11 March 2024

Goodman Nominee (NZ) Limited
Level 2, KPMG Centre
18 Viaduct Harbour Avenue
Auckland 1010

Attn: Sarah Haydock

Dear Sarah

**Waitomokia RFI: Addendum Hydrogeological Technical Memo - 118 Montgomerie Road, Mangere, Auckland**

**(Our Reference: 18043.000.001_09)**

# 1 Introduction

ENGEO Ltd was requested by Goodman Nominee (NZ) Limited to address a Request for Information (RFI) issued by Auckland Council in relation to the proposed Plan Change for the former Villa Maria at 118 Montgomerie Road, Mangere, Auckland. The project site is within the Waitomokia volcanic crater. Our response to the RFI is subsequent to a Preliminary Hydrogeological Investigation (Project No. 18043.000.001, Doc ID 07) issued by ENGEO 06/05/2023 (Revised). As part of our response, ENGEO has undertaken the following additional works:

- Update of preliminary hydrogeological conceptual model based on review of additional borehole data.
- Review of Auckland Council Bore Search records regarding existing and historical groundwater users in the local area.
- Additional groundwater analyses:
    - Extended monitoring timeframe
    - Historical and concurrent rainfall analyses.

Individual RFI items are outlined in separate sections following presentation of the additional works. As part of preparing our response, ENGEO have undertaken liaison with the following parties:

- Auckland Council: Marija Jukic (RFI scope / reasoning and draft response rationale).
- Te Kawerau ā Maki Trust (Project CVA: commentary re: Ihumatao Spring effects).
- Sertus Consulting Limited (Project civil designer: stormwater infrastructure layout and groundwater recharge).

# 2 Revised Conceptual Model

To support Council's assessment of potential interactions between future on-site activities and environmental receptors (springs flows, aquifer recharge and existing groundwater users), the preliminary conceptual model has been refined to demonstrate relative relationships between various components queried by Council.

## 2.1 Stratigraphic Inputs

Refinement of the conceptual model has made reference to additional borehole logs, including deeper abstraction wells (i.e. bore), in the surrounding area. A summary of the additional bore data sourced from the New Zealand Geotechnical Database (NZGD[1]) is presented in Table 2-1 and Figure 2-1. It is noted that the stratigraphy presented in Table 2-1 has required some interpretation due to the terminology used in some of the historical logs. As such, the Puketoka Formation has not been differentiated from the high order Tauranga Group in Table 1 due to insufficient detail in logs to determine depths across all additional logs. Kaawa Formation however, being part of the Kariotahi Group, is compositionally distinct enough to be differentiated from Tauranga Group materials in the absence of geological units being noted on the available logs.

In comparison to the surrounding area, the Waitomokia crater basin itself has been shown from geotechnical drilling associated with the current Waitomokia plan change to be underlain by:

- Tauranga Group. Recent alluvium from ground surface to depths of between 4-7 m bgl.
- Auckland Volcanic Field (AVF ). Basalt underlying alluvial materials extending to depths of generally between 8 – 11 m bgl, being thinnest towards the NE corner of the site, however extending to depths greater than 19 m bgl (End of Bore) near the centre of the site.
- Tauranga Group (Puketoka Formation). Generally comprised of interbedded low permeability clayey silts, and higher permeability sandy silt and silty sand horizons. Underlying the thinner AVF Basalt areas towards the Waitomokia crater edge. At the location of Initia borehole BH102 (NE corner of site), Puketoka Fm. strata extended from approximately 7.5 m bgl (directly below broken basalt rubble) to greater than 21 m bgl (End of Bore).

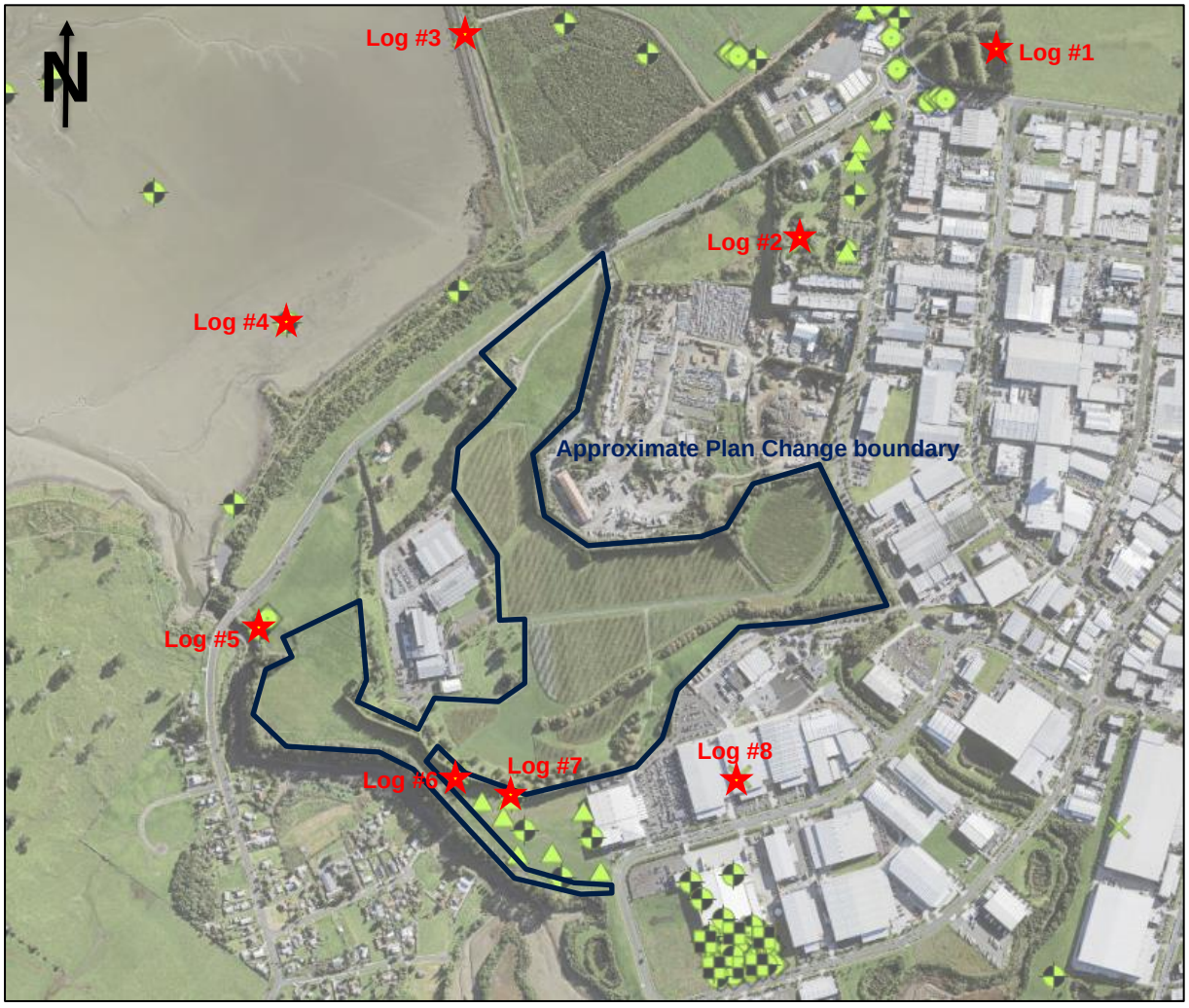
**Table 2-1: NZGD Drill-log Summaries**

| Log # | NZGD ID | Bore Type | Stratigraphy (m bgl) | Note |
|---|---|---|---|---|
| **1** | 79498 | Abstraction | 0 – 26: Tauranga Gp.<br>26 – 49: Kaawa Fm. | |
| **2** | 80461 | Abstraction | 0 – 12: AVF Tuff<br>12 – 20: AVF Basalt<br>20 – 47: Kaawa Fm.<br>47 – 55: Waitemata GP | |
| **3** | 78537 | Abstraction | 0 – 27: Tauranga Gp.<br>27 – 33: Kaawa Fm.<br>33 – 45+: Waitemata Gp. | |
| **4** | 65866 | Geotechnical | 0 – 15: Tauranga Gp. | |
| **5** | 94436 | Geotechnical | 0 – 12: AVF Tuff | |

[1] https://www.nzgd.org.nz

| Log # | NZGD ID | Bore Type | Stratigraphy (m bgl) | Note |
|---|---|---|---|---|
| **6** | 80893 | Abstraction | 0 – 12: AVF Tuff<br>12 – 40: Tauranga Gp.<br>40 – 51: Kaawa Fm.<br>51 – 100: Waitemata Gp. | Villa Maria Bore.<br>Backfilled to 50 m bgl for abstraction |
| **7** | 168627 | Geotechnical | 0 – 9: AVF Tuff<br>9 – 35: Tauranga Gp. | |
| **8** | 82506 | Abstraction | 0 – 24: Tauranga Gp.<br>24 – 100: Kaawa Fm. | |

**Figure 2-1: NZGD Borehole Locations**



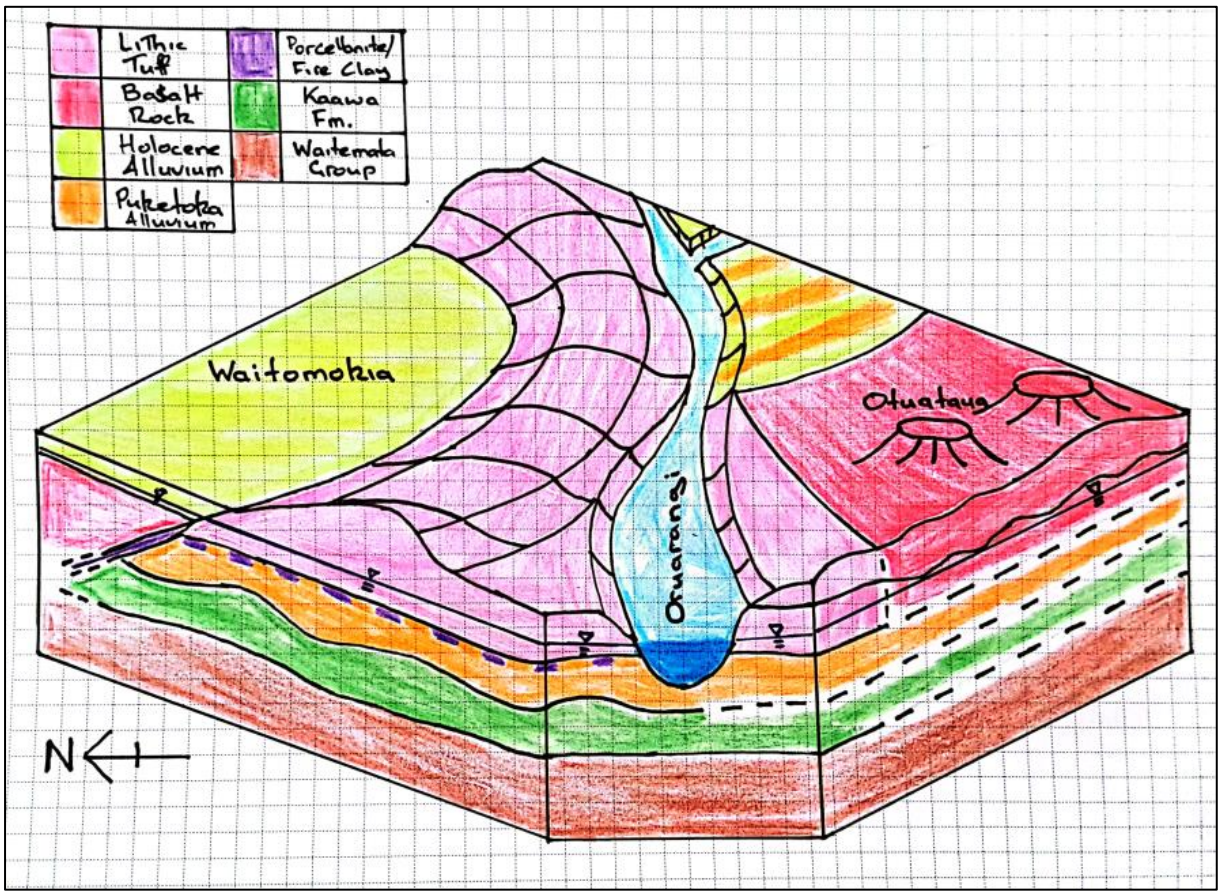
## 2.2 Waitomokia Hydro-Stratigraphic Summary

ENGEO consider that the investigation site area is best divided into three distinct hydro-stratigraphic profile types:

- Central Crater Area (Central portion of site):
    - Strata 1: Recent alluvium (surficial veneer)
    - Strata 2: AVF Basalt **[Otuataua Volcanic Aquifer]**
    - Strata 3: Unknown at depth as no drilling has extended below the AVF basalt. Due to the proximity to the Waitomokia volcanic main vent (Weddings Quarry adjacent to site on northern side) a degree of alteration from contact metamorphism is likely to have occurred. Hydrostratigraphic units encountered at depth may include:
        - Strata 3a: Porcellanite / "Fire clay" contact layer / horizon at base of basalt flows
        - Strata 3b: Puketoka Formation
        - Strata 3c: Kaawa Formation (likely locally altered from contact metamorphism due to proximity to Waitomokia volcanic complex) [**Mangere-Manurewa Kaawa Aquifer]**
        - Strata 3d: Waitemata Group (Likely locally altered from contact metamorphism due to proximity to Waitomokia volcanic complex) [**Manukau North Waitemata Aquifer**]
- Outer Crater Area (NE end of site):
    - Strata 1: Recent alluvium (surficial veneer)
    - Strata 2: AVF Basalt (outer crater "rubble front") [**Otuataua Volcanic Aquifer**]
    - Strata 3: Puketoka Formation
    - Strata 4: Kaawa Formation (Inferred at depth – potentially altered from contact metamorphism) [**Mangere-Manurewa Kaawa Aquifer]**
    - Strata 5: Waitemata Group (At depth – potentially altered from contact metamorphism) [**Manukau North Waitemata Aquifer**]
- Tuff Ring (SW portion of site / "Harbour View Block"):
    - Strata 1: AVF Tuff (Waitomokia crater ring) [**"Otuataua Volcanic Aquifer"** – Inferred 'dry' with no yield from Villa Maria Water Bore; Figure 2-1 Log 6]
    - Strata 2: Puketoka Formation
    - Strata 3: Kaawa Formation [**Mangere-Manurewa Kaawa Aquifer**]
    - Strata 4: Waitemata Group [**Manukau North Waitemata Aquifer**]

An updated conceptual model for the Waitomokia and Otuataua area is presented in Figure 2-2. The updated conceptual model has incorporated an inferred porcellanite / “Fire-clay” horizon at the base of the AVF basalt. Porcellanite is frequently encountered at the base of basalt lava flows across the Auckland area and is described as a ‘chert-like’ pyro-metamorphic contact arising from emplacement of lava on the pre-volcanic paleo-surface. With respect to the site area, no drilling within the Waitomokia crater has extended below the basalt flows in the proximity of the main vent area (Weddings Quarry to north, extending through to the central portion of former Villa Maria vineyard) to confirm the presence of porcellanite locally.

**Figure 2-2: Waitomokia & Otuataua Revised Conceptual Model**




## 3 Existing Groundwater Users

To support review of potential adverse impacts on nearby lawfully established groundwater users, ENGEO has undertaken an additional search of the Auckland Council Bore and Groundwater consent database. The radius of the search was 1 km from the centre of the current Waitomokia Site. The condensed results of the search are presented in Attachment 1.

Excluding the existing Resource Consent and bores within the former Villa Maria block, a total of five existing consented groundwater abstractions were identified (ENGEO Point IDs 2/36, 41, 48/50, 3/21/25, 45/53). Two of these (3/21/25, 45/53) are located south of Oruarangi Creek and are considered not to be directly connected to the groundwater regime beneath Waitomokia.

The other three abstractions are all located to the north with 2/36, a stock-bore, being the closest to this site at a distance of approximately 400 m from the nearest site boundary. This bore corresponds to Log 2 in Table 2-1, and is considered to be abstracting from the Kaawa Formation shell beds.

The other two bores to the north are identified based on available bore logs to be abstracting from the Kaawa Formation.

In addition to the above four bores, historical Permitted Activity bores were identified, however only one (ENGEO Point ID 8) was identified as being an abstraction bore. This location is south of Oruarangi Creek, at a distance of > 500 m from the nearest site boundary.

# 4 Groundwater Monitoring Review

## 4.1 Extended Groundwater Monitoring

To support review of long-term / inter-seasonal groundwater variations, ENGEO has been provided additional groundwater level data undertaken by Initia at monitoring piezometer BH106. This monitoring data spans a period of approximately seven months immediately prior to ENGEO's own monitoring in 2022. Additionally, a data-logger was reinstalled in piezometer BH108 for a period of two weeks at the end of February 2024. The remaining piezometers, as identified in our original report, could not be located and are believed to have been removed / decommissioned during ongoing site use / activities.

The compiled groundwater monitoring data is presented in Attachment 2. Observed groundwater elevations at BH108 from February 2024 are approximately the same as those observed in late-2022 (i.e. c.5.2 m RL). Groundwater levels in BH106 from March to October 2022 vary between approximately 5.5 and 4.8 m RL.

## 4.2 Rainfall Analyses

To support review of the representativeness of monitored groundwater levels against 'normal' hydrological conditions, a high-level review of historical rainfall records from the nearest rain gauge (Onehunga) has been performed. Both the historical rainfall ranges and rainfall measurements relative to the groundwater monitoring period have also been compared to the long-term rainfall trends reported by NIWA[2].

Long-term rainfall plots are presented in Attachment 3.

[2] The Climate and Weather of Auckland; 2nd Edition, 2012

# 5 Auckland Council Request for Information

## 5.1 Item A: Hydrogeological links between the volcanic aquifer and underlying aquifers

Auckland Council wrote:

*Please provide further information on the hydrogeological links between the volcanic aquifer and underlying aquifers so these links can be adequately assessed in relation to the plan change proposal, particularly regarding groundwater flow and recharge, and potential adverse effects on the underlying aquifers should appropriate mitigation measures not be adopted by the plan change proposal to address such effects where required.*

Additional to the above, supplementary commentary noted that:

Clause 25(4)(d) of the RMA's First Schedule requires a private plan change request to demonstrate consistency with Part 5 of the RMA before it can be accepted for notification. Therefore, further information is requested to demonstrate that the plan change is consistent with existing AUP groundwater provisions, including those contained in Chapters B6 and B7 of the RPS which require Mana Whenua values, mātauranga and tikanga associated with freshwater to be recognised and provided for, noting the following comments in Te Kawerau ā Maki's CVA:

"*Waitomokia is an important source of groundwater recharge on the peninsula and feeds the various springs around Ihumatao. Groundwater within the basin varies from 0.6 m to 1.5 m below ground level and could be perched or influenced by tidal force."*

Following discussions with Auckland Council, ENGEO liaised with the author of the CVA. Subsequent correspondence from the CVA noted that:

"*The CIA reference relates to some mātauranga passed down through a number of generations of kaumatua. In essence, the saying goes that Waitomokia – the name itself referring to the waters flowing down/underground – is the 'grandmother' of the surrounding springs of Ihumatao. That in essence its role as a recharge basin (and historically a swampy mahinga kai in parts) was very important. In terms of its link to wider springs, I think this is a matter of interpretation. On the one hand, the saying simply links the importance of it in terms of fresh water with the wider springs of the area, a whakapapa of a sort. On the other hand, the saying could have been applied to the general area of the peninsula, whereas perhaps it relates on a technical level only to springs to the north of Oruarangi awa, but that over time the specific kōrero became synonymous with the general area. Either way, the general essence of the importance of Waitomokia in terms of water remains. If the hydrogeology of the feature suggests the Waitomokia feeds a separate aquifer system to that of the Ihumatao peninsula to the south, that is fine also*."

On the basis of the above, ENGEO stands by commentary that recharge within the Waitomokia crater area does not have a direct effect on spring discharge or groundwater flows around Ihumatao. With further reference to the reported quality of groundwater within the Otuataua Volcanic aquifer beneath Waitomokia (ENGEO, 2022), ENGEO highlights the existing degraded groundwater quality. As such, we believe that the unconfined groundwater beneath the site is of very limited potential use without significant treatment and therefore of low value economically. In a cultural sense, ENGEO believe the quality of the shallow groundwater is somewhere between Wai-tai and Wai-kino[3], as detailed below:

- Wai-tai ('seawater'): Electrical conductivity is in excess of freshwater range towards western end of site; and
- Wai-kino ('polluted water'): The mauri (life force) of the water has been altered through pollution and has the potential to do harm to all living things (including humans and ecosystems). Biological contaminants (*E. coli*) reported to be significantly above the limit for drinking water guidelines (up to 3,500 CFU/100mL).

With respect to potential linkages between the Waitomokia crater area and aquifer units below the Otuataua Volcanic Aquifer, we refer to the hydrostratigraphic conceptual model revisions presented in Section 2.

The site itself is underlain by the Otuataua Volcanic Aquifer, with the Mangere-Manurewa Kaawa Aquifer and Manukau North Waitemata Aquifers located at depth below. While the presence of the stratigraphy itself is not disputed, the hydrostratigraphic nature of the materials and their ability to function as water bearing aquifers is considered relatively circumspect. Alteration from contact metamorphism is likely to have reduced the 'aquifer potential' directly adjacent to the Waitomokia volcanic vent.

Notwithstanding the above, the presence of the lower permeability Puketoka Formation strata between the shallow volcanic aquifer and the deeper sedimentary aquifers (Kaawa & Waitemata) is considered to preclude recharge to the deeper aquifers from surface infiltration within the Waitomokia crater.

As indicated in the updated conceptual model, the intervening Puketoka Formation strata are connected to the coastal constant head boundary at Oruarangi Creek. As such, ENGEO considers that any reduction in recharge to the Waitomokia portion of the Otuataua Volcanic Aquifer is unlikely to impact the quantum or quality of groundwater availability in either the Mangere-Manurewa Kaawa or Manukau North Waitemata Aquifers as the head pressure in the deeper aquifers is largely controlled by coastal heads so far as influences from within the Waitomokia area are concerned.

Nonetheless, ENGEO has previously commented on a potential engineering need to maintain recharge in order to avoid consolidation settlement arising from effective changes associated with reduction in groundwater levels. We understand from the project civil design (Sertus) that the existing drainage channels within the site will be retained, and that a surface water detention area will be excavated within the southern portion of the site (to a depth marginally above the 'standing' groundwater level). Although the civil works do not constitute recharge-by-design (i.e. not considered engineered recharge structures or infiltration basins), the mechanism of existing recharge will largely remain unaltered, and in fact be enhanced due to the additional detention basin structure.

[3] Water NZ, 2018: Nga momo wia / Types of water

As such ENGEO does not consider that groundwater recharge mechanisms within the Waitomokia crater area will be materially impacted. Further, ENGEO considers that the availability of groundwater from the aquifers underlying the site will not be adversely affected.

## 5.2 Item B: Existing and future groundwater use

Auckland Council wrote:

*Please provide further information on existing and future groundwater use, including any known or anticipated future taking of water from aquifers within the plan change precinct by associated users, area these links can be adequately assessed in relation to the plan change proposal, particularly regarding groundwater flow and recharge, and any effects the plan change may have on existing and future groundwater use within the proposed precinct.*

With reference to the summary of existing groundwater users in the local area (Section 3) we note the following:

- No existing groundwater-supply user has been identified that abstracts from the Waitomokia portion of the Otuataua Volcanic Aquifer.
- No existing Permitted Activity bore, either recent or historical, has been identified within appreciable distance of the site that might represent potential for a Permitted Activity Groundwater abstraction.

ENGEO consider that any future development within the Waitomokia crater area can only impact groundwater flows within the Otuataua Volcanic Aquifer. As such we refer to our original hydrogeological reporting (ENGEO, 2022) which indicates that the quality of the unconfined groundwater within the site is sufficiently degraded as to be of 'low-value' for any abstraction use beyond potentially dust-suppression.

ENGEO is not aware of any nearby development areas that may seek to incorporate groundwater abstraction from the limited expanse of Waitomokia-area Otuataua Volcanic Aquifer outside of the site area. Given the reduced groundwater quality as previously reported, abstraction of the shallow groundwater from Waitomokia is considered unlikely to be an 'attractive resource' for abstraction. All other existing groundwater users in the area are observed to be utilising other aquifer units.

## 5.3 Item C: Groundwater monitoring

Auckland Council wrote:

*Please provide an updated hydrogeological assessment which provides sufficient monitoring data over the longest period of time possible in Summer and Winter to adequately assess groundwater sources and levels inside the plan change precinct area, including the underlying Puketoka Formation, noting this will require the installation of additional groundwater monitoring boreholes, both across the area and into the Puketoka Formation.*

Please refer to Section 4 and Attachment 3. Updated groundwater monitoring plots for the site indicates no more than approximately 0.7 m of seasonal fluctuation in groundwater levels within the Otuataua Volcanic Aquifer (BH108).

Comparison of the reported groundwater monitoring levels against contemporary and historical rainfall data indicates that the 2022 monitoring period experienced 'above average' monthly and annual rainfall.

This is observed both in respect to local rainfall records for the Onehunga rain gauge, and in comparison to long-term seasonal / monthly norms reported by NIWA.

As such, ENGEO considers that the extent of groundwater monitoring undertaken to date sufficiently characterises the ranges of anticipated levels within the Otuataua Volcanic Aquifer at the Waitomokia crater area.

It is however acknowledged that monitoring of groundwater levels within the underlying Puketoka Formation has not be undertaken. The potential for changes in recharge patterns to the Puketoka Formation, while considered unlikely by ENGEO, cannot be dismissed at a risk-based level for protection of maintaining head-pressure conditions for confinement of the deeper Kaawa formation aquifer.

Following discussions with Auckland Council, ENGEO understands that Council would consider retention of remaining piezometers on-site, installed for tracking of pressure dissipations effects during the current geotechnical preload trials, and monitoring for a period through bulk site formation, as sufficient to confirm lack of adverse effects. Any such monitoring would not need to extend beyond the commencement of individual lot developments within the site, as any associated effects would be assessed and controlled by individual Resource Consents.

# 6 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Goodman Nominee (NZ) Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

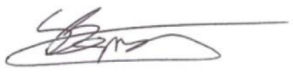
iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by



**Sean Berry**

Engineering Geologist / Hydrogeologist

Report reviewed by

**James Thurber**

Principal Hydrogeologist

**Erika McDonald, CMEngNZ**

Principal Environmental Engineer

# 7 Attachments

Attachment 1: Groundwater Users

Attachment 2: Groundwater Monitoring

Attachment 3: Rainfall Analyses

# Attachment 1

Groundwater Users

**Figure 7-1: Auckland Council Database Search – All WAT/LUC & Historic Consents**

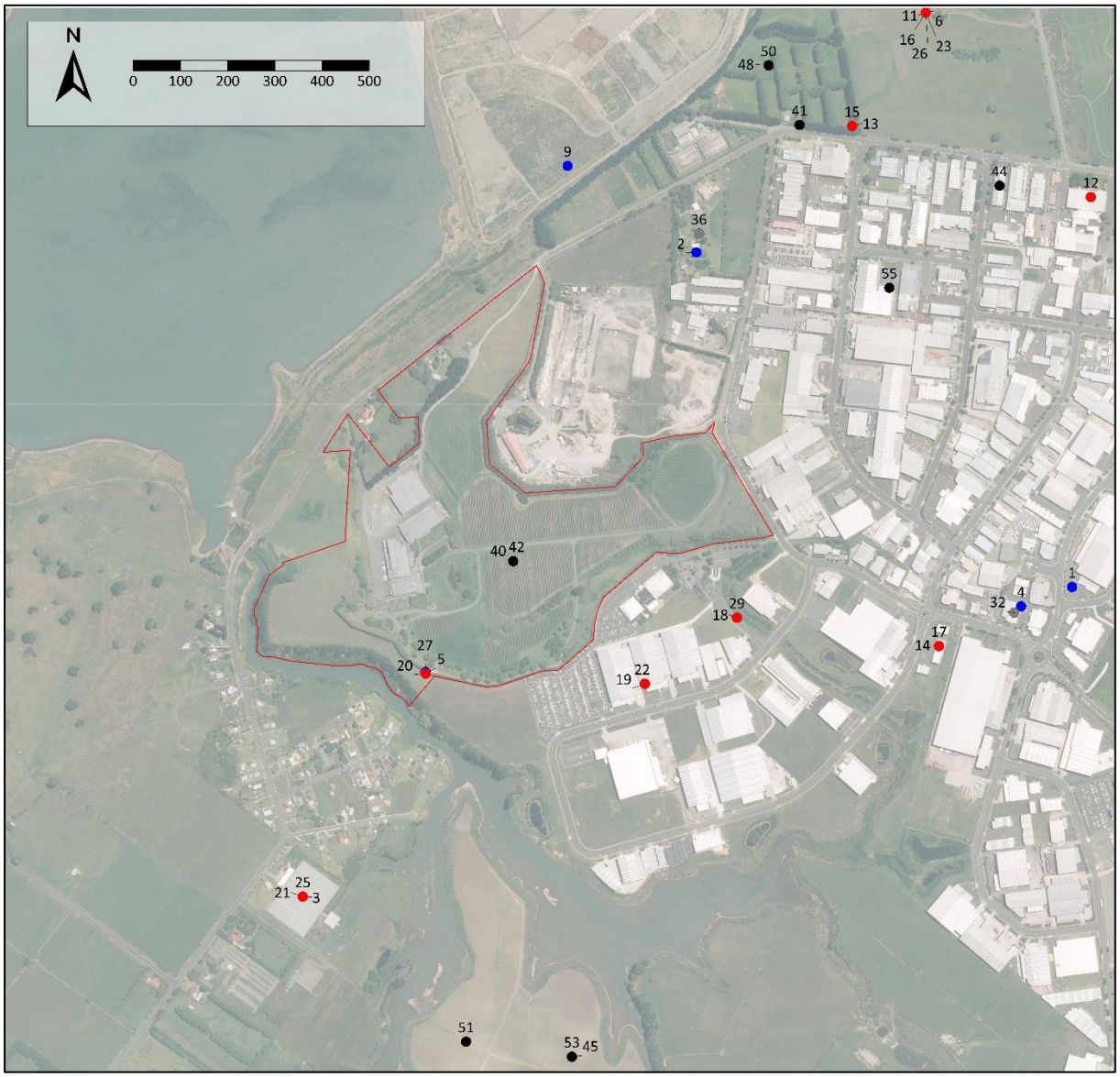


**Figure 7-2: Auckland Council Database Search - Bores**

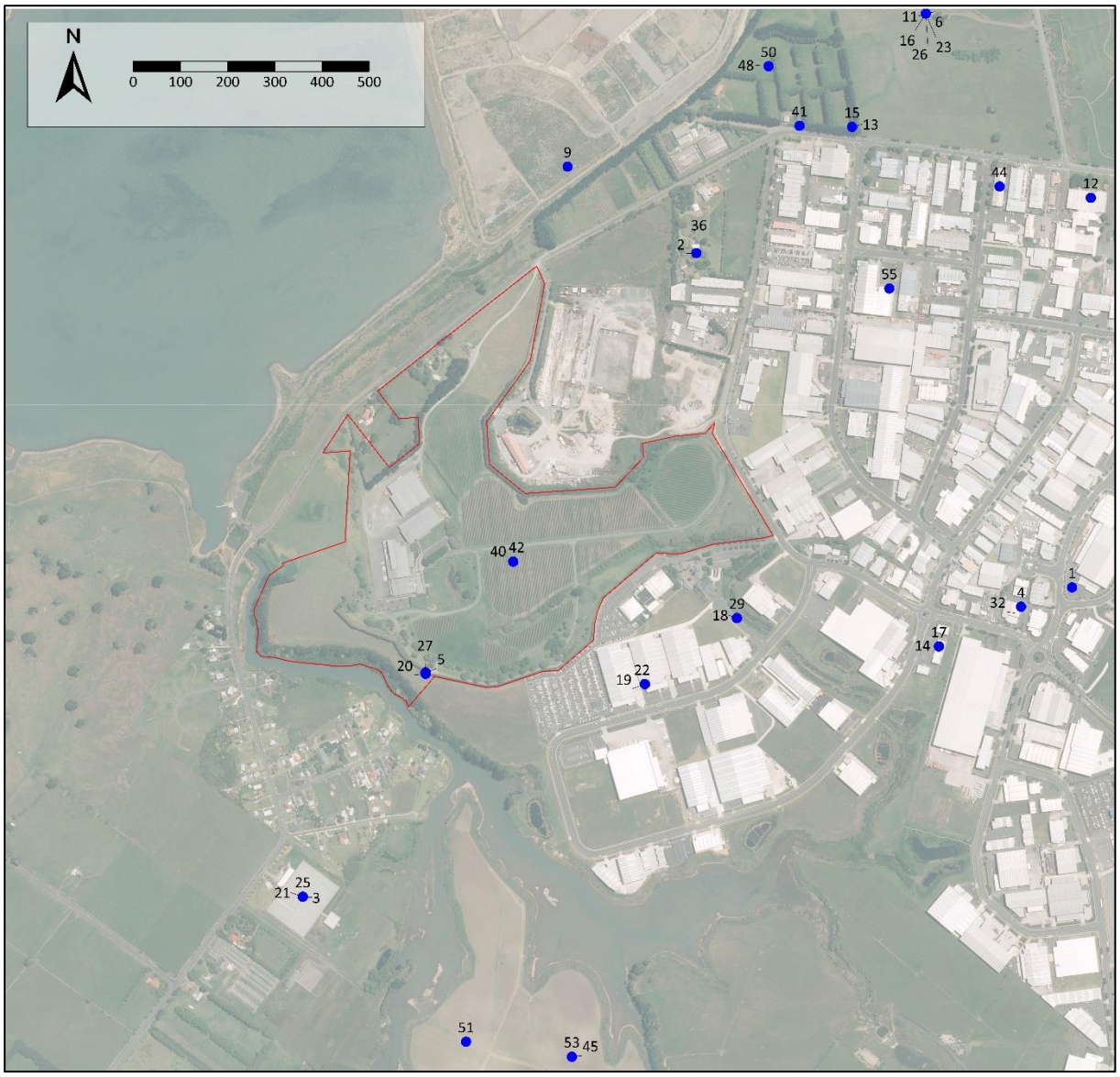


Table 7-1: Auckland Council Bore Search

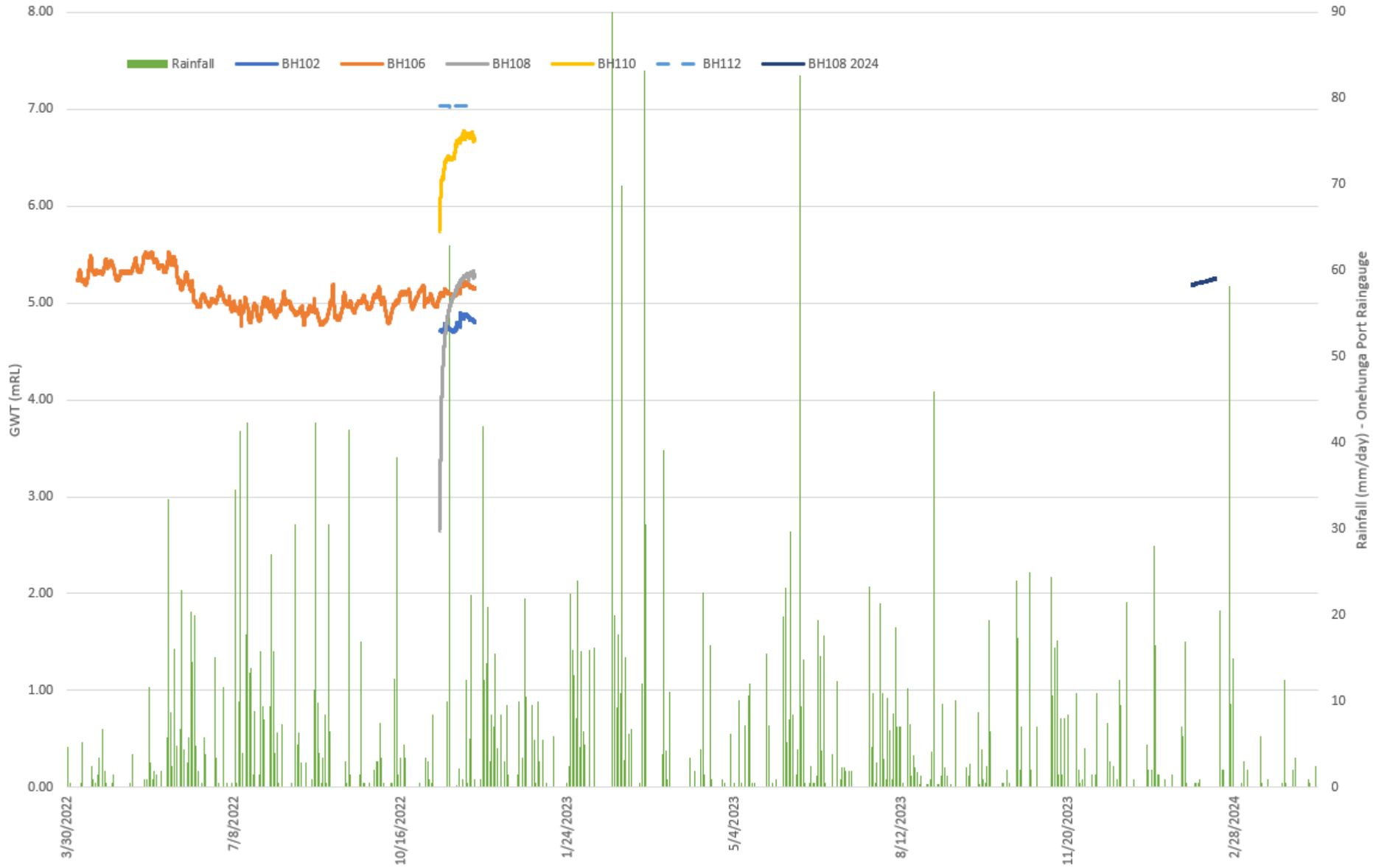
| ENGEO ID | Easting | Northing | Database Search Source Doc | Consent Status | Purpose / Description |
|---|---|---|---|---|---|
| 1 | 1758660 | 5905875 | OAS_CONS_LU_BORES | Expired | Authorize the construction of a bore for groundwater quality monitoring. |
| 2 | 1757864 | 5906583 | OAS_CONS_LU_BORES | Expired | To authorise the construction of a bore for stock and domestic purposes. |
| 3 | 1757030 | 5905220 | OAS_CONS_LU_BORES | Expired | Authorize the construction of a water bore to extract groundwater for irrigation. |
| 4 | 1758552 | 5905834 | OAS_CONS_LU_BORES | Expired | To authorise the construction of a bore for Environmental Monitoring purposes. |
| 5 | 1757290 | 5905695 | OAS_CONS_LU_BORES | Expired | Authorise the construction of a bore for irrigation supply. |
| 6 | 1758350 | 5907090 | OAS_CONS_LU_BORES | Expired | Authorise the construction of a test prodution bore. |
| 7 | 1758781 | 5905595 | OAS_PA_BORES | | The construction of twenty eight bores for geotechnical and groundwater investigation purposes. |
| 8 | 1757254 | 5904681 | OAS_PA_BORES | | The construction of one replacement bore for irrigation purposes. |
| 9 | 1757591 | 5906766 | OAS_PA_BORES | | To authorise the construction two bores for Groundwater Investigation & |
| 10 | 1758873 | 5905855 | OAS_PA_BORES | | The construction of twenty eight bores for geotechnical and groundwater investigation purposes. |
| 11 | 1758350 | 5907090 | OAS_APPL_W_TAKES | Withdrawn | To authorise the taking of groundwater to provide process water for sludge dewatering and in accordance with Section 14 of the Resource Management Act 1991. |
| 12 | 1758700 | 5906700 | OAS_CONS_W_TAKES | Surrendered | |
| 13 | 1758194 | 5906850 | OAS_CONS_W_TAKES | Cancelled | To take from a Bore up to 150 cmpd for - Pastoral |
| 14 | 1758378 | 5905750 | OAS_CONS_W_TAKES | Replaced | 40 ha mixed orchard, 3.5 ha shadehouse/plastic house, up to 9 ha outdoor flower crops and 1 ha nursery and topping up a dam |
| 15 | 1758194 | 5906850 | OAS_CONS_W_TAKES | Surrendered | TO TAKE GROUNDWATER FOR IRRIGATION OF 5 HECTARE OF TAMARILLOS AND CHERIMOYAS, 1500 M2 GLASSHOUSE AND USE IN PROCESSING SHED AND COOLSTORE |
| 16 | 1758350 | 5907090 | OAS_CONS_W_TAKES | Issued | To take 250m$^3$/day and 75,000m$^3$/year of groundwater from a 200mm diameter, 48 metre deep Manukau Kaawa aquifer bore for dust suppression, odour control, truck washing and construction for works associated with Mangere Wastewater Treatment Plant. |
| 17 | 1758378 | 5905750 | OAS_CONS_W_TAKES | Surrendered | TO TAKE GROUNDWATER FOR TOPPING UP DAM AND FOR IRRIGATION OF 40 HECTARES OF MIXED ORCHARD, 3.5 HECTARES OF SHADEHOUSE/PLASTIC HOUSE CROPS, UP TO 9.0 HECTARES OF OUTDOOR FLOWER CROPS AND 1.0 HECTARE OF NURSERY |
| 18 | 1757950 | 5905810 | OAS_CONS_W_TAKES | Cancelled | To take from a Dam up to 1400 cmpd for - Pastoral |
| 19 | 1757755 | 5905670 | OAS_CONS_W_TAKES | Replaced | 40 ha mixed orchard, 3.5 ha shadehouse/plastic house, up to 9 ha outdoor flower crops and 1 ha nursery and topping up a dam |
| 20 | 1757290 | 5905692 | OAS_CONS_W_TAKES | Issued | To authorise the taking of groundwater for irrigation use in a vineyard. |
| 21 | 1757030 | 5905220 | OAS_CONS_W_TAKES | Surrendered | TO TAKE GROUNDWATER FOR IRRIGATION OF 3.2 HECTARES OF GLASSHOUSE LILIES |
| 22 | 1757755 | 5905670 | OAS_CONS_W_TAKES | Surrendered | TO TAKE GROUNDWATER FOR TOPPING UP A DAM AND FOR IRRIGATION OF 40 HECTARES OF MIXED ORCHARD, 3.5 HECTARES OF SHADEHOUSE/PLASTIC HOUSE CROPS, UP TO 9.0 HECTARES OF OUTDOOR FLOWER CROPS AND 1.0 HECTARE OF NURSERY |
| 23 | 1758350 | 5907090 | OAS_CONS_W_TAKES | Superseded | To authorise the taking of groundwater for odour and dust control in accordance with Section 14 of the Resource Management Act 1991. |
| 24 | 1757254 | 5904681 | OAS_CONS_W_TAKES | Superseded | To take and use up to 400 m3/day and 30,600 m3/year of groundwater from an existing bore in the Manukau Kaawa aquifer for irrigation of 18ha of market garden crops and for stock drinking water at 145 Ihumatao Road, Mangere being Lot 1 DP 28940 (CT 985/62 |
| 25 | 1757030 | 5905220 | OAS_CONS_W_TAKES | Cancelled | TO TAKE GROUNDWATER FOR TRICKLE IRRIGATION OF A 12~HECTARE KIWIFRUIT ORCHARD~~~ |
| 26 | 1758350 | 5907090 | OAS_CONS_W_TAKES | Expired | To authorise the taking of groundwater to provide process water for sludge dewatering and in accordance with Section 14 of the Resource Management Act 1991. |
| 27 | 1757290 | 5905692 | OAS_CONS_W_TAKES | Superseded | To authorise the taking of groundwater for irrigation use in a vineyard in accordance with Section 14 of the Resource Management Act 1991. |
| 28 | 1757254 | 5904681 | OAS_CONS_W_TAKES | Issued | To take and use up to 400 m3/day and 50,000 m3/year of groundwater from an existing bore in the Manukau Kaawa aquifer for irrigation of 18ha of market garden crops and for stock drinking water at 145 Ihumatao Road, Mangere being Lot 1 DP 28940 (CT 9 |
| 29 | 1757950 | 5905810 | OAS_CONS_W_TAKES | Surrendered | TO TAKE SURFACE WATER FROM A DAMMING OF AN UNNAMED TRIBUTARY OF THE ORUARANGI CREEK FOR IRRIGATION OF A 40 HECTARE OF MIXED ORCHARD, 3.5 HECTARES OF SHADEHOUSE/PLASTIC HOUSE CROPS, UP TO 9.0 HECTARES OF OUTDOOR FLOWER CROPS AND 1.0 HECTARE OF NURSERY |
| 30 | 1757067 | 5907557 | BORE_AC_CONSENT | Complete | Drilling of a borehole to allow for the undertaking of a groundwater pump test' |
| 31 | 1757067 | 5907557 | BORE_AC_CONSENT | Issued | Permitted Activity - To authorise 6 investigation bores for wastewater treatment plant |
| 32 | 1758537 | 5905821 | BORE_AC_CONSENT | Complete | Construction of a bore for Environmental Monitoring pruposes. |
| 33 | 1757067 | 5907557 | BORE_AC_CONSENT | Complete | Drilling of a borehole to allow for the undertaking of a groundwater pump test' |
| 34 | 1757067 | 5907561 | BORE_AC_CONSENT | Complete | Drilling of a borehole to allow for the undertaking of a groundwater pump test' |
| 35 | 1757067 | 5907557 | BORE_AC_CONSENT | Complete | Permitted Activity - To authorise 6 investigation bores for wastewater treatment plant |
| 36 | 1757870 | 5906622 | BORE_AC_CONSENT | Complete | To authorise the construction of a bore for stock and domestic purposes. |
| 37 | 1757067 | 5907561 | BORE_AC_CONSENT | Complete | Drilling of a borehole to allow for the undertaking of a groundwater pump test' |
| 38 | 1759075 | 5905811 | WAT_AC_Consent | Construction Monitoring | To take groundwater for dewatering of a wetland area and the temporary diversion of groundwater. |
| 39 | 1759075 | 5905811 | WAT_AC_Consent | Created in Error | Error - Granted in error by legacy council as not mentioned in decision document - REGIONAL WATER TAKE P48475 \| RELATES TO DISTRICT LAND USE 48468 \| REGIONAL EARTHWORKS P48468 \| REGIONAL GROUNDWATER D |
| 40 | 1757476 | 5905930 | WAT_AC_Consent | Ongoing Monitoring | To authorise the taking of groundwater for irrigation use in a vineyard. |

| ENGEO ID | Easting | Northing | Database Search Source Doc | Consent Status | Purpose / Description |
|---|---|---|---|---|---|
| 41 | 1758083 | 5906852 | WAT_AC_Consent | Processing | A new application to take and use a maximum 1400 m3/day, at a rate of up to 60 m3/hour with a 7-day rolling average of 205 m3/day, and 30,000 m3/year of groundwater from the Mangere-Manurewa Kaawa Aqu |
| 42 | 1757476 | 5905930 | WAT_AC_Consent | Completed | A change to consent condition to increase from 200/24,000 to take up to 400 cmpd and 48,000 cmpy of groundwater from a 150mm diamete r, 51.7m deep bore (ID 21466) cased to 42m within the Manukau Kaawa |
| 43 | 1759075 | 5905811 | WAT_AC_Consent | Complete | REGIONAL WATER TAKE P48475 \| RELATES TO DISTRICT LAND USE 48468 \| REGIONAL EARTHWORKS P48468 \| REGIONAL GROUNDWATER DIVERSION P48474 \| REGIONAL STREAMWORKS P48476 \| REGIONAL STORMWATER P48484 |
| 44 | 1758507 | 5906724 | WAT_AC_Consent | Complete | electroplating |
| 45 | 1757600 | 5904881 | WAT_AC_Consent | Ongoing Monitoring | To take and use up to 400 m3/day and 50,000 m3/year of groundwater from an existing bore in the Manukau Kaawa aquifer for irrigation of 18ha of market garden crops and for stock drinking water at 145 |
| 46 | 1759075 | 5905811 | WAT_AC_Consent | Complete | REGIONAL DISCHARGE \| RELATES TO DISTRICT LAND USE 48468 \| REGIONAL EARTHWORKS P48468 \| REGIONAL GROUNDWATER DIVERSION P48474 \| REGIO NAL WATER TAKE P48475 \| REGIONAL STREAMWORKS P48476 |
| 47 | 1757067 | 5907557 | WAT_AC_Consent | Complete | The Mangere RRF bore abstracts groundwater from the Mangere Manurewa Kaawa Aquifer at a 40m depth. The application is to replace ex isting consent 30962. Water will be used for a wide range of uses |
| 48 | 1758017 | 5906978 | WAT_AC_Consent | Complete | 5 ha tamarillos and cherimoyas, 1500m2 glasshouse & use in processing hsed & coolstore |
| 49 | 1757067 | 5907557 | WAT_AC_Consent | Complete | Groundwater pump test for shaft excavation and tunnelling works in excess of 7 days |
| 50 | 1758017 | 5906978 | WAT_AC_Consent | Complete | To take from a Bore up to 150 cmpd for - Pastoral |
| 51 | 1757376 | 5904913 | WAT_AC_Consent | Completed | Condition 5 is to be changed to allow the water to be used for ongoing operations and maintenance activities and for infrastructure upgrading and land development activities in the Auckland Airport Pr |
| 52 | 1757067 | 5907557 | WAT_AC_Consent | Construction Monitoring | The Mangere RRF bore abstracts groundwater from the Mangere Manurewa Kaawa Aquifer at a 40m depth. The application is to replace ex isting consent 30962. Water will be used for a wide range of uses |
| 53 | 1757600 | 5904881 | WAT_AC_Consent | Complete | An application to take groundwater for market gardening and stock watering. |
| 54 | 1759075 | 5905811 | WAT_AC_Consent | Complete | REGIONAL GROUNDWATER DIVERSION \| RELATES TO DISTRICT LAND USE 48468 \| REGIONAL EARTHWORKS P48468 \| REGIONAL WATER TAKE P48475 \| REG IONAL STREAMWORKS P48476 \| REGIONAL STORMWATER P48484 |
| 55 | 1758273 | 5906508 | WAT_AC_Consent | Complete | Live lobster export facility |
| 56 | 1757067 | 5907557 | WAT_AC_Consent | Complete | Groundwater pump test for shaft excavation and tunnelling works in excess of 7 days |
| 57 | 1757067 | 5907557 | WAT_AC_Consent | Construction Monitoring | The Mangere RRF bore abstracts groundwater from the Mangere Manurewa Kaawa Aquifer at a 40m depth. The application is to replace existing consent 30962. Water will be used for a wide range of uses |

# Attachment 2

Groundwater Monitoring

Figure 7-3: Extended Groundwater Monitoring



# Attachment 3

Rainfall Records

Figure 7-4 Annual Rainfall – Onehunga Port Rain gauge

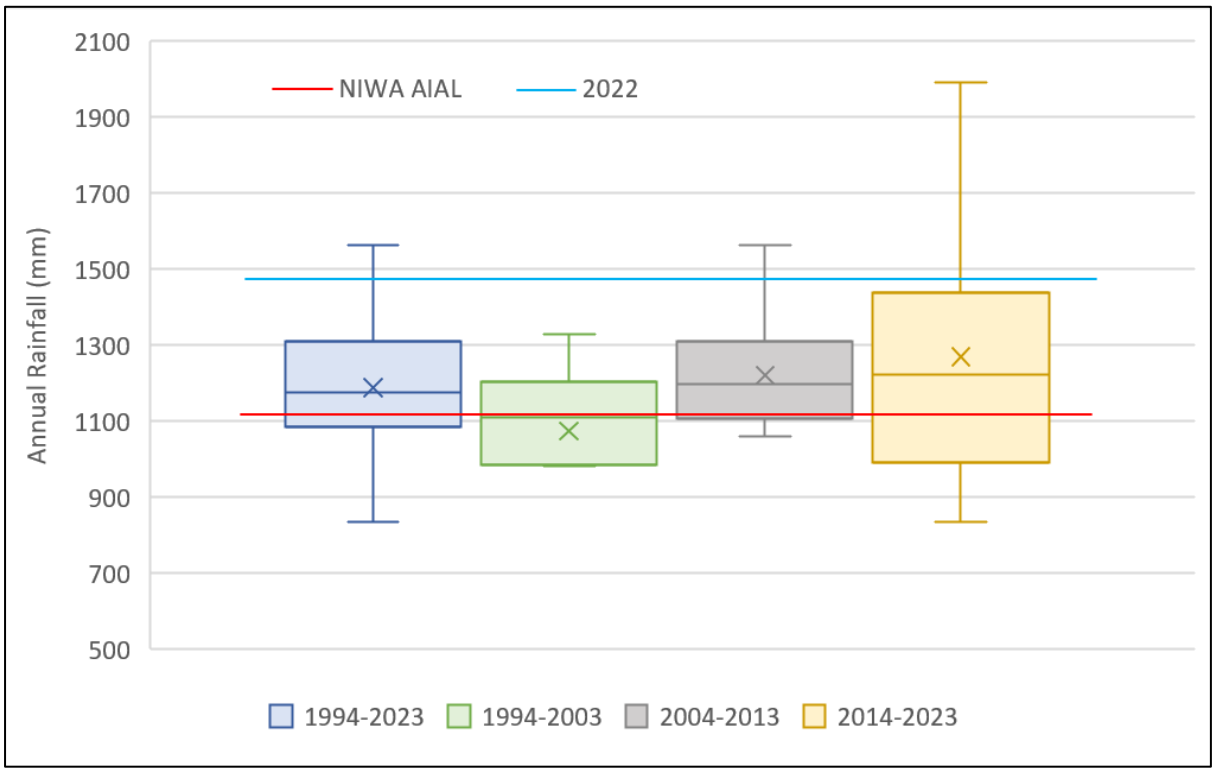



Figure 7-5 Historic Monthly Rainfall (1994-2023)– Onehunga Port Rain gauge

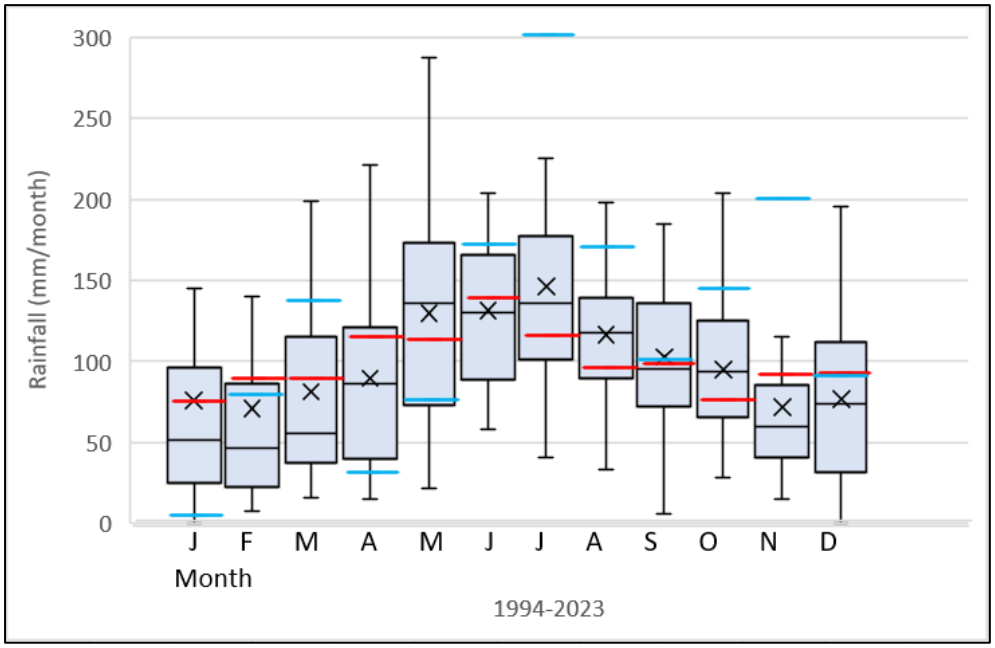


Figure 7-6 Historic Monthly Rainfall (1994-2003)– Onehunga Port Rain gauge

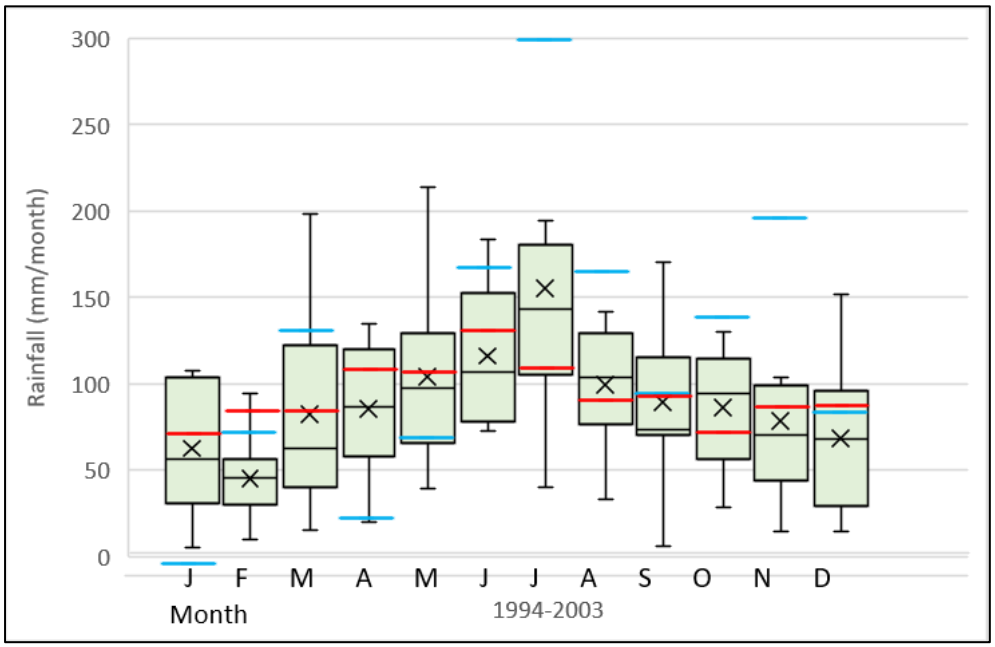



Figure 7-7 Historic Monthly Rainfall (2004-2013)– Onehunga Port Rain gauge

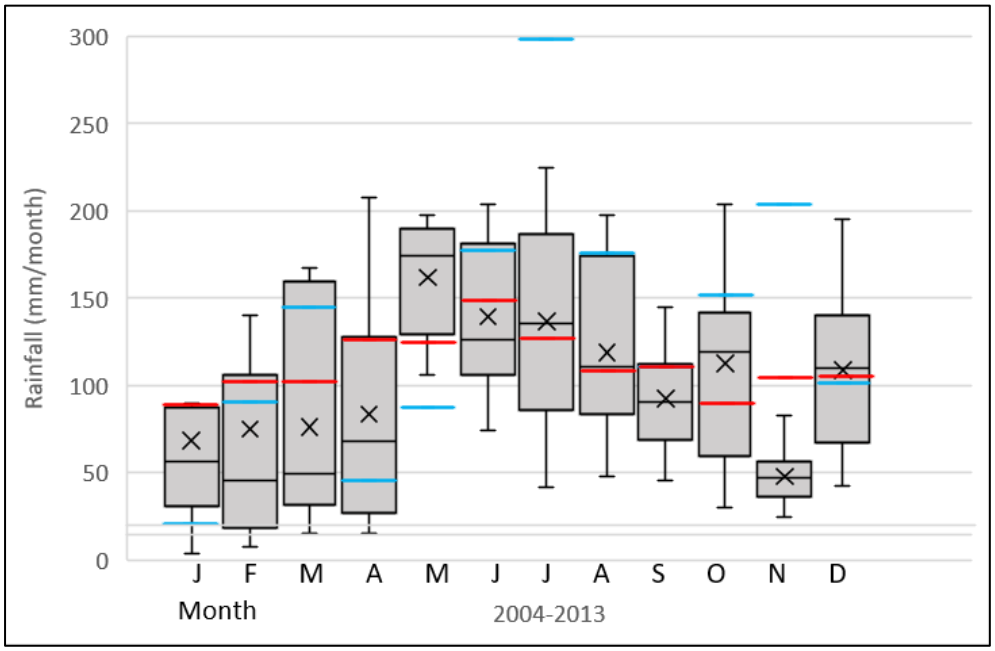


Figure 7-8 Historic Monthly Rainfall (2014-2023)– Onehunga Port Rain gauge