 June 2025 and therefore the manual measurements for each of these bores are shown in this figure prior to this date. The transducer data indicate typically similar patterns of groundwater level variations in these bores, with the exception of bores P02 and P22, where larger variations in levels compared with the other bores are observed.

Bore P22 shows a number of distinct periods whereby large increases in groundwater level have occurred, including during August 2025 and between November and December 2025 when levels briefly reached within close proximity (around 0.01 m) of ground level in the bore. We note these periods in P22 don't seem to correlate with rainfall and therefore we are unsure of the reason for these large spikes in water level in this bore.

With regard to P02, the record in this bore follows a similar pattern but potentially with larger fluctuations than the other bores. However, the most notable difference in this bore is between late October and late January 2026 when large variations can be observed. During this time there are periods where the groundwater levels fell quickly and significantly below prior measurements in the bore and where recovery of water levels could also be rapid. These patterns are similar to what could be expected from drawdown interference and given the late spring and early summer timeframe over which these changes occur, we expect this could be a relevant reason. We note P02 is located relatively close to onsite irrigation bore M35/0326, and therefore abstraction from this bore could possibly have influenced the water level record in P02.

All bores show a general falling water level trend from around August 2025, however there is also a significant step up in all records in mid-January 2026, coinciding with significant rainfall. The trend since that time has been relatively stable in all bores with the exception of fluctuations that are mostly correlated with rainfall. A relatively wet summer has resulted in levels during late summer that are higher than those in spring and early summer. It is possible that this pattern correlates with the cessation of large fluctuations in P02 in January 2026 as the elevated groundwater conditions during the 2026 summer may have resulted in less irrigation demand (including onsite).

Figures 6a and 6b show that there is now over 1 year of groundwater level monitoring that has been collected at this site.

3.2.2 Groundwater Use

As of mid-February 2026, ECans online wells database (Canterbury Maps[6]) identifies 606 bores located within a 2 km radius of the site. However, of these, 456 bores are recorded as 'Active (exist, present)', with the recorded status of the remaining 150 non-active bores varying between Buried/unlikely still exists, Capped (semi-permanent), Casing Retrieved/Abandoned, Collapsed, Filled In, Landparcel Proposed, No Info Expired Bore Consent, Not Drilled, Not Used, Proposed and Sealed/grouted Up.

Of the active bores, the recorded primary use includes Commercial/Industrial (1 bore) Dairy Use (6 bores), Domestic Supply or Domestic and Stockwater (271 bores), Geotechnical/Geological Investigation (1 bore), Irrigation (104 bores), Other (1 bore), Public Water Supply (1 bore), Small Community Supply (1 bore), Stock Supply (13 bores) and Water Level Observation (56 bores). In addition, there is one remaining bore with no specified use. We note, of the 56 active water level observation bores identified above, 53 are recorded as being located onsite.

We note some bores also have secondary uses including for drinking-water purposes. In total, there are 324 bores within 2 km of the site which have use information indicating they may be used for human drinking-water supply. However, this includes deep bores which are unlikely to be affected by the dewatering or dust suppression activities that will occur at the site. Shallow bores for the purpose of our assessments are assumed to be 30 m deep or less and there are up to 293 bores in this depth range (assuming those with no depth data are also shallow) that are potentially used for drinking-water supply.

[6] Canterbury Maps. https://mapviewer.canterburymaps.govt.nz/

4.0 Proposed Onsite Works and Estimation of Abstraction Rates

Dewatering is required as follows:

- For construction of SMA's;
- For installation of associated stormwater pipework and manholes;
- For installation of shallow wastewater pipework and installation of a subsoil drainage system beneath the proposed roading network; and
- For stream realignments.

The SMA's are expected to have an average construction period of around 90 days per SMA. The installation of underground pipework is expected to occur over shorter durations, with typical trench lengths open at any one time being up to 100 m to allow for pipework lengths between manholes to be inspected prior to backfilling. Further details of the excavation extents and dewatering requirements are provided in Section 4.1. As no contractor has been appointed for the work, the dewatering methodology is currently unknown.

Based on the potential for elevated metal concentrations in shallow groundwater (more details are presented in Section 5.1) it is intended that groundwater abstracted at the site during dewatering activities will be disposed of back to ground. This is likely to be relatively straightforward with discharge potentially being possible via temporary excavations down to gravel strata. However, it is also possible that in some areas groundwater may be of suitable quality to discharge to surface water following appropriate treatment for Total Suspended Solids (TSS). Any discharges to surface water will need to be supported by water quality testing to confirm that concentrations of dissolved metals meet the relevant surface water acceptance criteria limits set out in Schedule 5 of the LWRP after mixing.

In addition, where dewatering is occurring after the construction of onsite SMA's, these facilities may potentially be used to receive dewatering flows.

Groundwater abstraction for dust suppression may be required during construction, and it is intended that this water would be taken from existing onsite irrigation bore M35/0367. Water will not be taken from this bore for irrigation purposes (or any of the other three consented onsite irrigation bores) during construction and the quantities proposed to be taken from M35/0367 for dust suppression are very low in comparison to those allowed for irrigation, as explained in later sections of this report.

4.1 Dewatering Abstraction Rates

Based on Figure 2, the areas of proposed SMA 2A and SMA 2B (south-east corner of site) are the largest combined SMA areas within the development. Proposed SMA 2A covers an area of 10,540 m^2, while SMA 2B has an area of 8,080 m^2. This equates to a combined area for SMA 2A and SMA 2B of 18,620 m^2.

To estimate peak dewatering rates, we have assumed that the combined area of SMA 2A and SMA 2B may be dewatered and constructed at the same time. However, we understand excavation of other SMA areas in multiple subdivision stages will not occur concurrently. Therefore, it is expected that the combined excavation of SMA 2A and SMA 2B would represent the largest single excavation area (that requires dewatering) during subdivision development.

The SMA's have been designed based on expected upper groundwater level limits and we are aware that excavation depths will be up to 1.5 m below the assumed highest groundwater level at each location. The final depth will be approximately 1 m below the highest assumed groundwater level at each site. However, excavation at some sites is likely to intercept gravel strata (underlying the finer-grained surface sands and silts) and therefore at those locations it is intended to excavate to 1.5 m (into the gravels) and reinstate the base of the excavation with up to 0.5 of the natural sand and silt strata. This methodology will limit hydraulic connection between the basins and the underlying gravelly strata.

During construction, dry working conditions will be required at the base of the SMA excavations and therefore groundwater will be lowered to approximately 0.5 m below the excavation depth. Based on the 1.5 m excavation depth (below the maximum groundwater level) and the 0.5 m additional drawdown required under the basins, the maximum potential drawdown required at SMA's is around 2 m. In reality, excavation is not expected to coincide with high groundwater level conditions (construction of the basins is unlikely to occur in winter), however for estimation of dewatering rates we have conservatively assumed that up to 2 m of drawdown during construction may be required over the area of the SMA's.

To calculate dewatering rates for construction of SMA 2A and SMA 2B we have used ECan's online dewatering (Unconfined – Well or Pit) tool. The input parameters for the SMA model are shown in Figure 7, Appendix A. Key assumptions are as follows:

- A 200 m x 100 m excavation area (20,000 m^2, slightly greater than the combined 18,620 m^2 are of SMA 2A and SMA 2B).
- Drawdown requirement beneath SMA area of 2 m bgl.
- Assumed hydraulic conductivity of 30 m/day.
- Typical unconfined specific yield of 0.1.

We expect the assumed hydraulic conductivity adopted for the assessment is conservatively high as it is representative of highly permeable gravel-based strata, while we are aware that a large proportion of the excavations that will contribute to the dewatering inflows will be from fine-grained sand and silt-based strata. In addition, our assessment also assumes that horizontal flow to any dewatering intake could occur over a 7 m depth below the water table which we expect is conservatively deep given the shallow excavation depths.

The results of the assessment indicate a dewatering rate of 16.66 L/s after 30 days of continuous pumping, however higher dewatering rates of up to 45 L/s are predicted initially to draw down groundwater levels to the required level.

Based on the above assessment, the nature of the site and the assumptions of the prediction methodology, we consider 50 L/s is likely an appropriate upper limit for dewatering of the SMA's. Given all other SMA areas are smaller, focusing the peak rate assessment on SMA 2A and SMA 2B combined is considered conservative, particularly considering that the SMA's will not be constructed concurrently.

In addition to the SMA's, dewatering will also be required for installation of associated stormwater pipework, shallow wastewater pipework, installation of a subsoil drainage system beneath the proposed roading network and for stream realignment. Inovo has advised that the deepest stormwater pipework will have a maximum excavation depth of 2.5 m bgl and will be constructed in stages of up to 100 m at a time. There will also be a stormwater manhole installed in Stage 2 which will require a 3.5 m deep excavation (over a small 2 m x 2 m area), which is the deepest excavation anticipated at the site.

Dewatering requirements have been estimated for the stormwater pipework and manhole based on the ECan dewatering tool and the same general assumptions as per the estimates for the SMA's. However, the following inputs specific to the stormwater infrastructure are provided below:

- Trenches have been modelled as 100 m long x 2 m wide.
- The deep manhole in Stage 2 has been modelled as a square area of 2 m x 2 m.
- Groundwater levels are variable across the site, and it has been assumed that groundwater levels are 0.5 m below ground surface in order to provide a conservative assessment. This equates to a drawdown requirement of 2.5 m for the trenches and 3.5 m for the manhole (so there is 0.5 m of dry strata beneath the excavations).

The results indicate that for trenches the estimated dewatering rates could initially be around 19 L/s, reducing to around 8 L/s after 30 days. For the deep manhole, the estimated dewatering rate could be up to 14 L/s (note this excavation can be expected to be complete within a short period, likely a few days).

Based on these assessments we consider appropriate peak flow rates are up to 50 L/s for the SMA's, 25 L/s for trenches and 20 L/s for the deep manhole. These are upper estimates based on excavating in gravelly strata and assuming a shallow water table. It is considered the values presented above will also be sufficient for the dewatering requirements to install the subsoil drains at the site and allow for stream realignments. In reality, dewatering won't occur during the winter months when groundwater levels are at their highest and a large amount of the dewatering will intercept significant quantities of the shallower fine-grained strata (rather than gravels), so we expect most dewatering will occur at much lower rates than those predicted. However, there is always uncertainty in predicting dewatering rates and therefore it is important that the upper limits of take on a consent are not too low.

Given the uncertainty associated with the assessment of dewatering rates, we recommend applying for a maximum flow rate of 75 L/s which we expect should allow for the majority of trenching to occur simultaneously with the construction of the SMAs.

4.2 Dust Suppression Abstraction Rates

The Ministry for the Environment (2001) Good Practice Guide for Assessment and Managing the Environmental Effects of Dust Emissions[7] recommends that the minimum amount of water that should be available on site for dust suppression is 5 mm/m^2/day.

The largest non-stabilised area that will be developed onsite at any one time is 5 ha. Based on a peak application rate of 5 mm per day, this equates to a daily volume of 500 m^3/day. This volume aligns with Carter Group experience on other residential development sites, where typically a peak allowance over a 5 ha area is made for the following:

- 3 x 20 m^3 water carts onsite totalling 60 m^3 capacity.
- Peak usage of approximately 60 m^3/hour for 8 hours (3 carts per hour) totalling 480 m^3.

Based on the above, a peak daily volume of 500 m^3/day is requested. As indicated previously, the take will be from existing onsite irrigation bore M35/0367. The same peak instantaneous rate of abstraction as currently consented from this bore is requested which is 22.8 L/s. We note at a rate of 22.8 L/s a 20 m^3 water cart will take only approximately 15 minutes to fill.

[7] https://environment.govt.nz/publications/good-practice-guide-for-assessing-and-managing-dust/

Based on other Carter Group sites, five consecutive peak days are allowed for under particularly dry and windy conditions. However, on average, one peak day per week is allowed with average usage for the remaining six days of the week being 100 m^3/day. In addition, dust suppression is assumed to be required for 6 months of the year (26 weeks). As a result, the following rates and volumes of take are sought for dust suppression.

- Maximum instantaneous rate of take of 22.8 L/s from M35/0367.
- Maximum daily volume of 500 m^3.
- Maximum weekly volume limit of 2,700 m^3.
- Maximum annual volume of 28,600 m^3.

Existing consents CRC991022 and CRC991827 would not be exercised for irrigation purposes during development. Neither of the existing irrigation consents have annual volume restrictions, however we note that ECan has calculated an annual volume of 566,032 m^3 for CRC991022 in their accounting tally for the Eyre GAZ and an annual volume of 113,536 m^3 for consent CRC991827. Use data is available for both of these consents and is provided in Appendix D of this report. This data shows that the greatest seasonal use to date has been 503,318 cubic meters during the 2020 to 2021 irrigation season. It should be noted that Appendix D indicates that low (2022 to 2023 season) to no usage via CRC991827 has occurred since 2022. However, we understand there is an issue with the measuring and/or recording device for this consent and water has actually been abstracted from the CRC991827 bores each year since 2022.

Based on the above information the proposed usage of M35/0367 for dust suppression purposes (whereby conditions will ensure that the irrigation consents cannot be exercised during construction) represents a significant reduction in abstracted quantities of groundwater.

5.0 Assessment of Effects

5.1 Dewatering

The taking and use of groundwater for dewatering and the associated discharge of that water is a permitted activity under Rule 5.119 of the LWRP provided all the conditions of the rule are complied with.

However, in this situation, all the conditions cannot be met (Conditions 1, 2 and 4 are not met and condition 6 may not be met during any discharges to surface water). As a result, resource consent is required under Rule 5.120 of the plan. Under Rule 5.120 the activity is considered a restricted discretionary activity and ECan’s discretion is limited to the following matters:

1. The actual and potential environmental effects of not meeting the condition or conditions of Rule 5.119; and

2. Any adverse effects on Ngāi Tahu values or on sites of significance to Ngāi Tahu, including wāhi tapu and wāhi taonga; and

3. The potential adverse effects on any Critical Habitat.

With regard to matters of discretion 2 and 3 set out above, we are aware that a cultural assessment has been carried out by Inovo and is included amongst accompanying consent application documents. Inovo considers there are no adverse effects on Ngāi Tahu values or on sites of significance to Ngāi Tahu, including wāhi tapu and wāhi taonga. In addition, there are no areas of Critical Habitat at the site. As a result, matters of discretion 2 and 3 are assumed to be addressed and this report focusses on assessment against the specific conditions of Rule 5.119 of the LWRP (matter of discretion 1). Each specific condition of rule 5.119 is set out in bold below and underlying each condition a specific assessment relevant to the individual condition is provided.

5.1.1 Assessment against conditions of Rule 5.119

1. **The take continues only for the time required to carry out the work but the take will not last for a period exceeding 6 months –** [DOES NOT COMPLY]

The dewatering works will occur for longer than 6 months and therefore this condition is not met. Consent is sought for a period of 15 years, given that the development will occur in stages over a number of years. However, we understand that dewatering will not occur during the winter months (June through August) to avoid wet onsite conditions and high groundwater levels.

The main effects of not meeting this condition are in relation to the potential effects of long-term stream depletion, sediment accumulation and water quality impacts in surface waterways, and long-term drawdown effects on neighbouring bores. These issues are discussed in applicable sections below, and we consider there are no instances where the duration of the consent will impact on the potential environmental effects. Therefore, the effects of not meeting this condition are considered less than minor.

2. **The take or discharge is not from, into, or onto contaminated or potentially contaminated land –** [DOES NOT COMPLY]

Tetra Tech Coffey, 2025[8] has undertaken a Detailed Site Investigation (DSI) at the site which indicates the wider site is generally free of significant contamination (i.e. meets background concentrations). However, the site soils have some areas around existing buildings where heavy metals, Polycylic Aromatic Hydrocarbons (PAH) and asbestos were detected above background levels, including a few

[8] Tetra Tech Coffey. 2025. *Ohoka Development – Detailed Site Investigation – Fast Track Application*. Report Reference no. 773-CHCGE2888040AB. Prepared for Carter Group. 16 June 2025.

'hotspots' where concentrations of arsenic, cadmium, lead and asbestos are also above human health guidelines. However, the existing farm fields are mostly at background levels as expected with some minor exceedances. Tetra Tech Coffey has recommended that a Remediation Action Plan and Site Validation Report will be required as part of the earthworks, however in general concentrations and risks from contaminants are low.

Although soil contamination appears to be relatively minor, we expect the site would be considered contaminated or potentially contaminated by ECan in the context of this condition and therefore the condition is not met. The risk associated with not meeting this condition relates to the potential for site contaminants in soil to have leached into underlying groundwater and for these contaminants to be mobilised and discharged to surface waterways via any dewatering discharges directly to surface water.

The Ōhoka Stream and some of the other waterways on the site would be considered as 'spring-fed plains' waterways for which the 95% species protection level from Schedule 5 of the LWRP is appliable for the discharge water quality. Given the potential for some contamination of soils, representative groundwater quality samples have been collected from monitoring bores P1, P2, P11, P15 and P20. The locations represent a relatively even spread of sites across the development area. In addition, two surface water quality samples were also collected. The surface water samples were collected from Ōhoka Stream tributary and the South Ōhoka Branch (Figure 1), both at the downstream extents near Whites Road. These seven samples were collected from the site on 27 July 2025, while a previous single sample was also collected from ECan monitoring bore M35/0596 on 6 January 2025.

The recent samples were analysed for dissolved metals (groundwater samples) and total metals (surface water samples), nutrients, PAH's and Total Petroleum Hydrocarbons (TPH). The earlier sample collected from M35/0596 was analysed for dissolved metal, PAH and TPH concentrations. The laboratory results are presented in Appendix E, and a summary table comparing the recorded concentrations against the LWRP Schedule 5 surface water receiving water standards is provided in Appendix F.

The laboratory results showed that there were no groundwater or surface water samples where PAH or TPH compound concentrations were recorded above the applicable laboratory detection limit.

With regard to nutrients, two of the groundwater samples (P2 and P20) recorded high concentrations of Nitrate-N (3.6 and 4.3 g/m^3 respectively) which results in an exceedance of the Schedule 5 Dissolved Inorganic Nitrogen (DIN) limit of 1.5 g/m^3 for both samples. However, concentrations of Nitrate-N and DIN were generally the same or higher in the two surface water samples and therefore these elevated concentrations don't necessarily mean there is a risk to surface water from a groundwater discharge at the site. With regard to concentrations of Ammonia N and Dissolved Reactive Phosphorus, concentrations in groundwater are below the Schedule 5 limits, while DRP in the streams exceeds the Schedule 5 limit.

While nutrient samples are potentially suitable for the discharge of dewatering flows to surface water, there are multiple instances where dissolved metal concentrations exceeded the Schedule 5 limits. As seen in the Appendix F table, this occurs for the samples from P2 and P11 with respect to dissolved chromium, in M35/0596, P1, P2 and P11 for dissolved copper, in P2 for dissolved nickel and in M35/0596 and P2 for dissolved zinc.

It is noted that pH concentrations (measured in the field) are also lower in five of the six groundwater samples than the Schedule 5 range, although it is not uncommon for groundwater to have low pH.

These water quality results potentially prevent the discharge of dewatering flows into the onsite surface water bodies, although we note there are also two bore locations (P15 and P20) where the recorded concentrations of all metals were below the Schedule 5 limits. Therefore, depending on where dewatering is occurring at any one time, it is possible that at some sites the quality of the discharge may be suitable for disposal to surface water. As a result, it is proposed that there are two options for disposing of dewatering flows during the works. These are either directly to surface water when the water quality is suitable (will require confirmation via laboratory results prior to any discharge) or directly back to ground into the underlying shallow gravel strata.

The discharge of the same quality groundwater abstracted from the site directly back to ground is considered appropriate to manage any potential water quality impacts. Where discharge back to ground is occurring, we recommend that consent conditions require that the discharge water is disposed of to ground at a similar separation distance to the nearest stream as the distance between the stream and the point(s) of take. This will manage any potential impacts on surface water where potentially poor groundwater quality could otherwise possibly impact surface water quality. In addition, this requirement will also manage potential stream depletion impacts. The recommended conditions as discussed above are provided below under the section for Condition 4 of Rule 5.119, while proposed conditions are provided by Inovo within the full set of application documents.

Based on the above two options for the discharge water, while the proposal does not meet Condition 2 of Rule 5.119, it is considered any potential contamination issues can be managed so that any effects are less than minor.

3. **The take does not lower the groundwater level more than 8 m below the ground level of the site or cause subsidence of any other sites –** [COMPLIES]

Only minimal lowering of the water table will be required to allow for the construction of the SMAs as follows:

- Around 2 m below the localised high groundwater level at each SMA location (these excavations will be larger areas than those for service trenches and manholes).
- Up to around 3 m bgl for stormwater service trenches.
- Approximately 4 m bgl at the location of the deep Stage 2 stormwater manhole.
- Less than 2.5 m bgl for wastewater and subsoil drainage pipework and for realignment of streams.

Based on the above, groundwater levels will not be lowered more than 8 m below ground level at the site, meeting the first requirement of this condition.

Regarding subsidence, the record from long-term monitoring bore M35/0596 (Figure 4) indicates that groundwater levels within the site are typically shallow ranging from 0.22 to 1.5 m bgl at the location of the bore. Recent data from the onsite bores show a similar range, however we note that there are a significant number of onsite bores that have lower recorded groundwater levels than those measured in M35/0596 (Figures 6a and 6b). As a result, it can be assumed that the onsite monitoring has unlikely to have captured dry conditions and in the future lower levels than those shown in Figures 6a and 6b can be expected.

As discussed in Section 3.1, the upper layer of strata at the site is made up of silt and clayey silt to depths of 0.6 to 1.5 m bgl, underlain by sandy gravels. Therefore, the available soils and groundwater level data shows that groundwater levels can be expected to fall below the interface of the fine-grained silty strata and the underlying gravels. As a result, the shallow fine-grained strata (which could be susceptible to compression from the removal of pore water during dewatering) are expected to have already experienced natural settlement based on the measured seasonal groundwater level fluctuations at the site. Based on the above, no notable additional settlement within these strata from dewatering is anticipated. While at some locations dewatering may possibly lower groundwater levels beyond what has previously occurred at the site, these lower dewatering induced levels will occur in gravel-based strata which is clast supported and not considered to be susceptible to settlement effects from dewatering.

We also note that the key requirement of this condition is subsidence does not occur offsite. Available data indicates similar geology and groundwater levels on surrounding land and actual drawdown offsite from dewatering will be low.

Therefore, we don't consider there to be any significant risk of settlement offsite.

Based on the information above, Condition 3 of Rule 5.119 will be met.

4. **The take does not have a moderate, high or direct stream depletion effect on a surface waterbody, determined in accordance with Schedule 9, unless the abstracted groundwater is being discharged into the surface waterbody to which it is hydraulically connected. –** [DOES NOT COMPLY]

The shallow groundwater at the site is expected to have a moderate, high or direct hydraulic connection with surface water. Ideally groundwater removed from the site during dewatering would be discharged directly to the surface water bodies that are present at the site which would allow this condition to be met. However, as discussed above under the section relevant to Condition 2, there are instances where some dissolved metals concentrations measured in shallow groundwater exceed the LWRP Schedule 5 surface water receiving standards. As a result of these exceedances, discharge of groundwater directly back to ground will need to occur during dewatering, although it is also requested that the consent should allow for discharge to surface water when localised groundwater quality data indicates the Schedule 5 limits will be met.

In instances where discharge to surface water is feasible, given the multiple surface water features at the site, it is proposed that discharges of dewatering flows should be split between two stream channels in some instances. This is because there may be the potential for individual stream channels to be preferentially depleted of flow in some instances if discharges were only occurring to a single channel. As a result, the following consent condition is proposed to manage this potential effect.

- *Where discharge is occurring to surface water and the associated abstraction of groundwater as authorised by resource consent CRCXXXXX is occurring within 100 m of two surface water bodies, the dewatering discharge should be split evenly between the two surface water bodies.*

Where discharge to ground is required, the discharge(s) will need to occur sufficiently distant from the point of take to avoid recirculation effects (reducing the efficiency of the dewatering take and requiring high pumping rates). However, as discussed previously, conditions are proposed so that discharge to ground occurs at equal distances from the nearest surface water body as per the point or points of take. This will manage potential water quality impacts on streams and will also be affective in managing potential stream depletion impacts which are the basis of Condition 4 of Rule 5.119. As per the condition above relating to discharge to surface water in proximity of two streams, a similar control is recommended for disposal to ground when there are two streams within 100 m of the point or points of take.

Recommended conditions for discharges to ground are as follows:

- *Where discharge is occurring to ground, the discharge or discharges should occur at a similar distance to the nearest surface water body as the distance between the point or points of take authorised under resource consent CRCXXXXXX and the nearest surface water body.*
- *Where discharge is occurring to ground and the associated point or points of groundwater abstraction as authorised by resource consent CRCXXXXX is/are within 100 m of two surface water bodies, the dewatering discharges should occur at similar distance from each surface water body as the point or points of take and be split evenly between the two discharge areas.*

In addition to the conditions proposed above that manage stream depletion effects, it is important to note that existing resource consents CRC991022 and CRC991827 at the site allow for the abstraction of greater quantities of groundwater (for irrigation purposes) than the volumes that are proposed for dewatering. Resource consent CRC991022 allows for abstraction at up to 60 L/s from three shallow bores in the southern region of the site (although only two have been installed), while CRC991827 authorises abstraction at up to 45.6 L/s from two shallow bores in the northern area of the site. Therefore, the combined take from these two existing consents is 105.6 L/s, although we also note that consent CRC991827 includes a condition restricting the take at times of low surface water flow. The greatest level of restriction reduces the maximum take under this consent to 16 L/s, which results in a total combined take from CRC991022 and CRC991827 of 76 L/s (slightly greater peak rate than the proposed dewatering take).

We consider the operation of the existing irrigation consents can be expected to have a considerably greater stream depletion impact on surface water bodies at the site than will occur from the proposed dewatering activities. This is because the water taken for dewatering will be disposed of either back to surface water or back to ground onsite. As a result, the dewatering take will not have a direct impact on the streams in the same way as the consumptive irrigation takes. As previously stated, proposed conditions require that the irrigation consents will not be exercised during the development (although bore M36/0367 will be used to provide much smaller quantities of water for dust suppression) and therefore an overall reduction in stream depletion effects can be expected as a result of this proposal.

Based on the above information, while the proposal won’t meet Condition 4 of Rule 5.119, it will meet the intention of this condition which is to ensure there are no adverse stream depletion impacts as a result of dewatering. Any dewatering discharges will be non-consumptive as they will be discharged to the nearest surface waterway or back to ground to manage the potential stream depletion impact. As a result, a lower level of stream depletion will occur compared to the consented irrigation take that occurs each summer. Irrigation will not occur during development and therefore it can be expected that the effects of dewatering on stream flow will reduce compared to when the irrigation bores are operating. Therefore, it is considered that the effects of the proposal on surface water flows are less than minor.

5. **An assessment of interference effects, undertaken in accordance with Schedule 12, does not show that any community, group or private drinking-water supply bore will be prevented from taking any water –** [COMPLIES]

Dewatering at the site is not expected to prevent any community, group or private drinking-water supply bores from taking groundwater. This is based on the results of the assessment summarised below.

As discussed previously for the assessment under Condition 3, the depth of dewatering at this site is relatively limited, mostly requiring lowering of the water table to a maximum of 3 m bgl for trenches (less for SMA's) and a local small excavation (for a deep stormwater manhole in Stage 2) where the water table may be lowered to up to 4 m bgl.

ECan provides a low water level estimate for bores in the region (Calculated Minimum Water Level (calc min)), which is based on interpolation from groundwater level records of a groundwater level that is expected to be exceeded 80 percent of the time. We note the average calc min water level for shallow bores (less than 30 m deep) within 2 km of the site is 3.3 m bgl and the ECan Schedule 12 tool assumes all bores experience calc min water level conditions at the time they are assessed. Therefore, for bores in the area it can be expected that minimal dewatering is likely to be occurring under low groundwater level conditions (the condition assessed by Schedule 12), as the maximum level to which groundwater needs to be lowered at the site to achieve dry working conditions is mostly less than the calc min water level in most neighbouring bores.

Despite this, we have carried out a very conservative assessment that assumes high dewatering rates (as per the predictions in Section 4.1). This means we are assuming high rates of abstraction and the maximum drawdown requirements but assessing the potential effects in neighbouring bores at a time when groundwater levels are actually low (when much less drawdown will be required onsite).

Condition 5 of Rule 5.119 is concerned with effects in drinking-water bores only and the ECan wells database indicated there are a total of 293 drinking-water bores in a depth range from 0 to 30 m deep situated within 2 km of the site boundaries. Bores deeper than 30 m are not included in our assessment as the proposed onsite dewatering is unlikely to have any significant impact on these bores. This is supported by the Schedule 12 data check tool which indicates the majority of bores in the area are around 30 m deep or less. Bores deeper than 30 m also have significant amounts of available drawdown and are much less susceptible to drawdown interference effects.

Figure 8, Appendix A shows the location of the shallow drinking-water bores within 2 km of the site. We note that Schedule 12 of the LWRP requires that bores being assessed adequately penetrate the aquifer. The methodology to determine an adequately penetrating bore is as follows:

a. Either a depth below the calculated minimum water level, or below the level to which 50 % of bores within 2 km penetrating the aquifer are already established at 1 January 2002, whichever is the deeper; or

b. A depth determined by the application of the best available technical information and/or advice to be an adequate penetration depth.

There are 189 bores less than 30 m depth within 2 km of the site with drill dates prior to 1 January 2002. The median depth of these bores is 14.3 m bgl which is considered the appropriate adequate penetration depth for our drawdown interference assessment based on the methodology given in a. above.

The orange triangle markers in Figure 8 show the location of bores that are less than 14.3 m deep, whereas the markers for bores greater than this depth are shown as purple circles. In total there are 88 drinking-water bores within 2 km of the site with depths less than 14.3 m, although 11 of these bores have no recorded depth (so actual depth could be less than or greater than 14.3 m). The remaining 210 shallow drinking-water bores are all greater than 14.3 m deep, indicating that most bores are deeper than the adequate penetration depth, likely to maximise reliability of supply and because deeper bores are likely to have higher water quality.

Figure 8 also shows the location of WDC water service connections with the Ōhoka connections shown to the north and east of the site. Many of the bores shallower than the adequate penetration depth are situated at properties where a public water supply connection is available. In these cases (and where deeper bores are also shown at sites with a public water supply connection) it is unlikely these bores are still used for drinking water purposes.

There are relatively few water-supply bores less than 14.3 m deep (where a WDC water supply connection is not present) in close proximity to the site. Most are at distances whereby any drawdown from the proposal is likely to be small. It is also evident that there are a number of recorded drinking-water bores located onsite (both shallower and deeper than the adequate penetration depth) where any impacts from dewatering would not be a concern (these are either no longer used or will not be in use when the site is developed).

Because the site is very large (154.4 ha) and dewatering will occur over a large area of the site (particularly for service trenching), it is not practical to carry out individual Schedule 12 assessments of abstraction at all areas where dewatering will occur. Therefore, we have carried out a single Schedule 12 assessment that has been used to determine the potential sensitivity of shallow bores to drawdown interference (not directly assess the effects of this proposal). For this assessment we have assumed 9 virtual pumping bores at the site spread around the boundary of the property. The assumed location of these bores is shown in Figure 8 where the markers are yellow squares. They are positioned so that pumping simulations from the bores using the online Schedule 12 tool picks up all neighbouring bores within 2 km of the site. However, the simulation that has been run assumes only a 0.1 L/s take from each of the 9 virtual bores. This methodology has been used so that the direct effects of dewatering onsite are not simulated in the output file, rather the output file calculates only the existing cumulative drawdown interference effects of all neighbouring bores within 2 km of the site. The output file can then be used independent of where onsite dewatering is occurring to confirm the potential additive direct drawdown effects of the proposal as discussed further below.

The Schedule 12 assessment discussed above has been carried out as follows:

- The transmissivity (T) of the strata between the water table and a depth of 30 m below ground level is assumed to be 975 m^2/day.
- A typical unconfined storage coefficient (S) of 0.1 is assumed.
- The Theis (1935)[9] solution has been used to calculate drawdown in the aquifer.
- 7 day and 150 day simulations have been carried out (based on the rates from ECans database) as per the standard Schedule 12 methodology.
- An adequate penetration depth of 14.3 m bgl is assumed.
- A cut off depth of 30 m bgl has been adopted.

The assumed transmissivity has been estimated using an empirical relationship between the specific capacity of a bore and transmissivity derived from pumping tests in Canterbury (Bal, 1996)[10]. The derived value is based on specific capacity data (yield per unit of drawdown) from shallow bores within 2 km of the site.

[9] Theis, C.V.; (1935) The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage. Transactions American Geophysical Union, 16, 519-524.

[10] Bal, A. A.; (1996) Valley fills and coastal cliffs buried beneath an alluvial plain: evidence from variation of permeabilities in gravel aquifers, Canterbury Plains, New Zealand. Journal of Hydrology (NZ) Vol 35, No. 1 (1996), p.p. 1-27.

We also note ECans database provides constant rate pumping test results from three shallow bores (all screened above 24 m bgl) between 900 m and 2,100 m from the site. The reported transmissivity values are 1,343 m^2/day (M35/0313), 1,580 m^2/day (M35/4700) and 3,000 m^2/day (M35/9126). Higher values of transmissivity will typically predict less drawdown interference (although this can be distant dependant) and therefore we consider the lower adopted value of 975 m^2/day is conservative.

An excel spreadsheet file is included with the application documents which includes the raw output file in addition to a modification of the output file in a worksheet labelled 'Appendix G'. This worksheet is also shown in Appendix G of this report. The Appendix G output shows only shallow drinking-water bores (as per Condition 5 of Rule 5.119) and has the direct drawdown columns removed (as stated above, the pumping rate in the virtual bores was too low to cause any direct drawdown effects). An additional highlighted column is shown in the Appendix G file labelled 'Remaining Drawdown'.

The remaining drawdown represents subtraction of the Schedule 12 calculated cumulative drawdown (drawdown effects in all bores within 2 km of the site caused by the cumulative operation of all these bores) from the calculated available drawdown (the height of the water column in each individual bore available to accommodate drawdown effects, both self-induced drawdown to achieve a bores yield requirements and drawdown interference). The calculated remaining drawdown represents the height of the water column in all shallow bores within 2 km that is available to accommodate the direct drawdown interference effects of dewatering at the site (from dewatering onsite), in addition to the self-induced effects of each bore supplying its own yield requirements.

All these bores, with the exception of M35/5609, are domestic supply bores. Bore M35/5609 is shown in Figure 1 and is the shallow backup WDC water supply bore located directly adjacent to the site. This bore has a consented yield requirement of up to 18 L/s, whereas all private domestic supply bores only need to provide very low yields. LWRP rules 5.113 and 5.114 allow for the taking and use of up to 5 L/s and 10 m^3 (properties less than 20 ha under Rule 5.113) or 100 m^3 (properties over 20 ha under Rule 5.114) as a permitted activity and it is expected the domestic supply bores shown in Figure 8 will be operating under these rules. The majority of properties with domestic supply bores are less than 20 ha, however some are also larger. Irrespective of property size, the permitted volumes are relatively low across an area where the shallow strata is relatively permeable. Therefore, very little self-induced drawdown will be required to meet these requirements. We note a 10 m^3 water take over a period of a day represents an average flow rate of only 0.12 L/s, while a rate of 1.2 L/s is required to supply 100 m^3.

The remaining drawdown column in Appendix G shows that the calculated values range from 3.03 m through to 22.3 m and typically values will generally increase as the depth of the bore increases.

To assess the potential direct effects from dewatering we have carried out a very conservative assessment as follows:

- Use of the Theis (1935) Solution to calculate drawdown.
- Use of the same T and S values as per the Schedule 12 simulation.
- Simulation of abstraction from a single point at 75 L/s for 90 days.

The abstraction rate represents the peak dewatering rate, and the simulation time represents the maximum expected timeframe to construct each SMA. When SMA's are not being constructed, dewatering rates will be much lower and multiple SMA's will not be constructed at the same time. Therefore, 90 days is considered an appropriate simulation time for estimating the maximum drawdown impacts. Based on Section 4.1 the simulated abstraction rate also allows for dewatering of trenches at the same time as a SMA is being constructed. The assessment is presented in the form of a distance versus drawdown plot in Figure 9, Appendix A.

It should be noted we consider this distance drawdown plot to be a significant overprediction of direct drawdown effects in the strata surrounding the site for the following reasons.

- The rates assessed are conservative upper limits based on assuming dewatering will occur at times of high groundwater levels when much larger drawdown would be required. Dewatering will actually occur in the dryer months when less drawdown will be required and therefore lower rates are more likely.
- The assessment assumes the entire simulated flow rate is taken from a point source onsite which will significantly overpredict the drawdown for bores closest to the site. In reality, small scale drawdown is required over large areas.
- Dewatering flows will be discharged back to ground which means the actual take is non-consumptive which will significantly reduce the actual drawdown that will occur. If some flows end up being discharged to surface water (water quality dependant), this will still represent a significant reduction in drawdown in the aquifer compared to the modelled consumptive take, as the streams have hydraulic connection with shallow groundwater.

- There are a significant amount of surface water bodies within 2 km of the site and these will buffer drawdown effects in neighbouring bores due to the stable head conditions in these features and hydraulic connection with groundwater.
- The existing effects from the onsite irrigation abstractions are included in the cumulative drawdown effects assessment

For the reasons outlined above it is important to note that Figure 9 does not represent the actual drawdown effects that will occur in the surrounding strata as a result of the proposal. Rather this assessment is used to show that even when using a very conservative assessment methodology (to account for uncertainties) it can be shown that there are no significant predicted drawdown effects from the proposal.

As discussed previously, the modified Schedule 12 output file provided in Appendix G indicates there is between approximately 3 m and 22 m of remaining drawdown calculated in the shallow bores within 2 km of the site. For bores with remaining drawdown values less than 6 m, we have carried out direct assessments against the calculated direct drawdown shown in Figure 8 to determine whether any of these bores will be impacted by the effects of the proposal. This assessment is provided in Table format in Appendix H and together with the remaining drawdown value for each bore, this table also shows the distance from each neighbouring bore to the nearest site boundary, the conservative direct drawdown in each bore caused by the dewatering (as per Figure 9) and the balance remaining in each bore that is available to achieve an individual bores own yield once the direct effects are subtracted (labelled 'Balance of DD to achieve yield').

The Appendix H assessment shows that the minimum balance of drawdown is approximately 2.3 m which is for bore M35/4727 situated only 90 m from the property boundary.

To consider the self-induced drawdown requirements of individual bores, specific capacity data is useful. Specific capacity is a measure of bore efficiency and represents the yield of a bore per unit of drawdown. For shallow bores within 2 km of the site ECan's database indicates an average specific capacity of 4 L/s/m. Assuming bore M35/4727 has a similar specific capacity (no data is available for this bore), then it could potentially achieve a yield of over 8 L/s with the 2.3 m of drawdown remaining from the assessment. This is well in excess of the required drawdown for the yield authorised under the permitted activity rule.

Based on the results of this assessment for all bores with remaining drawdown greater than 6 m it is considered there will be more than enough drawdown after the direct effects of the proposal are for these bores to supply their own yields.

The only additional bore that needs assessing is M35/5609. Appendix G shows this bore has a predicted 12.1 m of remaining drawdown to accommodate direct and self-induced drawdown requirements. The conservative direct effects in M35/5609 from the proposal based on Figure 9 are potentially around 5.2 m due to the bore being only around 10 m from the property boundary. Further to the above, performance data from this bore indicates it needs around 5.6 m of drawdown to achieve its 18 L/s maximum yield. The remaining drawdown is therefore 1.3 m, once direct interference effects and self-induced yield requirements are considered, which indicates the bore would not be adversely impacted. In addition, it should be noted that the actual potential separation distance between this bore and any specific dewatering works will be over 50 m as that is the approximate distance between the bore and the nearest road (Road 2-2 as per Figure 2) where trenching is likely to occur (the nearest SMA is much further). Furthermore, the actual drawdown that occurs during trenching will not cause the water table to lower by significantly more than 3 m bgl directly beneath the trench and therefore the prediction of 5.2 m of direct drawdown at this bore is not realistic (more than 3 m of drawdown is unlikely to cross the property boundary).

Based on the assessment outlined above, we consider the potential effects on neighbouring drinking-water supply bores are less than minor and the proposal meets Condition 5 of Rule 5.119.

6. **At the point and time of any discharge to surface water, the rate of flow in the river or artificial watercourse is at least five times the rate of the discharge –** [MAY NOT COMPLY]

There are multiple watercourses at the site as shown in Figure 1. Flow gauging's undertaken within some of the waterways at the site were carried out on 24 and 25 February 2025. The results provided flow estimates ranging between 1.7 and 17.8 L/s. We expect these flow estimates were likely representative of seasonally low flows given the time of year they were taken. In addition, we note these flows are significantly less than the requested dewatering rates and therefore if the actual dewatering rates are similar to those requested, any discharges to surface water would not meet this condition.

As discussed previously, it is possible there may be no discharges to surface water due to elevated heavy metal concentrations in shallow groundwater. If that is the case for the entire onsite dewatering, then this condition is not relevant. However, if some discharges can occur to surface water there is a reasonable chance that this condition won't be met. It would definitely not be met if the dewatering rates end up being similar to the requested rates. In reality, we expect our dewatering rate calculations are conservatively high and if natural groundwater levels are low during dewatering, much lower rates may end up being abstracted. However, the measured gauging's indicate relatively low surface water flows (particularly in the upper reaches) and therefore it should be assumed that any discharge to surface water will not meet this condition.

If there are discharges to surface water, potential effects of any disparity in flows can be managed by carrying out all works onsite in accordance with a site Erosion and Sediment Control Plan (ESCP) that will be prepared in line with ECan's Erosion and Sediment Control Toolbox for Canterbury[11]. The ESCP will specify measures that will be employed onsite to ensure that erosion and scour of any stream bed does not occur during any discharge of dewatering flows to surface water and that visual clarity of the waterways are not adversely impacted by the discharges. The applicant is willing to accept standard resource consent conditions relevant to erosion and sediment control.

In addition, the applicant is willing to accept a further standard condition requiring that dewatering discharges cease if any downstream flooding as a result of the discharges is identified.

Based on the information provided above, the potential effects of not complying with condition 6 of Rule 5.119 are considered less than minor.

7. **The concentration of total suspended solids in any discharge to a surface waterbody does not exceed:** [COMPLIES]

   (a) **50 g/m^3 where the discharge is to any spring-fed river, Banks peninsula river, or to a lake or wetland; or**

   (b) **100 g/m^3 where the discharge is to any other river or to an artificial watercourse.**

The main watercourses at the site can be considered spring-fed and therefore to meet this condition the concentration of TSS should not exceed 50 g/m^3. Where any discharges occur to surface water it is expected that this requirement can be met via adequate treatment in a settlement tank(s) prior to discharge and the applicant is willing to accept standard consent conditions requiring TSS concentrations prior to discharge do not exceed 50 g/m^3. Therefore, this condition can be met.

8. **The discharge after reasonable mixing with the receiving waterbody meets the visual clarity standards in Schedule 5** [COMPLIES]

For any discharges to surface water, compliance with the Schedule 5 limits will first need to be confirmed via water quality testing (confirmation that dissolved metal concentrations are within the Schedule 5 criteria after reasonable mixing). In addition, the measures discussed under the sections for Conditions 6 and 7 above will ensure that the Schedule 5 criteria relating to water clarity and TSS concentrations will be met.

[11] Environment Canterbury. https://www.esccanterbury.co.nz/

9. **The point of discharge is not within a Community Drinking-water Protection Zone as set out in Schedule 1 –** [COMPLIES]

Figure 1 shows that the CDWPZ for shallow WDC supply bore M35/5609 intercepts the site in the north-west corner. As stated previously, this bore is an emergency backup bore and is typically not used anymore for water supply purposes. However, given the relatively small area of the site where the CDWPZ is present, it will be straightforward to avoid any dewatering discharges within this zone and the following condition is proposed.

- *No dewatering discharge shall occur within the Community Drinking-water Protection Zo*
- *ne for WDC bore M35/5609.*

Based on the proposed condition, the proposal will comply with condition 9 of Rule 5.119.

5.1.2 Conclusion on conditions of Rule 5.119

Although conditions 1, 2, 4 and likely 6 of Rule 5.119 won't be met by the proposal, the information provided above has shown that with appropriate management and recommended consent conditions the effects of not meeting these conditions are less than minor.

5.2 Dust Suppression

We expect a consent application to take and use groundwater at the site for dust suppression purposes would be assessed under sub-regional Rule 8.5.12 of the LWRP as a restricted discretionary activity, provided the four conditions of the rule are met. We assess each below.

5.2.1 Assessment against matters of discretion of Rule 8.5.12

Condition 1 of the rule states that for stream depleting groundwater takes, the take, in addition to all existing consented surface water takes, does not result in an exceedance of any minimum flow in Table 8c and 8d. It is considered that Table 8c is not relevant to this application as this table relates to the Ashley River and its tributaries which are not in the same catchment as the site. Table 8d is the relevant table relating to the Northern Waimakariri tributaries, including the Ōhoka Stream.

We are aware of an ECan letter (from ECan Principal Consents Planner Jo Mitten) addressed to Anderson Lloyd (Meg Davidson) and dated 1 May 2026, where ECan state they don't agree that the proposal complies with Condition 1 of Rule 8.5.12. ECan indicate that due to over-allocation of the surface water block, any stream depletion could affect the reliability of supply for existing surface water users.

Based on this ECan letter, we have carried out specific assessment of taking the water required for dust suppression from bore M36/0367. This assessment is provided in Section 5.2.2 of this report at pages 29 through 32. The assessment indicates that the hydraulic connection with surface water as determined by the methodology outlined in Schedule 9 of the LWRP is 'low'. Therefore, the take is not stream depleting, and this condition is not considered relevant. Furthermore, there will be a significant reduction in stream depletion at the site, as onsite irrigation consents, where there is a consented baseline of stream depletion effects will not be exercised as specified in proposed conditions of consent. Therefore, the proposal will actually result in a significant reduction in stream depletion, which provides a net positive effect on existing surface water users in an over allocated surface water catchment.

Condition 1 is therefore considered to be met.

Condition 2 (b) is relevant to this proposal (a new take) and requires that the rate, seasonal volume of take, in addition to all existing consented takes, does not exceed the allocation limits in Tables 8c, 8d and 8e.

The site is located within the Eyre GAZ which has an allocation limit of 99.07 million m^3/year as per Table 8e (Section 8.7.2) of the LWRP. The 1 May 2026 ECan letter to Anderson Lloyd states there is currently 95,055,741 m^3/year of groundwater allocated within the Eyre GWAZ. This represents 95.95% of the allocation limit and means there is still 4,014,259 m^3/year of groundwater allocation available within the zone. Therefore, the allocation limit for the zone given in Table 8e is not exceeded. Given there is available allocation within the groundwater zone, Condition 2 is considered to be met.

Condition 3 requires that the take and use of groundwater does not have direct, high or moderate stream depletion effects on any surface water body within the Kairaki/ McIntosh Surface Water Allocation Zone. The proposal is well outside this zone and therefore Condition 3 is met.

Condition 4 requires that the bore interference effects on any groundwater abstraction other than an abstraction by or on behalf of the applicant are acceptable, as determined in accordance with Schedule 12. This condition is met based on the assessment provided in the section relevant to drawdown interference effects below.

Given all conditions are considered to be met, we provide the following assessment against each of the individual matters of discretion set out under Rule 8.5.12 of the LWRP.

5.2.2 Assessment against matters of discretion of Rule 8.5.12

1. The rate, volume and timing of the take.

These matters are set out in Section 4.2 of this report and are provided as limits within consent conditions.

2. Whether the amount of water to be taken and used is reasonable for the proposed use.

The requested rates and volumes are based on MfE guidelines and the experience of the applicant on other similar sites as per Section 4.2 of this report. As a result, we consider they are reasonable.

3. The availability and practicality of using alternative supplies of water.

The only other possible source of water at the site is a direct take from the surface waterways. We understand the Ōhoka Stream is currently overallocated and therefore a direct surface water take is not considered feasible. In contrast, it is considered the use of groundwater with a 'low' hydraulic connection to surface water, will result in a less than minor environmental impact.

The proposed point of take is existing onsite irrigation bore M35/0367, which provides straightforward access to water without the need for additional infrastructure.

Furthermore, assessment provided later in this report indicates that abstraction from M35/0367 is not stream depleting, although abstraction from other existing irrigation bores likely is. Therefore, use of both existing irrigation consents (which authorise high abstraction rates and volumes) can be expected to result in significant stream depletion in the catchment. However, it is proposed that the existing irrigation consents will not be used during construction (and will be conditioned as such) and therefore the effects of taking and using much smaller volumes of groundwater for dust suppression (including stream depletion and drawdown interference) will be considerably less than the consented baseline effects relevant to existing irrigation consents at the site.

4. The maximum rate of take, including the capacity of the bore or bore field to achieve that rate, and the rate required to service any irrigation system.

Onsite bore M36/0367 that will be used for dust suppression already services an irrigation system, however while the bore will be used for abstraction, the irrigation system will not be used when construction commences.

The volumes of water required for dust suppression are much lower than those authorised for irrigation and the capacity of bore M36/0367 is more than enough to meet the requirements for dust suppression.

While the yield capacity of M36/0367 is greater than that needed to provide the volumes needed for dust suppression, the currently consented (for irrigation) maximum flow rate of 22.8 L/s from the bore is also requested on the proposed dust suppression consent. This is so that water carts can be filled as quickly as possible.

5. **The actual or potential adverse environmental effects on surface water resources.**

This proposal represents a large reduction in groundwater abstraction compared to the currently consented irrigation takes (which will not be exercised when the development is occurring).

The proposed volume of take for dust suppression is only 500 m^3/day, whereas the maximum consented combined take via existing irrigation consents CRC991022 and CRC991827 is 8,580 m^3/day. We note that consent CRC991827 includes restrictions relating to surface water flow, whereby the combined take from M35/0326 and M35/0367 must not exceed 1,267 m^3/day under the highest level of restriction. Under these conditions the combined take from both consents reduces to 6,235 m^3/day, however that is still over 12 times the daily volume that will be authorised for dust suppression.

Further to the above, we note that the 500 m^3/day proposed daily volume represents a continuous take of 5.8 L/s over a 24-hour period. The expected average daily take is only around 160 m^3/day which represents only 1.9 L/s over 24 hours.

Water will only be abstracted for dust suppression purposes via bore M35/0367. Therefore, we have carried out a stream depletion assessment of abstraction via this bore, which we consider indicates taking groundwater from the bore is not stream depleting (and as a result meets Condition 1 of LWRP Rule 8.5.12). We note that bore M35/0367 is situated approximately 330 m south of Ōhoka Stream and 190 m north of Ōhoka Stream Tributary (Figure 1). The hydraulic connection between the bore and these waterways has been assessed using the Hunt (2003)[12] solution and the methodology set out in Schedule 9 of the LWRP.
The assessment has been carried out using the following aquifer parameters:

- Transmissivity (T) – 975 m^2/day – As per the value used previously to represent the shallow aquifer for Schedule 12 well interference dewatering calculations.
- Storativity (S) – 0.1 – Used previously in the dewatering well interference assessments and a typical value for a water table aquifer.

[12] Hunt, B. 2003. Unsteady Stream Depletion when Pumping from Semiconfined Aquifer. ASCE Journal of Hydrologic Engineering, Vol. 8, No. 1, pp. 12-19.

- Streambed Conductance (λ) – 1.04 m/day – A specific value derived from testing in the Ōhoka River.
- Aquitard Conductance (K'/B') – 0.0000001 – Set to an arbitrarily low value so that unconfined aquifer conditions are modelled.

We note the value used for Streambed Conductance is taken from Table 5 of the report titled Observations of the Ōhoka Stream System in a Drought (ECan, 1999)[13]. This value was derived based on field testing carried out jointly by PDP and ECan as described in the report.

Schedule 9 of the LWRP has been used to estimate the hydraulic connection between bore M35/0367 and the streams to the north and south of the bore. The methodology requires determination of the percentage of the bore abstraction rate that is derived from the stream after 150 days of continuous steady pumping. While the pumping rate used in the assessment does not affect the proportion of the rate derived from the stream, we have assumed a pumping rate of 2.21 L/s (190.7 m^3/day) for the assessment to estimate the total scale of depletion. This rate represents abstraction of the proposed annual volume (28,600 m^3) over the 150 day assessment period. Table 1 below provides a summary of the results from the assessment.

Table 1: Stream depletion assessment results

Stream	Depletion Effect		Stream Depletion Category
	(L/s)	(% of abstraction)	
Ōhoka Stream (to the north)	0.80	36.1	Low
Ōhoka Stream Tributary (to the south)	0.88	39.8	Low

Table 1 shows that after 150 days of continuous pumping from M35/0367, the proportion of flow derived from the Ōhoka Stream is 36.1 % of the pumping rate and the flow derived from Ōhoka Stream Tributary is 39.8 % of the pumping rate. For each individual stream, Schedule 9 of the LWRP would define this level of hydraulic connection as 'low'. This assessment demonstrates that stream depletion in these water bodies can be expected to develop slowly and under such circumstances Schedule 9 would indicate that the groundwater required for dust suppression should be allocated from the groundwater block, with no allocation required from surface water.

[13] Environment Canterbury, 1999. Observations of the Ohoka Stream System in a Drought. Report No. U99/32.

Table 1 also shows that the actual amount of depletion in each surface water body is between only 0.8 L/s (Ōhoka Stream) and 0.88 L/s (Ōhoka Stream Tributary). In addition, the modelling predicts that short pumping durations (which will be typical of the use of filling water carts) result in significantly less depletion in the streams. For example, Section 4.2 of this report indicates that during peak demand conditions, the proposed maximum daily volume of 500 m^3/day is assumed to be required for up to 5 continuous days. After 5 days pumping at this rate, depletion of only 0.3 L/s is predicted in the Ōhoka Stream Tributary, and only 0.13 L/s is predicted in the Ōhoka Stream. There will also be prolonged periods (during rainfall and low wind conditions) when dust suppression will not be required, resulting in recovery of any small-scale stream depletion related to dust suppression.

As discussed in Section 5.2.1, ECan indicate that due to over-allocation of the surface water block, any stream depletion could affect the reliability of supply for existing surface water users. However, based on our stream depletion assessment, we consider the appropriate classification of the hydraulic connection under Schedule 9 of the LWRP is 'low' and this categorisation means that the proposal is not stream depleting and therefore Condition 1 of Rule 8.5.12 is met.

Further to the above, we also consider it is important that the actual environmental effects of the proposal should be taken into account. Existing irrigation consent CRC991827 allows for abstraction from M35/0367 for irrigation purposes at up to 1,806 m^3/day. In addition, there is no annual volume restriction on this consent and therefore theoretically the depletion from this bore operating for 150 days at this rate is up to 8.32 L/s in Ōhoka Stream Tributary and 7.54 L/s in Ōhoka Stream. Furthermore, the same amount of water can be taken for irrigation purposes from M35/0326 and this bore is closer to the Ōhoka Stream than M35/0367. Therefore, additional stream depletion from pumping via M35/0326 (for irrigation purposes) may be higher than that from M35/0367. As discussed, abstraction of groundwater for dust suppression will not be undertaken concurrently with the irrigation consents and that is proposed as a condition of consent. Therefore, this proposal will result in a very significant reduction in stream depletion compared to the consented baseline and operation of the existing consent.

Irrigation can also occur via consent CRC991022 from onsite bores M35/3065 and M35/3064. These bores are situated directly adjacent to the South Ōhoka Branch stream (Figure 1) and therefore we expect the hydraulic connection from these bores is likely to exceed the 'low' category defined in Schedule 9 of the LWRP. Operation of this consent will result in significant additional stream depletion above that related to abstraction under CRC991827. However, construction/dust suppression will not be able to occur concurrently while exercising CRC991022 or CRC991827 (as per proposed consent conditions) so there will be a further decrease in stream depletion from this proposal. Overall, the large decrease in stream depletion will increase the reliability of supply for existing surface water users, which meets the intent of Condition 1 of Rule 8.5.12.

We note that Ōhoka Stream Tributary flows into Ōhoka Stream approximately 1.8 km downstream of M35/0367. This potentially means that the sum of the depletion in both streams in Table 1 (totalling 75.9 % of the pumping rate in M35/0367) could potentially be considered relevant to the Ōhoka Stream downstream of that point. For a single stream, Schedule 9 would define a stream depletion effect that is greater than 60 % of the pumping rate (after 150 days of pumping) as a high degree of hydraulic connection, however that classification is also dependant on the rapid nature with which the stream depletion develops. In this instance, the assessment that has been carried out shows that the small magnitude of stream depletion that could develop from abstraction for dust suppression occurs slowly in each of the stream channels, which is consistent with a ‘low’ degree of hydraulic connection. For any larger (but still small in scale) effect that may develop downstream of the confluence of Ōhoka Stream and Ōhoka Stream Tributary, it would not be possible to manage that effect by imposing low flow restrictions on the take from M36/0367 (as would be possible for a typical high hydraulic connection), because of the slow development of the depletion. We consider this indicates the most appropriate classification for the hydraulic connection is still ‘low’.

Dewatering will occur at potentially high rates at the same time as dust suppression which may potentially offset some of the benefit to surface water flows by not exercising the existing irrigation consents. However, it is important to note that the dewatering abstractions will be discharged back to ground or directly to surface water and therefore the dewatering takes are effectively non-consumptive with regard to effects on surface water flow. As a result, all proposed groundwater abstractions onsite (dust suppression and dewatering) will result in a significant net gain in surface water flow compared to the currently consented irrigation takes at the site.

Based on the above information, the proposed take from M35/0367 will have a ‘low’ hydraulic connection with surface water. This means the proposal would not be considered stream depleting and the allocation of groundwater should be entirely from the groundwater allocation block. As a result, the proposal meets all the conditions of Rule 8.5.12 of the LWRP (including Condition 1). In addition, the proposal will result in a large reduction in stream depletion impacts compared to the operation of the existing irrigation bores via consents CRC991022 and CRC991827 and have a positive effect on the reliability of supply for existing surface water users.

6. **Unless the proposed take is the replacement of a lawfully established take affected by the provisions of sections 124-124C of the RMA, the actual or potential adverse environmental effects the take has on any other authorised takes, including interference effects as set out in Schedule 12.**

There will be a very significant reduction (over 12 times reduction in volume) in the amount of water taken for dust suppression compared to if the same bores were being used for irrigation (as currently consented). Therefore, a similarly large reduction in drawdown interference effects in neighbouring bores will occur compared to the currently consented effects under CRC991022 and CRC991827.

The Schedule 12 assessment provided in Section 5.1 (relevant to dewatering) of this report included the proposed cessation in take from the irrigation bores. This resulted in a reduction in drawdown interference effects in all neighbouring bores that previously experienced drawdown interference as a result of irrigation at the site.

7. **For stream depleting groundwater takes, the matters of discretion under Rule 8.5.6.**

As per the stream depletion assessment described previously, taking groundwater from existing onsite irrigation bore M35/0367 is not considered stream depleting, as assessment as per the methodology in Schedule 9 of the LWRP defines the hydraulic connection with surface water as 'low'. As a result, the matters of discretion under Rule 8.5.6 are not relevant to the proposal.

8. **Whether salt-water intrusion into the aquifer or landward movement of the salt water/fresh water interface is prevented.**

The site is located around 11 km from the coast, therefore salt-water intrusion or any landward movement of the salt water or fresh water interface is not of concern.

9. **The proximity and actual or potential adverse environmental effects of water use to any significant indigenous biodiversity and adjacent dryland habitats.**

Based on the criteria for determining significant indigenous vegetation and significant habitat of indigenous biodiversity given the Canterbury Regional Policy Statement (RPS, 2013)[14], it is considered there are no areas of significant indigenous biodiversity at the site. In addition, there are no dryland habitats at the site. Furthermore, there are no predicted adverse environmental effects resulting from the use of water for dewatering or dust suppression purposes and

[14] https://www.ecan.govt.nz/your-region/plans-strategies-and-bylaws/canterbury-regional-policy-statement/

therefore the potential effects relevant to this matter of discretion are not of concern.

10. **The protection of groundwater sources, including the prevention of backflow of water of contaminants.**

We understand the existing bores that will be used to supply water for dust suppression purposes are fitted with backflow prevention devices and therefore the proposal is consistent with this matter of discretion.

11. **The reduction in the rate of take and volume limits to enable reduction of over-allocation.**

Even though the proposal will result in a reduction in take compared to if the existing irrigation consents are exercised, this matter of discretion is not relevant as the groundwater allocation zone is not over allocated and the taking from M35/0367 is not stream depleting.

12. **Where the water is being used for irrigation, the preparation and implementation of a Farm Environment Plan in accordance with Schedule 7 that demonstrates that the water is being used efficiently.**

The water is being used for dust suppression and not irrigation (as authorised by the existing consents) and therefore this matter of discretion does not apply.

13. **Any adverse effects of the use of water on Ngāi Tahu values or on sites of significance to Ngāi Tahu, including wāhi tapu and wāhi taonga.**

Inovo has carried out a detailed cultural assessment of the proposal in their planning report.

5.2.3 Conclusion on Rule 8.5.12

The proposal to take and use groundwater for dust suppression purposes meets the conditions of Rule 8.5.12 and is consistent with the matters of discretion under this rule. The effects of taking and using groundwater for dust suppression will be significantly less than the current effects of groundwater abstraction and use at the site for irrigation as authorised by existing resource consents CRC991022 and CRC991827. Since the existing irrigation consents will not be used during the development of the subdivision, the effects of the proposal are considered less than minor.

6.0 Conclusion

Assessment of effects relating to the proposed take, use and discharge of groundwater for dewatering purposes and the taking and use of groundwater for dust suppression during construction of a residential subdivision at Ōhoka has been carried out.

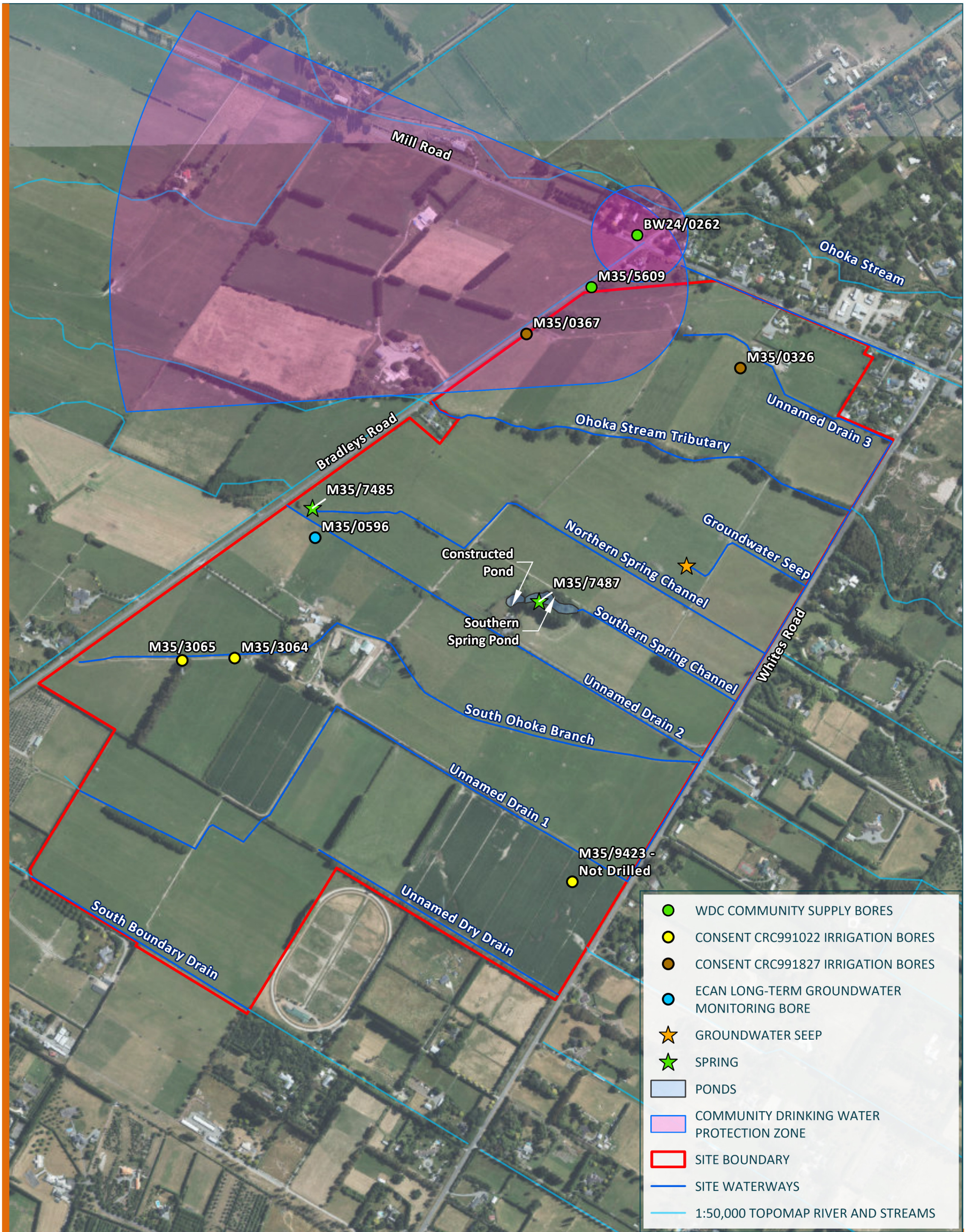
Assessments have been carried out against each of the conditions of LWRP permitted activity Rule 5.119 relating to dewatering. These assessments indicate some conditions of the Rule 5.119 are not met which means resource consent is required under Rule 5.120. However, the actual effects of not meeting the specific conditions of Rule 5.119 have been found to be less than minor. As a result, the proposal meets the first matter of discretion under Rule 5.120 of the LWRP. In addition, the proposal is consistent with all other matters of discretion under Rule 5.120. Therefore, it is appropriate for the consent applications to take, use and discharge groundwater for construction dewatering purposes to be granted.

An assessment of effects has also been carried out against the conditions and matters of discretion of Rule 8.5.12 of the LWRP relating to the proposed taking and use of groundwater for dust suppression purposes at the site. These assessments indicate the dust suppression take and use meets the four conditions of the rule, is consistent with the relevant matters of discretion that need to be considered and/or the effects of the proposed take and use for dust suppression will be less than minor. Therefore, it is also considered appropriate to grant the consent application for dust suppression.

The actual effects of taking and using water for dust suppression purposes will represent a significant reduction in the current consented baseline level of effects resulting from the exercise of irrigation consents CRC991022 and CRC991827. This is because these consents will not be exercised when groundwater is taken for dust suppression purposes and the volumes required for dust suppression are much lower than the consented irrigation takes. In addition, the relatively small take for dust suppression will be via a bore that is not considered stream depleting, whereas the consented abstractions from the existing irrigation bores will cause significant stream depletion. Therefore, not using the existing onsite bores for irrigation during construction will cause a significant reduction in stream depletion and improve the reliability of supply for existing surface water users in an over-allocated surface water catchment.

A reduction of effects is also relevant to the combined take and use of groundwater for both dust suppression and construction dewatering, as the dewatering flows will be discharged back to ground and possibly at times back to surface water, whereas the irrigation takes are consumptive. As for dust suppression, the irrigation consents will not be exercised during dewatering and therefore the scale of effects will be much reduced below the existing consented baseline.

Appendix A: Figures



pdp

FIGURE 1: SITE DETAIL

531 AND 535 MILL ROAD OHOKA - DEWATERING ASSESSMENT OF ENVIRONMENTAL EFFECTS

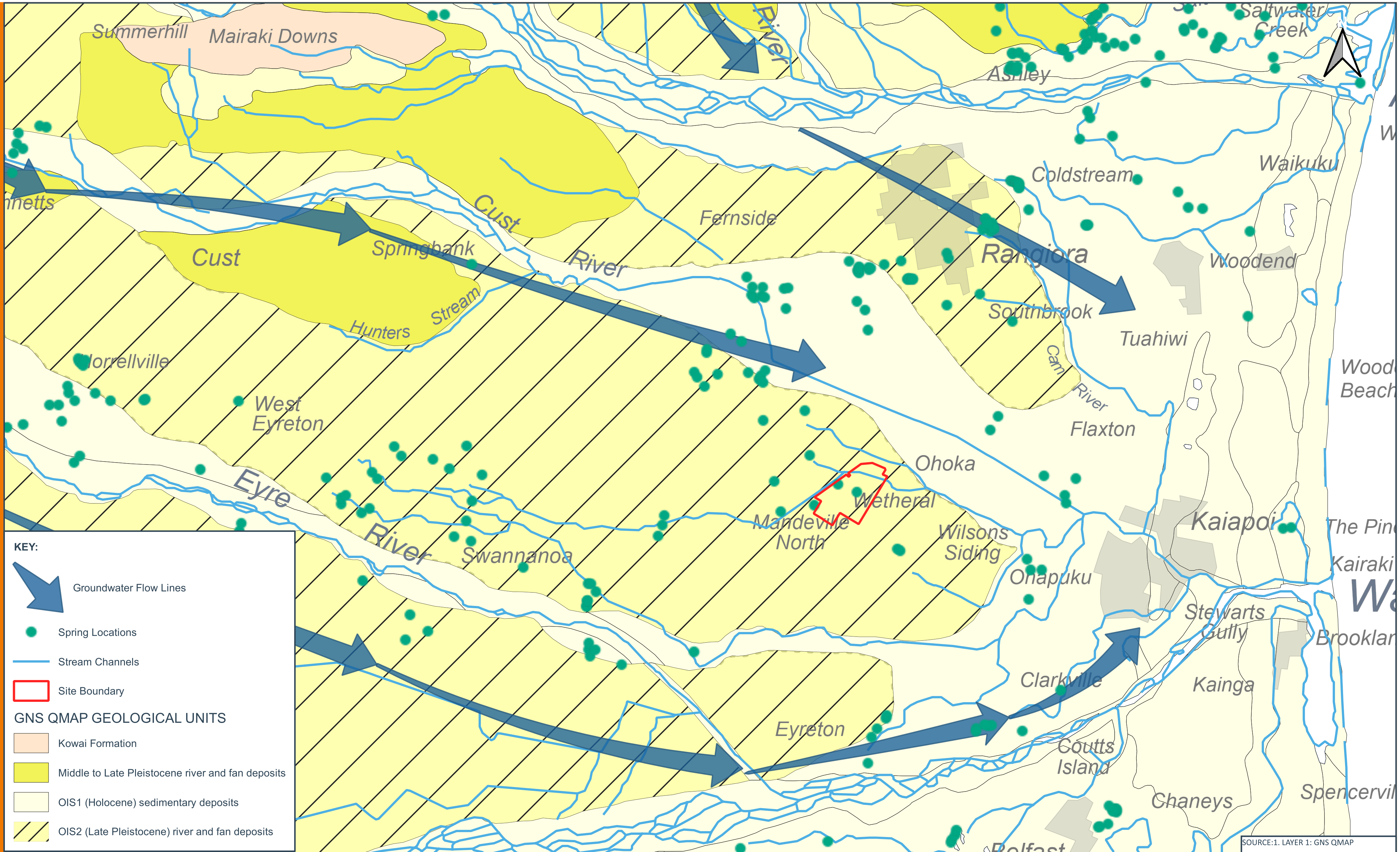
SOURCE:
1. AERIAL IMAGERY: EAGLE TECHNOLOGY, LINZ, STATSNZ, NIWA, NATURAL EARTH, © OPENSTREETMAP CONTRIBUTORS., EAGLE TECHNOLOGY, LAND INFORMATION NEW ZEALAND, EAGLE TECHNOLOGY, LAND INFORMATION NEW ZEALAND, GEBCO, COMMUNITY MAPS CONTRIBUTORS.
2. CDWPZ AND LINZ TOPOMAP RIVER LINES RETRIEVED FROM CANTERBURY MAPS, JAN 2025.
3. SPRINGS AND SEEPS IDENTIFIED FROM SITE WALKOVERS.

SCALE : 1:10,500 (A4)

REVISION: 01 | DATE: JUL 25 | BY: CF
CLIENT: CARTER GROUP LTD

C045180002R003_FIG1

FIGURE 2: GENERAL LAYOUT PLAN PROVIDED BY INOVO



0 1 2 km

KILOMETRES

SCALE : 1:120,000 (A4)

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A	FINAL	JUL 25	TG

CLIENT

CARTER GROUP LTD

FIGURE

FIGURE 3: GROUNDWATER FLOW PATHS AND HYDROGEOLOGICAL SETTING

PROJECT

531 AND 535 MILL ROAD OHOKA - DEWATERING ASSESSMENT OF ENVIRONMENTAL EFFECTS

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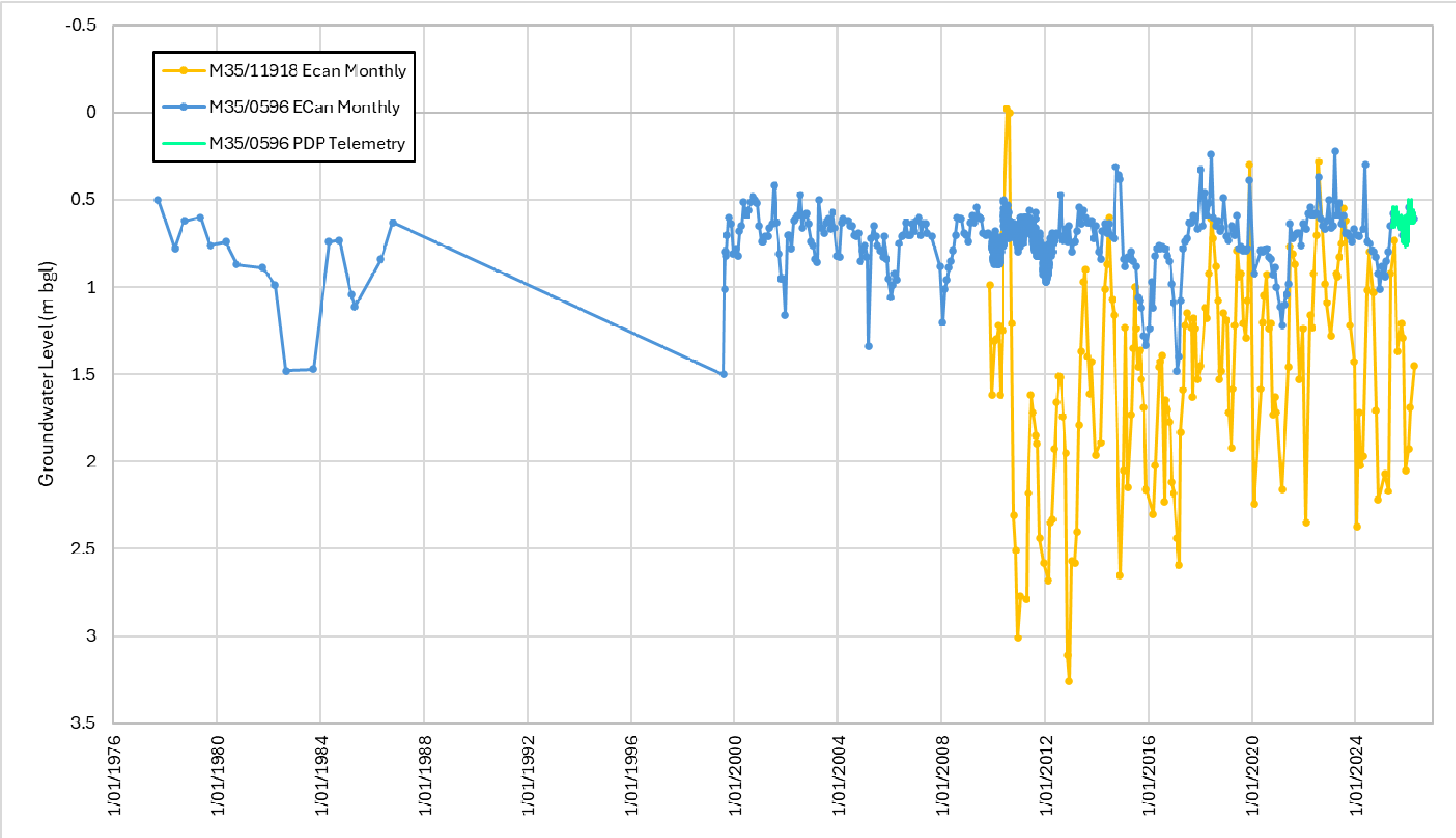

FIGURE 4: GROUNDWATER LEVEL RECORDS IN M35/0596 AND M35/11918

pdp

FIGURE 5: NEW GROUNDWATER MONITORING BORES

531 AND 535 MILL ROAD OHOKA - DEWATERING ASSESSMENT OF ENVIRONMENTAL EFFECTS

SOURCE:
1. AERIAL IMAGERY: EAGLE TECHNOLOGY, LINZ, STATSNZ, NIWA, NATURAL EARTH, © OPENSTREETMAP CONTRIBUTORS., EAGLE TECHNOLOGY, LAND INFORMATION NEW ZEALAND, GEBCO, COMMUNITY MAPS CONTRIBUTORS.

SCALE : 1:10,000 (A4)

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C045180002R003_FIG5

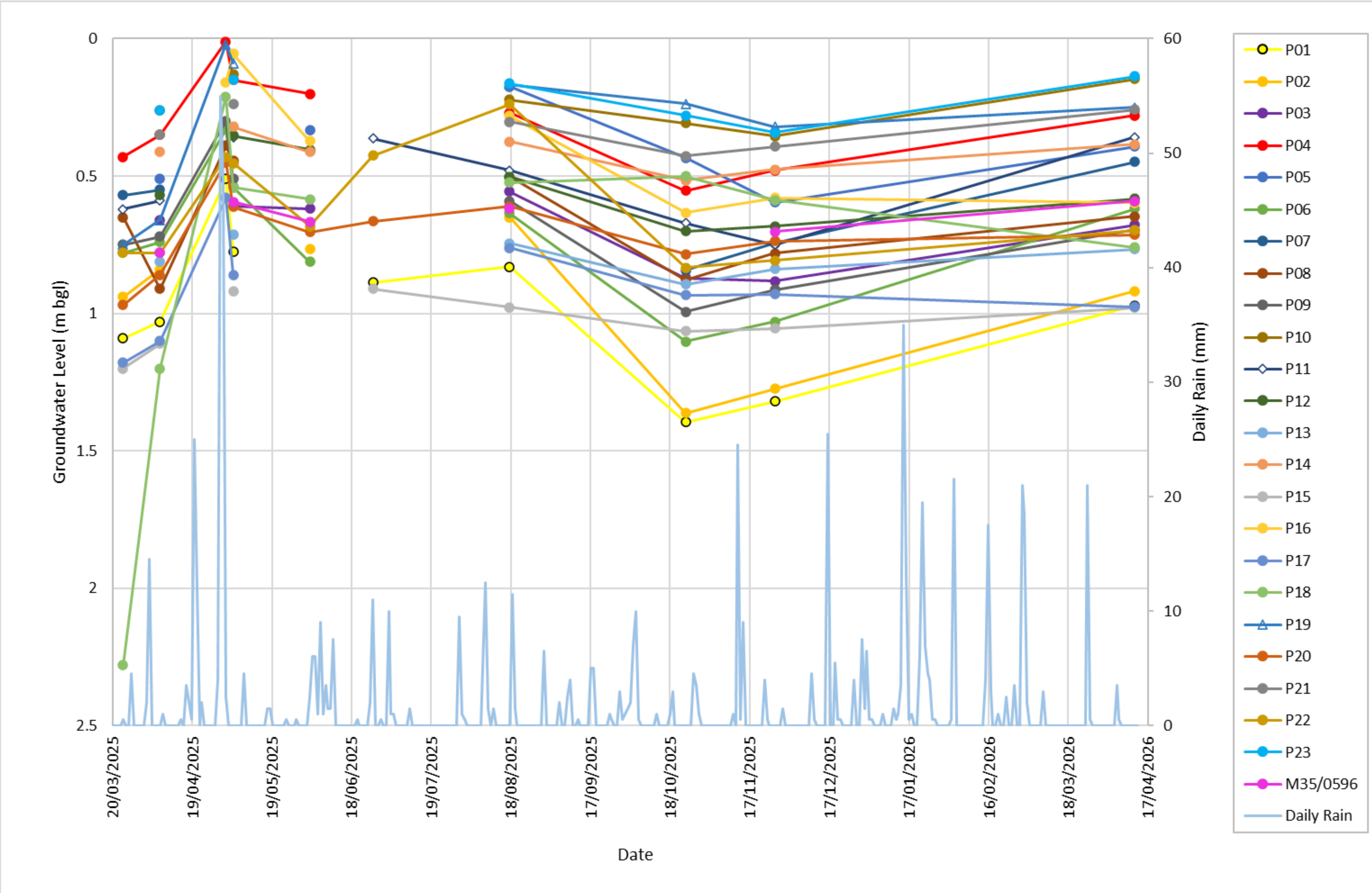


FIGURE 6A: GROUNDWATER LEVEL RECORDS IN M35/0596 AND M35/11918

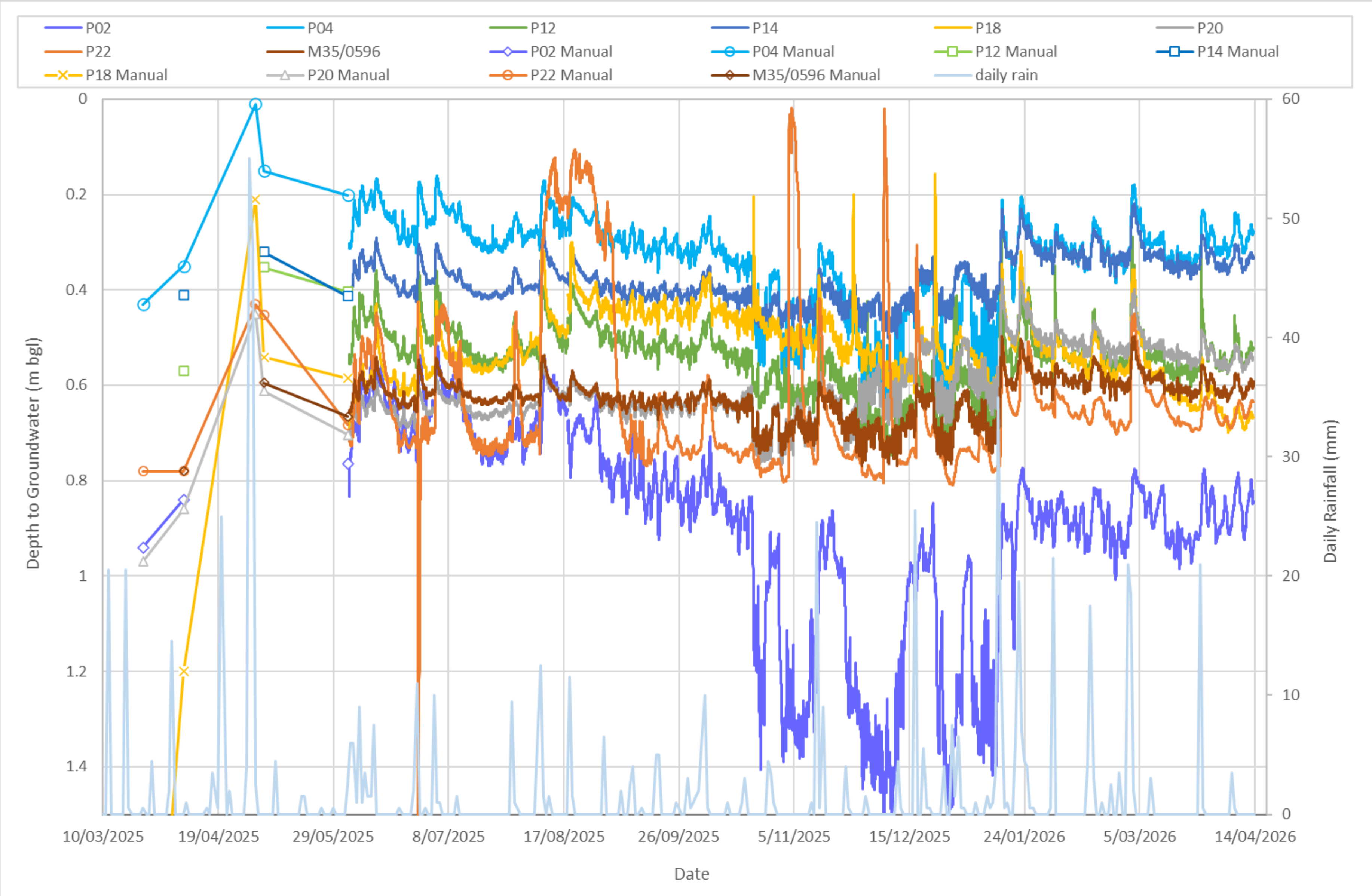
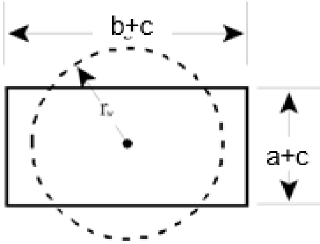


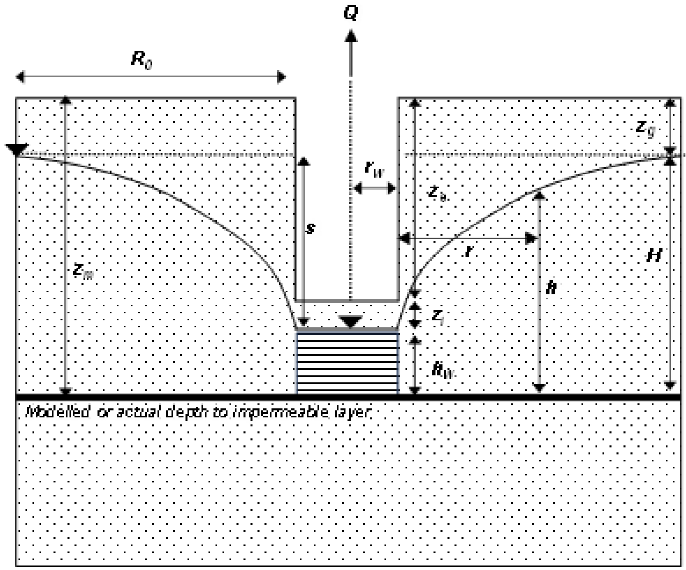
FIGURE 6B: GROUNDWATER LEVEL RECORDS IN TRANSDUCER MONITORING BORES

Dewatering (Well or Pit - Unconfined groundwater - No mitigation)



Generic Model Inputs

Static water table depth below ground	z_g	0.1	m	z_g must be < z_m Okay
Excavation depth below ground	z_e	1.6	m	
Target dewatering (water table) depth below ground	-	2.1	m	
Pumped water table depth below base of excavation footprir	z_i	0.5	m	Default: 0.5 m
Thickness of groundwater intake (i.e. well screen)	h_w	5	m	Default: Sump pump = 0.5 m, wells = 2 m
Modelled impermeable layer depth below ground	z_m	7.1	m	$z_m = z_e + z_i + h_w$. Must be <= actual depth to impermeable layer
Groundwater head above impermeable layer at R_0	H	7	m	$H = z_m - z_g$
Drawdown from static water level within excavation footprint	s	2	m	H - h
Mean hydraulic conductivity	K	30	m/d	
Maximum order of magnitude change in K	-	0	-	
Storage coefficient (use specific yield)	S	0.1	-	Default: 0.1
Duration of dewatering (maximum modelled = 30 days)	t	90	d	
Distance from edge of excavation	r	10	m	
Excavation length	a	200.0	m	
Excavation width	b	100.0	m	
Dewatering bore / well point spacing from excavation	c	5.0	m	
Length / width ratio (Rule 1)	a/b or b/a	2.00	-	
Okay to use model?	-	Yes	-	
Fixed excavation radius (Optional. Leave blank if unused)	$r_{w\text{-}fixed}$		m	
Fixed or effective radius (Equation 2)	$r_{w\text{-}calc}$	98.7	m	



Required input	(green)	Calculated	(grey)
Optional input	(blue)	Error check	(orange)

FIGURE 7: SMA DEWATERING INPUTS FOR ECAN'S ONLINE DEWATERING (UNCONFINED – WELL OR PIT) TOOL

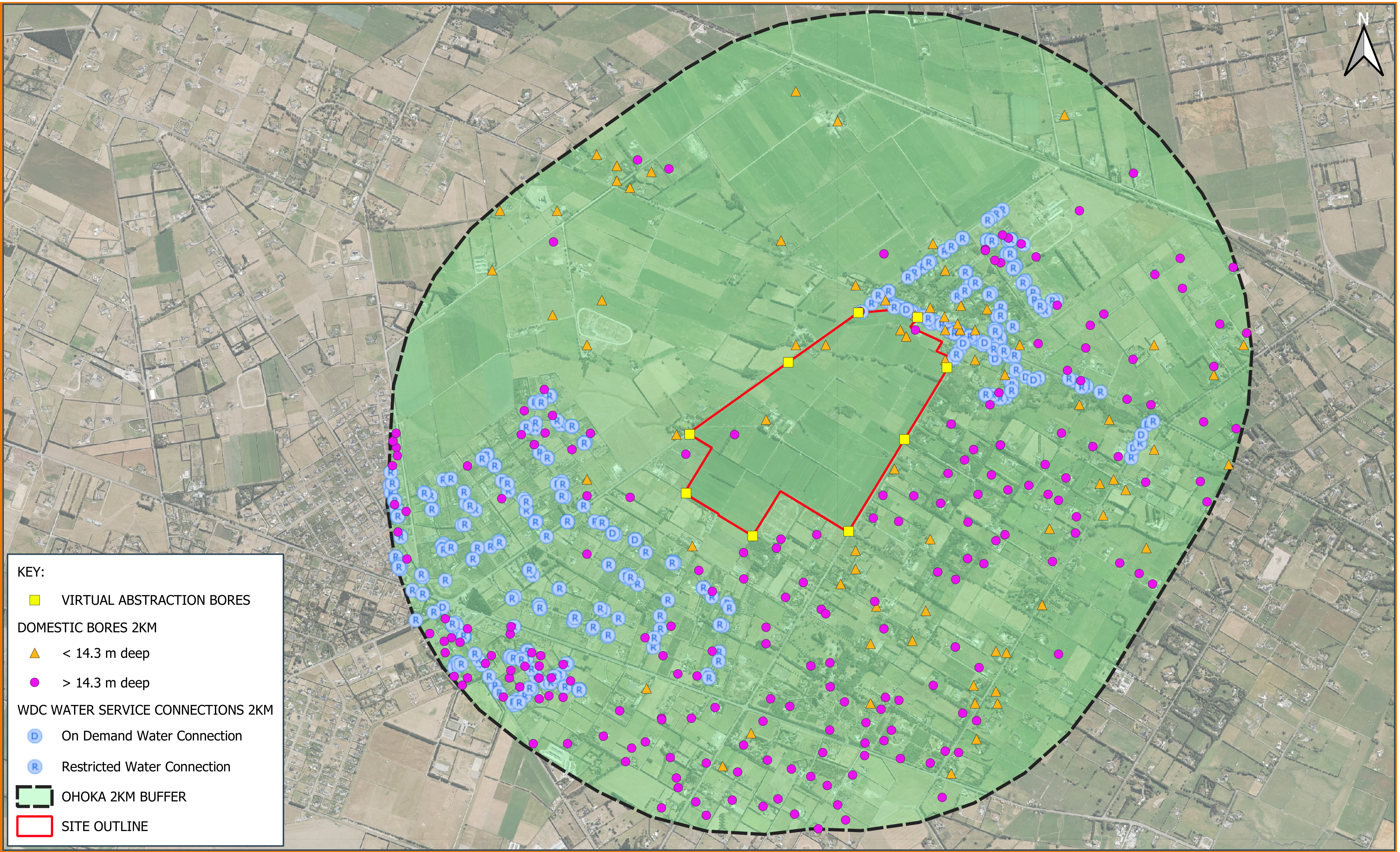


FIGURE 8: LOCATION OF DRINKING-WATER SUPPLY BORES WITHIN 2KM OF SITE

C045180002 - OHOKA PLAN CHANGE

NOTES:
1. AERIAL IMAGERY SOURCED FROM THE LINZ DATA SERVICE [https://data.linz.govt.nz] AND LICENCED BY LINZ FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
2. SITE OUTLINE SOURCED FROM ROLLESTON INDUSTRIAL DEVELOPMENTS.

0 750 1,500 m

KILOMETRES

SCALE : 1:33,000 (A4)

REVISION: 01 | DATE: JUL 25 | BY: FS

CLIENT: ROLLESTON INDUSTRIAL DEVELOPMENTS

S:\C04518\0002\Projects\C045180002_Z001_Proposed_Groundwater_Level_Monitoring_Bore_Locations.qgz

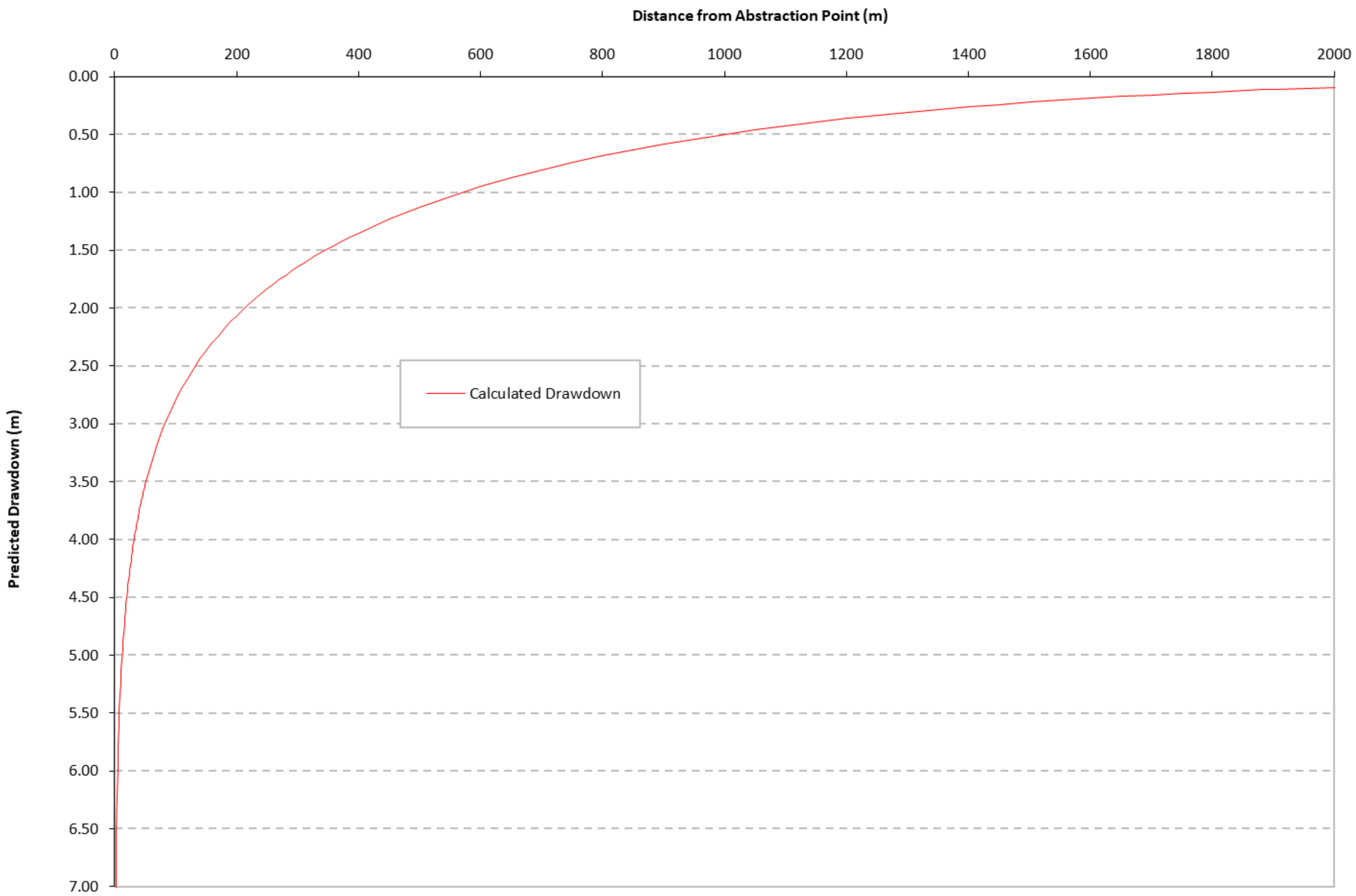


FIGURE 9: PREDICTED DIRECT DRAWDOWN EFFECTS AT DISTANCE FROM A SINGLE ABSTRACTION POINT

Appendix B: Curriculum Vitae

PATTLE DELAMORE PARTNERS LTD

Caitlin Frazer

Hydrogeologist

Caitlin is a hydrogeologist with a Postgraduate Diploma in Water Resource Management from the University of Canterbury. Since beginning at Pattle Delamore Partners in 2021, Caitlin has been involved in a wide variety of surface water and groundwater field work and technical assessments for both private clients and Territorial Authorities.

Qualifications

Bachelor of Science in Geography, University of Canterbury, 2018 - 2020

Postgraduate Diploma in Water Resource Management, University of Canterbury, 2021

Affiliations

Member of New Zealand Hydrological Society (NZHS)

Training

Essential First Aid Certificate (Red Cross)

Site Safe Consultant Passport

4WD Practical Safety Course

Leapfrog™ Works Fundamentals (Seequent)

Rescue3 – Safe Working in Water Certificate

Australia Groundwater School (Flinders University)

Career Summary

November 2021 – Present
Hydrogeologist, Pattle Delamore Partners Ltd, Christchurch

November 2020 - February 2021
Geospatial Intern, Environment Canterbury, Christchurch

February 2021- November 2021
University Tutor, University of Canterbury, Christchurch

EXPERTISE

- Water resource management
- Groundwater monitoring programmes
- Field supervision, testing and monitoring
- Pump test analysis
- Drawdown interference and stream depletion
- Geographic information systems
- Groundwater mounding assessments
- Contaminant transport assessments
- Assessment of environmental effects
- Technical review of consent applications
- Technical reporting

CAREER SUMMARY

Caitlin joined PDP at the completion of a Postgraduate Diploma of Water Resource Management. The diploma was mainly structured around water resources, surface water and groundwater quality and quantity assessment, and water management, policy, and planning.

Since starting at PDP, she has been involved in projects relating to assessments of environmental effects, managed aquifer recharge assessments, surface water and groundwater quality and quantity analysis, ArcGIS modelling and figure creation, dewatering, water balance assessments, and contaminant transport modelling in groundwater. Caitlin also has experience relating to peer reviews of consent applications for several regional councils.

Caitlin regularly leads environmental monitoring and field sampling, and is competent with fieldwork involving flow gauging, groundwater sampling using low-flow methods, slug testing, piezometric surveys, surface water quality and periphyton sampling.

PROJECT EXPERIENCE

Carter Group, Lincoln South Surface Water and Groundwater Monitoring (2022-present)
Hydrogeologist

The field lead for a ongoing monitoring programme, involving surface water monitoring in spring-fed streams and farm drains using a FlowTracker Handheld-ADV across several sites involving challenging stream conditions. Also involved with regular monitoring of 45+ bores including installation and maintenace of water level loggers in both streams and bores, and telemetry sites.

Christchurch City Council, Groundwater and Surface Water Quality and Level Monitoring at Duvauchelle and Robinsons Bay (2023 – 2024)
Hydrogeologist

Field lead for performing a 12-month monitoring programme to gather background information of baseline conditions at the sites for proposed wastewater disposal. Fieldwork consists of slug testing, monthly surface water quality and quantity monitoring, and quarterly groundwater sampling and water level monitoring. Subsequent AEE which involed mounding assessments, piezometric contours, and contaminant transport assessments.

Whitehaven Wine Company, Hydrogeological Assessment for a Storage Reservoir (2023)
Hydrogeologist, Project Manager

Project manager for a hydrogeological assessment to assess potential effects of a proposed storage reservior intercepting groundwater and impacting a downgradient wetland. Field work involved piezometric survey of surrounding streams, groundwater, and the wetland, and groundwater and wetland sampling. Subsequent analysis and reporting of the piezometric survey results and interpretation of water quality results.

Harley Road Holdings Limited, Machine Gully Wetland Hydrology Investigation (2023 - 2024)
Hydrogeologist

Undertaking field work to aid with understanding surface water flows within a wetland catchment and aiding with a subsequent water balance assessment to determine potential effects of stormwater on the wetland. Field work also involved slug testing of standpipes within the aquifer.

Hurunui District Council, Amberley WWTP Reconsenting (2024)
Hydrogeologist

Field work involving slug testing of several bores and a survey of groundwater and surface water levels across the site to create piezometric contours. Subsequent analysis of field work data was to aid an assessment for nutrient loads into a lagoon, which involved assessing previous groundwater quality information, groundwater flow direction, aquifer characteristics such as hydraulic conductivity, and contaminant transport.

Daltons Limited, Stormwater Consent Compliance (2024 - 2025)
Hydrogeologist, Project Manager

Project manager for aiding Daltons with their stormwater consent compliance. This involved analysing the groundwater quality record and communications with ECan to achieve leniency regarding the strict consent conditions, which was successfully achieved. Ongoing quarterly groundwater sampling using low-flow methods.

Tony Stuart Trustee Company Ltd, Drinking Water Supply (2025)
Hydrogeologist

Low-flow groundwater sampling of a bore to determine suitability for potable use. Comparison of lab results against relevant guidelines and recommendations presented regarding the suitability of the bore for future use.

Aurecon, Downgradient Bore Assessment (2025)
Hydrogeologist

Completed contaminant transport modelling for stormwater discharges at a proposed subdivision in Christchurch. The assessment estimated the effects of construction and operational phase stormwater discharges on downgradient receptors, specifically the effects of metals and *E. coli* on domestic supply bores.

Marlborough District Council, Speeds Road Pump Test Analysis (2025)
Hydrogeologist

Analysis of step-drawdown and constant rate test data from pumping tests on several bores in order to confirm performance characteristics and estimate aquifer parameters.

Hawkes Bay Regional Council, Source Water Risk Management Areas (2025)
Hydrogeologist

Updated the existing Source Protection Areas to be consistent with the newer Delineating Source Water Risk Management Areas (SWRMA) guidelines. The work involved using GIS systems to delineate new SWRMA zones for both springs and groundwater supplies for public drinking water.

Mt Hutt Station, Avalanche Creek Water Permit (2025)
Hydrogeologist

Completed a consent renewal for a water permit for the purposes of irrigated farming. The assessment involved a summary of local geology and hydrogeology, and evaluated potential effects on springs and stream depletion.

PATTLE DELAMORE PARTNERS LTD

Carl Steffens

TECHNICAL DIRECTOR – WATER RESOURCES

Carl is a hydrogeologist with over 20 years experience working on and managing groundwater projects throughout NZ.

Qualifications

BSc Geological Sciences, 2001, University of Canterbury

PGDipSci (Engineering geology), 2004, University of Canterbury

Affiliations

Member of New Zealand Hydrological Society

Career Summary

2004 – Present

Technical Director – Water Resources, Pattle Delamore Partners Ltd, Christchurch

CORE EXPERTISE

- Groundwater resource evaluation and modelling
- Groundwater sampling and monitoring
- Hydrogeological field testing
- Construction dewatering
- Resource consent assessments and applications
- Preparation and presentation of evidence for hearings
- Project management

MANAGEMENT EXPERIENCE

- PDP Groundwater Services Leader
- Experienced Project Manager and Technical Lead

CAREER SUMMARY

Carl has broad experience in hydrogeological field testing, monitoring and sampling, data interpretation/analysis, analytical and numerical modelling and reporting. Carl has been involved in the preparation of Assessment of Environmental Effects (AEE) reports for consent applications and presenting evidence as an expert witness at hearings.

He has worked on a broad range of construction related groundwater projects including projects relating to construction dewatering, stormwater basins, wastewater systems, roading developments and subdivisions. He also has extensive experience on irrigation projects.

Carl has provided assistance to local councils including CCC on the development of groundwater drinking water supply sources including consenting requirements. He has also worked on projects for various regional councils throughout the country including ECan.

PROJECT EXPERIENCE

Aurecon

Technical assessment of construction dewatering rates and assessment of effects to support resource consent application for Parakiore Recreation and Sports Facility.

Brian Perry Civil

Construction dewatering advice relating to civil works across Cashmere Stream at Eastman Wetlands.

Christchurch City Council

Groundwater assessments, pump testing and preparation of resource consent applications for new Christchurch City Community Drinking-water Supply bores at various city pumping stations.

Christchurch City Council

Groundwater assessments and/or monitoring relating to proposed stormwater infiltration, retention and wetland sites including Milns Basin (Eastman Wetlands) Worsleys Basin and Quaifes Road.

Confidential Client

Hydrogeological investigations and numerical modelling of dewatering requirements and groundwater management issues associated with proposed open cast mine developments.

Danne Mora Holding Ltd

Development of a Modflow numerical groundwater flow model to assess potential drainage flows to permanently lower the water table at a proposed residential subdivision.

Environment Canterbury

Technical review of various resource consent applications for the taking, use and discharge of groundwater within Canterbury.

Fire and Emergency New Zealand

Assessment of effects relating to construction dewatering associated with site redevelopment at various fire station sites. Preparation of resource consent application to take, use and discharge groundwater for dewatering purposes.

Foodstuffs (South Island) Properties Limited

Assessment of dewatering impacts relating to proposed construction works at Foodstuffs Prestons Road site, Christchurch.

Fulton Hogan Limited

Field investigations including slug testing and stream gauging, data analysis, hydrogeological modelling and predictions of groundwater flows emerging from a groundwater drainage system installed beneath the roading network at Longhurst subdivision, Halswell.

Gillman Wheelans Limited

Field testing and assessments relating to new community groundwater supply bores, construction dewatering relating to service installation, dewatering induced settlement and associated resource consenting for various subdivision developments within Canterbury.

New Zealand Transport Agency

Preparation and presentation of evidence at a resource consent hearing relating to an application by NZTA to Waimakariri District Council for the alteration of a designation and the construction of a State Highway realignment and the widening of an existing State highway in relation to the Woodend Short Eastern Alignment.

Ngāi Tahu Property Limited

Hydrogeological assessments to support dewatering and excavation consent applications relating to a multistorey car park building in central Christchurch.

Prestons Road Limited

Quantifying groundwater inflows into proposed stormwater management basins and wetlands at a Christchurch residential development. Hydraulic onsite testing including piezo installation, trench excavation, pumping trials and slug testing. Data interpretation and analysis and estimates of groundwater inflows via analytical flow models.

Rae Paenga

Numerical modelling and review of contractor dewatering methodology at Parakiore Recreation and Sports Facility. Expert witness at arbitration hearing between Principle and Contractor.

University of Canterbury

Field testing, design and analysis of a large-scale groundwater dewatering system involving direct discharge of large dewatering flows to multiple re-injection bores for construction of the University biosciences building. Other specialist groundwater services for UC relating to construction dewatering and groundwater sourced air condition systems.

Various clients

Technical assessments and preparation of resource consent applications to take, use and discharge groundwater for heating and cooling purposes, including for cooling computer servers at data centres, at various sites withing Christchurch City.

Various clients

Supervision of field investigations including the drilling and installation of groundwater abstraction/monitoring bores. Groundwater quality sampling and groundwater level monitoring.

Various clients

Preparation of assessment of environmental effects (AEE) reports for groundwater take, use and discharge consent applications. Assessments of potential well yields, interpretation and analysis of pumping test data, well interference and groundwater mounding assessments associated with groundwater takes and discharges, interaction of surface water and groundwater, groundwater quality assessments, sea water intrusion assessments, design of groundwater level and quality monitoring programmes, analytical and numerical modelling applications.

West Coast Regional Council

Advising and technical reviews of resource consent applications to vary existing discharge resources consents held by Taylorville Resource Park Limited near Greymouth.

PATTLE DELAMORE PARTNERS LTD

Nic Love

SERVICE LEADER – WATER RESOURCES

Nic is a service leader specialising in groundwater with over ten years of experience working at PDP's Christchurch Office. He has experience in surface water and groundwater resource assessments and consenting including water supply scoping and consenting, dewatering assessments, undertaking drawdown interference effects on neighbouring bores, assessments of stream depletion effects and aquifer testing analysis. Nic has extensive fieldwork experience in groundwater and surface water quality and level monitoring.

Qualifications

BSc (Geology), 2014, University of Canterbury

PMEG (Engineering Geology), 2015, University of Canterbury

Affiliations

Member of New Zealand hydrological Society

Training

Basic first aid

Site Safe Consultant Passport

Career Summary

2023 – Present

Service Leader – Water Resources, Pattle Delamore Partners Ltd, Christchurch

2021 – 2023

Senior Hydrogeologist, Pattle Delamore Partners Ltd, Christchurch

2016 – 2021

Hydrogeologist, Pattle Delamore Partners Ltd, Christchurch

2014 – 2015

Geophysicist (Summer Position), Shell Todd Oil Services, New Plymouth

CORE EXPERTISE

- Shallow groundwater level investigations, including piezometric contouring and assessing interactions with surface waterways
- Groundwater mounding assessments to assist stormwater infrastructure design
- Dewatering assessments and preparation of dewatering management plans
- Council hearing evidence preparation and attendance
- Resource consent technical assessments
- Pumping test analysis
- Drawdown interference analysis
- Stream depletion analysis
- Field supervision and testing
- Technical peer review of consent applications
- Delineating source water risk management areas

CAREER SUMMARY

Nic is an experienced hydrogeologist specialising in groundwater and consenting issues and has been involved with a large number of projects within New Zealand, including those relating to shallow groundwater implications for civil projects as well as water supply projects. These projects include the planning and consenting of dewatering activities for the installation of underground services or building foundations, and groundwater mounding assessments to determine potential effects from stormwater disposal on shallow groundwater and drawdown interference and stream depletion assessments for groundwater abstractions. Nic also has experience appearing as an expert witness at resource consent hearings.

Nic has routinely been involved in planning and completion of new groundwater supplies and has been involved with feasibility studies, site scoping, overseeing drilling operations, source protection zone delineation (where applicable) and preparation of resource consent applications throughout New Zealand.

Nic is proficient in the use of GIS systems, Excel and analytical solutions for modelling groundwater abstraction drawdown interference, stream depletion and mounding effects.

SELECTED PROJECT EXPERIENCE

Christchurch City Council - Technical Water Resources Advice

Hydrogeologist

Construction supervision for a number of new public supply bores within Christchurch. Technical advice on bore development and aquifer testing and delineation of source protection zones. Analysis of aquifer test data and assessment of stream depletion and well interference for multiple pumping stations for global groundwater abstraction consent.

Marlborough District Council - Assessment of New and Existing Community Supply Bores

Hydrogeologist

Undertaking scoping studies, assessments of stream depletion, saline intrustion and drawdown interference effects for a number of new and proposed public water supply bores for varius townships, including Blenheim, Havelock, Picton and Riverlands. Preparing resource consent applications and presenting evidence at a resource consent hearings where required.

Southland District Council - Various Drinking water Supply Consenting Projects

Hydrogeologist

Preparation of resource consent applications for the renewal of several community drinking water supplies, including Tuatapere, Otautau and Te Anau. Technical work involving aquifer testing analysis and Assessments of Environmental Effects.

Christchurch City Council - Assessment of Shallow Groundwater Levels and Water Balance Assessment for Blakes Road Stormwater Facility – Belfast, Christchurch

Hydrogeologist

Assessing on site shallow groundwater level data to estimate a high groundwater level surface to aid in the design of a proposed council stormwater facility. Preparation of a water balance assessment based on the as-built plans to determine the overall groundwater loss to surface water to assist with resource consenting aspects of the project.

Christchurch City Council - Assessment of Shallow Groundwater Levels and Water Balance Assessment for Clare Park Stormwater Facility – Burwood, Christchurch

Hydrogeologist

Assessing nearby shallow groundwater level data to estimate a high groundwater level surface within a proposed extension of a council stormwater facility. Preparation of a water balance assessment based on the as-built plans to determine whether groundwater will be discharged to downstream stormwater basins.

Christchurch City Council - Shallow Groundwater Investigations at Cranford Basin – Papanui, Christchurch

Hydrogeologist

Drilling supervision for a number of groundwater level monitoring bores, including hydraulic conductivity testing and long-term groundwater level monitoring to assist with the stormwater infrastructure design for the site.

Eliot Sinclair - Shallow Groundwater Level Assessment – Prebbleton

Hydrogeologist

Estimation of high groundwater levels at a proposed subdivision, based on linear correlation on site groundwater level data, nearby long-term groundwater level monitoring data and elevations of spring-fed streams.

Ngai Tahu Property – Shallow Groundwater Level Changes as a Result of Sea Level Rise – Aranui, Christchurch

Hydrogeologist

Estimation of changes in shallow groundwater levels at a proposed subdivision as a result of various sea level rise projections under different climate change scenarios, to assist with stormwater design for the site.

Danne Mora Residential – Groundwater Discharge from Subsurface Drainage System – Halswell, Christchurch

Hydrogeologist

Estimation of drainage flows from a proposed subsurface drainage system beneath a residential subdivision, including an assessment of environmental effects for the discharge of drainage flows to a surface waterway.

Foodstuffs South Island Limited - Dewatering Assessment – Halswell Road, Christchurch

Hydrogeologist

Preparation of a dewatering assessment to facilitate the resource consenting process for the construction of a new Pak'nSave supermarket, including groundwater sampling in order to characterise background groundwater quality.

Aurecon – Dewatering Assessment – Halswell Road/SH75 Christchurch

Hydrogeologist

Preparation of a dewatering assessment to facilitate the resource consenting process for the upgrade of roading infrastructure and underground services along a 2.7 km stretch of road corridor.

Ministry for the Environment - Technical Guidelines for Drinking Water Source Protection Zones

Author

Co-author of technical guidelines for the delineation of both groundwater and surface water drinking water source protection zones including specifications for a 'default' national approach. The report was commissioned as part of the Review of the National Environmental Standard for Sources of Human Drinking Water. Further advice to MfE on changes to the NES.

Appendix C: BW24/0262 Borelog

Borelog for well BW24/0262

Grid Reference (NZTM): 1565132 mE, 5199018 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 23.7 m +MSD Accuracy: < 2.5 m
Driller: Clemence Drilling Contractors
Drill Method: Unknown
Borelog Depth: 84.7 m Drill Date: 02-May-2015

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Depth(m)	Full Drillers Description	Formation Code
0.15m	TOPSOIL. Not Recorded.	
2.10m	Yellow clayey, silty GRAVEL (2 - 60 MM). Not Recorded.	
4.50m	Grey clayey GRAVEL (2 - 60 MM). Unsaturated (dry or moist).	
5.80m	Blue sandy GRAVEL (2 - 60 MM). Not Recorded.	
7.20m	Yellow clayey GRAVEL (2 - 60 MM). Not Recorded.	
8.00m	Yellow clayey, silty GRAVEL (2 - 60 MM). Not Recorded.	
9.50m	sandy GRAVEL (2 - 60 MM). Saturated (water-bearing).	
10.60m	clayey GRAVEL (2 - 60 MM) with some sand. Not Recorded.	
11.50m	Brown sandy GRAVEL (2 - 60 MM). Not Recorded.	
12.30m	GRAVEL (2 - 60 MM) with some sand. Saturated (water-bearing).	
13.20m	clayey GRAVEL (2 - 60 MM). Not Recorded.	
14.40m	GRAVEL (2 - 60 MM). Saturated (water-bearing).	
15.50m	clayey GRAVEL (2 - 60 MM). Not Recorded.	
17.20m	Yellow GRAVEL (2 - 60 MM) with some clay. Saturated (water-bearing).	
18.50m	clayey GRAVEL (2 - 60 MM). Not Recorded.	
19.40m	sandy GRAVEL (2 - 60 MM) with some silt. Saturated (water-bearing).	
21.70m	clayey GRAVEL (2 - 60 MM). Not Recorded.	
26.60m	Yellow CLAY with some gravel. Not Recorded.	
28.20m	Yellow clayey GRAVEL (2 - 60 MM). Not Recorded.	

Depth to base	Description
37.40m	Yellow clayey GRAVEL (2 - 60 MM). Not Recorded.
41.60m	clayey GRAVEL (2 - 60 MM). Not Recorded.
44.20m	Brown sandy GRAVEL (2 - 60 MM). Not Recorded.
55.20m	Yellow clayey GRAVEL (2 - 60 MM). Not Recorded.
58.80m	Yellow clayey GRAVEL (2 - 60 MM). Not Recorded.
61.40m	Yellow clayey GRAVEL (2 - 60 MM). Not Recorded.

	64.20m	Yellow clayey GRAVEL (2 - 60 MM). Unsaturated (dry or moist).
65	69.40m	clayey GRAVEL (2 - 60 MM). Not Recorded.
70	71.00m	Brown sandy GRAVEL (2 - 60 MM) with some clay. Not Recorded.
	72.20m	sandy GRAVEL (2 - 60 MM). Not Recorded.
	73.90m	sandy GRAVEL (2 - 60 MM). Well sorted. Not Recorded.
75	75.60m	GRAVEL (2 - 60 MM) with some clay. Saturated (water-bearing).
	76.70m	sandy GRAVEL (2 - 60 MM). Well sorted. Not Recorded.
	77.80m	Yellow sandy GRAVEL (2 - 60 MM) with some clay. Not Recorded.
	79.00m	Other colour sandy GRAVEL (2 - 60 MM) with some clay. Not Recorded.
80	81.20m	Other colour GRAVEL (2 - 60 MM) with some clay. Not Recorded.
	83.60m	Yellow GRAVEL (2 - 60 MM) with some clay. Not Recorded.
	84.20m	Other colour GRAVEL (2 - 60 MM). Well sorted. Not Recorded.
	84.70m	

Appendix D: CRC991022 and CRC991827 Irrigation Use Data

CRC991022 and CRC991827 Irrigation Use Records

Consents	**Bores**	**Irrigation Season**									
		2016/17	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**
	M35/3064	106,686	72,409	83,018	90,304	113,531	44,998	45,091	105,836	126,559	32,074
	M35/3065	101,547	76,379	39,594	160,317	176,202	82,984	102,165	143,443	62,472	81,285
CRC991022	Total	208,233	148,788	122,612	250,622	289,732	127,982	147,256	249,279	189,031	113,359
	M35/3026	68,835	56,129	49,449	104,174	122,443	13,987	0	0	0	0
	M35/0367	68,403	46,702	63,072	100,995	91,143	41,624	13,953	0	0	0
CRC991827	Total	137,238	102,831	112,521	205,170	213,586	55,611	13,953	0	0	0
CRC991022+CRC991827	All	345,471	251,619	235,133	455,791	503,318	183,593	161,209	249,279	189,031	113,359

Appendix E: Laboratory Water Quality Results

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Pattle Delamore Partners Limited	**Lab No:**	3749763	SPv1
Contact:	Caitlin Frazer C/- Pattle Delamore Partners Limited PO Box 389 Christchurch 8140	**Date Received:**	06-Jan-2025	
		Date Reported:	10-Jan-2025	
		Quote No:	81087	
		Order No:		
		Client Reference:	C045180002	
		Submitted By:	Caitlin Frazer	

Sample Type: Aqueous

	Sample Name:	M35/0596 06-Jan-2025 2:00 pm
	Lab Number:	3749763.1
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Dissolved Arsenic	g/m^3	0.0088
Dissolved Cadmium	g/m^3	< 0.00005
Dissolved Chromium	g/m^3	0.0008
Dissolved Copper	g/m^3	0.0064
Dissolved Lead	g/m^3	0.0028
Dissolved Nickel	g/m^3	0.0012
Dissolved Zinc	g/m^3	0.021
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq		
Acenaphthene	g/m^3	< 0.00010
Acenaphthylene	g/m^3	< 0.00010
Anthracene	g/m^3	< 0.00010
Benzo[a]anthracene	g/m^3	< 0.00010
Benzo[a]pyrene (BAP)	g/m^3	< 0.00010
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m^3	< 0.00010
Benzo[g,h,i]perylene	g/m^3	< 0.00010
Benzo[k]fluoranthene	g/m^3	< 0.00010
Chrysene	g/m^3	< 0.00010
Dibenzo[a,h]anthracene	g/m^3	< 0.00010
Fluoranthene	g/m^3	< 0.00010
Fluorene	g/m^3	< 0.0002
Indeno(1,2,3-c,d)pyrene	g/m^3	< 0.00010
Naphthalene	g/m^3	< 0.0005
Phenanthrene	g/m^3	< 0.0004
Pyrene	g/m^3	< 0.0002

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m^3	1
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m^3	1

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 09-Jan-2025 and 10-Jan-2025. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

SSP-1v1

Client:	Pattle Delamore Partners Limited	**Lab No:**	3925977
Contact:	Caitlin Frazer	**Date Received:**	27-Jun-2025
	C/- Pattle Delamore Partners Limited	**Date Reported:**	04-Jul-2025
	PO Box 389	**Quote No:**	138798
	Christchurch 8140	**Order No:**	
		Client Reference:	C045180002
		Submitted By:	Caitlin Frazer

Sample Type: Aqueous

Sample Name:		P20 27-Jun-2025 9:20 am
Lab Number:		3925977.1
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Dissolved Arsenic	g/m^3	< 0.0010
Dissolved Cadmium	g/m^3	< 0.00005
Dissolved Chromium	g/m^3	< 0.0005
Dissolved Copper	g/m^3	0.0007
Dissolved Lead	g/m^3	< 0.00010
Dissolved Nickel	g/m^3	< 0.0005
Dissolved Zinc	g/m^3	< 0.0010
Nutrient Profile		
Total Ammoniacal-N	g/m^3	< 0.010
Nitrite-N	g/m^3	< 0.002
Nitrate-N	g/m^3	4.3
Nitrate-N + Nitrite-N	g/m^3	4.3
Dissolved Reactive Phosphorus	g/m^3	0.007
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq		
Acenaphthene	g/m^3	< 0.00010
Acenaphthylene	g/m^3	< 0.00010
Anthracene	g/m^3	< 0.00010
Benzo[a]anthracene	g/m^3	< 0.00010
Benzo[a]pyrene (BAP)	g/m^3	< 0.00010
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m^3	< 0.00010
Benzo[g,h,i]perylene	g/m^3	< 0.00010
Benzo[k]fluoranthene	g/m^3	< 0.00010
Chrysene	g/m^3	< 0.00010
Dibenzo[a,h]anthracene	g/m^3	< 0.00010
Fluoranthene	g/m^3	< 0.00010
Fluorene	g/m^3	< 0.0002
Indeno(1,2,3-c,d)pyrene	g/m^3	< 0.00010
Naphthalene	g/m^3	< 0.0005
Phenanthrene	g/m^3	< 0.0004
Pyrene	g/m^3	< 0.0002
Total Petroleum Hydrocarbons in Water		
C7 - C9	g/m^3	< 0.10
C10 - C14	g/m^3	< 0.2
C15 - C36	g/m^3	< 0.4
Total hydrocarbons (C7 - C36)	g/m^3	< 0.7

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

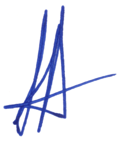
Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1
Total Ammoniacal-N	Filtered Sample from Christchurch. Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m³	1
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	1
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m³	1
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	1
Dissolved Reactive Phosphorus	Filtered sample from Christchurch. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) : Online Edition.	0.004 g/m³	1
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m³	1
Nutrient Profile		0.0010 - 0.010 g/m³	1
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m³	1
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m³	1
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m³	1
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m³	1
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m³	1

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 28-Jun-2025 and 03-Jul-2025. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.



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Certificate of Analysis

SSP-2v1

Client:	Pattle Delamore Partners Limited	**Lab No:**	3925977
Contact:	Caitlin Frazer	**Date Received:**	27-Jun-2025
	C/- Pattle Delamore Partners Limited	**Date Reported:**	04-Jul-2025
	PO Box 389	**Quote No:**	138798
	Christchurch 8140	**Order No:**	
		Client Reference:	C045180002
		Submitted By:	Caitlin Frazer

Sample Type: Aqueous

Sample Name:		P2 27-Jun-2025 2:30 pm
Lab Number:		3925977.2
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Dissolved Arsenic	g/m^3	0.0049
Dissolved Cadmium	g/m^3	< 0.00005
Dissolved Chromium	g/m^3	0.0020
Dissolved Copper	g/m^3	0.0033
Dissolved Lead	g/m^3	0.00016
Dissolved Nickel	g/m^3	0.163
Dissolved Zinc	g/m^3	0.0100
Nutrient Profile		
Total Ammoniacal-N	g/m^3	0.27
Nitrite-N	g/m^3	0.022
Nitrate-N	g/m^3	3.6
Nitrate-N + Nitrite-N	g/m^3	3.6
Dissolved Reactive Phosphorus	g/m^3	< 0.004
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq		
Acenaphthene	g/m^3	< 0.00010
Acenaphthylene	g/m^3	< 0.00010
Anthracene	g/m^3	< 0.00010
Benzo[a]anthracene	g/m^3	< 0.00010
Benzo[a]pyrene (BAP)	g/m^3	< 0.00010
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m^3	< 0.00010
Benzo[g,h,i]perylene	g/m^3	< 0.00010
Benzo[k]fluoranthene	g/m^3	< 0.00010
Chrysene	g/m^3	< 0.00010
Dibenzo[a,h]anthracene	g/m^3	< 0.00010
Fluoranthene	g/m^3	< 0.00010
Fluorene	g/m^3	< 0.0002
Indeno(1,2,3-c,d)pyrene	g/m^3	< 0.00010
Naphthalene	g/m^3	< 0.0005
Phenanthrene	g/m^3	< 0.0004
Pyrene	g/m^3	< 0.0002
Total Petroleum Hydrocarbons in Water		
C7 - C9	g/m^3	< 0.10
C10 - C14	g/m^3	< 0.2
C15 - C36	g/m^3	< 0.4
Total hydrocarbons (C7 - C36)	g/m^3	< 0.7

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	2
Total Ammoniacal-N	Filtered Sample from Christchurch. Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m³	2
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m³	2
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	2
Dissolved Reactive Phosphorus	Filtered sample from Christchurch. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) : Online Edition.	0.004 g/m³	2
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m³	2
Nutrient Profile		0.0010 - 0.010 g/m³	2
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m³	2
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m³	2
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m³	2
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m³	2
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m³	2

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 28-Jun-2025 and 04-Jul-2025. For completion dates of individual analyses please contact the laboratory.

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Client Services Manager - Environmental

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Certificate of Analysis

Client:	Pattle Delamore Partners Limited	**Lab No:**	3925977
Contact:	Caitlin Frazer	**Date Received:**	27-Jun-2025
	C/- Pattle Delamore Partners Limited	**Date Reported:**	04-Jul-2025
	PO Box 389	**Quote No:**	138798
	Christchurch 8140	**Order No:**	
		Client Reference:	C045180002
		Submitted By:	Caitlin Frazer

SSP-3v1

Sample Type: Aqueous

Sample Name:		P1 27-Jun-2025 12:30 pm
Lab Number:		3925977.3
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Dissolved Arsenic	g/m³	0.0044
Dissolved Cadmium	g/m³	< 0.00005
Dissolved Chromium	g/m³	0.0005
Dissolved Copper	g/m³	0.0014
Dissolved Lead	g/m³	< 0.00010
Dissolved Nickel	g/m³	0.0084
Dissolved Zinc	g/m³	0.0061
Nutrient Profile		
Total Ammoniacal-N	g/m³	0.25
Nitrite-N	g/m³	0.015
Nitrate-N	g/m³	0.018
Nitrate-N + Nitrite-N	g/m³	0.032
Dissolved Reactive Phosphorus	g/m³	< 0.004
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq		
Acenaphthene	g/m³	< 0.00010
Acenaphthylene	g/m³	< 0.00010
Anthracene	g/m³	< 0.00010
Benzo[a]anthracene	g/m³	< 0.00010
Benzo[a]pyrene (BAP)	g/m³	< 0.00010
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.00010
Benzo[g,h,i]perylene	g/m³	< 0.00010
Benzo[k]fluoranthene	g/m³	< 0.00010
Chrysene	g/m³	< 0.00010
Dibenzo[a,h]anthracene	g/m³	< 0.00010
Fluoranthene	g/m³	< 0.00010
Fluorene	g/m³	< 0.0002
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.00010
Naphthalene	g/m³	< 0.0005
Phenanthrene	g/m³	< 0.0004
Pyrene	g/m³	< 0.0002
Total Petroleum Hydrocarbons in Water		
C7 - C9	g/m³	< 0.10
C10 - C14	g/m³	< 0.2
C15 - C36	g/m³	< 0.4
Total hydrocarbons (C7 - C36)	g/m³	< 0.7

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	3
Total Ammoniacal-N	Filtered Sample from Christchurch. Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m³	3
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	3
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m³	3
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	3
Dissolved Reactive Phosphorus	Filtered sample from Christchurch. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) : Online Edition.	0.004 g/m³	3
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m³	3
Nutrient Profile		0.0010 - 0.010 g/m³	3
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m³	3
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m³	3
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m³	3
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m³	3
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m³	3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 28-Jun-2025 and 03-Jul-2025. For completion dates of individual analyses please contact the laboratory.

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Certificate of Analysis

SSP-4v1

Client:	Pattle Delamore Partners Limited	**Lab No:**	3925977
Contact:	Caitlin Frazer	**Date Received:**	27-Jun-2025
	C/- Pattle Delamore Partners Limited	**Date Reported:**	04-Jul-2025
	PO Box 389	**Quote No:**	138798
	Christchurch 8140	**Order No:**	
		Client Reference:	C045180002
		Submitted By:	Caitlin Frazer

Sample Type: Aqueous

Sample Name:		P15 27-Jun-2025 3:20 pm
Lab Number:		3925977.4
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Dissolved Arsenic	g/m^3	0.0030
Dissolved Cadmium	g/m^3	< 0.00005
Dissolved Chromium	g/m^3	0.0007
Dissolved Copper	g/m^3	< 0.0005
Dissolved Lead	g/m^3	0.00027
Dissolved Nickel	g/m^3	0.0026
Dissolved Zinc	g/m^3	0.0029
Nutrient Profile		
Total Ammoniacal-N	g/m^3	0.087
Nitrite-N	g/m^3	0.009
Nitrate-N	g/m^3	0.028
Nitrate-N + Nitrite-N	g/m^3	0.037
Dissolved Reactive Phosphorus	g/m^3	< 0.004
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq		
Acenaphthene	g/m^3	< 0.00010
Acenaphthylene	g/m^3	< 0.00010
Anthracene	g/m^3	< 0.00010
Benzo[a]anthracene	g/m^3	< 0.00010
Benzo[a]pyrene (BAP)	g/m^3	< 0.00010
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m^3	< 0.00010
Benzo[g,h,i]perylene	g/m^3	< 0.00010
Benzo[k]fluoranthene	g/m^3	< 0.00010
Chrysene	g/m^3	< 0.00010
Dibenzo[a,h]anthracene	g/m^3	< 0.00010
Fluoranthene	g/m^3	< 0.00010
Fluorene	g/m^3	< 0.0002
Indeno(1,2,3-c,d)pyrene	g/m^3	< 0.00010
Naphthalene	g/m^3	< 0.0005
Phenanthrene	g/m^3	< 0.0004
Pyrene	g/m^3	< 0.0002
Total Petroleum Hydrocarbons in Water		
C7 - C9	g/m^3	< 0.10
C10 - C14	g/m^3	< 0.2
C15 - C36	g/m^3	< 0.4
Total hydrocarbons (C7 - C36)	g/m^3	< 0.7

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	4
Total Ammoniacal-N	Filtered Sample from Christchurch. Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m³	4
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m³	4
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	4
Dissolved Reactive Phosphorus	Filtered sample from Christchurch. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) : Online Edition.	0.004 g/m³	4
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m³	4
Nutrient Profile		0.0010 - 0.010 g/m³	4
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m³	4
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m³	4
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m³	4
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m³	4
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m³	4

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 28-Jun-2025 and 03-Jul-2025. For completion dates of individual analyses please contact the laboratory.

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Certificate of Analysis

SSP-5v1

Client:	Pattle Delamore Partners Limited	**Lab No:**	3925977
Contact:	Caitlin Frazer	**Date Received:**	27-Jun-2025
	C/- Pattle Delamore Partners Limited	**Date Reported:**	04-Jul-2025
	PO Box 389	**Quote No:**	138798
	Christchurch 8140	**Order No:**	
		Client Reference:	C045180002
		Submitted By:	Caitlin Frazer

Sample Type: Aqueous

Sample Name:		P11 27-Jun-2025 4:00 pm
Lab Number:		3925977.5
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Dissolved Arsenic	g/m^3	0.0024
Dissolved Cadmium	g/m^3	< 0.00005
Dissolved Chromium	g/m^3	0.0017
Dissolved Copper	g/m^3	0.0032
Dissolved Lead	g/m^3	0.00070
Dissolved Nickel	g/m^3	0.0058
Dissolved Zinc	g/m^3	0.0067
Nutrient Profile		
Total Ammoniacal-N	g/m^3	0.111
Nitrite-N	g/m^3	0.010
Nitrate-N	g/m^3	0.48
Nitrate-N + Nitrite-N	g/m^3	0.49
Dissolved Reactive Phosphorus	g/m^3	0.006
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq		
Acenaphthene	g/m^3	< 0.00010
Acenaphthylene	g/m^3	< 0.00010
Anthracene	g/m^3	< 0.00010
Benzo[a]anthracene	g/m^3	< 0.00010
Benzo[a]pyrene (BAP)	g/m^3	< 0.00010
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m^3	< 0.00010
Benzo[g,h,i]perylene	g/m^3	< 0.00010
Benzo[k]fluoranthene	g/m^3	< 0.00010
Chrysene	g/m^3	< 0.00010
Dibenzo[a,h]anthracene	g/m^3	< 0.00010
Fluoranthene	g/m^3	< 0.00010
Fluorene	g/m^3	< 0.0002
Indeno(1,2,3-c,d)pyrene	g/m^3	< 0.00010
Naphthalene	g/m^3	< 0.0005
Phenanthrene	g/m^3	< 0.0004
Pyrene	g/m^3	< 0.0002
Total Petroleum Hydrocarbons in Water		
C7 - C9	g/m^3	< 0.10
C10 - C14	g/m^3	< 0.2
C15 - C36	g/m^3	< 0.4
Total hydrocarbons (C7 - C36)	g/m^3	< 0.7

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	5
Total Ammoniacal-N	Filtered Sample from Christchurch. Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m^3	5
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	5
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m^3	5
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	5
Dissolved Reactive Phosphorus	Filtered sample from Christchurch. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) : Online Edition.	0.004 g/m^3	5
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m^3	5
Nutrient Profile		0.0010 - 0.010 g/m^3	5
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m^3	5
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m^3	5
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m^3	5
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m^3	5
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m^3	5

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 28-Jun-2025 and 03-Jul-2025. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Certificate of Analysis

SSP-6v1

Client:	Pattle Delamore Partners Limited	**Lab No:**	3925977
Contact:	Caitlin Frazer	**Date Received:**	27-Jun-2025
	C/- Pattle Delamore Partners Limited	**Date Reported:**	04-Jul-2025
	PO Box 389	**Quote No:**	138798
	Christchurch 8140	**Order No:**	
		Client Reference:	C045180002
		Submitted By:	Caitlin Frazer

Sample Type: Aqueous

Sample Name:		Ohoka South 27-Jun-2025 11:00 am
Lab Number:		3925977.6
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Total Arsenic	g/m^3	< 0.0011
Total Cadmium	g/m^3	< 0.000053
Total Chromium	g/m^3	< 0.00053
Total Copper	g/m^3	0.00084
Total Lead	g/m^3	0.00012
Total Nickel	g/m^3	< 0.00053
Total Zinc	g/m^3	0.0035
Nutrient Profile		
Total Ammoniacal-N	g/m^3	0.22
Nitrite-N	g/m^3	0.017
Nitrate-N	g/m^3	4.1
Nitrate-N + Nitrite-N	g/m^3	4.2
Dissolved Reactive Phosphorus	g/m^3	0.20
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq		
Acenaphthene	g/m^3	< 0.00010
Acenaphthylene	g/m^3	< 0.00010
Anthracene	g/m^3	< 0.00010
Benzo[a]anthracene	g/m^3	< 0.00010
Benzo[a]pyrene (BAP)	g/m^3	< 0.00010
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m^3	< 0.00010
Benzo[g,h,i]perylene	g/m^3	< 0.00010
Benzo[k]fluoranthene	g/m^3	< 0.00010
Chrysene	g/m^3	< 0.00010
Dibenzo[a,h]anthracene	g/m^3	< 0.00010
Fluoranthene	g/m^3	< 0.00010
Fluorene	g/m^3	< 0.0002
Indeno(1,2,3-c,d)pyrene	g/m^3	< 0.00010
Naphthalene	g/m^3	< 0.0005
Phenanthrene	g/m^3	< 0.0004
Pyrene	g/m^3	< 0.0002
Total Petroleum Hydrocarbons in Water		
C7 - C9	g/m^3	< 0.10
C10 - C14	g/m^3	< 0.2
C15 - C36	g/m^3	< 0.4
Total hydrocarbons (C7 - C36)	g/m^3	< 0.7

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	6
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	6
Total Ammoniacal-N	Filtered Sample from Christchurch. Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m^3	6
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	6
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m^3	6
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	6
Dissolved Reactive Phosphorus	Filtered sample from Christchurch. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) : Online Edition.	0.004 g/m^3	6
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.000053 - 0.0011 g/m^3	6
Nutrient Profile		0.0010 - 0.010 g/m^3	6
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m^3	6
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m^3	6
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m^3	6
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m^3	6
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m^3	6

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 28-Jun-2025 and 03-Jul-2025. For completion dates of individual analyses please contact the laboratory.

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This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

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Certificate of Analysis

SSP-7v1

Client:	Pattle Delamore Partners Limited	**Lab No:**	3925977
Contact:	Caitlin Frazer	**Date Received:**	27-Jun-2025
	C/- Pattle Delamore Partners Limited	**Date Reported:**	04-Jul-2025
	PO Box 389	**Quote No:**	138798
	Christchurch 8140	**Order No:**	
		Client Reference:	C045180002
		Submitted By:	Caitlin Frazer

Sample Type: Aqueous

Sample Name:		Ohoka North 27-Jun-2025 1:10 pm
Lab Number:		3925977.7
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Total Arsenic	g/m^3	< 0.0011
Total Cadmium	g/m^3	< 0.000053
Total Chromium	g/m^3	< 0.00053
Total Copper	g/m^3	< 0.00053
Total Lead	g/m^3	0.00011
Total Nickel	g/m^3	< 0.00053
Total Zinc	g/m^3	0.0015
Nutrient Profile		
Total Ammoniacal-N	g/m^3	< 0.010
Nitrite-N	g/m^3	0.006
Nitrate-N	g/m^3	5.5
Nitrate-N + Nitrite-N	g/m^3	5.5
Dissolved Reactive Phosphorus	g/m^3	0.024
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq		
Acenaphthene	g/m^3	< 0.00010
Acenaphthylene	g/m^3	< 0.00010
Anthracene	g/m^3	< 0.00010
Benzo[a]anthracene	g/m^3	< 0.00010
Benzo[a]pyrene (BAP)	g/m^3	< 0.00010
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m^3	< 0.00010
Benzo[g,h,i]perylene	g/m^3	< 0.00010
Benzo[k]fluoranthene	g/m^3	< 0.00010
Chrysene	g/m^3	< 0.00010
Dibenzo[a,h]anthracene	g/m^3	< 0.00010
Fluoranthene	g/m^3	< 0.00010
Fluorene	g/m^3	< 0.0002
Indeno(1,2,3-c,d)pyrene	g/m^3	< 0.00010
Naphthalene	g/m^3	< 0.0005
Phenanthrene	g/m^3	< 0.0004
Pyrene	g/m^3	< 0.0002
Total Petroleum Hydrocarbons in Water		
C7 - C9	g/m^3	< 0.10
C10 - C14	g/m^3	< 0.2
C15 - C36	g/m^3	< 0.4
Total hydrocarbons (C7 - C36)	g/m^3	< 0.7

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	7
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	7
Total Ammoniacal-N	Filtered Sample from Christchurch. Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m^3	7
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	7
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m^3	7
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	7
Dissolved Reactive Phosphorus	Filtered sample from Christchurch. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) : Online Edition.	0.004 g/m^3	7
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.000053 - 0.0011 g/m^3	7
Nutrient Profile		0.0010 - 0.010 g/m^3	7
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m^3	7
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m^3	7
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m^3	7
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m^3	7
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m^3	7

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 28-Jun-2025 and 03-Jul-2025. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Appendix F: Schedule 5 Comparison Table

Parameter	Units	Samples								Schedule 5 Limits
		6/01/2025	27/07/2025							
		M35/0596	P1	P2	P11	P15	P20	Ohoka South	Ohoka North	
pH		5.99	5.74	6.31	6.25	6.51	5.92	6.61	6.75	6.5 - 8
Dissolved Arsenic	g/m^3	0.0088	0.0044	0.0049	0.0024	0.003	<0.0010	-	-	0.013
Dissolved Cadmium	g/m^3	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	-	0.0002
Dissolved Chromium	g/m^3	0.0008	0.0005	0.002	0.0017	0.0007	<0.0005	-	-	0.001
Dissolved Copper	g/m^3	0.0064	0.0014	0.0033	0.0032	<0.0005	0.0007	-	-	0.0014
Dissolved Lead	g/m^3	0.0028	<0.00010	0.00016	0.0007	0.00027	<0.00010	-	-	0.0034
Dissolved Nickel	g/m^3	0.0012	0.0084	0.163	0.0058	0.0026	<0.0005	-	-	0.011
Dissolved Zinc	g/m^3	0.021	0.0061	0.01	0.0067	0.0029	<0.0010	-	-	0.008
Total Arsenic	g/m^3	-	-	-	-	-	-	<0.0011	<0.0011	-
Total Cadmium	g/m^3	-	-	-	-	-	-	<0.000053	<0.000053	-
Total Chromium	g/m^3	-	-	-	-	-	-	<0.00053	<0.00053	-
Total Copper	g/m^3	-	-	-	-	-	-	0.00084	<0.00053	-
Total Lead	g/m^3	-	-	-	-	-	-	0.00012	0.00011	-
Total Nickel	g/m^3	-	-	-	-	-	-	<0.00053	<0.00053	-
Total Zinc	g/m^3	-	-	-	-	-	-	0.0035	0.0015	-
Total Ammoniacal N	g/m^3	-	0.25	0.27	0.111	0.087	<0.010	0.22	<0.010	2.46 - 2.57
Nitrite-N	g/m^3	-	0.015	0.022	0.01	0.009	<0.002	0.017	0.006	-
Nitrate-N	g/m^3	-	0.018	3.6	0.48	0.028	4.3	4.1	5.5	-
Nitrate-N + Nitrate-N	g/m^3	-	0.032	3.6	0.49	0.037	4.3	4.2	5.5	-
DIN (calcualted)	g/m^3	-	0.282	3.870	0.601	0.124	4.310	4.420	5.510	1.5
Dissolved Reactive Phosphorus	g/m^3	-	<0.004	<0.004	0.006	<0.004	0.007	0.2	0.024	0.016

Concentration exceeds Schedule 5 surface water receiving standards after mixing

Appendix G: Schedule 12 Remaining Drawdown Assessment

Input file used 9 virtual bores 2.prn
Model Parameters for drawdown calculations
Standard Screen Length :3m
Standard Pump Length :2m
Depth Range of pumped Aquifer taken from 0m till 30m
Transmissivity 975 m2/d
Storativity 0.1

Appendix G Remaining Drawdown Assessment
(Only shallow drinking water bores shown)

WellNo	Owner	Depth	AdoptDepth	Top_Screen	CutOff	Calc80Min	Available	Protected	DD4Interference	CumDD	Remaining Drawdown (m)
M35/0388	WALLS G.D.	0	14.3	11.3	9.3	-2.158	7.142	5.713	1.428	1.584	5.558
M35/4614	TOZER N.A.	0	14.3	11.3	9.3	-2.974	6.326	5.061	1.265	2.137	4.189
M35/4723	ARMITAGE P.L.	0	14.3	11.3	9.3	-2.198	7.102	5.682	1.420	0.509	6.593
M35/4740	CAMERON J G (EX WARD F.J)	0	14.3	11.3	9.3	-2.778	6.522	5.218	1.304	2.504	4.018
M35/4744	ARMSTRONG M.A.& G.G.	0	14.3	11.3	9.3	-1.824	7.476	5.980	1.495	0.556	6.919
M35/4745	ARMSTRONG M.A.& G.G.	0	14.3	11.3	9.3	-2.035	7.265	5.812	1.453	1.310	5.955
M35/4770	DELLOW P.K.	0	14.3	11.3	9.3	-2.142	7.158	5.727	1.432	1.585	5.573
M35/4772	Robin Ames	0	14.3	11.3	9.3	-2.604	6.696	5.357	1.339	0.303	6.393
M35/4788	WRAPSON J.	0	14.3	11.3	9.3	-1.467	7.833	6.266	1.567	1.619	6.213
M35/5134	MURRAY IMPLEMENTS CO.	0	14.3	11.3	9.3	-1.871	7.429	5.943	1.486	0.933	6.496
M35/7023	BLACK PC & KL	0	14.3	11.3	9.3	-2.830	6.470	5.176	1.294	0.183	6.287
M35/0386	LESLIE D.H.& M.A.	4	14.3	11.3	9.3	-1.380	7.920	6.336	1.584	1.282	6.638
M35/4984	CLEEVE L.A.& J.E.	4.2	14.3	11.3	9.3	-0.960	8.340	6.672	1.668	0.367	7.973
M35/4720	MOORE E.H.	5.4	14.3	11.3	9.3	-1.350	7.950	6.360	1.590	0.974	6.976
M35/4747	LESLIE D.H.& M.A.	5.4	14.3	11.3	9.3	-1.400	7.900	6.320	1.580	1.283	6.617
M35/4726	MARSHELL J.J.	5.7	14.3	11.3	9.3	-1.090	8.210	6.568	1.642	0.116	8.094
M35/0305	LESLIE D.H.& M.A.	5.8	14.3	11.3	9.3	-1.550	7.750	6.200	1.550	1.821	5.929
M35/0387	REGNAULT C.R.	6	14.3	11.3	9.3	-1.500	7.800	6.240	1.560	2.211	5.589
M35/0696	MULLIGAN P.R.R.	6.1	14.3	11.3	9.3	-2.040	7.260	5.808	1.452	0.135	7.125
M35/4785	THACKWELL G.M.	6.1	14.3	11.3	9.3	-1.440	7.860	6.288	1.572	1.619	6.241
M35/4794	HEATLEY K.	6.1	14.3	11.3	9.3	-1.290	8.010	6.408	1.602	0.642	7.368
M35/4841	MAUNSELL R.& J.L.	6.1	14.3	11.3	9.3	-1.290	8.010	6.408	1.602	0.642	7.368
M35/0385	FLINTOFT W.L.	6.5	14.3	11.3	9.3	-1.260	8.040	6.432	1.608	0.596	7.444
M35/3066	MASON W.I.G.	6.7	14.3	11.3	9.3	-1.720	7.580	6.064	1.516	1.475	6.105
M35/4771	CROZIER N.J.	6.7	14.3	11.3	9.3	-1.060	8.240	6.592	1.648	0.141	8.099
M35/0390	Mr P PASTARS	7	14.3	11.3	9.3	-4.020	5.280	4.224	1.056	2.189	3.091
M35/4752	MAUGER S.W. & M.J.	7.6	14.3	11.3	9.3	-1.770	7.530	6.024	1.506	0.216	7.314
M35/4606	PARROTT T.D.	8	14.3	11.3	9.3	-2.870	6.430	5.144	1.286	2.033	4.397
M35/4735	GOTTERMEYER (EX FROST)	8.2	14.3	11.3	9.3	-2.010	7.290	5.832	1.458	0.327	6.963
M35/4719	POWER G.J.	8.5	14.3	11.3	9.3	-1.590	7.710	6.168	1.542	2.339	5.371
M35/5190	TUANUI B.V.	9	14.3	11.3	9.3	-1.030	8.270	6.616	1.654	0.265	8.005
M35/0320	OFFWOOD D.	9.1	14.3	11.3	9.3	-1.310	7.990	6.392	1.598	0.721	7.269
M35/4717	IRELAND W.P.& F.W.	9.1	14.3	11.3	9.3	-1.320	7.980	6.384	1.596	0.967	7.013
M35/4727	THIELE G.J.	9.1	14.3	11.3	9.3	-2.220	7.080	5.664	1.416	1.909	5.171
M35/4742	SCOTT J.H.	9.1	14.3	11.3	9.3	-3.330	5.970	4.776	1.194	2.367	3.603
M35/4746	VERKERK A.	9.1	14.3	11.3	9.3	-1.610	7.690	6.152	1.538	1.878	5.812
M35/4748	REID R.C.	9.1	14.3	11.3	9.3	-3.640	5.660	4.528	1.132	2.635	3.025
M35/4792	OLSEN M.	9.1	14.3	11.3	9.3	-1.250	8.050	6.440	1.610	0.528	7.522
M35/4832	RANDS B.W.	9.1	14.3	11.3	9.3	-1.990	7.310	5.848	1.462	2.119	5.191
M35/4683	HARRIS I.R.	9.3	14.3	11.3	9.3	-2.860	6.440	5.152	1.288	0.723	5.717
M35/4790	WALLS C.A.S.	10.2	14.3	11.3	9.3	-1.290	8.010	6.408	1.602	0.642	7.368
M35/8399	LYNN RJ	10.5	14.3	11.3	9.3	-1.240	8.060	6.448	1.612	0.603	7.457
M35/2920	RICHARDS M.E.	10.6	14.3	11.3	9.3	-2.330	6.970	5.576	1.394	0.000	6.970
BW23/0572	Kevin Hart	10.62	14.3	11.3	9.3	-3.032	6.268	5.014	1.254	2.303	3.964
BW23/0643	Kevin Hart	11	14.3	11.3	9.3	-2.939	6.361	5.089	1.272	2.001	4.360
M35/3235	BYRNE M.H.	11	14.3	11.3	9.3	-1.800	7.500	6.000	1.500	0.147	7.353
M35/4184	COMBRIDGE K.	11	14.3	11.3	9.3	-1.930	7.370	5.896	1.474	0.105	7.265
M35/4669	WARD L.G.	11	14.3	11.3	9.3	-1.500	7.800	6.240	1.560	0.952	6.848
M35/6650	COKER N.& R.G.L.	11	14.3	11.3	9.3	-0.920	8.380	6.704	1.676	0.434	7.946
M35/4739	WARD L.G.& I.L.	11.2	14.3	11.3	9.3	-1.530	7.770	6.216	1.554	0.982	6.788
M35/4774	BURROWS T.F.	11.2	14.3	11.3	9.3	-1.870	7.430	5.944	1.486	0.176	7.254
BW24/0520	Tim Baker	11.22	14.3	11.3	9.3	-1.829	7.471	5.977	1.494	0.764	6.707
M35/4099	CAMERON J.G.& J.L.	11.5	14.3	11.3	9.3	-2.980	6.320	5.056	1.264	2.617	3.703
M35/4377		11.5	14.3	11.3	9.3	-2.450	6.850	5.480	1.370	0.106	6.744
BW24/0560	Graham Brown	11.7	14.3	11.3	9.3	-1.785	7.515	6.012	1.503	0.000	7.515
M35/6191	CUSICK D.J.	11.7	14.3	11.3	9.3	-1.890	7.410	5.928	1.482	2.026	5.384
BW23/0821	Sarah Chamerberlain	11.73	14.3	11.3	9.3	-3.637	5.663	4.531	1.133	1.886	3.777
M35/0683	MEREDITH A (EX MCINTYRE)	11.8	14.3	11.3	9.3	-2.570	6.730	5.384	1.346	0.265	6.465
M35/8170	Mr & Mrs D B & C R Pugh	11.92	14.3	11.3	9.3	-1.150	8.150	6.520	1.630	0.103	8.047
M35/3309	J G & S Wright	12	14.3	11.3	9.3	-1.320	7.980	6.384	1.596	0.000	7.980
M35/5147	BOULTON I.W.	12	14.3	11.3	9.3	-1.350	7.950	6.360	1.590	1.062	6.888
M35/6181	WALKER D.J.	12	14.3	11.3	9.3	-1.560	7.740	6.192	1.548	0.563	7.177
M35/7205	TONKIN G.D. & S.A.	12	14.3	11.3	9.3	-1.240	8.060	6.448	1.612	0.112	7.948
M35/7288	POLSON AH DR	12	14.3	11.3	9.3	-1.840	7.460	5.968	1.492	0.000	7.460
M35/8191	Mr & Mrs D B & C R Pugh	12	14.3	11.3	9.3	-1.795	7.505	6.004	1.501	0.000	7.505
M35/8786	Myers JC	12	14.3	11.3	9.3	-3.145	6.155	4.924	1.231	1.759	4.396
M35/4730	RUTHERFORD K.A.	12.1	14.3	11.3	9.3	-1.610	7.690	6.152	1.538	0.178	7.512
M35/0611	MEHRTENS G	12.2	14.3	11.3	9.3	-1.460	7.840	6.272	1.568	0.121	7.719
M35/4731	FREWER K.P.	12.2	14.3	11.3	9.3	-1.690	7.610	6.088	1.522	0.000	7.610
M35/2756	JOHNSTON N.J.& R.A.	12.5	14.3	11.3	9.3	-1.830	7.470	5.976	1.494	0.103	7.367
M35/4681	SANDERS E.W.& T.J.	12.8	14.3	11.3	9.3	-2.750	6.550	5.240	1.310	2.102	4.448
M35/5021	SCOTT R.S.	12.8	14.3	11.3	9.3	-1.820	7.480	5.984	1.496	0.316	7.164
M35/3078	Mr R G & Mrs D R Dalley	13	14.3	11.3	9.3	-1.670	7.630	6.104	1.526	0.105	7.525
M35/4857	ROWLANDS W.R.	13	14.3	11.3	9.3	-0.900	8.400	6.720	1.680	0.515	7.885
M35/4827	S & L C BATCHELOR	13.1	14.3	11.3	9.3	-1.110	8.190	6.552	1.638	0.103	8.087
M35/2699	Mr & Mrs J D & K A McKenzie	13.3	14.3	11.3	9.3	-1.370	7.930	6.344	1.586	0.000	7.930
M35/6123	ALLISON .R.	13.6	14.3	11.3	9.3	-1.840	7.460	5.968	1.492	0.142	7.318
M35/0326	Mr & Mrs P J & R J Sherriff	13.7	14.3	11.3	9.3	-1.390	7.910	6.328	1.582	1.184	6.726
M35/4738	A. Smith	13.7	14.3	11.3	9.3	-1.780	7.520	6.016	1.504	0.467	7.053
M35/4743	ARMSTRONG M.A.& G.G.	13.7	14.3	11.3	9.3	-1.170	8.130	6.504	1.626	0.457	7.673
M35/4789	MURRAY IMPLEMENTS	13.7	14.3	11.3	9.3	-1.310	7.990	6.392	1.598	0.913	7.077
M35/4879	MCQUILLAN R.	13.7	14.3	11.3	9.3	-1.190	8.110	6.488	1.622	0.426	7.684
M35/4795	WaterForce Rangiora	13.8	14.3	11.3	9.3	-1.140	8.160	6.528	1.632	0.951	7.209
M35/5972	Mr & Mrs J D & K A McKenzie	13.9	14.3	11.3	9.3	-1.160	8.140	6.512	1.628	0.000	8.140
M35/6830	Mr R J Fife and D J Jamieson	13.9	14.3	11.3	9.3	-1.750	7.550	6.040	1.510	0.117	7.433
M35/0602	ARMSTRONG MA & GG	14	14.3	11.3	9.3	-0.900	8.400	6.720	1.680	0.412	7.988
M35/8343	AIKIN GW MK	14	14.3	11.3	9.3	-1.890	7.410	5.928	1.482	0.324	7.086
BW24/0364	Gabe Rijpma	14.1	14.3	11.3	9.3	-1.885	7.415	5.932	1.483	0.680	6.735
M35/5608	Pheloung Investments Limited	15	15	13.5	11.5	-2.110	9.390	7.512	1.878	0.000	9.390
M35/5988	SEED SL & M	15	15	14	12	-2.740	9.260	7.408	1.852	0.226	9.034
M35/6008	HUTHINSON GK & MT	15	15	14	12	-2.070	9.930	7.944	1.986	0.475	9.455
M35/6547	CLARK DG & EM	15	15	12	10	-1.870	8.130	6.504	1.626	0.116	8.014
M35/6587	WARREN AH & BL	15	15	12	10	-2.010	7.990	6.392	1.598	0.511	7.479
M35/6794	BROWN K.T.	15	15	12	10	-2.090	7.910	6.328	1.582	0.000	7.910

M35/6863	BARRINGTON W.J.	15	15	12	10	-1.720	8.280	6.624	1.656	1.911	6.369
M35/7204	COKER N.	15	15	12	10	-0.910	9.090	7.272	1.818	0.500	8.590
M35/4732	SINCOCK G.J.	15.2	15.2	12.2	10.2	-1.950	8.250	6.600	1.650	0.207	8.043
M35/4777	BAGRIE W.L.	15.2	15.2	12.2	10.2	-1.070	9.130	7.304	1.826	0.214	8.916
M35/11286	Macrae Land Company	15.3	15.3	14.3	12.3	-0.740	11.560	9.248	2.312	0.360	11.200
M35/0676	BEZZANT AM & JM	15.5	15.5	12.5	10.5	-7.320	3.180	2.544	0.636	0.000	3.180
M35/5300	SEED S.L.& M.	15.7	15.7	12.7	10.7	-2.700	8.000	6.400	1.600	0.202	7.798
M35/0314	BAGRIE WL	15.8	15.8	11	9	-1.320	7.680	6.144	1.536	1.007	6.673
M35/7198	BROWN K.T.	16	16	13	11	-2.030	8.970	7.176	1.794	0.000	8.970
M35/9641	MR & MRS D J & K A McKENZIE	16.05	16.05	14.05	12.05	-1.310	10.740	8.592	2.148	0.000	10.740
M35/5308	DORNABELL W.P. (EX SEELEN)	16.4	16.4	13.4	11.4	-2.420	8.980	7.184	1.796	0.115	8.865
M35/9640	MR & MRS D J & K A McKENZIE	16.47	16.47	14.47	12.47	-1.330	11.140	8.912	2.228	0.000	11.140
M35/9630	MR B T LENNOX	16.59	16.59	14.59	12.59	-2.910	9.680	7.744	1.936	2.559	7.121
M35/4680	ABBOTT W.E.L.	16.7	16.7	13.7	11.7	-3.520	8.180	6.544	1.636	1.068	7.112
M35/11074	MACRAE LAND COMPANY	17	17	15.5	13.5	-0.830	12.670	10.136	2.534	0.420	12.250
M35/11106	MR & MRS RJ & LK THOMAS	17	17	16	14	-2.890	11.110	8.888	2.222	2.610	8.500
M35/3306	Merv Emms	17	17	14	12	-1.580	10.420	8.336	2.084	0.589	9.831
M35/7368	IRRIGATION PUMPING SERVICES	17	17	14	12	-1.570	10.430	8.344	2.086	0.236	10.194
BW23/0831	Mitchell King	17.1	17.1	15.04	13.04	-3.523	9.517	7.613	1.903	2.256	7.260
M35/9642	MR & MRS D J & K A McKENZIE	17.25	17.25	15.25	13.25	-1.300	11.950	9.560	2.390	0.000	11.950
M35/9598	MR & MRS J D & K A MCKENZIE	17.28	17.28	15.28	13.28	-1.310	11.970	9.576	2.394	0.226	11.744
BW24/0544	Michael Meade	17.3	17.3	15.3	13.3	-1.808	11.492	9.194	2.298	0.631	10.861
BW24/0427	Ohoka School	17.35	17.35	15.85	13.85	-1.729	12.121	9.697	2.424	0.116	12.005
M35/9634	MR & MRS D J & K A McKENZIE	17.35	17.35	14.85	12.85	-1.420	11.430	9.144	2.286	0.125	11.305
M35/9632	MR & MRS D J & K A McKENZIE	17.37	17.37	15.37	13.37	-1.490	11.880	9.504	2.376	0.105	11.775
M35/9599	Mr & Mrs G.J & T.A Burbery	17.4	17.4	15.4	13.4	-1.370	12.030	9.624	2.406	0.380	11.650
M35/9602	MR & MRS J D & K A MCKENZIE	17.4	17.4	15.4	13.4	-1.170	12.230	9.784	2.446	0.000	12.230
M35/10570	INGLEWOOD HOLDINGS LTD	17.41	17.41	15.41	13.41	-0.910	12.500	10.000	2.500	0.394	12.106
M35/11711	MR WT MCLAUGHLAN	17.41	17.41	15.41	13.41	-0.890	12.520	10.016	2.504	0.338	12.182
M35/9639	MR & MRS D J & K A McKENZIE	17.5	17.5	15	13	-1.380	11.620	9.296	2.324	0.100	11.520
M35/9643	Mr BW Magee & Mrs R McCourt	17.5	17.5	15.5	13.5	-1.300	12.200	9.760	2.440	0.000	12.200
M35/9600	MR & MRS J D & K A MCKENZIE	17.53	17.53	15.53	13.53	-1.410	12.120	9.696	2.424	0.387	11.733
M35/10130	Ohoka Park Truffiere limited	17.54	17.54	14.54	12.54	-2.200	10.340	8.272	2.068	0.000	10.340
M35/10219	Mr & Mrs IJ & BJ Giles	17.55	17.55	16.55	14.55	-1.850	12.700	10.160	2.540	0.148	12.552
M35/9633	MR & MRS D J & K A McKENZIE	17.55	17.55	15.55	13.55	-1.460	12.090	9.672	2.418	0.000	12.090
M35/10221	Mr & Mrs IJ & BJ Giles	17.58	17.58	16.58	14.58	-1.990	12.590	10.072	2.518	0.229	12.361
M35/9637	MR & MRS D J & K A McKENZIE	17.6	17.6	15.1	13.1	-1.440	11.660	9.328	2.332	0.129	11.531
M35/10129	Ohoka Park Truffiere limited	17.62	17.62	15.62	13.62	-2.230	11.390	9.112	2.278	0.000	11.390
M35/10612	MR & MRS EJ & A BAILEY	17.7	17.7	15.7	13.7	-2.380	11.320	9.056	2.264	0.277	11.043
M35/7113	CLEMENTS K.S.	17.7	17.7	15	13	-2.000	11.000	8.800	2.200	0.121	10.879
M35/9603	MR & MRS J D & K A MCKENZIE	17.7	17.7	15.7	13.7	-1.140	12.560	10.048	2.512	0.107	12.453
BW23/0368	Honor Mackay & Martin Neal	17.8	17.8	16.3	14.3	-4.142	10.158	8.126	2.032	1.252	8.906
M35/10220	Mr & Mrs IJ & BJ Giles	17.8	17.8	16.8	14.8	-1.910	12.890	10.312	2.578	0.108	12.782
M35/8414	SANDERS SW & LR	17.8	17.8	16.4	14.4	-2.760	11.640	9.312	2.328	1.872	9.768
M35/9398	MR D A BOARD & MS S A HODGES-BOARD	17.8	17.8	15.78	13.78	-3.570	10.210	8.168	2.042	1.042	9.168
M35/9740	MR & MRS K & L CAMPAGNOLO	17.8	17.8	15.29	13.29	-2.100	11.190	8.952	2.238	0.114	11.076
M35/9636	RJ & AR North	17.82	17.82	15.82	13.82	-1.260	12.560	10.048	2.512	0.000	12.560
M35/9638	MR & MRS D J & K A McKENZIE	17.82	17.82	15.32	13.32	-1.380	11.940	9.552	2.388	0.218	11.722
M35/11372	MR & MRS IJ & BJ GILES	17.85	17.85	16.35	14.35	-2.000	12.350	9.880	2.470	0.258	12.092
M35/9635	MR & MRS D J & K A McKENZIE	17.86	17.86	15.36	13.36	-1.250	12.110	9.688	2.422	0.000	12.110
M35/10177	Mr PRR Mulligan	17.9	17.9	16.4	14.4	-1.730	12.670	10.136	2.534	0.146	12.524
M35/10520	Mr & Mrs RW & HI Southam	17.9	17.9	15.9	13.9	-1.220	12.680	10.144	2.536	0.300	12.380
BW24/0057	MR & MRS T & K KOMAI	18	18	16.49	14.49	-2.984	11.506	9.205	2.301	0.112	11.395
BW24/0529	Jarrad Allen	18	18	16	14	-1.835	12.165	9.732	2.433	0.641	11.524
BW24/0539	Brian and Agnes McLintock	18	18	16	14	-2.172	11.828	9.462	2.366	0.137	11.691
BW24/0545	K Vaughan	18	18	16	14	-1.835	12.165	9.732	2.433	0.639	11.525
BW24/0565	Simon Collin	18	18	16	14	-1.816	12.184	9.748	2.437	0.616	11.568
BW24/0575	Greg Holland	18	18	16	14	-2.190	11.810	9.448	2.362	0.107	11.704
BW24/0624	Sam Jury	18	18	16	14	-1.816	12.184	9.748	2.437	0.648	11.537
BW24/0778	Matthew Hobbs	18	18	16.17	14.17	-3.385	10.785	8.628	2.157	0.102	10.683
M35/10169	Mr & Mrs SJ & TA Duff	18	18	15	13	-3.143	9.857	7.886	1.971	0.233	9.624
M35/10634	MR & MRS C D & C L HEAPHY	18	18	17	15	-3.470	11.530	9.224	2.306	2.891	8.639
M35/10982	MR & MRS IL & JH WARD	18	18	16.5	14.5	-1.390	13.110	10.488	2.622	2.067	11.043
M35/11048	MR & MRS CP & MC COFFEY	18	18	16	14	-0.920	13.080	10.464	2.616	0.414	12.666
M35/11069	MACRAE LAND COMPANY	18	18	16.5	14.5	-0.590	13.910	11.128	2.782	0.153	13.757
M35/11072	MACRAE LAND COMPANY	18	18	16.5	14.5	-0.700	13.800	11.040	2.760	0.399	13.401
M35/11077	MACRAE LAND COMPANY	18	18	16.5	14.5	-0.740	13.760	11.008	2.752	0.229	13.531
M35/11227	KAVANAGH FAMILY TRUST	18	18	17	15	-2.590	12.410	9.928	2.482	2.230	10.180
M35/18188	MR M P EMMS	18	18	16.86	14.86	-1.240	13.620	10.896	2.724	0.359	13.261
M35/18231	MR & MRS MWH & JL TYREE	18	18	17	15	-1.540	13.460	10.768	2.692	2.620	10.840
M35/6688	MASON W.I.G	18	18	15	13	-1.900	11.100	8.880	2.220	1.626	9.474
M35/6795	AIKIN GW	18	18	16	14	-1.860	12.140	9.712	2.428	0.110	12.030
M35/6851	Mr S T Hampton	18	18	15	13	-1.930	11.070	8.856	2.214	0.376	10.694
M35/7575	VERBERN F.W	18	18	16.5	14.5	-1.480	13.020	10.416	2.604	0.000	13.020
M35/7903	DAVIDSON LA & J	18	18	16.5	14.5	-1.610	12.890	10.312	2.578	0.136	12.754
M35/8311	HENDREN LP & GJ	18	18	16.5	14.5	-1.920	12.580	10.064	2.516	0.000	12.580
M35/8536	OHOKA PARK TRUST	18	18	16.5	14.5	-1.780	12.720	10.176	2.544	0.187	12.533
M35/8537	OHOKA PARK TRUST	18	18	16.5	14.5	-1.750	12.750	10.200	2.550	0.165	12.585
M35/8539	OHOKA PARK TRUST	18	18	16.5	14.5	-1.680	12.820	10.256	2.564	0.000	12.820
M35/8935	Mr M K & Mrs S M Sinclair	18	18	17	15	-2.100	12.900	10.320	2.580	0.106	12.794
M35/8936	Mr M K & Mrs S M Sinclair	18	18	17	15	-2.140	12.860	10.288	2.572	0.108	12.752
M35/9257	Mr M D & Mrs N E Wilkinson	18	18	16.5	14.5	-1.360	13.140	10.512	2.628	0.142	12.998
M35/9258	Mr M D & Mrs N E Wilkinson	18	18	16.5	14.5	-1.340	13.160	10.528	2.632	0.121	13.039
M35/9420	OHOKA VIEWS HOLDINGS LIMITED	18	18	16	14	-0.620	13.380	10.704	2.676	0.150	13.230
M35/8951	J D & K A McKenzie	18.05	18.05	16.05	14.05	-1.460	12.590	10.072	2.518	0.407	12.183
BW24/0246	Inglewood Holdings Kaiapoi Limited	18.3	18.3	16.3	14.3	-1.597	12.703	10.162	2.541	0.466	12.236
M35/18054	MR G J & MRS J M CAMPBELL	18.8	18.8	17.8	15.8	-1.020	14.780	11.824	2.956	0.282	14.498
M35/5609	Waimakariri District Council	18.8	18.8	16.8	14.8	-1.480	13.320	10.656	2.664	1.226	12.094
M35/7073	WALKER D.J.H.& C.M.	18.8	18.8	16.8	14.8	-1.530	13.270	10.616	2.654	0.285	12.985
M35/11068	MACRAE LAND COMPANY	19	19	17.5	15.5	-0.640	14.860	11.888	2.972	0.350	14.510
M35/3072	Dr T B Taylor	19	19	16	14	-2.480	11.520	9.216	2.304	0.120	11.400
M35/8662	WHYTE GK & C	19	19	17	15	-1.840	13.160	10.528	2.632	0.149	13.011
M35/18053	WITHER HILLS HOMESTAYS LTD	19.2	19.2	18.2	16.2	-1.050	15.150	12.120	3.030	0.170	14.980
M35/6468	Mr & Mrs A T & J R Cox	19.3	19.3	16.3	14.3	-2.540	11.760	9.408	2.352	0.157	11.603
M35/4428	HARRIS I.R.	19.4	19.4	16.4	14.4	-1.910	12.490	9.992	2.498	0.306	12.184
M35/6891	RICHARDS M.E.	19.5	19.5	17.4	15.4	-2.280	13.120	10.496	2.624	0.000	13.120
M35/3032	Kate Mullins	19.7	19.7	16.7	14.7	-1.690	13.010	10.408	2.602	0.551	12.459
M35/4725	ROBSON W.J.	19.8	19.8	16.8	14.8	-1.960	12.840	10.272	2.568	0.132	12.708
M35/5290	CHARTERIS	19.8	19.8	16.8	14.8	-2.650	12.150	9.720	2.430	0.186	11.964
M35/5298	NEATE K.C.	19.8	19.8	16.8	14.8	-2.510	12.290	9.832	2.458	0.245	12.045
M35/10626	MR J D MCKENZIE	19.87	19.87	17.87	15.87	-1.270	14.600	11.680	2.920	0.139	14.461
BW24/0552	Benn & Amy Mathieson	20	20	18	16	-1.824	14.176	11.341	2.835	0.646	13.530
M35/10625	MR J D MCKENZIE	20	20	18	16	-1.280	14.720	11.776	2.944	0.161	14.559

M35/11067	MACRAE LAND COMPANY	20	20	18.5	16.5	-0.690	15.810	12.648	3.162	0.295	15.515
M35/11075	MACRAE LAND COMPANY	20	20	17	15	-1.070	13.930	11.144	2.786	0.229	13.701
M35/5133	MARSHALL J.J.	20	20	17	15	-1.260	13.740	10.992	2.748	0.301	13.439
M35/6179	JOHNSON R.& G.	20	20	17	15	-0.960	14.040	11.232	2.808	0.116	13.924
M35/6483	GRAINGER .P.	20	20	18	16	-1.830	14.170	11.336	2.834	0.250	13.920
M35/6797	WITHERS D	20	20	17	15	-1.950	13.050	10.440	2.610	0.159	12.891
M35/6867	HARRIS I. R.	20	20	17	15	-2.520	12.480	9.984	2.496	1.732	10.748
M35/6892	RICHARDS M.E.	20	20	17	15	-2.290	12.710	10.168	2.542	0.000	12.710
M35/6893	RICHARDS M.E.	20	20	17	15	-2.320	12.680	10.144	2.536	0.000	12.680
M35/6894	RICHARDS M.E.	20	20	17	15	-2.350	12.650	10.120	2.530	0.000	12.650
M35/6895	RICHARDS M.E.	20	20	17	15	-2.370	12.630	10.104	2.526	0.000	12.630
M35/6899	ANTONIUK R.M.& M.J.	20	20	17	15	-2.570	12.430	9.944	2.486	0.127	12.303
M35/7909	MOORE EH	20	20	17	15	-1.440	13.560	10.848	2.712	1.533	12.027
M35/4678	MCINTYRE J.L.	20.1	20.1	17.1	15.1	-4.340	10.760	8.608	2.152	1.330	9.430
M35/8112	Walker DJH and CM	20.25	20.25	18.25	16.25	-3.970	12.280	9.824	2.456	0.464	11.816
M35/11073	Jenkins M	20.3	20.3	18.8	16.8	-3.690	13.110	10.488	2.622	0.382	12.728
M35/11070	MACRAE LAND COMPANY	20.4	20.4	18.9	16.9	-3.650	13.250	10.600	2.650	0.389	12.861
M35/4782	BISMAN I.W.	20.4	20.4	20.4	18.4	-4.150	14.250	11.400	2.850	1.226	13.024
M35/5309	DEAN E.M.	20.4	20.4	17.4	15.4	-4.900	10.500	8.400	2.100	0.158	10.342
M35/9295	Smith C B	20.4	20.4	18.4	16.4	-4.170	12.230	9.784	2.446	0.680	11.550
M35/9876	Mr & Ms M C & P J Maxwell & Duffield	20.48	20.48	18.48	16.48	-4.720	11.760	9.408	2.352	1.098	10.662
M35/10624	MR J D MCKENZIE	20.5	20.5	18.5	16.5	-3.840	12.660	10.128	2.532	0.151	12.509
M35/9946	Mr & Mrs R A & M R Jacobs	20.74	20.74	18.74	16.74	-4.830	11.910	9.528	2.382	0.727	11.183
M35/6061	CAMERON N & A	20.8	20.8	17.8	15.8	-4.140	11.660	9.328	2.332	0.240	11.420
M35/9875	Mr & Mrs B M & C S Falconer	20.8	20.8	18.8	16.8	-4.210	12.590	10.072	2.518	0.755	11.835
M35/11066	MACRAE LAND COMPANY	21	21	19.5	17.5	-3.590	13.910	11.128	2.782	0.453	13.457
M35/9592	Mr NA Harrison	21	21	18.89	16.89	-4.620	12.270	9.816	2.454	0.812	11.458
M35/9262	Mr G D & Mrs L J Wall	21.4	21.4	19.4	17.4	-4.570	12.830	10.264	2.566	0.954	11.876
M35/10731	MR & MRS PJ & RJ HEAPHY	22	22	21	19	-4.070	14.930	11.944	2.986	3.361	11.569
M35/8975	P A & P L Trumic	22	22	20.5	18.5	-3.910	14.590	11.672	2.918	0.427	14.163
M35/9741	MR O W PIMM & MS C J DOLAMORE	22	22	20	18	-4.550	13.450	10.760	2.690	0.947	12.503
BW24/0768	Craig Pethig	22.56	22.56	17.4	15.4	-1.751	13.649	10.920	2.730	0.458	13.192
BW24/0615	Dean McConnell	22.8	22.8	20.8	18.8	-2.219	16.581	13.265	3.316	0.135	16.446
BW23/0705	Renee Browne	22.89	22.89	21.39	19.39	-3.499	15.891	12.713	3.178	0.129	15.762
BW24/0640		23	23	15	13	-1.780	11.220	8.976	2.244	0.687	10.533
M35/10516	Mr & Mrs MD & NRJ Fairbrother	23	23	20.7	18.7	-4.610	14.090	11.272	2.818	0.546	13.544
M35/18806	Ariana C. & Geoffrey B. Wilkins	23	23	22	20	-4.092	15.908	12.727	3.182	0.797	15.111
M35/10517	Union Specialties (NZ) Limited	23.16	23.16	21.16	19.16	-4.300	14.860	11.888	2.972	1.773	13.087
M35/8409	ARCHIBALD TR	23.2	23.2	22.2	20.2	-3.430	16.770	13.416	3.354	0.113	16.657
BW24/0407	Graham Armstrong	23.3	23.3	21.33	19.33	-1.527	17.803	14.242	3.561	0.519	17.284
BW23/0407	S Boot	23.5	23.5	22	20	-4.190	15.810	12.648	3.162	1.176	14.634
BW24/0120	MR DEAN STEPHEN MCCONNELL	23.5	23.5	21.5	19.5	-2.371	17.129	13.703	3.426	0.000	17.129
M35/10179	Mr & Mrs DA & JA Scott	23.5	23.5	21.5	19.5	-5.950	13.550	10.840	2.710	1.919	11.631
M35/10536	Mr & Mrs GM & EA Painter	23.5	23.5	21.5	19.5	-4.750	14.750	11.800	2.950	0.554	14.196
M35/18131	MR JG & MRS S J VAN T VEEN	23.5	23.5	22.81	20.81	-4.760	16.050	12.840	3.210	0.177	15.873
M35/9601	MR & MRS J D & K A MCKENZIE	23.5	23.5	21.5	19.5	-4.010	15.490	12.392	3.098	0.226	15.264
M35/9995	Mr SD Syme	23.56	23.56	21.56	19.56	-4.660	14.900	11.920	2.980	0.935	13.965
M35/9199	G S & B A COATES	23.68	23.68	21.66	19.66	-4.850	14.810	11.848	2.962	0.691	14.119
M35/10480	Mr & Mrs DW & TL Lindsay	23.73	23.73	21.73	19.73	-4.230	15.500	12.400	3.100	0.519	14.981
M35/9812	MR A K CUSSONS	23.83	23.83	21.83	19.83	-4.810	15.020	12.016	3.004	0.850	14.170
BW24/0808		23.84	23.84	21.94	19.94	-2.595	17.345	13.876	3.469	0.115	17.230
M35/8410	MR B M DAVEY	23.9	23.9	21.9	19.9	-3.750	16.150	12.920	3.230	0.000	16.150
M35/9626	S H & P J MITCHELL	23.9	23.9	21.9	19.9	-5.000	14.900	11.920	2.980	0.990	13.910
M35/9666	MR & MRS T B & M J TAYLOR	23.95	23.95	20.95	18.95	-4.690	14.260	11.408	2.852	0.138	14.122
M35/9983	Mr & Mrs MA & MJ Prosser	23.95	23.95	19.95	17.95	-3.980	13.970	11.176	2.794	0.123	13.847
BW23/0218	Sarah Craig Trust	24	24	21	19	-3.404	15.596	12.477	3.119	0.442	15.154
BW23/0342	David and Adrienne Rushworth	24	24	22.5	20.5	-4.164	16.336	13.069	3.267	1.117	15.219
BW23/0346	Dennis and Jacki Jones	24	24	22.5	20.5	-4.139	16.361	13.089	3.272	1.264	15.098
BW23/0522	Bridie Gray	24	24	22	20	-4.251	15.749	12.599	3.150	1.038	14.710
BW23/0590	Muhammad	24	24	22	20	-4.079	15.921	12.737	3.184	1.134	14.787
BW23/0591	James Morgan	24	24	22	20	-4.062	15.938	12.750	3.188	1.161	14.777
BW23/0636	James Borsje Clark	24	24	22.5	20.5	-4.294	16.206	12.965	3.241	0.875	15.331
BW23/0666	L Buckley	24	24	22.1	20.1	-4.264	15.836	12.668	3.167	0.937	14.899
BW23/0667	J Catlin	24	24	22.1	20.1	-4.233	15.867	12.694	3.173	1.072	14.795
BW23/0691		24	24	22	20	-4.302	15.698	12.559	3.140	0.909	14.789
BW23/0693		24	24	22.1	20.1	-4.224	15.876	12.701	3.175	1.043	14.833
BW23/0696		24	24	22.1	20.1	-4.195	15.905	12.724	3.181	1.209	14.696
BW23/0816	P E & R T McAllum	24	24	22	20	-4.193	15.807	12.646	3.161	1.342	14.465
BW24/0334	Russell Pegler	24	24	23	21	-1.899	19.101	15.281	3.820	0.000	19.101
M35/10472	Mr & Mrs KM & DA Arthur	24	24	23	21	-3.700	17.300	13.840	3.460	0.187	17.113
M35/17863	MR & MRS R A & Y M EDWARDS	24	24	22	20	-3.720	16.280	13.024	3.256	0.668	15.612
M35/18261	MR J D & MRS S H ADAMS	24	24	20.59	18.59	-3.990	14.600	11.680	2.920	0.186	14.414
M35/6773	BLACK P.C.	24	24	22	20	-4.170	15.830	12.664	3.166	0.296	15.534
M35/7194	Mr M R & Mrs S J Wells	24	24	22	20	-3.560	16.440	13.152	3.288	0.215	16.225
M35/7754	WILKINSON PB	24	24	23	21	-3.720	17.280	13.824	3.456	0.471	16.809
M35/7997	SHIINO Y & Y	24	24	22.5	20.5	-4.640	15.860	12.688	3.172	0.288	15.572
M35/8032	ALLAN DJ & ML	24	24	21	19	-4.660	14.340	11.472	2.868	0.675	13.665
M35/8480	Mr & Mrs R & S Wix	24	24	22.5	20.5	-4.750	15.750	12.600	3.150	0.415	15.335
M35/8694	CHADDERTON DB	24	24	22	20	-4.670	15.330	12.264	3.066	0.834	14.496
M35/9222	Mr A & Mrs F A MacKenzie	24	24	22.5	20.5	-3.880	16.620	13.296	3.324	0.141	16.479
M35/9916	Mr & Mrs D L & S M Scott	24	24	18	16	-4.230	11.770	9.416	2.354	0.000	11.770
M35/17681	SOUTHERN CROSS TRUFFLES LIMITED	24.1	24.1	21.74	19.74	-3.950	15.790	12.632	3.158	0.122	15.668
M35/10530	Mr & Mrs CW & GN Singleton	24.13	24.13	22.13	20.13	-4.500	15.630	12.504	3.126	1.907	13.723
M35/10507	Mr GA Brown	24.16	24.16	22.16	20.16	-4.460	15.700	12.560	3.140	2.645	13.055
BW23/0411	Blair Tipler	24.2	24.2	22.7	20.7	-4.270	16.430	13.144	3.286	0.860	15.569
M35/2919	RICHARDS M.E.	24.2	24.2	21.2	19.2	-4.190	15.010	12.008	3.002	0.000	15.010
M35/7710	HARRIS IR	24.2	24.2	22.2	20.2	-5.180	15.020	12.016	3.004	0.469	14.551
BW23/0637	Dale Powers	24.23	24.23	22.73	20.73	-4.089	16.641	13.313	3.328	0.572	16.069
M35/8199	LAURIE CS & VC	24.6	24.6	22.6	20.6	-4.540	16.060	12.848	3.212	0.825	15.235
M35/8606	BURNEY RT	24.8	24.8	23.27	21.27	-3.920	17.350	13.880	3.470	0.274	17.076
M35/11063	MR & MRS EJ & JR GRAHAM	25	25	22	20	-4.400	15.600	12.480	3.120	2.114	13.486
BW23/0702	Jacque & Daryl Bloomfield	25.5	25.5	24	22	-4.177	17.823	14.258	3.565	1.095	16.728
M35/17977	MR U VAN NEK	25.62	25.62	22.07	20.07	-4.960	15.110	12.088	3.022	0.158	14.952
M35/10524	Mr & Ms BR & DV Hickling & Sinclair	25.9	25.9	23.9	21.9	-4.250	17.650	14.120	3.530	0.546	17.104
M35/7998	SHIINO Y & Y	26	26	24.5	22.5	-4.870	17.630	14.104	3.526	0.324	17.306
BW24/0528	C Summers	27	27	22.5	20.5	-2.369	18.131	14.504	3.626	0.000	18.131
M35/9631	MR & MRS SH & SJ TAYLOR	27	27	25	23	-4.750	18.250	14.600	3.650	0.851	17.399
M35/4728	ADAMS R.D.	27.4	27.4	24.4	22.4	-4.130	18.270	14.616	3.654	0.105	18.165
M35/4737	Messrs J G & G B van't Veen	27.85	27.85	23.05	21.05	-4.190	16.860	13.488	3.372	0.141	16.719
BW23/0334	Simon Family Trust	29.39	29.39	27.89	25.89	-3.307	22.583	18.066	4.517	0.244	22.339
BW24/0121	MR DEAN STEPHEN MCCONNELL	29.9	29.9	21.5	19.5	-2.371	17.129	13.703	3.426	0.000	17.129

Appendix H: Individual Drinking Water Bore Assessments

Appendix H Individual Drinking Water Bore Assessment

WellNo	Owner	Available DD (m)	Cumulative DD (m)	Remaining DD (m)	Distance from Site Boundary (m)	Direct DD (m)	Balance of DD to Achieve Yield (m)
M35/4748	REID R.C.	5.660	2.635	3.025	1,180	0.37	2.655
M35/0390	Mr P PASTARS	5.280	2.189	3.091	1,710	0.15	2.941
M35/0676	BEZZANT AM & JM	3.180	0.000	3.180	1,175	0.38	2.800
M35/4742	SCOTT J.H.	5.970	2.367	3.603	910	0.58	3.023
M35/4099	CAMERON J.G.& J.L.	6.320	2.617	3.703	1,070	0.45	3.253
BW23/0821	Sarah Chamerberlain	5.663	1.886	3.777	1,970	0.1	3.677
BW23/0572	Kevin Hart	6.268	2.303	3.964	1,570	0.2	3.764
M35/4740	CAMERON J G (EX WARD F.J)	6.522	2.504	4.018	700	0.81	3.208
M35/4614	TOZER N.A.	6.326	2.137	4.189	1,500	0.22	3.969
BW23/0643	Kevin Hart	6.361	2.001	4.360	1,580	0.19	4.170
M35/8786	Myers JC	6.155	1.759	4.396	1,880	0.11	4.286
M35/4606	PARROTT T.D.	6.430	2.033	4.397	1,730	0.15	4.247
M35/4681	SANDERS E.W.& T.J.	6.550	2.102	4.448	670	0.85	3.598
M35/4727	THIELE G.J.	7.080	1.909	5.171	90	2.91	2.261
M35/4832	RANDS B.W.	7.310	2.119	5.191	1,660	0.17	5.021
M35/4719	POWER G.J.	7.710	2.339	5.371	700	0.81	4.561
M35/6191	CUSICK D.J.	7.410	2.026	5.384	1,750	0.14	5.244
M35/0388	WALLS G.D.	7.142	1.584	5.558	Located onsite		5.558
M35/4770	DELLOW P.K.	7.158	1.585	5.573	170	2.24	3.333
M35/0387	REGNAULT C.R.	7.800	2.211	5.589	190	2.12	3.469
M35/4683	HARRIS I.R.	6.440	0.723	5.717	270	1.75	3.967
M35/4746	VERKERK A.	7.690	1.878	5.812	70	3.17	2.642
M35/0305	LESLIE D.H.& M.A.	7.750	1.821	5.929	Located onsite		5.929
M35/4745	ARMSTRONG M.A.& G.G.	7.265	1.310	5.955	190	2.12	3.835