Levin Landfill July 2022 Quarterly Groundwater, Surface Water and Leachate Monitoring Report

PREPARED FOR Horowhenua District Council | August 2022

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Revision Schedule

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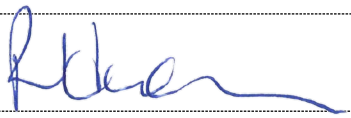
APPROVED FOR ISSUE BY R. Hulme		26 / 10 / 2022

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Abbreviations

Enter Abbreviation	Enter Full Name
ANZECC LDW	ANZECC 2000 Livestock Drinking Water
BDL	Below the detection limit
cfu	Colony-forming unit
COD	Chemical Oxygen Demand
DWSNZ GVs	Drinking Water Standards for New Zealand - Guideline Values for aesthetic determinants
DWSNZ MAVs	Drinking Water Standards for New Zealand – Maximum Acceptable Values
EC	Electrical Conductivity
HDC	Horowhenua District Council
Hg	Soluble mercury
HRC	Horizons Regional Council
NH_3-N	Ammoniacal-nitrogen
NO_3-N	Nitrate nitrogen
scBOD$_5$	Soluble carbonaceous Biochemical Oxygen Demand (5-day)

Executive Summary

Horowhenua District Council (HDC) is required to carry out quarterly compliance monitoring of groundwater and monthly sampling at selected surface water monitoring locations at the Levin Landfill, as part of the conditions of Resource Consents DP6009, DP6010, DP6011 and DP102259. This report summarises the findings for the monitoring events from the first quarter (i.e., May 2022 to July 2022) sampling round and includes results for:

- Background (natural) groundwater (Bores G1S and G1D)
- Landfill leachate (manhole next to leachate pond)
- Groundwater bores, down-gradient of the new landfill (Bores D1, D2, D3rs, D4, D5, D6 and E1S)
- Groundwater bores within theold irrigation area (Bores F1, F2 and F3)
- Shallow aquifers, down-gradient of the old landfill (Bores B1, B2, B3s, C1, C2, C2DS, E2S, G2s, Xs1 and Xs2)
- The deep aquifer (Bores C2DD, D3rd, E1D, E2D and Xd1)
- The Tatana Drain (TD1), and
- The Hokio Stream (HS1A, HS1, HS2 and HS3).

Stantec has reviewed the results of this first quarter monitoring round on behalf of HDC.

Monitoring results for other aspects of the landfill operations such as for air quality/odour and stormwater quality are reported annually, as per resource consent requirements.

Samples were collected from 26[1] groundwater bores from around Levin Landfill during July 2022, and landfill leachate was sampled at a manhole next to the leachate pond. Additionally, five surface water sites were each sampled during May 2022, June 2022, and July 2022. All samples were analysed for the parameters set out in Discharge Permit 6010, and as listed in the results tables presented in this report.

The July 2022 samples were collected progressively over a 9-day period, which is outside of the normally accepted 7-day sampling period. Meeting the monitoring timeframe is important because it provides greater confidence in comparing results from different parts of the site.

The resource consent for the landfill (namely, discharge permit 6010) establishes compliance limits for the quality of deeper and shallow groundwater which are based upon the Drinking Water Standards for New Zealand – Maximum Acceptable Values (DWSNZ MAVs), Guideline Values for aesthetic determinants (DWSNZ GVs), and the ANZECC 2000 Livestock Drinking Water (ANZECC LDW) trigger values, respectively. Compliance limits for surface water are based on the ANZECC 2000 Aquatic Ecosystems (ANZECC AE)[2] default guideline values (DGV) for 95th percentile species protection, as required by the revised Resource Consent condition approved in December 2019.

The May 2022 to July 2022 monitoring results have been assessed against these limits, where they are applicable.

Twenty-six non-compliances with resource consent conditions were recorded at eight individual monitoring locations, as follows:

- For *E. coli* in bores Xd1 (with 8 cfu/100ml) and D3rd (with 100 cfu/100ml) which exceed the DWSNZ MAV of nil. The D3rd *E. coli* result may be a result of misreporting and should have been shown as being < 100 cfu/100ml, which is below the detection limit applied. However, without further information the result needs to be reported as an exceedance.
- For dissolved manganese in bores C2DD, Xd1, and D3rd (with 0.628 mg/L, 0.472 mg/L and 0.514 mg/L, respectively), which exceeded the DWSNZ MAV of 0.4 mg/L.
- For nitrate-nitrogen (NO_3-N) at Tatana Drain (TD1) in June 2022 (1.510 mg/L) and July 2022 (1.590 mg/L), which exceed the ANZECC AE (95%ile species protection) DGV of 0.16 mg/L.
- The concentration of dissolved aluminium in June 2022 (0.071 mg/L) at TD1 exceeded the ANZECC AE (95%ile) DGV of 0.055 mg/L. This was the highest value recorded to date but reduced to below the ANZECC AE (95%ile) DGV in July 2022.
- For $scBOD_5$ during the July 2022 sampling round at HS1 and HS2 (both 4 mg/L), which exceeded the ANZECC AE (95%ile) DGV of 2 mg/L.

[1] From the consents requires monitoring at 27 groundwater bores on a quarterly basis but bore D5 was not sampled during this monitoring round because a tree had fallen across the track, blocking access to the bore.
[2] Now superseded by the Australian and New Zealand Water Quality Guidelines 2018 (ANZG 2018), however the ANZECC 2000 guideline values are applied in accordance with the resource consent.

- For NO_3-N during the May 2022, June 2022 and July 2022 rounds at all Hokio Stream sampling locations, which exceeded the ANZECC AE (95%ile) DGV of 0.16mg/L.
- For dissolved copper during the July 2022 sampling round at all Hokio Stream sampling locations, which exceeded the ANZECC AE (95%ile) DGV of 0.0014 mg/L at all sampling locations.

The May 2022 to July 2022 results were also considered in the context of background water quality, both within the groundwater aquifers (shallow and deep bores) and the surface water receiving environment. For example, low pH at background bore G1S, and elevated iron concentrations in the same bore indicate that groundwater could be being impacted by up-gradient activities unrelated to the landfill operations. This trend is examined in greater detail in the Annual Report.

There were three occasions where the leachate effluent quality (at the leachate pond manhole sampling location) was outside of the ranges for typical leachate composition, as recorded generally at Class 1 landfills in New Zealand. This occurred for COD and ammoniacal-nitrogen (NH_4-N) which exceeded the typical range for Class 1 landfills, and for dissolved mercury which was not detected and so was under the typical range. Note that leachate effluent is not subject to any consent limits.

Bore D5 was not sampled during July 2022 because of lack of access due to a fallen tree, and bores D3rs and D3rd were tested for the indicator suite of parameters, instead of for the comprehensive suite (as shown in Table 2-1). These errors are non-compliances with respect to the resource consent conditions.

The level of detection used in the laboratory for testing *E. coli* was mostly set at < 100 cfu/100ml. This is impractical for water samples from the deep aquifer which need to be compared against the DWSNZ trigger level of 0 cfu/100ml for *E. coli.* Future testing for *E. coli* needs to revert to the more accurate level of detection used previously, which is < 4 cfu/100ml.

Methane was detected in fourteen groundwater monitoring bores in the July 2022 sampling round. This is an increase compared to the last monitoring round, and the methane concentrations were slightly higher. The highest concentration of methane, which was in bores E2d and B2 (0.32%), was well below the lower explosive limit for methane (which is 5%).

Additionally, a very high level of carbon dioxide (3.6%) was measured at bore B2. Previously, bore B2 showed a CO_2 level of 5.2%, so there appears to be a trend occurring, which should be investigated further

The possibility of encountering methane (and possible hydrogen sulphide) in groundwater bores endorses the need for appropriate health and safety measures to be adopted during monitoring, as is the case for the landfill gas extraction wells. No smoking should be permitted when personnel undertake groundwater sampling and when in the vicinity of the groundwater monitoring wells, or in fact anywhere else on the Levin Landfill site. For sake of safety a personal gas detector should be worn by all staff when working at the landfill site.

1 Introduction

Horowhenua District Council (HDC) first commissioned Stantec New Zealand (then Montgomery Watson) to carry out environmental reporting for the discharge consent monitoring undertaken at the Levin Landfill site in the early 2000s. Monitoring has been undertaken by contractors every three months at 32 locations, as required by the resource consent conditions (namely for discharge permit 6010). These sampling locations consist of 27 boreholes penetrating the sand and gravel aquifers; four surface water sampling locations within Hokio Stream; one surface sampling location along the Tatana Drain, and one leachate sampling point, as shown in the Site Plan in Appendix A.

The Levin Landfill site is comprised of two landfills: one old, closed, and unlined landfill and one new, lined landfill that has been closed pending a decision by HDC to continue operating it. The new landfill footprint has been developed in stages. The most recent stage was Stage 3C which was developed in 2017, though landfill operations have, until the end of October 2021, occurred over the top of Stages 1A, 2 and 3C. The current landfill within this new footprint has reached capacity and has been capped with a permanent clay capping (0.7m thick) on all sides except for under the access road and on the front face of the landfill where there is a temporary capping (0.3m thick). Council has deferred a decision on the future of the landfill and has committed to make that decision before the end of 2025.

The Levin Landfill site is located above two identified aquifers, a shallow sand aquifer and a deeper gravel aquifer. The shallow aquifer is unconfined, has a low to moderate permeability, and flows in a northerly direction. The deeper gravel aquifer is a confined to semi-confined aquifer. Horizons Regional Council hydrology staff advises that '*the general confined groundwater flow direction is towards the west*". Groundwater quality in the area is highly variable because of interaction with peat deposits that are prevalent in the area, localised effects such as from grazing activities, droppings from scavenging birds and from nitrogen-fixing plants such as gorse.

Since July 2010 groundwater has been tested for dissolved metals and nutrients, rather than for total concentrations of these parameters.

A review of the resource consent conditions was finalised in December 2019. Changes have been made to some of the surface water and groundwater monitoring conditions and HDC has acted on all the changes. Sampling since the January 2021 sampling round has been in line with previous monitoring, but different reference parameters have been applied to assess the surface water sampling results, as required by the new consent conditions.

This report presents the results for the July 2022 quarterly monitoring round.

Please note, the laboratory detection limit for *E. coli* is 1 cfu/100ml; however, in the results received, results were often noted as being below a detection limit of <100 cfu/100ml. This is assumed to be a change in procedure at the laboratory that needs to be corrected. Results of < 100 cfu/100ml have been noted in the report as being "ND" (not detected).

Laboratory detection limits are provided for all test results which are attached in Appendix C.

2 Groundwater and Surface Water Monitoring

2.1 Sample Analyses

Surface water samples were collected by Downer (a contractor to HDC) on 24 May, 28 June, 27 July, with the samples being received by the Eurofins ELS Ltd laboratory in Lower Hutt, Wellington within 24 hours of sampling.

Groundwater samples were collected by Downer (a contractor to HDC) on 19, 20, 21, 25 and 28 July, with the samples being received by the Eurofins ELS Ltd laboratory in Lower Hutt, Wellington within 24 hours of sampling.

The monitoring schedule for July 2021 - April 2024 is summarised in Appendix B. From July 2019, *E.coli* counts analyses have been included within the indicator and comprehensive analytical suites, as agreed by HDC with the Horizons Regional Council (HRC). This means that *E.coli* counts will be assessed more frequently throughout each year, as compared to the past monitoring regime.

Groundwater samples taken each of the boreholes (except for D5) and a sample of the leachate effluent were analysed for the indicator list of parameters which is outlined in Table 2-1. Surface water samples from Hokio Stream were analysed for the comprehensive list of parameters (see Table 2-1).

Note that, following the revision of the resource consent conditions which were approved in December 2019, 5-day soluble carbonaceous Biochemical Oxygen Demand ($scBOD_5$) and soluble mercury (Hg) have each been added to the indicator and comprehensive suites of parameters, and *E. coli* added to the comprehensive suite of parameters. The $scBOD_5$ and *E. coli* parameters replace BOD_5 and faecal coliforms, respectively. Monitoring of these additional began with the April 2020 sampling round.

Table 2-1: Test Parameters

Type	Indicator Parameters	Comprehensive Parameters
Physico-chemical characteristics	pH, Electrical Conductivity (EC)	pH, Electrical Conductivity (EC), Alkalinity, Total Hardness, Suspended Solids
Oxygen demand	Chemical Oxygen Demand (COD), $scBOD_5$++	Chemical Oxygen Demand (COD), $scBOD_5$++
Nutrients*	Nitrate nitrogen (NO_3-N), Ammoniacal-nitrogen (NH_4-N)	Nitrate nitrogen (NO_3-N), Ammoniacal-nitrogen (NH_4-N), Dissolved Reactive Phosphorus (DRP), Sulphate (SO_4)
Metals*	Aluminium (Al), Manganese (Mn), Nickel (Ni), Lead (Pb), Mercury (Hg)++	Aluminium (Al), Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Iron (Fe)**, Magnesium (Mg), Manganese (Mn), Nickel (Ni), Lead (Pb), Zinc (Zn), Mercury (Hg)++
Other elements	Boron (B), Chloride (Cl)	Boron (B), Calcium (Ca), Chloride (Cl), Potassium (K), Sodium (Na)**
Biological+	*E. coli*	*E. coli*
Organics		Total organic carbon, total phenols, volatile acids

Note:

*Analyses performed for nutrients and metals are for dissolved rather than total concentrations.

++Soluble carbonaceous BOD_5 ($scBOD_5$) and Soluble Mercury added as per revised consent conditions for Discharge Permit 6010, December 2019

Those chemical constituents for which concentrations were below laboratory detection limits during the reporting period have had results set at 50% of the laboratory detection limit, which is then used to calculate a median value for annual reporting purposes. This is standard practice when dealing with chemical concentrations in water, where the constituent is not detected. However, the same rule cannot be applied for *E. coli* in the context of the Levin Landfill.

2.2 Background Groundwater Quality

The background (natural) quality of the groundwater water up-gradient from the landfill site is not subject to any consent conditions. However, for comparison purposes, both the ANZECC LDW trigger values and the DWSNZ guidelines are regularly used to benchmark the quality of water up-gradient from the landfill site.

Groundwater samples were collected from the two background bores situated hydraulically up-gradient from both the new and old landfills to the southeast of the site in July 2022 (bores G1S and G1D, see Site Plan, Appendix A). These two bores were constructed in late 2009 to sample background water quality from the two main hydrogeological units.

The results are presented in Table 2-2.

Bore F3 is also included in the background table as it is near the southern boundary of the landfill site (and further west) and is unlikely to be impacted by landfill activities. A full laboratory report containing analytical results is presented in Appendix C and the historical graphs are presented in Appendix D.

Table 2-2: Background Monitoring Results for July 2022

Determinant	Units	DWSNZ MAV	ANZECC LDW	G1S	G1D	F3
Sampling date				19/07/2022	19/07/2022	19/07/2022
Water level	mbgl	-	-	13.79	14.26	4.81
pH	pH units	7 to 8.5*	6 to 9	**6.8**	7.0	7.1
Conductivity	mS/m	-	-	41.4	27.5	21.7
COD	mg/L	-	-	90	*7.5*	*7.5*
$scBOD_5$	mg/L	-	-	*3*	*3*	*1.5*
E. Coli	CFU/100ml	NIL	100	ND	ND	ND
Chloride	mg/L	250*	-	63.4	31.1	23.2
Nitrate-N	mg/L	11.3	90.3	0.02	*0.005*	0.37
Ammoniacal-N	mg/L	1.17	-	0.05	0.10	*0.005*
Sodium	mg/L	200*	-	60.8	n/r	27.0
Dissolved Aluminium	mg/L	0.1*	5	**0.122**	*0.001*	0.002
Dissolved Boron	mg/L	1.4	5	*0.015*	0.04	*0.015*
Dissolved Iron	mg/L	0.2*	-	**2.96**	n/r	*0.005*
Dissolved Lead	mg/L	0.01	0.1	0.0007	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	0.4	-	0.0565	0.0606	0.0016
Dissolved Mercury	mg/L	0.007	0.002	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.08	1	0.0016	*0.00025*	*0.00025*

Notes:

*denotes guideline values for aesthetic determinants (G.V.)

All `<' values have been reported as half the detection limit for statistical purposes and are *expressed in italics*

'ND' indicates where *E. coli* were not detected at or above the laboratory detection limit (<100cfu/100ml)

n/r – not required to be tested during this monitoring period

n/p – result not provided at the time of preparing this report

Values which exceeded the DWSNZ MAV are shown in **bold**

The results in Table 2-2 show that all parameters at bores G1D and F3 were within the ANZECC LDW trigger values and DWSNZ limits during the July 2022 monitoring round.

At G1S, the dissolved aluminium (0.122 mg/L) concentration exceeded the DWSNZ limit of 0.1 mg/L, and the dissolved iron (2.96 mg/L) concentration exceeded the DWSNZ limit of 0.2 mg/L. Additionally, the pH at G1S (6.8) was slightly less than the lower DWSNZ limit of 7.0.

As discussed in Section 1 of this report, a detection limit of < 100 cfu/100ml was reported by the laboratory for this sampling round (it has been much lower at < 4 cfu/100ml previously), and no *E.coli* was detected in any of the bores above this limit. This detection limit is not practical when comparing against the DWSNZ (which require the lowest possible detection limit, as the standards are for zero contamination, or 0 CFU/100mL) and as such the laboratory procedure needs to be changed for next sampling round.

2.3 Groundwater Quality Hydraulically Down-Gradient of the New Landfill

Monitoring is carried out within the two main hydrogeological units for bores hydraulically up-gradient of the old landfill and hydraulically down-gradient of the new landfill.

2.3.1 Shallow Aquifer

Bores D1, D2, D3(rs), D4, D5, D6, and E1S (Refer to Site Plan, Appendix A) are located hydraulically up-gradient of the old landfill, but down-gradient of the new landfill. This means they are not influenced by potential leaching from the old landfill and can act as a warning system for any leaching from the new landfill.

Borehole D4 is likely to show evidence of any leaching from the new landfill if such leaching was to occur.

Borehole D5 is located at the south-western corner of the site and is expected to provide an indication of shallow background groundwater quality because it is unlikely to be influenced by either landfill. Bore D5 was not sampled this sampling round because a tree had fallen across the track during a winter storm, blocking access to the bore.

It is considered unlikely that leachate from the new landfill would significantly affect groundwater quality due to the leachate collection system which is in place at the new landfill; however, these bores would still provide early warning of any potential problems. It is noted that bore D3r was replaced in June 2021 with two bores; D3rs, which is a shallow bore and D3rd, which is a deep bore. Both were sampled from October 2021 onwards. This is discussed in section 2.3.2. It is noted also that new bores D3rs and D3rd were required to be monitored for the comprehensive suite of parameters for the first two years following installation, but they were only sampled for the indicator suite of parameters in the July 2022 sampling round (therefore, this constitutes a non-compliance).

The results from the July 2022 monitoring round for these bores are presented in Table 2-3 and the results have been compared with the ANZECC LDW trigger values as per the consent conditions.

The full laboratory report is included in Appendix C and the historical graphs are presented in Appendix D.

All sampling results for *E.coli* were reported as being below the level of detection of 100 cfu/100ml (please refer to discussion of this error in Section 1 above). So, the results have been reported as “<100” and, as such, the results are below the ANZECC LDW value of 100 cfu/100ml.

There were **no exceedances of the resource consent conditions during the July 2022** monitoring round in samples from the shallow aquifer.

Table 2-3: D-Series and E1S Monitoring Bore Results for July 2022

Determinant	Units	ANZECC LDW	D1	D2	D3rs	D4	D5	D6	E1S
Sampling date			20/07/2022	20/07/2022	21/07/2022	25/07/2022	Not sampled	21/07/2022	21/07/2022
Water level	mbgl	-	16.64	21.23	5.39	7.67	9.25	16.24	11.21
pH	pH units	6 to 9	7.1	6.60	6.5	6.9	n/p	7.1	7.2
Conductivity	mS/m	-	24.8	46.5	19.7	29.7	n/p	39.4	26.7
COD	mg/L	-	22	55	77	28	n/p	7.5	7.5
scBOD5	mg/L	-	*2*	*3*	*3*	*3*	n/p	*3*	*3*
E. Coli	CFU/100ml	100	*<100*	*<100*	*<100*	*<100*	n/p	*<100*	*<100*
Chloride	mg/L	-	11.8	45.2	15.3	35.4	n/p	18.4	27.1
Nitrate-N	mg/L	90.3	4.38	0.07	*0.005*	*0.005*	n/p	13.9	*0.005*
Ammoniacal-N	mg/L	-	*0.005*	0.62	0.63	0.25	n/p	*0.005*	0.20
Sodium	mg/L	-	n/r	41.4	20.0	33.4	n/p	n/r	28.5
Dissolved Aluminium	mg/L	5	*0.001*	0.007	0.077	*0.001*	n/p	0.002	0.007
Dissolved Boron	mg/L	5	0.03	0.05	0.03	*0.015*	n/p	0.05	0.03
Dissolved Iron	mg/L	-	n/r	5.98	16.2	0.32	n/p	n/r	5.79
Dissolved Lead	mg/L	0.1	*0.00025*	*0.00025*	*0.00025*	*0.00025*	n/p	*0.00025*	0.0012
Dissolved Manganese	mg/L	-	*0.00025*	0.506	0.388	0.200	n/p	0.0006	0.269
Dissolved Mercury	mg/L	0.002	*0.00025*	*0.00025*	*0.00025*	*0.00025*	n/p	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	1	*0.00025*	*0.00025*	0.0007	*0.00025*	n/p	*0.00025*	*0.00025*

Notes:

All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics

n/r – not required to be tested during this monitoring period

n/p – result not provided at the time of preparing this report

2.3.2 Deep Gravel Aquifer

Bores E1D, C2DD, E2D, Xd1, and the new replacement bore D3rd all penetrate the deeper gravel aquifer. Deep groundwater flow is assumed to be towards the northwest.

Boreholes E2D and C2DD are located to the north-northwest of both the landfills and are therefore considered to be hydraulically down-gradient of both landfills.

Borehole E1D is located to the southwest of the old landfill and it is therefore considered that this bore would be unlikely to be affected by either landfill.

Bore Xd1 was installed in late 2020 as a requirement of the reviewed resource consent conditions (December 2019). It is located on the western boundary of the site and slightly downstream of the old landfill.

Results for the July 2022 compliance monitoring round are presented in Table 2-4. The results have been compared with the DWSNZ as per the requirements of discharge consent 6010. The full laboratory report is included in Appendix C and the historical graphs are presented in Appendix D.

Table 2-4: Results for Monitoring Bores within the Deep Aquifer for July 2022

Determinant	Units	DWSNZ MAV	E1D	C2DD	E2D	Xd1	D3rd
Sampling date			20/07/2022	20/07/2022	21/07/2022	28/07/2022	21/07/2022
Water level	mbgl	-	11.07	2.45	4.39	2.33	5.75
pH	pH units	7 to 8.5*	7.5	7.7	7.6	7.5	7.7
Conductivity	mS/m	-	45.1	57.2	44.4	53.6	52.3
COD	mg/L	-	19	33	*7.5*	*7.5*	30
$scBOD_5$	mg/L	-	*1.5*	*1.5*	*3*	*3*	*1.5*
E. coli	CFU/100ml	NIL	ND	ND	ND	**8**	**100**
Chloride	mg/L	250*	39.1	41.8	41.6	57.9	31.6
Nitrate-N	mg/L	11.3	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Ammoniacal-N	mg/L	1.17	0.20	0.35	0.25	0.41	0.41
Sodium	mg/L	200*	39.6	n/r	n/r	n/r	n/r
Dissolved Aluminium	mg/L	0.1*	*0.001*	0.006	0.002	*0.001*	*0.001*
Dissolved Boron	mg/L	1.4	0.05	0.06	0.06	0.05	0.05
Dissolved Iron	mg/L	0.2*	0.02	n/r	n/r	n/r	n/r
Dissolved Lead	mg/L	0.01	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	0.4	0.226	**0.628**	0.391	**0.472**	**0.514**
Dissolved Mercury	mg/L	0.007	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.08	*0.00025*	0.0007	*0.00025*	*0.00025*	*0.00025*

Notes:

* denotes guideline values for aesthetic determinants (G.V.)

Bold – denotes an exceedance of the relevant DWSNZ (2008) standard

All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics

'ND' indicates where *E. coli* were not detected at the laboratory detection limit (<100cfu/100ml)

n/r – not required to be tested during this monitoring period

n/p – result not provided at the time of preparing this report

There were **five exceedances of the DWSNZ limits** in samples from the deep gravel aquifer during the July 2022 monitoring round, as follows:

- For *E. coli*, bore Xd1 (8 cfu/100ml) exceeded the DWSNZ MAV of nil. Bore Xd1 is new but has yielded similar values of *E. coli*. For some reason, this was one of only four samples that were tested to a level of detection of 4 cfu/100ml.
- For *E. coli*, bore D3rd was reported as having 100 cfu/100ml. Given that the level of detection that was used for this bore and almost all others was 100 cfu/100ml, it is not clear if this is an actual result or if the result should have been reported as being < 100 cfu/100ml, like so many of the other bores. Without that clarity, one must accept that it

is an exceedance, and, if so, it represents a significant increase compared to previous results, which would be of concern.

- The dissolved manganese concentrations in bores C2DD, Xd1, and D3rd exceeded the DWSNZ MAV of 0.4 mg/L. The results for C2DD and Xd1 are within the historical range of concentrations observed. Bore D3rd is relatively new but there is an emerging trend which indicates that manganese is generally elevated in this new bore, as it is for the other deep aquifer bores.

2.4 Impact of Old Landfill on Groundwater Quality

Water sampling is carried out to characterise the groundwater quality in a series of shallow bores situated hydraulically down-gradient from the old unlined landfill.

The Series B boreholes are located within 50m of the old landfill in a line along its northern edge.

The Series C boreholes are located further down the hydraulic gradient from the old landfill towards Hokio Beach Road to detect whether leachate is moving off site.

Borehole E2S is located northwest of the old landfill to detect any leachate moving directly towards the nearest house down-stream of the site.

Bore G2S was installed in late 2009 and is located to the north of the landfill site, hydraulically down-gradient of the old landfill by Hokio Road and the entrance road to the landfill.

Bores Xs1 and Xs2 are located along Hokio Beach Road, within the road reserve. Bore Xs1 is adjacent to Tatana's property and bore Xs2 is next to the driveway leading to a Council-owned property. Bore Xs2 is hydraulically upgradient of the old landfill (See Site Plan, Appendix A).

The results from the July 2022 consent monitoring round for these bores are presented in Table 2-5 and have been compared with the ANZECC LDW trigger values as per the requirements of discharge consent 6010. The full laboratory report is included in Appendix C and the historical graphs are presented in Appendix D.

There were **no exceedances of the ANZECC LDW trigger values** during the July 2022 monitoring round.

For *E.Coli* bore C2 was reported as having 100 cfu/100ml. Given that the level of detection that was used for this bore and almost all others was 100 cfu/100ml, it is not clear if this is an actual result or if the result should have been reported as being < 100 cfu/100ml, like so many of the other bores.

If the result is 100 cfu/100ml then it is equal to the ANZECC LDW of 100 cfu/100ml for *E. coli* but does not exceed it.

Table 2-5: Monitoring Results for Shallow Boreholes Down-Gradient from the Old Landfill for July 2022

Determinant	Units	ANZECC LDW	E2S	B1	B2	B3s	C1	C2	C2DS	G2S	Xs1	Xs2
Sampling date			21/07/22	25/07/22	25/07/22	28/07/22	25/07/22	25/07/22	25/07/22	19/07/22	22/07/22	22/07/22
Water level	mbgl	-	5.3	0.7	0.92	0.0	0.0	0.0	2.13	1.86	0.4	1.8
pH	pH units	6 to 9	7.7	6.8	6.7	7.1	6.6	6.9	6.7	7.3	6.6	7.0
Conductivity	mS/m	-	33.3	187	141	214	20.7	234	147	127	76.9	16.6
COD	mg/L	-	35	87	99	129	73	116	72	38	77	*7.5*
scBOD5	mg/L	-	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*1.5*	*3*	*3*
E-Coli	CFU/100ml	100	*<100*	*<100*	*<100*	*2*	*<100*	100	*<100*	*<100*	*<100*	*<100*
Chloride	mg/L	-	39.0	297	97.0	109	25.4	130	89.6	249	39.7	11.3
Nitrate-N	mg/L	90.3	*0.005*	29.2	62.8	*0.05*	0.02	*0.05*	*0.05*	*0.005*	0.01	1.05
Ammoniacal-N	mg/L	-	0.31	4.27	16.9	145	0.33	165	1.51	*0.005*	9.84	*0.005*
Sodium	mg/L	-	30.2	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
Dissolved Aluminium	mg/L	5	0.002	0.017	0.013	0.004	0.076	0.021	*0.001*	0.011	0.009	0.007
Dissolved Boron	mg/L	5	0.03	1.15	0.98	0.9	0.07	1.37	0.85	0.69	0.09	*0.015*
Dissolved Iron	mg/L	-	0.08	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
Dissolved Lead	mg/L	0.1	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	0.0006	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	-	0.227	5.09	1.88	2.41	0.0623	0.0934	2.06	0.0527	1.43	0.0133
Dissolved Mercury	mg/L	0.002	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	1	*0.00025*	0.0023	0.0012	0.0075	0.0007	0.0039	0.0020	0.0026	0.0006	*0.00025*

Notes:

All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics

n/r – not required to be tested during this monitoring period

n/p – result not provided at the time of preparing this report

Bold - denotes exceedance of ANZECC LDW

2.5 Groundwater Quality Down-Gradient of the Irrigation Area

The F-series boreholes intersect the shallow aquifer down-gradient of the area that was used to irrigate leachate from 2004 to October 2008. All leachate is now pumped to the Levin Wastewater Treatment Plant. The F1 borehole is located within the area where leachate from the new landfill was irrigated. The F2 and F3 boreholes are in an area that was set aside for leachate irrigation but was never used for that purpose. It is expected that bores F2 and F3 would therefore be representative of background groundwater quality.

The results from the F series boreholes are presented in Table 2-6 and have been compared with the ANZECC LDW trigger values, as per discharge consent 6010. The full laboratory report is included in Appendix C and the historical graphs are presented in Appendix D.

There were **no exceedances of the resource consent conditions** in samples from these bores during the July 2022 monitoring round.

Table 2-6: Results from Monitoring Bores in the Irrigation Area for July 2022

Determinant	Units	ANZECC LDW	F1	F2	F3
Sampling date			19/07/2022	19/07/2022	19/07/2022
Water level	mbgl	-	7.46	2.44	4.81
pH	pH units	6 to 9	7.0	7.1	7.1
Conductivity	mS/m	-	41.6	22.2	21.7
COD	mg/L	-	33	19	*7.5*
scBOD5	mg/L	-	*1.5*	*1.5*	*1.5*
E-Coli	CFU/100ml	100	*<100*	*<100*	*<100*
Chloride	mg/L	-	41.0	22.8	23.2
Nitrate-N	mg/L	90.3	0.56	0.40	0.37
Ammoniacal-N	mg/L	-	0.01	*0.005*	*0.005*
Sodium	mg/L	-	n/r	n/r	27.0
Dissolved Aluminium	mg/L	5	0.002	0.002	0.002
Dissolved Boron	mg/L	5	0.04	0.04	*0.015*
Dissolved Iron	mg/L	-	n/r	n/r	*0.005*
Dissolved Lead	mg/L	0.1	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	-	0.0047	0.0016	0.0016
Dissolved Mercury	mg/L	0.002	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	1	*0.00025*	*0.00025*	*0.00025*

Notes:

All `<' values have been reported as half the detection limit for statistical purposes and are *expressed in italics*

n/r – not required to be tested during this monitoring period

n/p – result not provided at the time of preparing this report

2.6 Leachate Effluent Results

Leachate effluent from the landfill is not subject to any water quality consent conditions and is sent to the Levin Wastewater Treatment Plant for treatment. However, for comparison purposes, typical leachate characteristics for landfills, as published by the Waste Management Institute New Zealand (*Technical Guidelines for Disposal to Land*, August 2018, WasteMINZ), have been compared against the leachate quality monitoring results (Table 2-9). The full laboratory report is included in Appendix C and the historical graphs are presented in Appendix D.

Table 2-7 shows that the concentrations of monitored parameters for leachate effluent samples collected in July 2022 were mostly within the typical ranges to be expected for this type of landfill.

Up until April 2022, samples of leachate were tested monthly for the comprehensive suite of parameters, as stated in Table C under condition 3H of discharge permit 6010. This requirement was for 2 years and condition 3P of discharge permit 6010 allows the monitoring frequency to shift to a conditional sampling frequency (i.e., six monthly comprehensive, quarterly indicator) if there is good consistency of water sample analysis results and no decline in water quality over a period of four consecutive sampling rounds. The quality of leachate is considered to have met these criteria and so the change in monitoring from April 2022 was justified. The resource consent conditions allowed this change to occur immediately after the four consecutive sampling rounds were completed.

There were **three exceedances of the typical leachate characteristics**. Typical leachate characteristics were exceeded for COD and for ammoniacal-N in the July 2022 monitoring results. The result for dissolved mercury was noticeably less than the minimum typical value in July 2022.

The results reported here are consistent with those previously reported for leachate monitoring.

Table 2-7: Results from Leachate Effluent Monitoring for July 2022

Determinant	Units	Typical Leachate Characteristics* (range)	July 2022 result
Sampling date			27/07/2022
pH	pH units	5.9 - 8.5	7.6
Conductivity	mS/m	308 – 27,900	1,770
COD	mg/L	84 – 5,090	**5,180**
$scBOD_5$	mg/L	-	130
E-Coli	CFU/100mL	-	*<100*
Chloride	mg/L	45 – 2,584	1,310
Nitrate-N	mg/L	-	*0.5*
Ammonia-N	mg/L	3.4 – 1,440	**1,830**
Dissolved Aluminium	mg/L	-	0.977
Dissolved Boron	mg/L	0.54 – 20.1	7.25
Dissolved Lead	mg/L	0.001 - 0.42	*0.0025*
Dissolved Manganese	mg/L	0.3 - 45***	1.38
Dissolved Mercury	mg/L	0.2 – 50	***0.00025***
Dissolved Nickel	mg/L	0.02 – 2.05**	0.137

Notes:

* for Class 1-type landfills, Table 5-5, p82, Technical Guidelines for Disposal to Land, WasteMINZ August 2018 (same as Table 4.2 of the CAE Landfill Guidelines 2000, but corrections made to Table 5-5 in line with Table 4.2)

**Data taken from Table 5-4, p81 of the same guideline, for parameters for which no differences in concentrations between the phases of landfill development could be observed

***Data taken from Table 5-4, p81 of the same guideline, for parameters during the methanogenic phase

Bold – denotes a deviation from the typical leachate characteristics range

All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics

2.7 Tatana Property Drain

A drain is located on the Tatana property (see Site Plan in Appendix A). Since July 2015 HDC has agreed to sample surface water from this drain for a selection of parameters that were set by HRC. Four sampling points were selected to represent the top of the drain (SW1), middle of the drain (SW2 and SW3) and lower drain (SW4) respectively.

The revised consent conditions have since reduced the extent of sampling to a single location. This is known as 'TD1' and is the same sampling location as for the previously denoted 'SW3'.

Results from the May, June and July 2022 sampling rounds are presented in Table 2-8 and have been compared with the ANZECC AE[3] 95%ile DGVs, as per the revised resource consent conditions.

Table 2-8 Tatana Drain Monitoring Results for May, June and July 2022

Determinant	Units	ANZECC AE (95%)	TD1 (formerly SW3)		
			May	June	July
Sampling date			24/05/2022	28/06/2022	27/07/2022
pH	pH units	-	6.6	7.1	7.4
Suspended Solids	mg/l	-	2190	43	*2*
TOC	mg/L	-	50.6	25.1	18.1
Alkalinity	mg CaCO3/L	-	98	62	109
Conductivity	mS/m	-	30.4	30.2	38.2
COD	mg/L	-	275	107	74
scBOD5	mg/L	2	BDL	BDL	BDL
E-Coli	CFU/100ml	-	n/p	ND	n/p
Chloride	mg/L	-	24.6	43.3	43.4
Nitrate-N	mg/L	0.16	*0.005*	**1.510**	**1.590**
Sulphate	mg/L	-	2.59	7.13	4.39
Ammoniacal-N	mg/L	2.1	0.76	0.18	1.85
Hardness	mg CaCO3/L	-	86	67	95
Calcium	mg/L	-	22.2	12.9	19.2
Magnesium	mg/L	-	7.46	8.50	11.4
Potassium	mg/L	-	7.34	7.2	12.4
Sodium	mg/L	-	21.8	30.4	34.6
D.R. Phosphorus	mg/L	-	0.013	0.034	0.020
Dissolved Aluminium	mg/L	0.055	0.049	**0.071**	0.033
Dissolved Arsenic	mg/L	0.024	0.001	0.001	0.0005
Dissolved Boron	mg/L	-	0.04	*0.015*	0.14
Dissolved Cadmium	mg/L	0.0002	*0.0001*	*0.0001*	*0.0001*
Dissolved Chromium	mg/L	-	*0.0005*	*0.0005*	*0.0005*
Dissolved Copper	mg/L	0.0014	0.0006	0.0007	0.0009
Dissolved Iron	mg/L	-	0.692	1.33	2.11
Dissolved Lead	mg/L	0.0034	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	1.9	0.337	0.231	0.029
Dissolved Mercury	mg/L	0.0006	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.011	0.0006	0.0007	0.0009
Dissolved Zinc	mg/L	0.008	0.003	0.003	0.005

Notes:
Bold – denotes an exceedance of the ANZECC AE 95% protection level trigger values
All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics

[3]Australian and New Zealand Guidelines for Fresh and Marine Water Quality - Aquatic Ecosystems (AE), Australian and New Zealand Environment and Conservation Council (ANZECC), Canberra, Australia, 2000

'ND' indicates where *E. coli* were not detected at the laboratory detection limit (<100cfu/100ml)
"BDL" means results are below detection limits
n/r – not required to be tested during this monitoring period
n/p – result not provided at the time of preparing this report

There have been **three exceedances of the resource consent conditions** for two monitored parameters in samples from the Tatana Drain property at the TD1 location during the June 2022 and July 2022 sampling rounds.

The concentration of nitrate-N in June 2022 (1.510 mg/L) and July 2022 (1.590 mg/L) exceeded the ANZECC AE (95%ile) DGV of 0.16 mg/L. These are the highest values recorded since April 2021 but are not exceptional compared to the results over the past two years.

The concentration of dissolved aluminium (0.071 mg/L) in June 2022 exceeded the ANZECC AE (95%ile) DGV of 0.055 mg/L. This is the highest value recorded to date.

Please note that using the method of halving results that are recorded as being below detection limits, the $scBOD_5$ concentrations at TD1 in the May 2022 and June 2022 monitoring rounds is expressed as 3 mg/L. This suggests that there are exceedances of the ANZECC AE (95%) trigger value of 2 mg/L which misrepresents the level of compliance. Therefore, these results for $scBOD_5$ concentrations have been represented in Table 2-11 as being below the detection limit (i.e., as "BDL").

2.8 Hokio Stream

Surface water grab samples are obtained monthly from Hokio Stream at sites HS1A, HS1, HS2 and HS3 (refer to Appendix A) to investigate whether groundwater containing leachate is having an adverse environmental effect on the stream. Sites HS1A and HS1 are situated up-stream of the old landfill, HS2 is situated alongside the old landfill and up-stream of the Tatana Property Drain discharge, and HS3 is located approximately 50m down-stream of the landfill site property boundary and the Tatana Property Drain discharge. Samples from these monitoring locations on Hokio Stream are analysed for a comprehensive suite of parameters every month (as shown in Appendix B).

Results from the May, June, and July 2022 sampling rounds are presented in Table 2-9 and have been compared with the ANZECC AE 95%ile DGVs, as per the revised resource consent conditions (2019).

Monitoring for $scBOD_5$ and soluble mercury concentrations has now been added as per the revised Resource Consent conditions.

The revised conditions have recently been implemented and monitoring of these additional parameters, including at the new location, commenced during the April 2020 monitoring round.

Table 2-9: Hokio Stream Monitoring Results for May, June, and July 2022

Determinant	Units	ANZECC AE (95%)	Consent Trigger Values (Table C1)	HS1A (new)	HS1	HS2	HS3	HS1A (new)	HS1	HS2	HS3	HS1A (new)	HS1	HS2	HS3
				May				June				July			
Sampling date				24/05/22	24/05/22	24/05/22	24/05/22	28/06/22	28/06/22	28/06/22	28/06/22	27/07/22	27/07/22	27/07/22	27/07/22
pH	pH units	-	-	7.5	7.5	7.4	7.6	7.4	7.6	7.4	7.6	7.3	7.2	7.3	7.4
Suspended Solids	mg/l	-	-	11	11	9	8	6	6	33	6	27	28	53	34
Phenol	mg/l			No result	No result	No result	No result	No result	No result	No result	No result	*0.025*	*0.025*	*0.025*	*0.025*
VFA	mg/l			No result	No result	No result	No result	No result	No result	No result	No result	*2.5*	*2.5*	*2.5*	*2.5*
TOC	mg/L	-	-	7.2	7.2	7.1	7.2	6.1	5.9	5.6	5.7	8.2	7.7	8.7	7.4
Alkalinity	mg CaCO3/L	-	-	55	55	56	56	43	45	44	45	32	36	35	34
Conductivity	mS/m	-	-	23.9	24.0	24.2	24.3	21.5	21.5	21.7	22.0	20.4	20.4	20.7	20.7
COD	mg/L	-	-	31	39	51	38	34	33	26	31	36	28	22	29
$scBOD_5$	mg/L	2	Monthly Ave. 2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**4**	**4**	BDL
E. coli	CFU/100 ml	-	-	No result	No result	No result	No result	100	100	*50*	200	300	*50*	300	100
Chloride	mg/L	-	-	23.6	24.5	23.9	24.1	22.4	21.7	22.5	22.9	20.7	20.3	21.4	20.5
Nitrate-N	mg/L	0.16	0.16	**0.78**	**0.81**	**0.79**	**0.80**	**2.29**	**2.22**	**2.27**	**2.27**	**2.46**	**2.39**	**2.49**	**2.39**
Sulphate	mg/L	-	-	16.8	17.4	16.8	16.8	18.5	17.9	18.4	18.2	17.7	17.2	17.7	16.9
Ammoniacal-N	mg/L	2.1	Max. 2.1 Ave. 0.400	0.25	0.28	0.26	0.27	0.04	0.05	0.07	0.09	0.08	0.06	0.08	0.10
Hardness	mg CaCO3/L	-	-	63	64	65	70	55	55	57	57	59	61	61	58
Calcium	mg/L	-	-	13.6	13.7	13.9	15.0	12.2	12.2	12.5	12.4	13.6	14.0	14.0	13.3
Magnesium	mg/L	-	-	7.13	7.22	7.28	7.90	6.05	6.06	6.21	6.24	6.16	6.33	6.33	5.94
Potassium	mg/L	-	-	3.88	3.83	3.91	4.27	3.13	3.02	3.15	3.31	3.44	3.39	3.48	3.43
Sodium	mg/L	-	-	19.9	20.0	20.3	21.8	17.1	17.1	17.5	17.3	16.0	16.4	16.3	16.1
D.R. Phosphorus	mg/L	-	-	0.028	0.032	0.030	0.030	0.016	0.019	0.024	0.019	0.032	0.032	0.035	0.034
Dissolved Aluminium	mg/L	0.055	Med. 0.055	0.017	0.048	0.021	0.018	0.019	0.032	0.033	0.029	0.046	0.028	0.033	0.031
Dissolved Arsenic	mg/L	0.024	Med. 0.024	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*

Determinant	Units	ANZECC AE (95%)	Consent Trigger Values (Table C1)	HS1A (new)	HS1	HS2	HS3	HS1A (new)	HS1	HS2	HS3	HS1A (new)	HS1	HS2	HS3
				May				June				July			
Dissolved Boron	mg/L	0.370	-	0.05	0.05	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Dissolved Cadmium	mg/L	0.0002	Med. 0.0002	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*
Dissolved Chromium (VI)	mg/L	0.001	-	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*
Dissolved Copper	mg/L	0.0014	Med. 0.0014	*0.00025*	*0.00025*	0.0005	*0.00025*	0.0011	0.0011	0.0009	0.0013	**0.0018**	**0.0018**	**0.0019**	**0.0019**
Dissolved Iron	mg/L	-	-	0.068	0.070	0.075	0.078	0.072	0.098	0.105	0.108	0.142	0.109	0.123	0.115
Dissolved Lead	mg/L	0.0034	Med. 0.0034	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	1.9	-	0.0306	0.0343	0.0382	0.0349	0.0162	0.0166	0.0152	0.0209	0.0022	0.0055	0.0038	0.0055
Dissolved Mercury	mg/L	0.0006	Med. 0.0006	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.011	Med. 0.011	*0.00025*	*0.00025*	*0.00025*	*0.00025*	0.0005	0.0005	*0.00025*	0.0007	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Zinc	mg/L	0.008	Med. 0.008	*0.001*	*0.001*	0.003	*0.001*	0.003	0.003	*0.001*	0.004	0.003	0.002	0.004	0.003

Notes:

Bold – denotes an exceedance of the ANZECC AE 95% protection level trigger values

Underlined – denotes exceedance of the Consent Trigger Value.

All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics

"BDL" means results are below detection limits

n/r – not required to be tested during this monitoring period

n/p – result not provided at the time of preparing this report

There were **eighteen exceedances** of the resource consent conditions in samples from the Hokio Stream during the May, June, and July 2022 sampling rounds.

The exceedances are summarised as follows:

- In May, June and July 2022, the nitrate-N concentrations exceeded the ANZECC AE (95%ile) DGV of 0.16mg/L at all sampling locations, with the June results being nearly three times higher than the May results, and the July results being even higher than the June results. Whilst the results were not the highest ever on record, they are the highest they have been within the past three years.
- In July 2022, the $scBOD_5$ concentrations at sampling locations HS1 and HS2 (both 4 mg/L) exceeded the ANZECC AE (95%ile) DGV of 2 mg/L.
- In July 2022, the dissolved copper concentrations exceeded the ANZECC AE (95%ile) DGV of 0.0014 mg/L at all sampling locations. Whilst the results were not the highest ever, they are the highest they have been since November 2021.

Please note that using the method of halving results that are recorded as being below detection limits, the $scBOD_5$ concentrations at all four sites (HS1A, HS1, HS2, and HS3) in the May 2022 and June 2022 monitoring rounds is expressed as 3 mg/L. This suggests that there are exceedances of the ANZECC AE (95%ile) DGV of 2 mg/L which is incorrect. Therefore, these results for $scBOD_5$ concentrations have been represented in Table 2-9 as being below the detection limit (i.e., as “BDL”).

Overall, the differences in monitoring results between the sites are marginal and there is little to no change in concentrations between upstream and downstream sites on the Hokio Stream. The *E. coli* counts are an exception to this trend, as they differ significantly between sites and sampling rounds. However, the *E. coli* counts noted in this report are within the historical range.

3 Landfill Gas Detection in Monitoring Wells

Condition 4 of Discharge Permit 6011 requires that: "…*groundwater monitoring wells shall be sampled for landfill gas when groundwater samples are taken from the wells. As a minimum, sampling shall be undertaken for methane, carbon dioxide and oxygen…*"

In the past, landfill gas monitoring results were only reported in the Annual Report. A recommendation of the 2019 - 2020 Annual Report was that these results should be included in every quarterly monitoring report so that if any results are unusually high, appropriate action can be promptly undertaken, including putting safeguards in place at the monitoring bores.

Appendix E summarises the results of landfill gas monitoring undertaken on 06th and 07th July, and 6th August 2022.

Out of the 27 groundwater monitoring bores:

- Methane was detected in fourteen of the bores. The highest recorded level was 0.32% in bores E2d and B2. This is well below the lower explosive limit of 5% and is therefore deemed at represent a 'safe' level. However, the detection of methane reinforces the need for the necessary precautions generally applicable at landfill sites to be taken when conducting sampling.
- Landfill bore B2 showed a relatively high carbon dioxide level of 3.6%, which is almost five times higher than the next highest level of CO_2. Previously, bore B2 showed a CO_2 level of 5.2%, so there appears to be a trend occurring, which should be investigated further.
- The landfill gas levels in July 2022 appear to be slightly higher than the previous quarter and reinforce the importance of continuing to monitor these changes and map any patterns. The results may be due to seasonal variations (e.g., different ground temperatures and/or groundwater levels), or may be related to prevailing weather conditions (e.g., different air pressures).

The possibility of encountering methane (and possible hydrogen sulphide) in groundwater bores endorses the need for appropriate health and safety measures to be adopted during monitoring, as is the case for the landfill gas extraction wells. No smoking should be permitted when personnel undertake groundwater sampling and when in the vicinity of the groundwater monitoring wells, or in fact anywhere else on the Levin Landfill site. For sake of safety a personal gas detector should be worn by all staff when working in the vicinity of the landfill.

4 Discussion

4.1 Sampling Quality Control and Assurance

The landfill extends over a significant area and there are many sampling locations. However, it is important that the time span of the sampling period is kept as short as possible because more infrequent (or erratic) sampling can make it difficult to compare results between rounds and determine trends at individual monitoring locations.

The July 2022 samples were collected over a 9-day period, which is outside the normally accepted 7 days. Meeting the monitoring timeframe is important because it means that there can be greater confidence in comparing results from different parts of the site. The results during the July sampling round do not, however, show wide disparity from previous results and so it is concluded that this month there was no issue with having the samples taken over the 9-day period, instead of over a 7-day period, aside from that it is not best practice.

The laboratory used a detection limit of 100 CFU/100mL for *E. coli* for the July 2022 sampling round for most of the samples except for bores Xd1, D3rd, B3s and C2, for which the much lower detection limit of < 4 cfu/100ml was applied. The latter limit of detection is what has been previously used. This change in laboratory analytical method is not conducive to assessing compliance with the resource consent conditions, which require zero contamination (0 CFU / 100mL); it is recommended that the laboratory method is carefully reviewed and corrected for future analyses. Checks should be undertaken by the sampling personnel before submitting samples for analysis, including on the Chain of Custody documentation, to ensure that the correct tests are requested and performed, with appropriate limits of detection.

4.2 Background Groundwater Quality

The quality of the natural background groundwater up-gradient from the landfill site is not subject to any consent conditions.

Results since 2010 for the background bores indicate that low pH values (i.e., typically between 6.0 and 6.8) are representative of background water quality in the shallow sand aquifer (G1S). However, the pH level for the July 2022 sampling round was 6.8 which is below the lower limit of the DWSNZ MAV for aesthetic determinants (7.0 pH units). As usual the deeper gravel aquifer (G1D) has a slightly higher pH of 7.0.

Dissolved iron concentrations have fluctuated considerably at both the G1S and G1D bores since monitoring of those bores began in 2010 and are mostly above the DWSNZ GV for aesthetic determinants (0.2 mg/L). During the July 2022 sampling round, the iron concentration at G1S exceeded the DWSNZ GV but was still within the historical results range recorded at this bore. Analysis of dissolved iron was not required for bore G1D during this sampling round. Elevated iron concentrations in groundwater are likely to be related to hydrogeological conditions found at the site and this phenomenon is common in groundwater in this area.

During the July 2022 sampling round, the dissolved aluminium concentration at G1S (0.122 mg/L) exceeded the DWSNZ MAV limit of 0.1 mg/L but was within the range observed at this location historically.

As has been noted in Section 1, testing for *E. coli* was conducted at a level of detection of < 100 cfu/100ml. All bores had *E. coli* levels below this, however this level of detection is not practical for deep aquifer bores, like G1D, where the results should be compared against the DWSNZ.

The monitoring results suggest that the quality of background groundwater may be being impacted by local ground conditions and/or activities up-gradient of the landfill. Background bore G1S consistently records elevated concentrations of a range of parameters which indicates that it is likely modified or impacted by anthropogenic activities, and therefore may not be suitable to use as reliable ‘control’ location for background water quality in the future.

4.3 Shallow Aquifer Groundwater Quality

4.3.1 Hydraulically down-gradient of the Old Landfill

There were **no exceedances of the ANZECC LDW trigger values** during the July 2022 monitoring round in samples hydraulically down-gradient of the old landfill.

Bore C2 was reported as having an *E. coli* count of 100 cfu/100ml, which is equal to the ANZECC LDW of 100 cfu/100ml but does not exceed it. Given that the level of detection that was used for this bore and almost all others was 100

cfu/100ml, it is not clear if this is an actual result or if the result should have been reported as being < 100 cfu/100ml, like so many of the other bores.

4.3.2 Hydraulically up-gradient of the Old Landfill and down-gradient of the New Landfill

There were **no exceedances of the ANZECC LDW trigger values** during the July 2022 monitoring round in samples hydraulically up-gradient of the old landfill and down-gradient of the new landfill.

However, bore D5 was not sampled during this sampling round, due to access being blocked by a fallen tree. This still represents a non-compliance with the resource consent conditions.

Bore D3rs was sampled for the indicator suite of parameters, instead of the comprehensive suite (refer to Table 2-1for a description of both analytical suites). Table B in resource consent condition 3 of discharge permit 6010 requires bores D3rs and D3rd, as placement wells of bore D3r, to be sampled quarterly for the comprehensive suite of parameters for two years. Sampling of D3rs and D3rd started in October 2021 and should continue until, and including July 2023, to get two years of comprehensive monitoring. As such, sampling of bore D3rs using the indicator suite of parameters is a non-compliance.

4.3.3 Irrigation Area

There were **no exceedances of the ANZECC LDW trigger values** during the July 2022 monitoring round in groundwater samples taken from bores within the irrigation area (as described in Section 2.5 above).

4.4 Deep Aquifer Groundwater Quality

There were **five exceedances of the DWSNZ limits** in samples from the deep gravel aquifer during the July 2022 monitoring round.

The *E. coli* count at bore Xd1 (8 cfu/100ml) exceeded the DWSNZ MAV of nil. Bore Xd1 is new but has yielded similar levels of *E. Coli*. This was one of only four samples that were tested to a level of detection of 4 cfu/100ml, but the reason for the discrepancy in analytical method (compared with the rest of the samples analysed, as detailed in Section 1) is not known

Bore D3rd was reported as having an *E. coli* count of 100 cfu/100ml. Given that the level of detection that was used for this bore and almost all others was 100cfu/100ml, it is not clear if this is an actual result or if the result should have been reported as being < 100cfu/100ml, like so many of the other bores. Without that clarity, one must accept that it is an exceedance, and, if so, it represents a significant increase compared to previous results, which would be of concern.

The dissolved manganese concentrations in bores C2DD, Xd1, and D3rd exceeded the DWSNZ MAV of 0.4mg/L. The results for C2DD and Xd1 are within the historical range of concentrations observed. Bore D3rd is relatively new but there is an emerging trend which indicates that manganese is generally elevated in this bore, as it is for the other deep aquifer bores.

As stated in the previous section for bore D3rs, bore D3rd was sampled for the indicator suite of parameters, instead of the comprehensive suite. Bore D3rd was installed in June 2021 and first sampled in October 2021. Sampling needs to be done quarterly for the comprehensive suite of parameters for two years (i.e., until, and including July 2023). As such, sampling of bore D3rd using the indicator suite of parameters is a non-compliance.

4.5 Leachate Effluent

Monitoring results from the leachate effluent samples are not required to meet either the ANZECC LDW trigger values or DWSNZ standards. However, during the July 2022 monitoring round there were three test results that were outside of the typical composition ranges for leachate at Class 1 landfills, as published in the WasteMINZ guidelines[4].

[4] Technical Guidelines for Disposal to Land, WasteMINZ, 2018

These were for COD (5,180 mg/L) which exceeded the typical range of 84 – 5,090 mg/L; for ammoniacal-nitrogen (1,830 mg/L) which exceeded the range of 3.4 – 1,440 mg/L, and for dissolved mercury which was not detected (i.e., < 0.0005 mg/L) and so was less than the range of 0.2 – 50 mg/L.

While these results are not reflective of typical conditions at other, similar landfills around New Zealand, it is noted that they are within the historical range of results observed at the Levin Landfill site.

4.6 Tatana Property Drain

Under the revised resource consent conditions (2019), the Tatana Property drain samples are now assessed against the ANZECC AE 95%ile DGVs.

There were **three exceedances of the resource consent conditions** for two monitored parameters in samples from the TD1 location during the June 2022 and July 2022 sampling rounds:

- The concentration of nitrate-nitrogen in June 2022 (1.510 mg/L) and July 2022 (1.590 mg/L) exceeded the ANZECC AE (95%ile) DGV of 0.16 mg/L. These are the highest values recorded since April 2021 but are not exceptional compared to the results over the past two years.
- The concentration of dissolved aluminium in June 2022 (0.071 mg/L) exceeded the ANZECC AE (95%ile) DGV of 0.055 mg/L. This is the highest value recorded at TD1 to date.

4.7 Hokio Stream

Under the revised resource consent conditions (2019), a new monitoring location (HS1A), upstream of HS1, was added to the Hokio Stream monitoring sites and all monitoring results for the Hokio Stream samples are now assessed against the ANZECC AE 95%ile DGVs.

There were **eighteen exceedances of the resource consent conditions** in samples from the Hokio Stream during the May, June, and July 2022 sampling rounds.

The exceedances are summarised as follows:

- In May, June and July 2022, the nitrate-N concentrations exceeded the ANZECC AE (95%ile) DGV of 0.16 mg/L at all sampling locations. Whilst the results were not the highest ever, they are the highest they have been for the past three years.
- In July 2022, the scBOD$_5$ concentrations at sampling locations HS1 and HS2 (both 4 mg/L) exceeded the ANZECC AE (95%ile) DGV of 2 mg/L.
- In July 2022, the dissolved copper concentrations exceeded the ANZECC AE (95%ile) DGV of 0.0014 mg/L at all sampling locations. Whilst the results were not the highest ever, they are the highest they have been since November 2021.

4.8 Consent Compliance

Discharge permit 6010 states that quarterly and annual monitoring results shall comply with the ANZECC LDW trigger values in the shallow groundwater aquifer (sand aquifer) and surface water bodies. Samples from the deep groundwater (gravel aquifer) shall comply with the applicable DWSNZ values. Should any parameters exceed these standards, the permit holder shall report to the Regional Council as soon as practicable on the significance of the results and, where the change can be attributed to the influence of landfill leachate, consult with the Regional Council to determine if further investigations or remedial measures are required.

Shallow Aquifer and Irrigation Area

There were **no exceedances** of consent conditions hydraulically up-gradient of the old landfill and down-gradient of the new landfill during the July 2022 monitoring period.

There were **no exceedances** of the consent conditions hydraulically down-gradient of the old landfill during the July 2022 monitoring period.

There were **no exceedances** of the resource consent conditions during the July 2022 sampling round for samples obtained from bores within the irrigation area.

Bore D5 was not sampled in July 2022, which is a consent non-compliance.

Bore D3rs sample was tested against the indicator suite of parameters, instead of the comprehensive suite, which is also a consent non-compliance.

Deeper Gravel Aquifer

There were **five exceedances of the DWSNZ limits** in samples from the deep gravel aquifer during the July 2022 monitoring round.

- The *E. coli* count at bore Xd1 (8 cfu/100ml) exceeded the DWSNZ MAV of nil. Bore Xd1 is new but has yielded similar values of *E. Coli.*
- Bore D3rd was reported as having an *E. coli* count of 100 cfu/100ml, but it is not clear if this is an actual result or if the result should have been reported as being < 100 cfu/100ml, which is the level of detection that was used for most bore samples this monitoring round. Without other information it must be assumed that the result is accurate and so is a significant exceedance compared to previous results.
- The dissolved manganese concentrations in bores C2DD, Xd1, and D3rd exceeded the DWSNZ MAV of 0.4 mg/L. The results for C2DD and Xd1 are within the historical range of concentrations observed. Bore D3rd is relatively new but monitoring data indicates an emerging trend of elevated manganese within this bore, as it is for the other deep aquifer bores, so these exceedances are not considered significant.

Bore D3rd sample was analysed for the indicator suite of parameters, instead of the comprehensive suite (as detailed in Appendix B), which is a consent non-compliance.

Tatana Property Drain

There were **three exceedances of the resource consent conditions** for samples from TD1 location during the May 2022 to July 2022 monitoring period.

These occurred during the June 2022 and July 2022 sampling rounds as follows:

- The concentration of nitrate-N in June 2022 (1.510 mg/L) and July 2022 (1.590 mg/L) exceeded the ANZECC AE (95%ile) DGV of 0.16 mg/L. These are the highest value recorded since April 2021 but are not exceptional compared to the results over the past two years.
- In June 2022, the concentration of dissolved aluminium (0.071 mg/L) exceeded the ANZECC AE (95%ile) DGV of 0.055 mg/L. This was the highest value recorded to date, but reduced to 0.033 mg/L in July 2022, so the result is not considered to be significant.

Hokio Stream

There were **eighteen exceedances** of the resource consent conditions in samples from the Hokio Stream during the May, June and July 2022 sampling rounds.

The exceedances are summarised as follows:

- In May, June and July 2022, the nitrate-N concentrations exceeded the ANZECC AE (95%ile) DGV of 0.16 mg/L at all sampling locations. Whilst the results were not the highest ever, they are the highest they have been for the past three years.
- In July 2022, the $scBOD_5$ concentrations at sampling locations HS1 and HS2 (both 4 mg/L) exceeded the ANZECC AE (95%ile) DGV of 2 mg/L.
- In July 2022, the dissolved copper concentrations exceeded the ANZECC AE (95%ile) DGV of 0.0014 mg/L at all sampling locations. Whilst the results were not the highest ever, they are the highest they have been since November 2021.

5 Conclusions

Monitoring results obtained in the May 2022 to July 2022 sampling rounds suggest that the groundwater at the background monitoring sites at the Levin Landfill is being impacted by local ground conditions and/or activities up-gradient of the landfill.

During the May 2022 to July 2022 monitoring period there were twenty-six exceedances of the resource consent conditions; five exceedances were in samples from the deep gravel aquifer, three exceedances were in samples from Tatana Property drain, and eighteen exceedances occurred in samples from the surface water monitoring at locations along the Hokio Stream.

There were three occasions where the leachate effluent quality was outside of the ranges for typical leachate composition, as recorded generally at Class 1 landfills in New Zealand. This occurred for COD and ammoniacal-N which exceeded the typical range, and for mercury which was not detected and so was under the typical range. Note that leachate effluent is not subject to any consent limits.

Bore D5 was not sampled during July 2022, because access was blocked by a fallen tree, and bores D3rs and D3rd were analysed for the indicator suite of parameters, instead of for the comprehensive suite. These errors are non-compliances with respect to the resource consent conditions.

The level of detection used in the laboratory for testing *E. coli* was mostly set at < 100 cfu/100ml. This is impractical for water samples from the deep aquifer which need to be compared against the DWSNZ which have a trigger level of 0 cfu/100ml for *E. coli*. Future testing for *E. coli* needs to revert to the more accurate level of detection used previously, which is < 4 cfu/100ml.

Methane was detected in fourteen groundwater monitoring bores in the July 2022 sampling round. This is an increase compared to the last monitoring round, and the methane concentrations were slightly higher. The highest concentration of methane, which was in bores E2d and B2 (0.32%), was well below the lower explosive limit for methane (which is 5%).

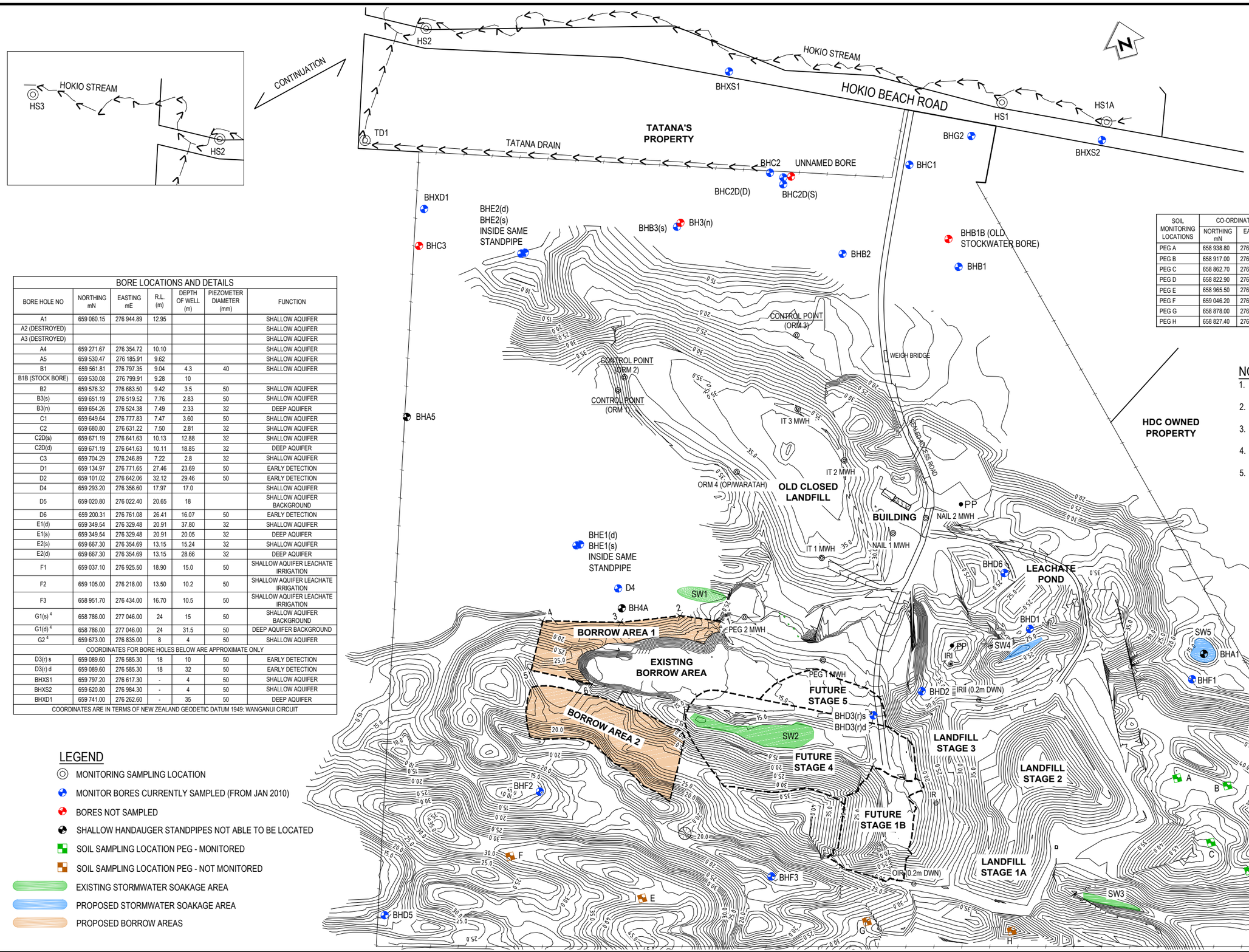
Additionally, a very high level of carbon dioxide (3.6%) was measured at bore B2. Previously, bore B2 showed a CO_2 level of 5.2%, so there appears to be a trend occurring, which should be investigated further

The possibility of encountering methane (and possible hydrogen sulphide) in groundwater bores endorses the need for appropriate health and safety measures to be adopted during monitoring, as is the case for the landfill gas extraction wells. No smoking should be permitted when personnel undertake groundwater sampling and when in the vicinity of the groundwater monitoring wells, or in fact anywhere else on the Levin Landfill site. For sake of safety a personal gas detector should be worn by all staff when working at the landfill site.

Appendices

We design with community in mind

Appendix A Site Plan



COORDINATES OF SURVEY CONTROL MARKS			
PT	NORTHING mN	EASTING mE	RL
ORM 1	659 498.38	276 412.21	38.94
ORM 2	659 510.09	276 422.72	34.98
ORM 3	659 505.14	276 612.86	21.10
ORM 4(OP/W)	659 380.16	276 511.94	30.92
MWH NAIL 1	659 272.67	276 656.87	27.61
MWH NAIL 2	659 278.98	276 695.22	28.40
MWH IT 1	659 267.33	276 576.02	30.03
MWH IT 2	659 361.94	276 627.00	33.70
MWH IT 3	659 428.24	276 593.00	32.74
MWH PEG 1	659 160.94	276 548.30	32.99
MWH PEG 2	659 227.86	276 479.35	30.49
IRII	659 075.85	276 698.70	30.04
OIR	658 903.62	276 579.37	30.35
IRI	659 121.09	276 679.47	40.00
IR	276 625.10	658 981.29	21.30
COORDINATES ARE IN TERMS OF NEW ZEALAND GEODETIC DATUM 1949: WANGANUI CIRCUIT			

SOIL MONITORING LOCATIONS	CO-ORDINATES		LEVEL (m)
	NORTHING mN	EASTING mE	
PEG A	658 938.80	276 882.30	39.2
PEG B	658 917.00	276 932.10	39.5
PEG C	658 862.70	276 899.00	46.1
PEG D	658 822.90	276 930.40	40.4
PEG E	658 965.50	276 294.00	36.6
PEG F	659 046.20	276 169.10	32.9
PEG G	658 878.00	276 520.20	32.6
PEG H	658 827.40	276 667.60	23.5

BORROW AREA 1 SET-OUT COORDINATES		
POINT NO.	NORTHINGS mN	EASTINGS mE
1	659 230.38	276 453.28
2	659 247.32	276 413.49
3	659 257.33	276 349.62
4	659 280.93	276 269.42
5	659 233.27	276 243.39
6	659 201.34	276 302.68

BORE LOCATIONS AND DETAILS						
BORE HOLE NO	NORTHING mN	EASTING mE	R.L. (m)	DEPTH OF WELL (m)	PIEZOMETER DIAMETER (mm)	FUNCTION
A1	659 060.15	276 944.89	12.95			SHALLOW AQUIFER
A2 (DESTROYED)						SHALLOW AQUIFER
A3 (DESTROYED)						SHALLOW AQUIFER
A4	659 271.67	276 354.72	10.10			SHALLOW AQUIFER
A5	659 530.47	276 185.91	9.62			SHALLOW AQUIFER
B1	659 561.81	276 797.35	9.04	4.3	40	SHALLOW AQUIFER
B1B (STOCK BORE)	659 530.08	276 799.91	9.28	10		
B2	659 576.32	276 683.50	9.42	3.5	50	SHALLOW AQUIFER
B3(s)	659 651.19	276 519.52	7.76	2.83	50	SHALLOW AQUIFER
B3(n)	659 654.26	276 524.38	7.49	2.33	32	DEEP AQUIFER
C1	659 649.64	276 777.83	7.47	3.60	50	SHALLOW AQUIFER
C2	659 680.80	276 631.22	7.50	2.81	32	SHALLOW AQUIFER
C2D(s)	659 671.19	276 641.63	10.13	12.88	32	SHALLOW AQUIFER
C2D(d)	659 671.19	276 641.63	10.11	18.85	32	DEEP AQUIFER
C3	659 704.29	276.246.89	7.22	2.8	32	SHALLOW AQUIFER
D1	659 134.97	276 771.65	27.46	23.69	50	EARLY DETECTION
D2	659 101.02	276 642.06	32.12	29.46	50	EARLY DETECTION
D4	659 293.20	276 356.60	17.97	17.0		SHALLOW AQUIFER
D5	659 020.80	276 022.40	20.65	18		SHALLOW AQUIFER BACKGROUND
D6	659 200.31	276 761.08	26.41	16.07	50	EARLY DETECTION
E1(d)	659 349.54	276 329.48	20.91	37.80	32	SHALLOW AQUIFER
E1(s)	659 349.54	276 329.48	20.91	20.05	32	DEEP AQUIFER
E2(s)	659 667.30	276 354.69	13.15	15.24	32	SHALLOW AQUIFER
E2(d)	659 667.30	276 354.69	13.15	28.66	32	DEEP AQUIFER
F1	659 037.10	276 925.50	18.90	15.0	50	SHALLOW AQUIFER LEACHATE IRRIGATION
F2	659 105.00	276 218.00	13.50	10.2	50	SHALLOW AQUIFER LEACHATE IRRIGATION
F3	658 951.70	276 434.00	16.70	10.5	50	SHALLOW AQUIFER LEACHATE IRRIGATION
G1(s) [4]	658 786.00	277 046.00	24	15	50	SHALLOW AQUIFER BACKGROUND
G1(d) [4]	658 786.00	277 046.00	24	31.5	50	DEEP AQUIFER BACKGROUND
G2 [4]	659 673.00	276 835.00	8	4	50	SHALLOW AQUIFER
COORDINATES FOR BORE HOLES BELOW ARE APPROXIMATE ONLY						
D3(r) s	659 089.60	276 585.30	18	10	50	EARLY DETECTION
D3(r) d	659 089.60	276 585.30	18	32	50	EARLY DETECTION
BHXS1	659 797.20	276 617.30	-	4	50	SHALLOW AQUIFER
BHXS2	659 620.80	276 984.30	-	4	50	SHALLOW AQUIFER
BHXD1	659 741.00	276 262.60	-	35	50	DEEP AQUIFER
COORDINATES ARE IN TERMS OF NEW ZEALAND GEODETIC DATUM 1949: WANGANUI CIRCUIT						

NOTES:

1. LEVELS ARE TOP OF STANDPIPE. WHERE THERE IS NO STANDPIPE, LEVELS ARE TOP OF PVC PIPE.
2. BHA2, BHA3 AND BHD3 HAVE BEEN LOST DUE TO SITE WORKS.
3. "A" SERIES BORE HOLES ARE AUGER HOLES ONLY AND MAY NOT BE ABLE TO BE LOCATED.
4. BORES INSTALLED IN AUG 2009. DETAILS ARE APPROXIMATE.
5. CONTOUR INTERVALS: 5m MAJOR, 1m MINOR

LEGEND

- MONITORING SAMPLING LOCATION
- MONITOR BORES CURRENTLY SAMPLED (FROM JAN 2010)
- BORES NOT SAMPLED
- SHALLOW HANDAUGER STANDPIPES NOT ABLE TO BE LOCATED
- SOIL SAMPLING LOCATION PEG - MONITORED
- SOIL SAMPLING LOCATION PEG - NOT MONITORED
- EXISTING STORMWATER SOAKAGE AREA
- PROPOSED STORMWATER SOAKAGE AREA
- PROPOSED BORROW AREAS

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

REV	REVISIONS	DRN	CHK	APP	DATE
E	FOR INFORMATION - BHD3(r)s AND BHD3(r)d ADDED, AND CONTOURS UPDATED FROM JULY 2021 SURVEY	BCJ	PSL	PSL	24.09.21
D	FOR INFORMATION - BORROW AREA 2 RELOCATED, DEFINED AREAS OF FUTURE STAGES 1B, 4 AND 5	BCJ	PSL	PSL	01.06.21
C	FOR INFORMATION - BORROW AREA AND LANDFILL AREA UPDATES AND BORE HOLES AND SAMPLING LOCATIONS ADDED FOR HOKIO STREAM AND TATANA DRAIN	BCJ	PSL	PSL	24.03.21
B	FOR INFORMATION - BORROW AREA AND LANDFILL AREA UPDATES	BCJ	PSL	PSL	22.09.20
A	FOR INFORMATION	BCJ	PSL	PSL	26.08.19

SURVEYED	MWH	
DESIGNED	N/A	-
DRAWN	Brent James	08.2019
CAD REVIEW	Brent James	23.09.21
APPROVED	Phil Landmark	23.09.21
PROF REGISTRATION:		

Stantec

Client:

HOROWHENUA DISTRICT COUNCIL
LEVIN LANDFILL

MONITORING BORES, SOIL SAMPLING LOCATIONS & BORROW AREAS
SITE PLAN, LOCATION AND DETAILS

Status Stamp: FOR INFORMATION ONLY
Date Stamp: 24.09.21
Scales: 1:2000 (A1) 1:4000 (A3)
Drawing No.: 310101088-19-001-G001
Rev.: E

26/08/2019 9:35 a.m.

pw:\\stantec-ap-pw.bentley.com:stantec-ap-pw-01\Documents\New Zealand Clients\Horowhenua District Council\80500724 (310101088) - Levin Landfill Volumes\2019\General\310101088-19-001-G001

Appendix B Sampling Schedule

LEVIN LANDFILL - SUMMARY OF SURFACE AND GROUNDWATER MONITORING REQUIREMENTS (July 2021 - April 2024).

(The testing regime is based on Consent Conditions following the completion of the 2015 Resource Consent Review process).

Reports Due		Sampling Month	Table A (Condition 3, DP 6010)	Table B (Condition 3, DP 6010)																							Table C (Condition 3, DP 6010)							
			Deep Aquifer Bores	Shallow Aquifer Bores																					Irrigation Bores				Hokio Stream[4], [8]				Tatana Drain	Leachate Pond[5]	
Annual	Quarterly		C2dd	E1d	E2d	G1d	Xd1	D3rd[1]	C1	C2[6]	C2ds[6]	D4	B1	B2	B3s	E1s	E2s	D1[2]	D2[2]	D3rs[1,2]	D6[2]	G1s	G2s	Xs1[6]	Xs2[6]	D5[3]	F1[3]	F2[3]	F3[3]	HS1	HS1A	HS2	HS3	TD1[7]		
Sep-21	**Aug-21**	**Jul-21**	I	I + SW	I	I	C	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	C	C	I	I	I	I + SW	Monthly Compre. To 03/2022	Monthly Compre. To 03/2022	Monthly Compre. To 03/2022	Monthly Compre. To 03/2022	Monthly Compre. To 03/2022	Monthly Compre.	
	Nov-21	**Oct-21**	I	I + SW	I	I	C	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	C	C	I	I	I	I + SW							A
	Feb-22	**Jan-22**	I	I + SW	I	I	C	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	C	C	I	I	I	I + SW							
	May-22	**Apr-22**	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C	C	C + A
Sep-22	**Aug-22**	**Jul-22**	I	I + SW	I	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	I	I	I	I	I	I + SW	Discontinue after 2 years, i.e. after March 2022	I	I	I	I	I	
	Nov-22	**Oct-22**	I	I + SW	I	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	I	I	I	I	I	I + SW		C	C	C	C	C	
	Feb-23	**Jan-23**	I	I + SW	I	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	I	I	I	I	I	I + SW		I	I	I	I	I	
	May-23	**Apr-23**	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A		C	C	C	C	C	
Sep-23	**Aug-23**	**Jul-23**	I	I + SW	I	I	I	I	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	I	I	I	I	I	I + SW		I	I	I	I	I	
	Nov-23	**Oct-23**	I	I + SW	I	I	I	I	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	I	I	I	I	I	I + SW		C	C	C	C	C	
	Feb-24	**Jan-24**	I	I + SW	I	I	I	I	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	I	I	I	I	I	I + SW		I	I	I	I	I	
	May-24	**Apr-24**	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A		C	C	C	C	C	
			Measure groundwater level and sample all bores for CH_4, CO_2 and O_2 each time that groundwater is sampled (Condition 4a of DP 6011)																																

Notes:

(1) Replacement bore D3r consists of two nested piezometers that have been calledL D3rs and D3rd.
(2) See table below
(3) If irrigation re-commences then the annual sampling is to change from comprehensive + 3 times indicator to bi-annual comprehensive + indicator (Clause D of Condition 3, DP 6010) .
(4) See table below
(5) See table below
(6) Measure water level at C2, C2ds, Xs1 and Xs2 when taking monthly samples at TD1 and within the Hokio Stream.
(7) Start taking comprehensive samples at TD1 every month when sampling the Hokio Stream sites. Also note the depth of water in the drain invert at TD1.
(8) Start measuring approximately the depth of flow in the Hokio Stream at each sampling site when sampling monthly.
C Comprehensive list (see below)
I Indicator list (see below)
A Pesticide and SVOC analysis
SW Add sodium and iron analysis (for stormwater consent 102559)

A reduction in sampling frequency at any **groundwater monitoring point** is conditional on (Clauses A - D of Condition 3, DP 6010):

A. Completion of the initial monitoring program;
B. Good consistency of groundwater sample analysis results, or a clearly identified reason for inconsistent results that excludes the contaminant source being landfill operations, stored waste or leachate;
C. No decline in groundwater quality as determined from indicator parameter trends over a period of four consecutive sampling rounds;
D. If a well being monitored on a conditional frequency becomes non-compliant with condition C, the monitoring frequency for that well should return to the initial monitoring frequency until conditions B and C are again being fulfilled.

(2) If site management planning indicates any **early detection monitoring well** is likely to become buried or otherwise destroyed within the following year as a result of normal operations (Clauses E - H, Condition 3, DP 6010):

E. This must be communicated to the regional council;
F. A replacement well is to be constructed in a position agreed upon with Horizons Regional Council
G. The replacement well should be installed in a position suitable to act as a early detection well and be classed as an early detection well;
H. The replacement well should be constructed as a nested well (or two separate wells) with screens positioned in both shallow and deep aquifers.

(4) A reduction in sampling frequency at the **Hokio Stream monitoring locations (HS1A, HS2 and HS3)** is conditional on (Clauses I - L, Condition 3 of DP 6010):

I. No signficant increases in the concentrations between monitoring sites HS1A and HS3, for parameters exceeding the trigger values contained in Table C1 at Site HS3.
J. A statistical analysis approach is to be used to determine if there is a significant increase in contaminant levels between HS1A and HS3.
K. Following the 24 month monitoring period, there shall be no significant increases in concentrations between monitoring sites HS1A and HS3.
L. If the Hokio Stream monitoring locations are being sampled on a conditional frequency and do not meet condition K, the monitoring frequency for all three monitoring locations (HS1A, HS2 and HS3) shall return to the base case intensive monitoring until conditions J and K are again being fulfilled.

(5) A reduction in sampling frequency at the **leachate pond outlet** is conditional on (Clauses M - P, Condition 3, DP 6010):

M. Completion of the initial 2 year monitoring program;
N. Good consistency of water sample analysis results, or a clearly identified reason for inconsistent results;
O. No decline in water quality over a period of four consecutive sampling rounds;
P. If the leachate pond outlet is being sampled on a conditional frequency and becomes non-compliant with condition O, the monitoring frequency should return to the base case intensive monitoring until conditions N and O are again being fulfilled.

COMPREHENSIVE PARAMETER LIST (Table E of Condition 3, DP 6010)

Characterising parameters	pH
	electrical conductivity (EC)
	alkalinity
	total hardness
	suspended solids
Oxygen demand	COD and $scBOD_5$
Nutrients*	NO3-N, NH4-N, DRP and SO_4
Metals*	Al, As, Cd, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Zn and Hg
Other elements	B, Ca, Cl, K and Na
Organics	Total organic carbon, total phenols, volatile acids
Biological	E. coli

* Analyses performed for nutrients and metals are for dissolved rather than total concentrations

INDICATOR PARAMETER LIST (Table F, Condition 3, DP 6010)

Characterising parameters	pH
	electrical conductivity (EC)
Oxygen demand	COD and $scBOD_5$
Nutrients*	NO3-N and NH4-N
Metals*	AL, Mn, Ni, Pb and Hg
Other elements	B and Cl
Biological+	E. coli

* Analyses performed for nutrients and metals are for dissolved rather than total concentrations

+ E. coli added from April 2019 sampling onwards

Appendix C Analytical Results

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ANALYTICAL REPORT

REPORT CODE **AR-22-NW-026423-01** REPORT DATE **04/08/2022**

Attention Downer NZ Ltd (EDI Levin)
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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill
Order code: EUNZWE-00048831

SAMPLE CODE **812-2022-00077634**

Sampling Point WIL-B1:Levin B1
Reception Date & Time: 26/07/2022 9:01
Analysis Start Date & Time: 26/07/2022 09:03
Analysis Ending Date: 04/08/2022
Sampled Date & Time 25/07/2022 12:46
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	4.27	(± 0.64) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	87	(± 14) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	297	(± 14.9) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	187	(± 3.7) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	29.2	(± 1.46) mg/l	0.01
NW195	**pH**			
	pH	6.8	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.017	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	1.15	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	5.09	(± 0.509) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

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		RESULTS (UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**		
	Nickel (Ni)	0.0023 (± 0.0007) mg/l	0.0005

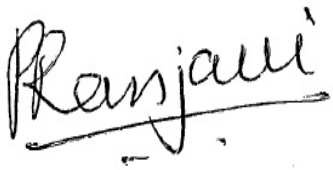
LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Amit Kumar Assistant Manager

Marylou Cabral Laboratory Manager



Pathma Ranjanie Senior laboratory Analyst

EXPLANATORY NOTE

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⑥ Test result is provided by the customer and is not accredited
⑦ Tested in the field by Eurofins and is not accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-026425-01** REPORT DATE **04/08/2022**

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Contact for your orders: Lauren May
Contract: Landfill
Order code: EUNZWE-00048831

SAMPLE CODE **812-2022-00077636**

Sampling Point WIL-B2:Levin B2
Reception Date & Time: 26/07/2022 9:01
Analysis Start Date & Time: 26/07/2022 09:14
Analysis Ending Date: 04/08/2022
Sampled Date & Time 25/07/2022 12:46
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	16.9	(± 1.69) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	99	(± 16) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	97.0	(± 4.85) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	141	(± 2.8) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	62.8	(± 3.14) mg/l	0.01
NW195	**pH**			
	pH	6.7	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.013	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.98	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	1.88	(± 0.188) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

		RESULTS (UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**		
	Nickel (Ni)	0.0012 (± 0.0004) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Maria Norris Laboratory Manager, Microbiology

Amit Kumar Assistant Manager

EXPLANATORY NOTE

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⑦ Tested in the field by Eurofins and is not accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-027295-01** REPORT DATE **10/08/2022**

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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill
Order code: EUNZWE-00049627

SAMPLE CODE **812-2022-00079453**

Sampling Point WIL-B3:Levin B3s
Reception Date & Time: 29/07/2022 17:26
Analysis Start Date & Time: 29/07/2022 17:29
Analysis Ending Date: 10/08/2022
Sampled Date & Time 28/07/2022 08:58
Sampler(s) Client nominated external sampler

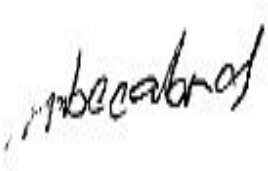
		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	145	(± 14.5) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	129	(± 14) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	109	(± 5.43) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	214	(± 4.3) mS/m	0.1
ZM0UY	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<4	cfu/100 ml	4
NW010	**Nitrate-N**			
	Nitrate-N	<0.10	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	7.1	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.004	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.90	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	2.41	(± 0.241) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

		RESULTS	(UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0075	(± 0.0023) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM0UY	**Escherichia coli E (Water) [NZ] <4 >240 /100 ml (0) m-FC Agar-F:** SMEWW 9222I; APHA Online

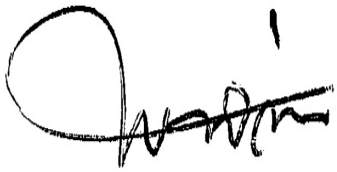
Signature



Marylou Cabral Laboratory Manager

Amit Kumar Assistant Manager

Amitesh Kumar Supervisor



Maria Norris Laboratory Manager, Microbiology

EXPLANATORY NOTE

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-026346-01** REPORT DATE **04/08/2022**

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Contact for your orders: Lauren May
Contract: Landfill
Order code: EUNZWE-00048738

SAMPLE CODE **812-2022-00077438**

Sampling Point WIL-C1:Levin C1
Reception Date & Time: 25/07/2022 18:00
Analysis Start Date & Time: 25/07/2022 18:02
Analysis Ending Date: 04/08/2022
Sampled Date & Time 25/07/2022 08:08
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.33	(± 0.10) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	73	(± 12) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	25.4	(± 1.27) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	20.7	(± 0.4) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.02	(± 0.006) mg/l	0.01
NW195	**pH**			
	pH	6.6	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.076	(± 0.008) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.07	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0623	(± 0.0125) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

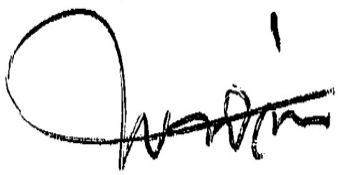
		RESULTS (UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**		
	Nickel (Ni)	0.0007 (± 0.0003) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager



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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-026359-01** REPORT DATE **04/08/2022**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill
Order code: EUNZWE-00048831

SAMPLE CODE **812-2022-00077635**

Sampling Point WIL-C2:Levin C2
Reception Date & Time: 26/07/2022 9:01
Analysis Start Date & Time: 26/07/2022 09:05
Analysis Ending Date: 04/08/2022
Sampled Date & Time 25/07/2022 12:46
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	165	(± 16.5) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	116	(± 13) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	130	(± 6.50) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	234	(± 4.7) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.10	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	6.9	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.021	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	1.37	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	0.0006	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0934	(± 0.0187) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

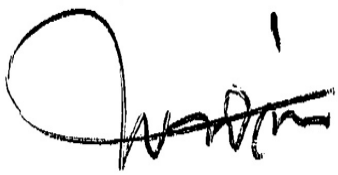
		RESULTS (UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**		
	Nickel (Ni)	0.0039 (± 0.0012) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager



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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025413-01** REPORT DATE **28/07/2022**

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4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00047862

SAMPLE CODE **812-2022-00075573**

Sampling Point WIL-C2dd:Levin C2dd
Reception Date & Time: 20/07/2022 14:13
Analysis Start Date & Time: 20/07/2022 15:13 **Analysis Ending Date:** 28/07/2022
Sampled Date & Time 20/07/2022 07:57 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.35	(± 0.11) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	33	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	41.8	(± 2.09) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	57.2	(± 1.1) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.7	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.006	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.06	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.628	(± 0.0628) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0007	(± 0.0003) mg/l	0.0005

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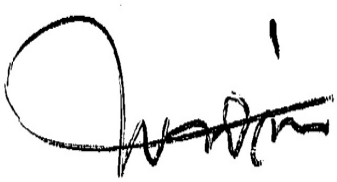
RESULTS (UNCERTAINTY) LOQ

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Maria Norris Laboratory Manager, Microbiology

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ANALYTICAL REPORT

REPORT CODE **AR-22-NW-026426-01** REPORT DATE **04/08/2022**

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4741 Levin
NEW ZEALAND
Phone (06) 367 2705
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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill
Order code: EUNZWE-00048831

SAMPLE CODE **812-2022-00077637**

Sampling Point WIL-C2ds:Levin C2ds
Reception Date & Time: 26/07/2022 9:01
Analysis Start Date & Time: 26/07/2022 09:14
Analysis Ending Date: 04/08/2022
Sampled Date & Time 25/07/2022 12:47
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	1.51	(± 0.23) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	72	(± 12) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	89.6	(± 4.48) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	147	(± 2.9) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.10	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	6.7	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.85	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	2.06	(± 0.206) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

		RESULTS (UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**		
	Nickel (Ni)	0.0020 (± 0.0006) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Maria Norris Laboratory Manager, Microbiology

Amit Kumar Assistant Manager

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ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025765-01** REPORT DATE **29/07/2022**

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4741 Levin
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Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill

Order code: EUNZWE-00048101

SAMPLE CODE **812-2022-00076375**

Sampling Point WIL-D1:Levin D1
Reception Date & Time: 21/07/2022 15:28
Analysis Start Date & Time: 21/07/2022 17:04
Analysis Ending Date: 29/07/2022
Sampled Date & Time 20/07/2022 11:41
Sampler(s) Client nominated external sampler

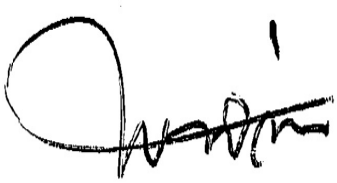
		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.003) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	22	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	11.8	(± 0.59) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	24.8	(± 0.5) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	4.38	(± 0.44) mg/l	0.01
NW195	**pH**			
	pH	7.1	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.03	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	<0.0005	(± 0.0002) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

		RESULTS (UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**		
	Nickel (Ni)	<0.0005 (± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Maria Norris Laboratory Manager, Microbiology

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ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025764-01** REPORT DATE **29/07/2022**

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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill

Order code: EUNZWE-00048101

SAMPLE CODE **812-2022-00076374**

Sampling Point WIL-D2:Levin D2
Reception Date & Time: 21/07/2022 15:28
Analysis Start Date & Time: 21/07/2022 17:04
Analysis Ending Date: 29/07/2022
Sampled Date & Time 20/07/2022 11:41
Sampler(s) Client nominated external sampler

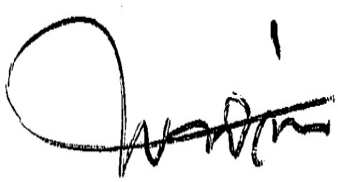
		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.62	(± 0.19) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	55	(± 10) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	45.2	(± 2.26) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	46.5	(± 0.9) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.07	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	6.6	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.007	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	5.98	(± 1.20) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.506	(± 0.0506) mg/l	0.0005
NW114	**Soluble Mercury**			

		RESULTS	(UNCERTAINTY)	LOQ
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	41.4	mg/l	0.01

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Maria Norris Laboratory Manager, Microbiology

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025352-01** REPORT DATE **27/07/2022**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00048101

SAMPLE CODE **812-2022-00076204**

Sampling Point WIL-D3rd:Levin D3rd
Reception Date & Time: 21/07/2022 15:28
Analysis Start Date & Time: 21/07/2022 15:31 **Analysis Ending Date:** 27/07/2022
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.41	(± 0.12) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	30	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	31.6	(± 1.58) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	52.3	(± 1.0) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.7	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.514	(± 0.0514) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005

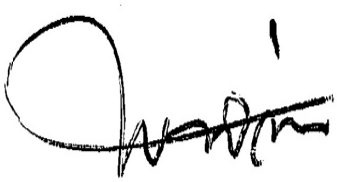
Food & Water Testing

RESULTS (UNCERTAINTY) LOQ

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Maria Norris Laboratory Manager, Microbiology

EXPLANATORY NOTE

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END OF REPORT

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025763-01** REPORT DATE **29/07/2022**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill

Order code: EUNZWE-00048101

SAMPLE CODE **812-2022-00076203**

Sampling Point WIL-D3rs:Levin D3rs
Reception Date & Time: 21/07/2022 15:28
Analysis Start Date & Time: 21/07/2022 15:31
Analysis Ending Date: 29/07/2022
Sampled Date & Time 21/07/2022 09:53
Sampler(s) Client nominated external sampler

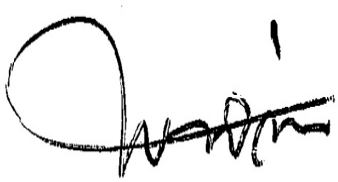
		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.63	(± 0.19) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	77	(± 13) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	15.3	(± 0.77) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	19.7	(± 0.4) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	6.5	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.077	(± 0.008) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.03	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	16.2	(± 1.62) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.388	(± 0.0388) mg/l	0.0005
NW114	**Soluble Mercury**			

		RESULTS	(UNCERTAINTY)	LOQ
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005 mg/l		0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0007	(± 0.0003) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	20.0 mg/l		0.01

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Maria Norris Laboratory Manager, Microbiology

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-026347-01** REPORT DATE **04/08/2022**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
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Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill
Order code: EUNZWE-00048738

SAMPLE CODE **812-2022-00077439**

Sampling Point WIL-D4:Levin D4
Reception Date & Time: 25/07/2022 18:00
Analysis Start Date & Time: 25/07/2022 18:02
Analysis Ending Date: 04/08/2022
Sampled Date & Time 25/07/2022 08:09
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.25	(± 0.08) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	28	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	35.4	(± 1.77) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	29.7	(± 0.6) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	6.9	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	0.32	(± 0.06) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.200	(± 0.0200) mg/l	0.0005
NW114	**Soluble Mercury**			

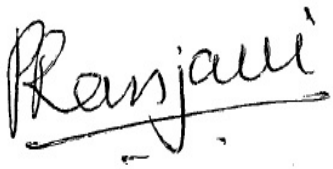
		RESULTS	(UNCERTAINTY)	LOQ
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	33.4	mg/l	0.01

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager



Pathma Ranjanie Senior laboratory Analyst

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END OF REPORT

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025857-01** REPORT DATE **30/07/2022**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill

Order code: EUNZWE-00048370

SAMPLE CODE **812-2022-00076936**

Sampling Point WIL-D6:Levin D6
Reception Date & Time: 22/07/2022 17:31
Analysis Start Date & Time: 22/07/2022 19:17
Analysis Ending Date: 30/07/2022
Sampled Date & Time 21/07/2022 12:02
Sampler(s) Client nominated external sampler

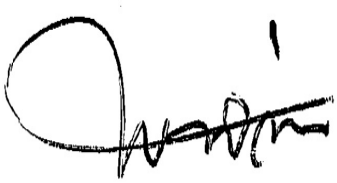
		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.004) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	18.4	(± 0.92) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	39.4	(± 0.8) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	13.9	(± 0.69) mg/l	0.01
NW195	**pH**			
	pH	7.1	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0006	(± 0.0002) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

		RESULTS (UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**		
	Nickel (Ni)	<0.0005 (± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Maria Norris Laboratory Manager, Microbiology

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END OF REPORT

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025412-01** REPORT DATE **28/07/2022**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00047862

SAMPLE CODE **812-2022-00075572**

Sampling Point WIL-E1d:Levin E1d
Reception Date & Time: 20/07/2022 14:13
Analysis Start Date & Time: 20/07/2022 15:13 **Analysis Ending Date:** 28/07/2022
Sampled Date & Time 20/07/2022 07:58 **Sampler(s)** Client nominated external sampler

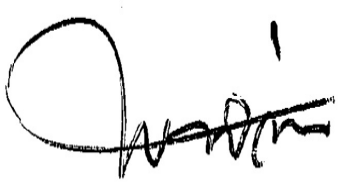
		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.20	(± 0.06) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	19	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	39.1	(± 1.96) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	45.1	(± 0.9) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.5	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	0.02	(± 0.006) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.226	(± 0.0226) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

		RESULTS	(UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	39.6	mg/l	0.01

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Maria Norris Laboratory Manager, Microbiology

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END OF REPORT

Eurofins ELS Limited
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Lower Hutt
Wellington 5010
NEW ZEALAND

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www.eurofins.co.nz

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025855-01** REPORT DATE **30/07/2022**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill

Order code: EUNZWE-00048370

SAMPLE CODE **812-2022-00076934**

Sampling Point WIL-E1s:Levin E1s
Reception Date & Time: 22/07/2022 17:31
Analysis Start Date & Time: 22/07/2022 19:17
Analysis Ending Date: 30/07/2022
Sampled Date & Time 21/07/2022 12:00
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.20	(± 0.06) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	27.1	(± 1.35) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	26.7	(± 0.5) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.2	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.007	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.03	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	5.79	(± 1.16) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	0.0012	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.269	(± 0.0269) mg/l	0.0005
NW114	**Soluble Mercury**			

		RESULTS	(UNCERTAINTY)	LOQ
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	28.5	mg/l	0.01

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

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Sunita Raju Business Unit Manager
Microbiology

EXPLANATORY NOTE

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025856-01** REPORT DATE **30/07/2022**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill

Order code: EUNZWE-00048370

SAMPLE CODE **812-2022-00076935**

Sampling Point WIL-E2d:Levin E2d
Reception Date & Time: 22/07/2022 17:31
Analysis Start Date & Time: 22/07/2022 19:17
Analysis Ending Date: 30/07/2022
Sampled Date & Time 21/07/2022 12:01
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.25	(± 0.08) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	41.6	(± 2.08) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	44.4	(± 0.9) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.6	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.06	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.391	(± 0.0391) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

		RESULTS (UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**		
	Nickel (Ni)	<0.0005 (± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

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Sunita Raju Business Unit Manager
Microbiology

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025854-01** REPORT DATE **30/07/2022**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill

Order code: EUNZWE-00048370

SAMPLE CODE **812-2022-00076933**

Sampling Point WIL-E2s:Levin E2s
Reception Date & Time: 22/07/2022 17:31
Analysis Start Date & Time: 22/07/2022 19:17
Analysis Ending Date: 30/07/2022
Sampled Date & Time 21/07/2022 12:02
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.31	(± 0.09) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	35	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	39.0	(± 1.95) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	33.3	(± 0.7) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.7	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.03	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	0.08	(± 0.02) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.227	(± 0.0227) mg/l	0.0005
NW114	**Soluble Mercury**			

		RESULTS	(UNCERTAINTY)		LOQ
NW114	**Soluble Mercury**				
	Mercury (Hg)	<0.0005		mg/l	0.0005
NW116	**Soluble Nickel**				
	Nickel (Ni)	<0.0005	(± 0.0002)	mg/l	0.0005
NW120	**Soluble Sodium**				
	Sodium (Na)	30.2		mg/l	0.01

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Sunita Raju Business Unit Manager
Microbiology

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025408-01** REPORT DATE **28/07/2022**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00047862

SAMPLE CODE **812-2022-00075543**

Sampling Point WIL-F1:Levin F1
Reception Date & Time: 20/07/2022 14:13
Analysis Start Date & Time: 20/07/2022 14:15 **Analysis Ending Date:** 28/07/2022
Sampled Date & Time 19/07/2022 12:33 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.01	(± 0.005) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	33	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	41.0	(± 2.05) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	41.6	(± 0.8) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.56	(± 0.14) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.04	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0047	(± 0.0010) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005

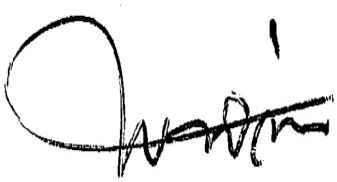
Food & Water Testing

RESULTS (UNCERTAINTY) LOQ

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Maria Norris Laboratory Manager, Microbiology

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ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025411-01** REPORT DATE **28/07/2022**

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P O Box 642
4741 Levin
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Phone (06) 367 2705
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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00047862

SAMPLE CODE **812-2022-00075558**

Sampling Point WIL-F2:Levin F2
Reception Date & Time: 20/07/2022 14:13
Analysis Start Date & Time: 20/07/2022 14:30 **Analysis Ending Date:** 28/07/2022
Sampled Date & Time 19/07/2022 12:33 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.004) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	19	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	22.8	(± 1.14) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	22.2	(± 0.4) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.40	(± 0.10) mg/l	0.01
NW195	**pH**			
	pH	7.1	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.04	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0016	(± 0.0004) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005

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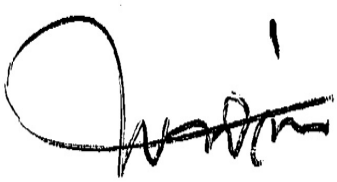
RESULTS (UNCERTAINTY) LOQ

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Maria Norris Laboratory Manager, Microbiology

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ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025410-01** REPORT DATE **28/07/2022**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00047862

SAMPLE CODE **812-2022-00075557**

Sampling Point WIL-F3:Levin F3
Reception Date & Time: 20/07/2022 14:13
Analysis Start Date & Time: 20/07/2022 14:25 **Analysis Ending Date:** 28/07/2022
Sampled Date & Time 19/07/2022 12:33 **Sampler(s)** Client nominated external sampler

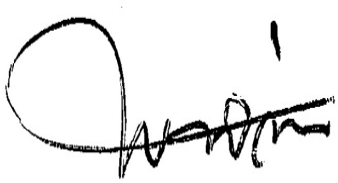
		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.004) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	23.2	(± 1.16) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	21.7	(± 0.4) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.37	(± 0.09) mg/l	0.01
NW195	**pH**			
	pH	7.1	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	<0.01	(± 0.003) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0016	(± 0.0004) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

		RESULTS	(UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	27.0	mg/l	0.01

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Maria Norris Laboratory Manager, Microbiology

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025057-01** REPORT DATE **25/07/2022**

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NEW ZEALAND

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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00047627

SAMPLE CODE **812-2022-00074937**

Sampling Point WIL-G1D:Levin G1D
Reception Date & Time: 19/07/2022 14:57
Analysis Start Date & Time: 19/07/2022 15:00 **Analysis Ending Date:** 25/07/2022
Sampled Date & Time 19/07/2022 08:35 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.10	(± 0.03) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	31.1	(± 1.55) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	27.5	(± 0.6) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.04	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0606	(± 0.0121) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005

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RESULTS (UNCERTAINTY) LOQ

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Sunita Raju Business Unit Manager
Microbiology

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ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025058-01** REPORT DATE **25/07/2022**

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Contact for your orders: Lauren May **Order code:** EUNZWE-00047627

SAMPLE CODE **812-2022-00074964**

Sampling Point WIL-G1S:Levin G1S
Reception Date & Time: 19/07/2022 14:57
Analysis Start Date & Time: 19/07/2022 15:26 **Analysis Ending Date:** 25/07/2022
Sampled Date & Time 19/07/2022 08:36 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.05	(± 0.02) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	90	(± 14) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	63.4	(± 3.17) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	41.4	(± 0.8) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.02	(± 0.005) mg/l	0.01
NW195	**pH**			
	pH	6.8	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.122	(± 0.012) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	2.96	(± 0.59) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	0.0007	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0565	(± 0.0113) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

		RESULTS	(UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0016	(± 0.0005) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	60.8	mg/l	0.01

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Sunita Raju Business Unit Manager
Microbiology

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025409-01** REPORT DATE **28/07/2022**

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Contact for your orders: Lauren May **Order code:** EUNZWE-00047862

SAMPLE CODE **812-2022-00075546**

Sampling Point WIL-G2:Levin G2s
Reception Date & Time: 20/07/2022 14:13
Analysis Start Date & Time: 20/07/2022 14:21 **Analysis Ending Date:** 28/07/2022
Sampled Date & Time 19/07/2022 12:31 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.003) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	38	(± 8) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	249	(± 12.5) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	127	(± 2.5) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.3	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.011	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.69	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0527	(± 0.0105) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0026	(± 0.0008) mg/l	0.0005

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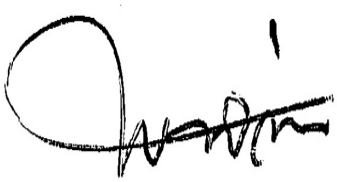
RESULTS (UNCERTAINTY) LOQ

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Maria Norris Laboratory Manager, Microbiology

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REPORT CODE **AR-22-NW-019407-01** REPORT DATE **15/06/2022**

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Contact for your orders: Lauren May **Order code:** EUNZWE-00041007

SAMPLE CODE **812-2022-00054023**

Sampling Point WIL-HS1:Levin HS1
Reception Date & Time: 25/05/2022 15:48
Analysis Start Date & Time: 25/05/2022 16:05 **Analysis Ending Date:** 09/06/2022
Sampled Date & Time 24/05/2022 14:14 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.28	(± 0.08) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	13.7	(± 1.37) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	39	(± 8) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	24.5	(± 1.22) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	24.0	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.032	(± 0.007) mg/l	0.005
NW029	**Hardness**			
	Hardness	64	(± 6) mg CaCO3/l	1
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.070	(± 0.014) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.22	(± 0.72) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.81	(± 0.20) mg/l	0.01
NW195	**pH**			
	pH	7.5	(± 0.2)	0.1
NW469	**Sodium - Dissolved**			
	Sodium (Na)	20.0	(± 2.00) mg/l	0.02

		RESULTS	(UNCERTAINTY)	LOQ
NW098	**Soluble Aluminium**			
	Aluminium	0.048	(± 0.005) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	<0.0005	(± 0.0002) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0343	(± 0.0069) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.83	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	17.4	(± 0.87) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	11	(± 3) mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	55	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	7.2	(± 0.7) mg/l	0.1

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA 4110 B
NW010 **Nitrate-N:** APHA 4110 B
NW011 **Sulphate:** APHA 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 C
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Hardness:** APHA 2340 B
NW098 **Soluble Aluminium:** APHA 3125 B mod.
NW103 **Soluble Boron:** APHA 3125 B mod.
NW104 **Soluble Cadmium:** APHA 3125 B mod.
NW106 **Soluble Chromium:** APHA 3125 B mod.
NW108 **Soluble Copper:** APHA 3125 B mod.
NW110 **Soluble Lead:** APHA 3125 B mod.
NW113 **Soluble Manganese:** APHA 3125 B mod.
NW114 **Soluble Mercury:** APHA 3125 B mod.
NW116 **Soluble Nickel:** APHA 3125 B mod.
NW117 **Soluble Potassium:** APHA 3125 B mod.
NW125 **Soluble Zinc:** APHA 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B

NW206	**Suspended Solids:** APHA Online Edition 2540 D	NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	NW457	**Calcium - Dissolved:** APHA 3120 B mod.
NW460	**Iron - Dissolved:** APHA 3120 B mod.	NW462	**Magnesium - Dissolved:** APHA 3120 B mod.
NW469	**Sodium - Dissolved:** APHA 3120 B mod.	NW583	**Arsenic - Soluble:** APHA 3125 B mod.

Signature

Marylou Cabral Laboratory Manager

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REPORT CODE **AR-22-NW-022156-01** REPORT DATE **05/07/2022**

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Contact for your orders: Lauren May **Order code:** EUNZWE-00044940

SAMPLE CODE **812-2022-00067194**

Sampling Point WIL-HS1:Levin HS1
Reception Date & Time: 29/06/2022 17:21
Analysis Start Date & Time: 29/06/2022 19:16 **Analysis Ending Date:** 05/07/2022
Sampled Date & Time 28/06/2022 11:29 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.05	(± 0.02) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	12.2	(± 1.22) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	33	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	21.7	(± 1.09) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	21.5	(± 0.4) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.019	(± 0.004) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	100	cfu/100 ml	100
NW029	**Hardness**			
	Hardness	55	(± 6) mg CaCO3/l	1
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.098	(± 0.020) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	6.06	(± 0.61) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	2.22	(± 0.22) mg/l	0.01
NW195	**pH**			
	pH	7.6	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
NW469	**Sodium - Dissolved**			
	Sodium (Na)	17.1	(± 1.71) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.032	(± 0.003) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0011	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0166	(± 0.0033) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.02	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.003	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	17.9	(± 0.90) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	6	(± 2) mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	45	(± 5) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	5.9	(± 0.6) mg/l	0.1

LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA 4110 B
NW010	**Nitrate-N:** APHA 4110 B	NW011	**Sulphate:** APHA 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Hardness:** APHA 2340 B	NW098	**Soluble Aluminium:** APHA 3125 B mod.
NW103	**Soluble Boron:** APHA 3125 B mod.	NW104	**Soluble Cadmium:** APHA 3125 B mod.
NW106	**Soluble Chromium:** APHA 3125 B mod.	NW108	**Soluble Copper:** APHA 3125 B mod.
NW110	**Soluble Lead:** APHA 3125 B mod.	NW113	**Soluble Manganese:** APHA 3125 B mod.
NW114	**Soluble Mercury:** APHA 3125 B mod.	NW116	**Soluble Nickel:** APHA 3125 B mod.
NW117	**Soluble Potassium:** APHA 3125 B mod.	NW125	**Soluble Zinc:** APHA 3125 B mod.

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NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B	NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B	NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA 3120 B mod.	NW460	**Iron - Dissolved:** APHA 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA 3120 B mod.	NW469	**Sodium - Dissolved:** APHA 3120 B mod.
NW583	**Arsenic - Soluble:** APHA 3125 B mod.	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Sunita Raju Business Unit Manager
Microbiology

EXPLANATORY NOTE

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N/A means Not applicable
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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-019406-01** REPORT DATE **15/06/2022**

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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00041007

SAMPLE CODE **812-2022-00054022**

Sampling Point WIL-HS1A:Levin HS1A
Reception Date & Time: 25/05/2022 15:48
Analysis Start Date & Time: 25/05/2022 16:05 **Analysis Ending Date:** 09/06/2022
Sampled Date & Time 24/05/2022 13:25 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.25	(± 0.08) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	13.6	(± 1.36) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	31	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	23.6	(± 1.18) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	23.9	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.028	(± 0.006) mg/l	0.005
NW029	**Hardness**			
	Hardness	63	(± 6) mg CaCO3/l	1
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.068	(± 0.014) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.13	(± 0.71) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.78	(± 0.19) mg/l	0.01
NW195	**pH**			
	pH	7.5	(± 0.2)	0.1
NW469	**Sodium - Dissolved**			
	Sodium (Na)	19.9	(± 1.99) mg/l	0.02

		RESULTS	(UNCERTAINTY)	LOQ
NW098	**Soluble Aluminium**			
	Aluminium	0.017	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	<0.0005	(± 0.0002) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0306	(± 0.0061) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.88	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	16.8	(± 0.84) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	11	(± 3) mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	55	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	7.2	(± 0.7) mg/l	0.1

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA 4110 B
NW010 **Nitrate-N:** APHA 4110 B
NW011 **Sulphate:** APHA 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 C
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Hardness:** APHA 2340 B
NW098 **Soluble Aluminium:** APHA 3125 B mod.
NW103 **Soluble Boron:** APHA 3125 B mod.
NW104 **Soluble Cadmium:** APHA 3125 B mod.
NW106 **Soluble Chromium:** APHA 3125 B mod.
NW108 **Soluble Copper:** APHA 3125 B mod.
NW110 **Soluble Lead:** APHA 3125 B mod.
NW113 **Soluble Manganese:** APHA 3125 B mod.
NW114 **Soluble Mercury:** APHA 3125 B mod.
NW116 **Soluble Nickel:** APHA 3125 B mod.
NW117 **Soluble Potassium:** APHA 3125 B mod.
NW125 **Soluble Zinc:** APHA 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B

NW206	**Suspended Solids:** APHA Online Edition 2540 D	NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	NW457	**Calcium - Dissolved:** APHA 3120 B mod.
NW460	**Iron - Dissolved:** APHA 3120 B mod.	NW462	**Magnesium - Dissolved:** APHA 3120 B mod.
NW469	**Sodium - Dissolved:** APHA 3120 B mod.	NW583	**Arsenic - Soluble:** APHA 3125 B mod.

Signature

Marylou Cabral Laboratory Manager

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ANALYTICAL REPORT

REPORT CODE **AR-22-NW-022155-01** REPORT DATE **05/07/2022**

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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00044940

SAMPLE CODE **812-2022-00067193**

Sampling Point WIL-HS1A:Levin HS1A
Reception Date & Time: 29/06/2022 17:21
Analysis Start Date & Time: 29/06/2022 19:16 **Analysis Ending Date:** 05/07/2022
Sampled Date & Time 28/06/2022 11:29 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.04	(± 0.01) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	12.2	(± 1.22) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	34	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	22.4	(± 1.12) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	21.5	(± 0.4) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.016	(± 0.004) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	100	cfu/100 ml	100
NW029	**Hardness**			
	Hardness	55	(± 6) mg CaCO3/l	1
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.072	(± 0.015) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	6.05	(± 0.60) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	2.29	(± 0.23) mg/l	0.01
NW195	**pH**			
	pH	7.4	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
NW469	**Sodium - Dissolved**			
	Sodium (Na)	17.1	(± 1.71) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.019	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0011	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0162	(± 0.0033) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.13	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.003	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	18.5	(± 0.92) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	6	(± 2) mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	43	(± 4) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	6.1	(± 0.6) mg/l	0.1

LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA 4110 B
NW010	**Nitrate-N:** APHA 4110 B	NW011	**Sulphate:** APHA 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Hardness:** APHA 2340 B	NW098	**Soluble Aluminium:** APHA 3125 B mod.
NW103	**Soluble Boron:** APHA 3125 B mod.	NW104	**Soluble Cadmium:** APHA 3125 B mod.
NW106	**Soluble Chromium:** APHA 3125 B mod.	NW108	**Soluble Copper:** APHA 3125 B mod.
NW110	**Soluble Lead:** APHA 3125 B mod.	NW113	**Soluble Manganese:** APHA 3125 B mod.
NW114	**Soluble Mercury:** APHA 3125 B mod.	NW116	**Soluble Nickel:** APHA 3125 B mod.
NW117	**Soluble Potassium:** APHA 3125 B mod.	NW125	**Soluble Zinc:** APHA 3125 B mod.

NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B	NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B	NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA 3120 B mod.	NW460	**Iron - Dissolved:** APHA 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA 3120 B mod.	NW469	**Sodium - Dissolved:** APHA 3120 B mod.
NW583	**Arsenic - Soluble:** APHA 3125 B mod.	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Sunita Raju Business Unit Manager
Microbiology

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-019404-01** REPORT DATE **15/06/2022**

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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00041007

SAMPLE CODE **812-2022-00054011**

Sampling Point WIL-HS2:Levin HS2
Reception Date & Time: 25/05/2022 15:48
Analysis Start Date & Time: 25/05/2022 15:52 **Analysis Ending Date:** 09/06/2022
Sampled Date & Time 24/05/2022 13:09 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.26	(± 0.08) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	13.9	(± 1.39) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	51	(± 9) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	23.9	(± 1.19) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	24.2	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.030	(± 0.006) mg/l	0.005
NW029	**Hardness**			
	Hardness	65	(± 6) mg CaCO3/l	1
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.075	(± 0.015) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.28	(± 0.73) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.79	(± 0.20) mg/l	0.01
NW195	**pH**			
	pH	7.4	(± 0.2)	0.1
NW469	**Sodium - Dissolved**			
	Sodium (Na)	20.3	(± 2.03) mg/l	0.02

		RESULTS	(UNCERTAINTY)	LOQ
NW098	**Soluble Aluminium**			
	Aluminium	0.021	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0005	(± 0.0002) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0382	(± 0.0076) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.91	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.003	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	16.8	(± 0.84) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	9	(± 3) mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	56	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	7.1	(± 0.7) mg/l	0.1

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA 4110 B
NW010 **Nitrate-N:** APHA 4110 B
NW011 **Sulphate:** APHA 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 C
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Hardness:** APHA 2340 B
NW098 **Soluble Aluminium:** APHA 3125 B mod.
NW103 **Soluble Boron:** APHA 3125 B mod.
NW104 **Soluble Cadmium:** APHA 3125 B mod.
NW106 **Soluble Chromium:** APHA 3125 B mod.
NW108 **Soluble Copper:** APHA 3125 B mod.
NW110 **Soluble Lead:** APHA 3125 B mod.
NW113 **Soluble Manganese:** APHA 3125 B mod.
NW114 **Soluble Mercury:** APHA 3125 B mod.
NW116 **Soluble Nickel:** APHA 3125 B mod.
NW117 **Soluble Potassium:** APHA 3125 B mod.
NW125 **Soluble Zinc:** APHA 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B

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NW206	**Suspended Solids:** APHA Online Edition 2540 D	NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	NW457	**Calcium - Dissolved:** APHA 3120 B mod.
NW460	**Iron - Dissolved:** APHA 3120 B mod.	NW462	**Magnesium - Dissolved:** APHA 3120 B mod.
NW469	**Sodium - Dissolved:** APHA 3120 B mod.	NW583	**Arsenic - Soluble:** APHA 3125 B mod.

Signature

Marylou Cabral Laboratory Manager

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END OF REPORT

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ANALYTICAL REPORT

REPORT CODE **AR-22-NW-022154-01** REPORT DATE **05/07/2022**

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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00044940

SAMPLE CODE **812-2022-00067190**

Sampling Point WIL-HS2:Levin HS2
Reception Date & Time: 29/06/2022 17:21
Analysis Start Date & Time: 29/06/2022 19:16 **Analysis Ending Date:** 05/07/2022
Sampled Date & Time 28/06/2022 09:30 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.07	(± 0.02) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	12.5	(± 1.25) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	26	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	22.5	(± 1.13) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	21.7	(± 0.4) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.024	(± 0.005) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW029	**Hardness**			
	Hardness	57	(± 6) mg CaCO3/l	1
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.105	(± 0.021) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	6.21	(± 0.62) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	2.27	(± 0.23) mg/l	0.01
NW195	**pH**			
	pH	7.4	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
NW469	**Sodium - Dissolved**			
	Sodium (Na)	17.5	(± 1.75) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.033	(± 0.003) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0009	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0152	(± 0.0030) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.15	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	18.4	(± 0.92) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	33	(± 8) mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	44	(± 4) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	5.6	(± 0.6) mg/l	0.1

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA 4110 B
NW010 **Nitrate-N:** APHA 4110 B
NW011 **Sulphate:** APHA 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Hardness:** APHA 2340 B
NW098 **Soluble Aluminium:** APHA 3125 B mod.
NW103 **Soluble Boron:** APHA 3125 B mod.
NW104 **Soluble Cadmium:** APHA 3125 B mod.
NW106 **Soluble Chromium:** APHA 3125 B mod.
NW108 **Soluble Copper:** APHA 3125 B mod.
NW110 **Soluble Lead:** APHA 3125 B mod.
NW113 **Soluble Manganese:** APHA 3125 B mod.
NW114 **Soluble Mercury:** APHA 3125 B mod.
NW116 **Soluble Nickel:** APHA 3125 B mod.
NW117 **Soluble Potassium:** APHA 3125 B mod.
NW125 **Soluble Zinc:** APHA 3125 B mod.

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NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B	NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B	NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA 3120 B mod.	NW460	**Iron - Dissolved:** APHA 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA 3120 B mod.	NW469	**Sodium - Dissolved:** APHA 3120 B mod.
NW583	**Arsenic - Soluble:** APHA 3125 B mod.	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Sunita Raju Business Unit Manager
Microbiology

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-019405-01** REPORT DATE **15/06/2022**

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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00041007

SAMPLE CODE **812-2022-00054021**

Sampling Point WIL-HS3:Levin HS3
Reception Date & Time: 25/05/2022 15:48
Analysis Start Date & Time: 25/05/2022 16:05 **Analysis Ending Date:** 09/06/2022
Sampled Date & Time 24/05/2022 13:24 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.27	(± 0.08) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	15.0	(± 1.50) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	38	(± 8) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	24.1	(± 1.21) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	24.3	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.030	(± 0.006) mg/l	0.005
NW029	**Hardness**			
	Hardness	70	(± 7) mg CaCO3/l	1
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.078	(± 0.016) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.90	(± 0.79) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.80	(± 0.20) mg/l	0.01
NW195	**pH**			
	pH	7.6	(± 0.2)	0.1
NW469	**Sodium - Dissolved**			
	Sodium (Na)	21.8	(± 2.18) mg/l	0.02

		RESULTS	(UNCERTAINTY)	LOQ
NW098	**Soluble Aluminium**			
	Aluminium	0.018	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.06	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	<0.0005	(± 0.0002) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0349	(± 0.0070) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	4.27	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	16.8	(± 0.84) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	8	(± 2) mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	56	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	7.2	(± 0.7) mg/l	0.1

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA 4110 B
NW010 **Nitrate-N:** APHA 4110 B
NW011 **Sulphate:** APHA 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 C
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Hardness:** APHA 2340 B
NW098 **Soluble Aluminium:** APHA 3125 B mod.
NW103 **Soluble Boron:** APHA 3125 B mod.
NW104 **Soluble Cadmium:** APHA 3125 B mod.
NW106 **Soluble Chromium:** APHA 3125 B mod.
NW108 **Soluble Copper:** APHA 3125 B mod.
NW110 **Soluble Lead:** APHA 3125 B mod.
NW113 **Soluble Manganese:** APHA 3125 B mod.
NW114 **Soluble Mercury:** APHA 3125 B mod.
NW116 **Soluble Nickel:** APHA 3125 B mod.
NW117 **Soluble Potassium:** APHA 3125 B mod.
NW125 **Soluble Zinc:** APHA 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B

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NW206	**Suspended Solids:** APHA Online Edition 2540 D	NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	NW457	**Calcium - Dissolved:** APHA 3120 B mod.
NW460	**Iron - Dissolved:** APHA 3120 B mod.	NW462	**Magnesium - Dissolved:** APHA 3120 B mod.
NW469	**Sodium - Dissolved:** APHA 3120 B mod.	NW583	**Arsenic - Soluble:** APHA 3125 B mod.

Signature

Marylou Cabral Laboratory Manager

EXPLANATORY NOTE

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Not Detected means not detected at or above the Limit of Quantification (LOQ)
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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-022157-01** REPORT DATE **05/07/2022**

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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00044940

SAMPLE CODE **812-2022-00067197**

Sampling Point WIL-HS3:Levin HS3
Reception Date & Time: 29/06/2022 17:21
Analysis Start Date & Time: 29/06/2022 19:16 **Analysis Ending Date:** 05/07/2022
Sampled Date & Time 28/06/2022 11:29 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.09	(± 0.03) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	12.4	(± 1.24) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	31	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	22.9	(± 1.14) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	22.0	(± 0.4) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.019	(± 0.004) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	200	cfu/100 ml	100
NW029	**Hardness**			
	Hardness	57	(± 6) mg CaCO3/l	1
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.108	(± 0.022) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	6.24	(± 0.62) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	2.27	(± 0.23) mg/l	0.01
NW195	**pH**			
	pH	7.6	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
NW469	**Sodium - Dissolved**			
	Sodium (Na)	17.3	(± 1.73) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.029	(± 0.003) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0013	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0209	(± 0.0042) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0007	(± 0.0003) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.31	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.004	(± 0.0008) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	18.2	(± 0.91) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	6	(± 2) mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	45	(± 4) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	5.7	(± 0.6) mg/l	0.1

LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA 4110 B
NW010	**Nitrate-N:** APHA 4110 B	NW011	**Sulphate:** APHA 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Hardness:** APHA 2340 B	NW098	**Soluble Aluminium:** APHA 3125 B mod.
NW103	**Soluble Boron:** APHA 3125 B mod.	NW104	**Soluble Cadmium:** APHA 3125 B mod.
NW106	**Soluble Chromium:** APHA 3125 B mod.	NW108	**Soluble Copper:** APHA 3125 B mod.
NW110	**Soluble Lead:** APHA 3125 B mod.	NW113	**Soluble Manganese:** APHA 3125 B mod.
NW114	**Soluble Mercury:** APHA 3125 B mod.	NW116	**Soluble Nickel:** APHA 3125 B mod.
NW117	**Soluble Potassium:** APHA 3125 B mod.	NW125	**Soluble Zinc:** APHA 3125 B mod.

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NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B	NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B	NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA 3120 B mod.	NW460	**Iron - Dissolved:** APHA 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA 3120 B mod.	NW469	**Sodium - Dissolved:** APHA 3120 B mod.
NW583	**Arsenic - Soluble:** APHA 3125 B mod.	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Sunita Raju Business Unit Manager
Microbiology

EXPLANATORY NOTE

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REPORT CODE **AR-22-NW-026396-01** REPORT DATE **04/08/2022**

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Contact for your orders: Lauren May
Contract: Landfill

Order code: EUNZWE-00049183

SAMPLE CODE **812-2022-00078442**

Sampling Point WIL-LP:Levin Leachate Pond
Reception Date & Time: 27/07/2022 18:31
Analysis Start Date & Time: 27/07/2022 18:35
Analysis Ending Date: 04/08/2022
Sampled Date & Time 27/07/2022 07:30
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	1830	(± 180) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	130	(± 19) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	5180	(± 260) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	1310	(± 70.0) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	1770	(± 40.0) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<1.00	(± 0.10) mg/l	0.01
NW195	**pH**			
	pH	7.6	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.977	(± 0.098) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	7.25	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0050	(± 0.0005) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	1.38	(± 0.138) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

		RESULTS (UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**		
	Nickel (Ni)	0.137 (± 0.0137) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Maria Norris Laboratory Manager, Microbiology

Amit Kumar Assistant Manager

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ANALYTICAL REPORT

REPORT CODE **AR-22-NW-019403-01** REPORT DATE **15/06/2022**

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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00041007

SAMPLE CODE **812-2022-00054010**

Sampling Point WIL-TD1:Levin TD1
Reception Date & Time: 25/05/2022 15:48
Analysis Start Date & Time: 25/05/2022 15:52 **Analysis Ending Date:** 09/06/2022
Sampled Date & Time 24/05/2022 14:04 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.76	(± 0.23) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	22.2	(± 2.22) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	275	(± 28) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	24.6	(± 1.23) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	30.4	(± 0.6) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.013	(± 0.003) mg/l	0.005
NW029	**Hardness**			
	Hardness	86	(± 9) mg CaCO3/l	1
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.692	(± 0.138) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.46	(± 0.75) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.004) mg/l	0.01
NW195	**pH**			
	pH	6.6	(± 0.2)	0.1
NW469	**Sodium - Dissolved**			
	Sodium (Na)	21.8	(± 2.18) mg/l	0.02

		RESULTS	(UNCERTAINTY)	LOQ
NW098	**Soluble Aluminium**			
	Aluminium	0.049	(± 0.005) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.04	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0006	(± 0.0002) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.337	(± 0.0337) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0006	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	7.34	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.003	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	2.59	(± 0.26) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	2190	(± 70) mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	98	(± 10) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	50.6	(± 5.1) mg/l	0.1

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA 4110 B
NW010 **Nitrate-N:** APHA 4110 B
NW011 **Sulphate:** APHA 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 C
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Hardness:** APHA 2340 B
NW098 **Soluble Aluminium:** APHA 3125 B mod.
NW103 **Soluble Boron:** APHA 3125 B mod.
NW104 **Soluble Cadmium:** APHA 3125 B mod.
NW106 **Soluble Chromium:** APHA 3125 B mod.
NW108 **Soluble Copper:** APHA 3125 B mod.
NW110 **Soluble Lead:** APHA 3125 B mod.
NW113 **Soluble Manganese:** APHA 3125 B mod.
NW114 **Soluble Mercury:** APHA 3125 B mod.
NW116 **Soluble Nickel:** APHA 3125 B mod.
NW117 **Soluble Potassium:** APHA 3125 B mod.
NW125 **Soluble Zinc:** APHA 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B

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NW206	**Suspended Solids:** APHA Online Edition 2540 D	NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	NW457	**Calcium - Dissolved:** APHA 3120 B mod.
NW460	**Iron - Dissolved:** APHA 3120 B mod.	NW462	**Magnesium - Dissolved:** APHA 3120 B mod.
NW469	**Sodium - Dissolved:** APHA 3120 B mod.	NW583	**Arsenic - Soluble:** APHA 3125 B mod.

Signature

Marylou Cabral Laboratory Manager

EXPLANATORY NOTE

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N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

END OF REPORT

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-022153-01** REPORT DATE **05/07/2022**

Attention Downer EDI Levin
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May **Order code:** EUNZWE-00044940

SAMPLE CODE **812-2022-00067178**

Sampling Point WIL-TD1:Levin TD1
Reception Date & Time: 29/06/2022 17:21
Analysis Start Date & Time: 29/06/2022 19:16 **Analysis Ending Date:** 05/07/2022
Sampled Date & Time 28/06/2022 11:29 **Sampler(s)** Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.18	(± 0.05) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	12.9	(± 1.29) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	107	(± 12) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	43.3	(± 2.17) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	30.2	(± 0.6) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.034	(± 0.007) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW029	**Hardness**			
	Hardness	67	(± 7) mg CaCO3/l	1
NW460	**Iron - Dissolved**			
	Iron (Fe)	1.33	(± 0.133) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	8.50	(± 0.85) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	1.51	(± 0.15) mg/l	0.01
NW195	**pH**			
	pH	7.1	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
NW469	**Sodium - Dissolved**			
	Sodium (Na)	30.4	(± 3.04) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.071	(± 0.007) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0004) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0007	(± 0.0002) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.231	(± 0.0231) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0007	(± 0.0003) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	7.16	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.003	(± 0.0008) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	7.13	(± 0.71) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	43	(± 10) mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	62	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	25.1	(± 2.5) mg/l	0.1

LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA 4110 B
NW010	**Nitrate-N:** APHA 4110 B	NW011	**Sulphate:** APHA 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Hardness:** APHA 2340 B	NW098	**Soluble Aluminium:** APHA 3125 B mod.
NW103	**Soluble Boron:** APHA 3125 B mod.	NW104	**Soluble Cadmium:** APHA 3125 B mod.
NW106	**Soluble Chromium:** APHA 3125 B mod.	NW108	**Soluble Copper:** APHA 3125 B mod.
NW110	**Soluble Lead:** APHA 3125 B mod.	NW113	**Soluble Manganese:** APHA 3125 B mod.
NW114	**Soluble Mercury:** APHA 3125 B mod.	NW116	**Soluble Nickel:** APHA 3125 B mod.
NW117	**Soluble Potassium:** APHA 3125 B mod.	NW125	**Soluble Zinc:** APHA 3125 B mod.

NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B	NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B	NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA 3120 B mod.	NW460	**Iron - Dissolved:** APHA 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA 3120 B mod.	NW469	**Sodium - Dissolved:** APHA 3120 B mod.
NW583	**Arsenic - Soluble:** APHA 3125 B mod.	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Sunita Raju Business Unit Manager
Microbiology

EXPLANATORY NOTE

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N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

END OF REPORT

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ANALYTICAL REPORT

REPORT CODE **AR-22-NW-029451-01** REPORT DATE **25/08/2022**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill
Order code: EUNZWE-00049183

SAMPLE CODE **812-2022-00078443**

Sampling Point WIL-TD1:Levin TD1
Reception Date & Time: 27/07/2022 18:31
Analysis Start Date & Time: 27/07/2022 18:35
Analysis Ending Date: 25/08/2022
Sampled Date & Time 27/07/2022 09:31
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	1.85	(± 0.28) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	19.2	(± 1.92) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	74	(± 12) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	43.4	(± 2.17) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	38.2	(± 0.8) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.020	(± 0.004) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW029	**Hardness**			
	Hardness	95	(± 9) mg CaCO3/l	1
NW460	**Iron - Dissolved**			
	Iron (Fe)	2.11	(± 0.211) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	11.4	(± 1.14) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	1.59	(± 0.16) mg/l	0.01
NW195	**pH**			

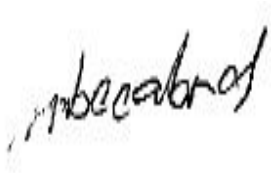
		RESULTS	(UNCERTAINTY)	LOQ
NW195	**pH**			
	pH	7.4	(± 0.2)	0.1
③**VQ088**	**Phenolics (Total)**			
	Total phenols	<0.05	ml/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	34.6	(± 3.46) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.033	(± 0.003) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.14	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0004) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0009	(± 0.0002) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0292	(± 0.0058) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0009	(± 0.0003) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	12.4	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.005	(± 0.0008) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	4.39	(± 0.44) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	<4	(± 1) mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	109	(± 11) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	18.1	(± 1.8) mg/l	0.1
③**VQ876**	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5
	Isovaleric acid	<5	mg/l	5

	RESULTS	(UNCERTAINTY)	LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

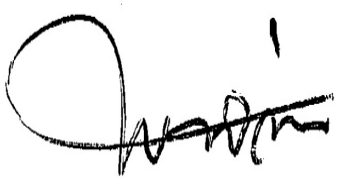
NW003	**Total Alkalinity:** APHA Online Edition 2320 B
NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Hardness:** APHA Online Edition 2340 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW104	**Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108	**Soluble Copper:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117	**Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125	**Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B
NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460	**Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469	**Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583	**Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088	**Phenolics (Total):** APHA 5530
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



Marylou Cabral Laboratory Manager

Amitesh Kumar Supervisor



Maria Norris Laboratory Manager, Microbiology

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END OF REPORT

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-027019-01** REPORT DATE **08/08/2022**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill

Order code: EUNZWE-00049627

SAMPLE CODE **812-2022-00079452**

Sampling Point WIL-Xd1:Levin Xd1
Reception Date & Time: 29/07/2022 17:26
Analysis Start Date & Time: 29/07/2022 17:29
Analysis Ending Date: 08/08/2022
Sampled Date & Time 28/07/2022 08:59
Sampler(s) Client nominated external sampler

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.41	(± 0.12) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	57.9	(± 2.90) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	53.6	(± 1.1) mS/m	0.1
ZM0UY	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	8	cfu/100 ml	4
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.5	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.472	(± 0.0472) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

		RESULTS	(UNCERTAINTY)	LOQ
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM0UY	**Escherichia coli E (Water) [NZ] <4 >240 /100 ml (0) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Amit Kumar Assistant Manager

Marylou Cabral Laboratory Manager

Sunita Raju Business Unit Manager Microbiology

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END OF REPORT

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025782-01** REPORT DATE **29/07/2022**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
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NEW ZEALAND

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Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill

Order code: EUNZWE-00048370

SAMPLE CODE **812-2022-00076855**

Sampling Point WIL-Xs1:Levin Xs1
Reception Date & Time: 22/07/2022 17:31
Analysis Start Date & Time: 22/07/2022 17:39
Analysis Ending Date: 29/07/2022

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	9.84	(± 1.48) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	77	(± 13) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	39.7	(± 1.99) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	76.9	(± 1.5) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.01	(± 0.005) mg/l	0.01
NW195	**pH**			
	pH	6.6	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.009	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.09	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	1.43	(± 0.143) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0006	(± 0.0003) mg/l	0.0005

Food & Water Testing

RESULTS (UNCERTAINTY) LOQ

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Sunita Raju Business Unit Manager
Microbiology

EXPLANATORY NOTE

① Test is not accredited
② Test is subcontracted within Eurofins group and is accredited
③ Test is subcontracted within Eurofins group and is not accredited
④ Test is subcontracted outside Eurofins group and is accredited
⑤ Test is subcontracted outside Eurofins group and is not accredited
⑥ Test result is provided by the customer and is not accredited
⑦ Tested in the field by Eurofins and is not accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

END OF REPORT

eurofins

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-22-NW-025783-01** REPORT DATE **29/07/2022**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Ryanh (RyanH@horowhenua.govt.nz), Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Lauren May
Contract: Landfill

Order code: EUNZWE-00048370

SAMPLE CODE **812-2022-00076856**

Sampling Point WIL-Xs2:Levin Xs2
Reception Date & Time: 22/07/2022 17:31
Analysis Start Date & Time: 22/07/2022 17:39
Analysis Ending Date: 29/07/2022

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.004) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	11.3	(± 0.57) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	16.6	(± 0.3) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.05	(± 0.11) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.007	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0133	(± 0.0027) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005

Food & Water Testing

RESULTS (UNCERTAINTY) LOQ

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Sunita Raju Business Unit Manager
Microbiology

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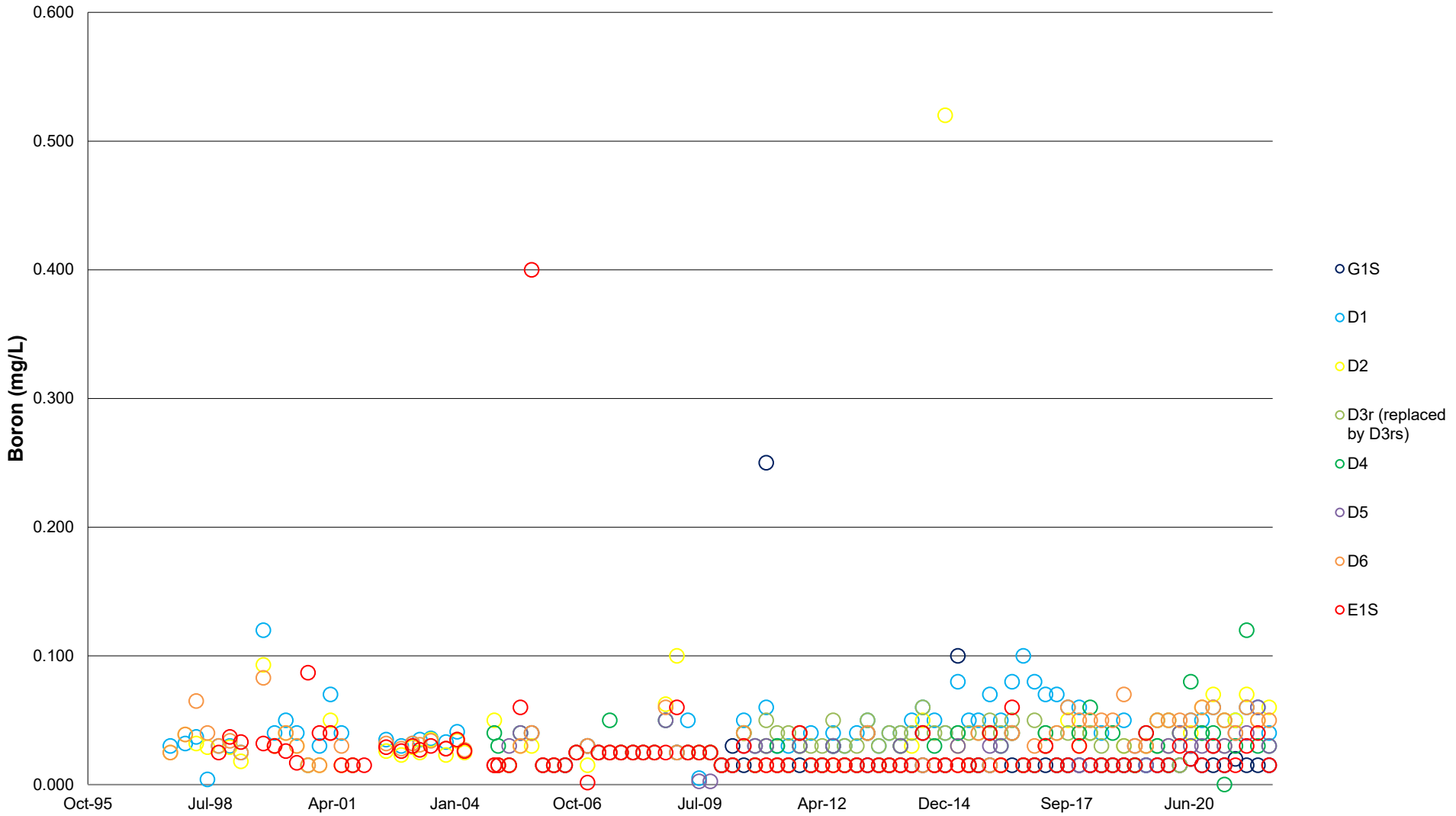
⑥ Test result is provided by the customer and is not accredited
⑦ Tested in the field by Eurofins and is not accredited

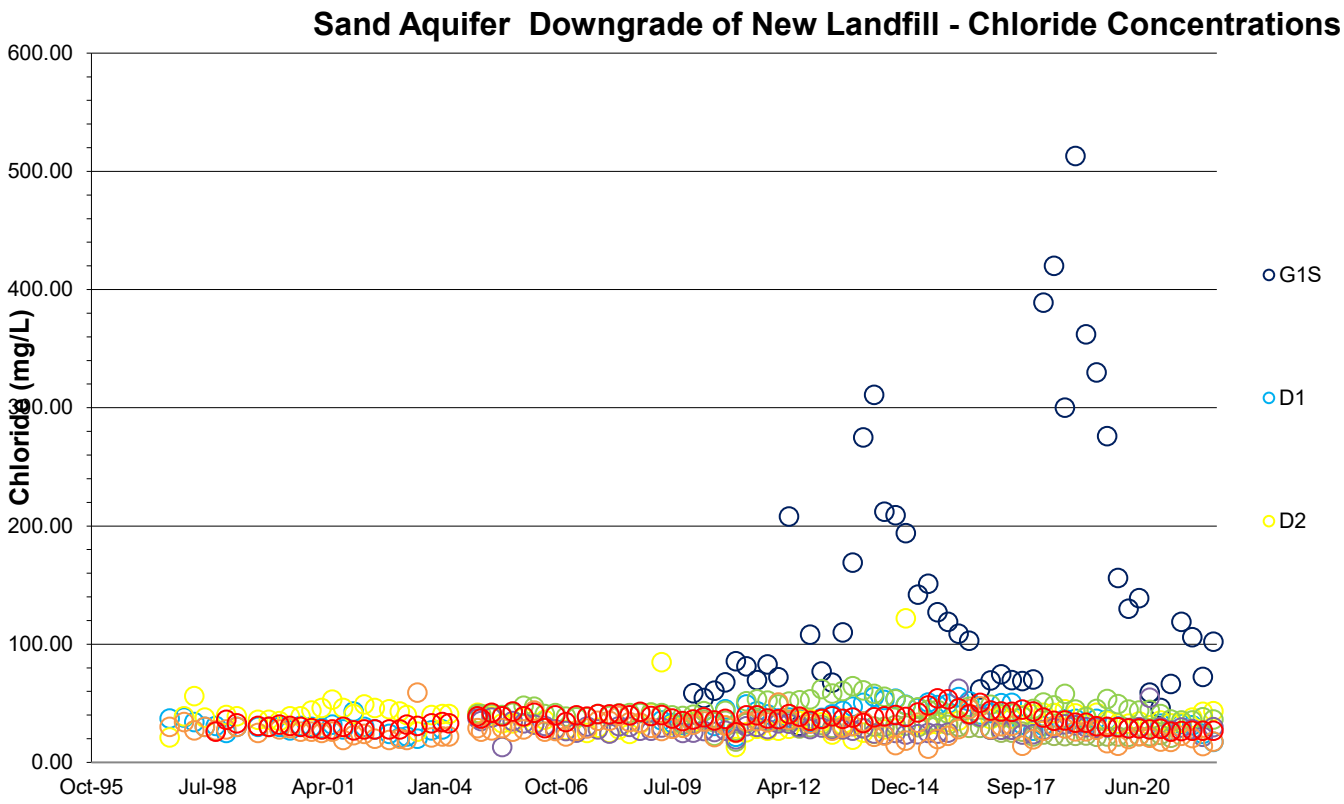
N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

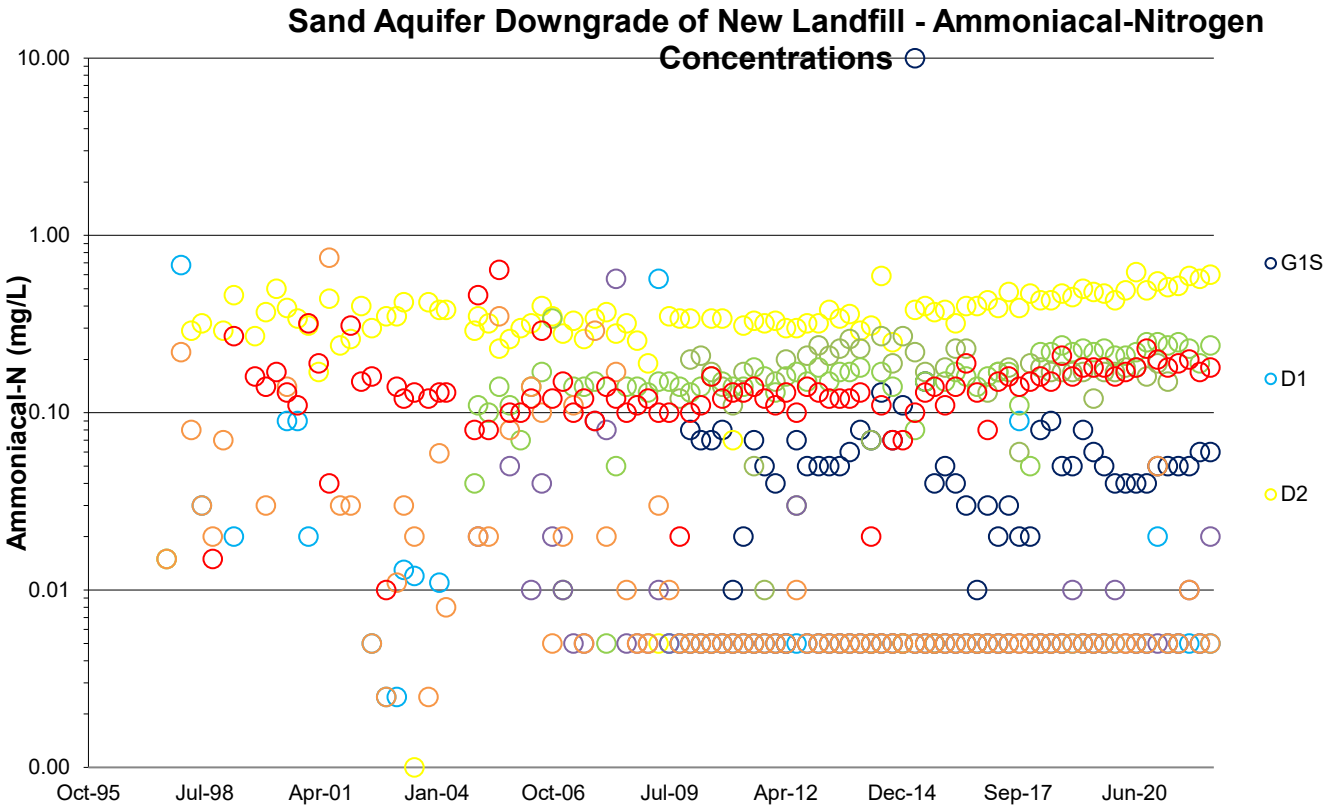
END OF REPORT

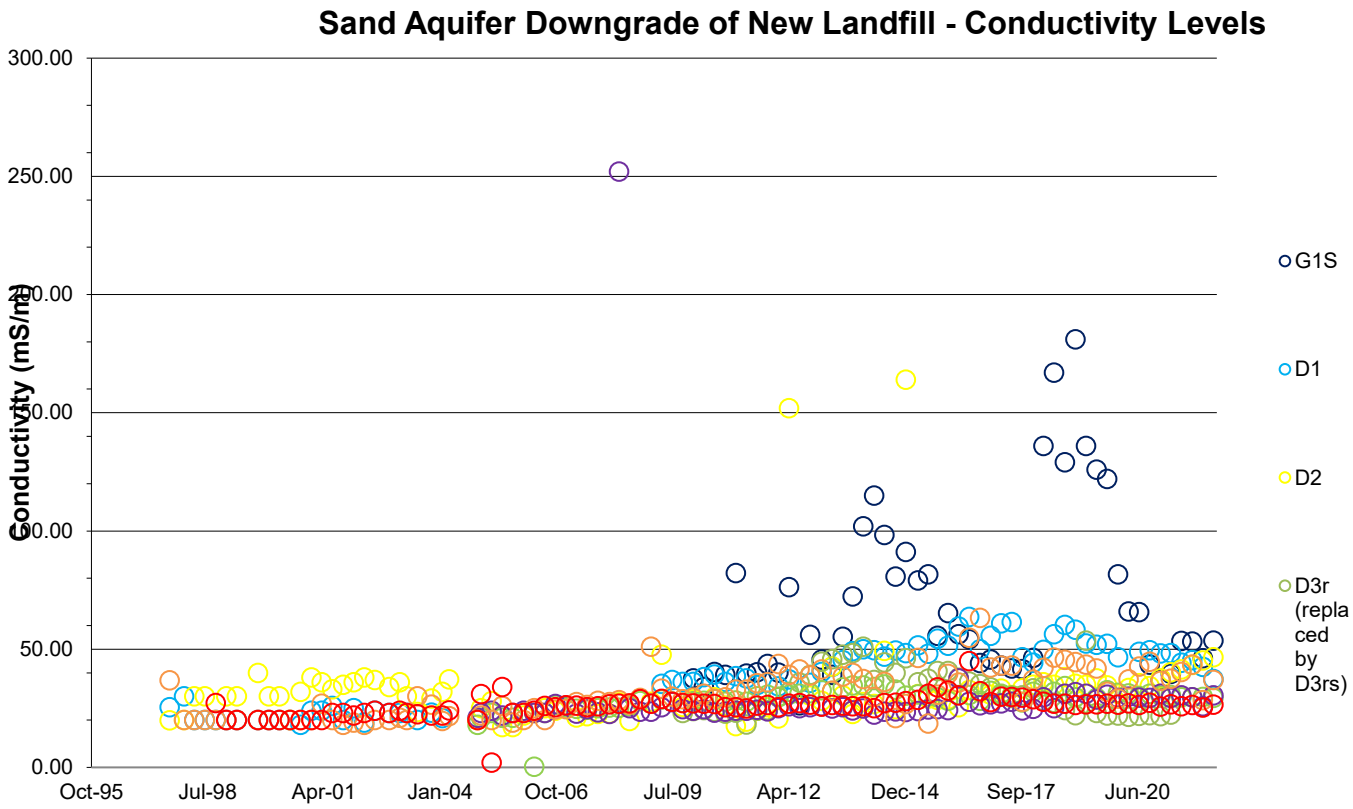
Appendix D Historical Results Graphs

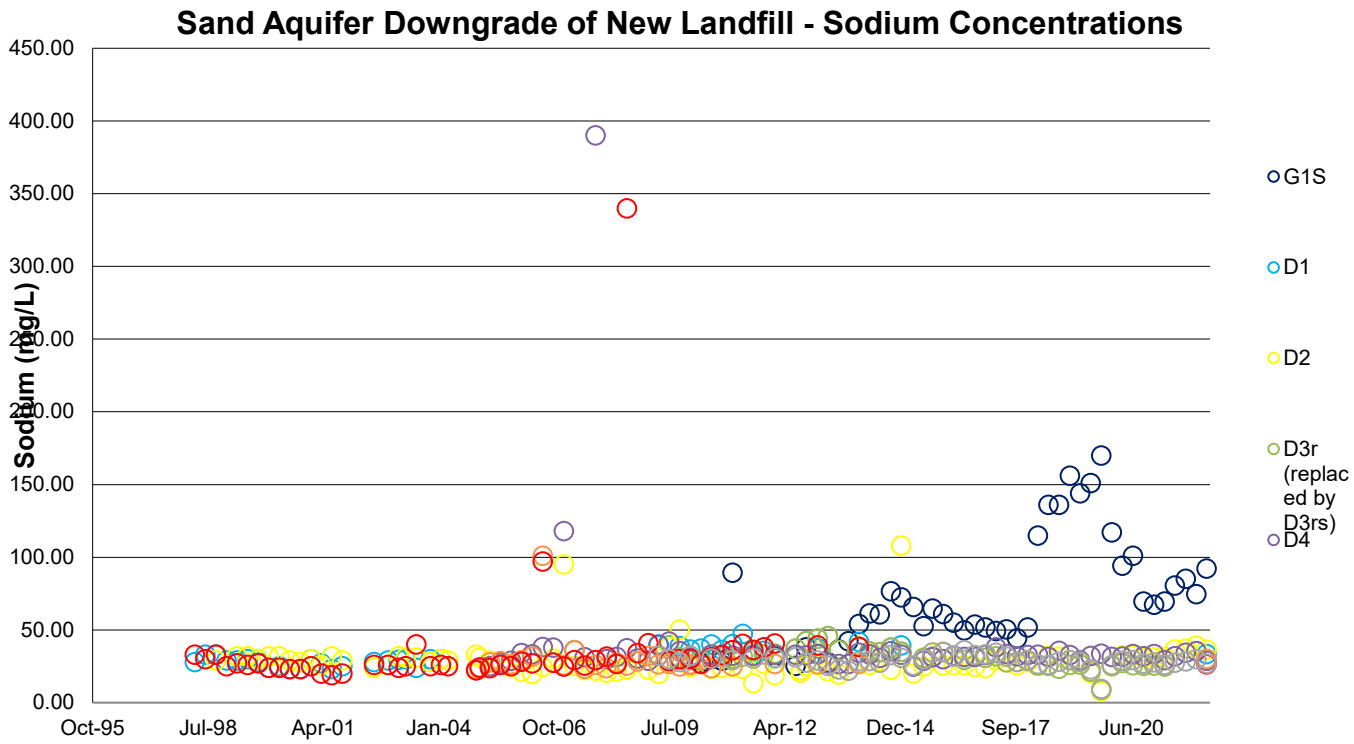
Sand Aquifer Downgrade of New Landfill - Boron Concentrations

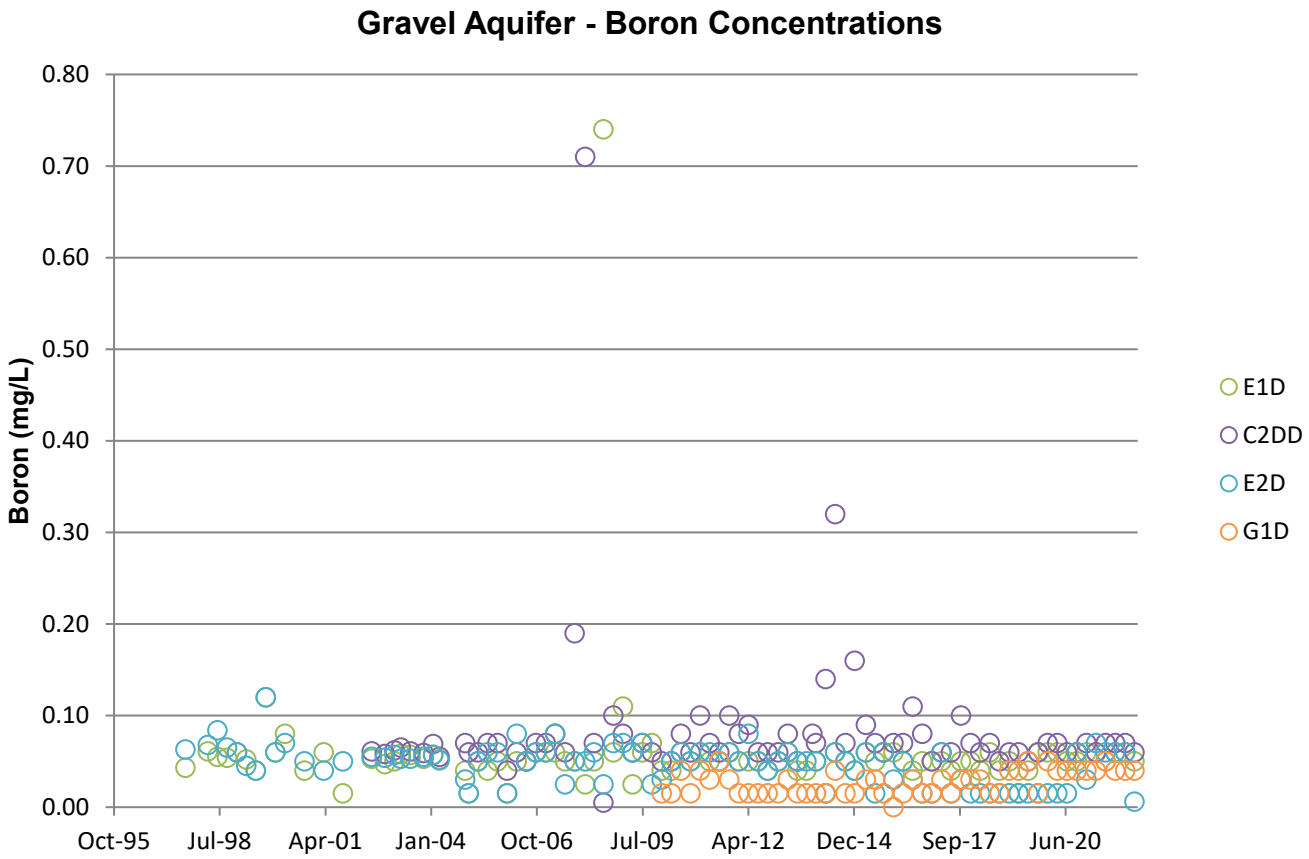


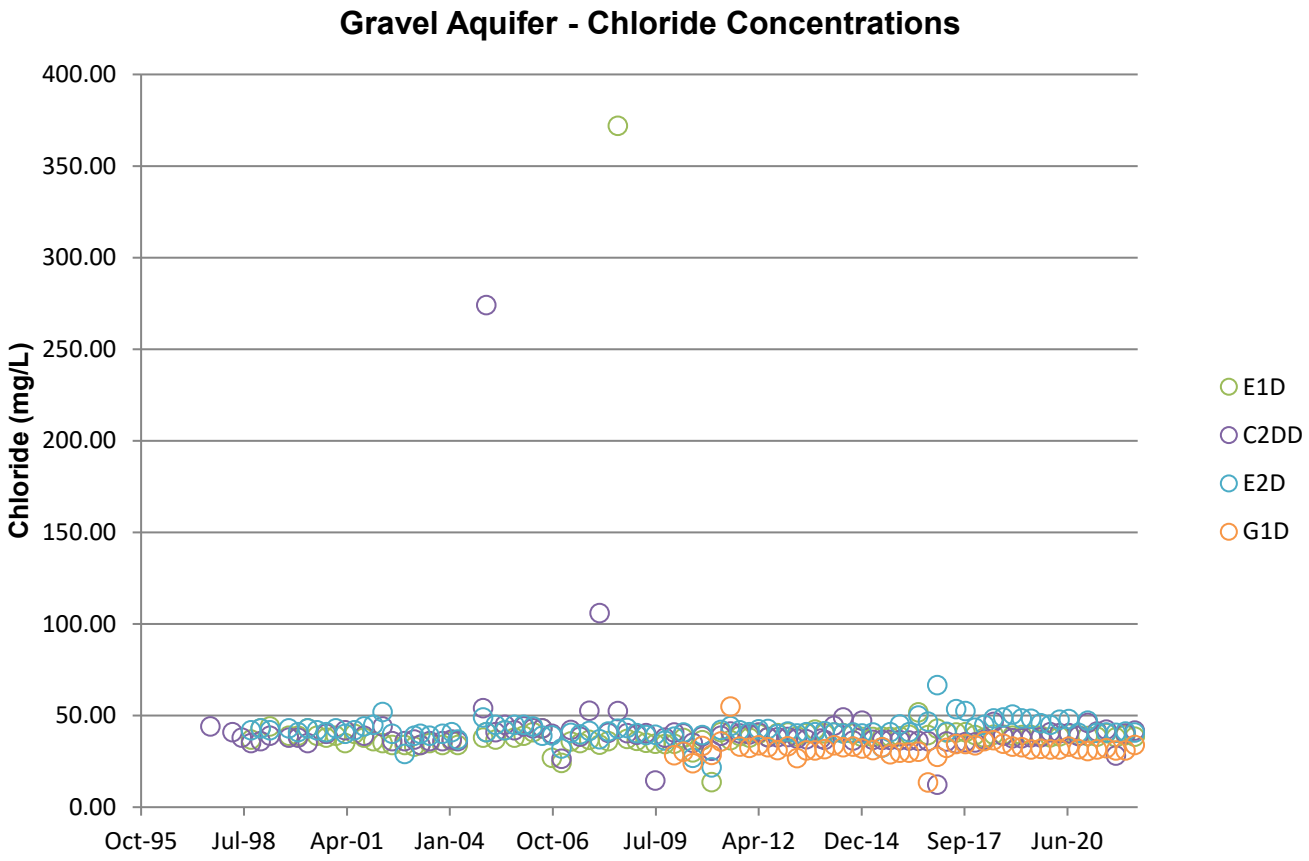

Sand Aquifer Downgrade of New Landfill - Chloride Concentrations
Chloride (mg/L)
600.00
500.00
400.00
300.00
200.00
100.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
G1S
D1
D2

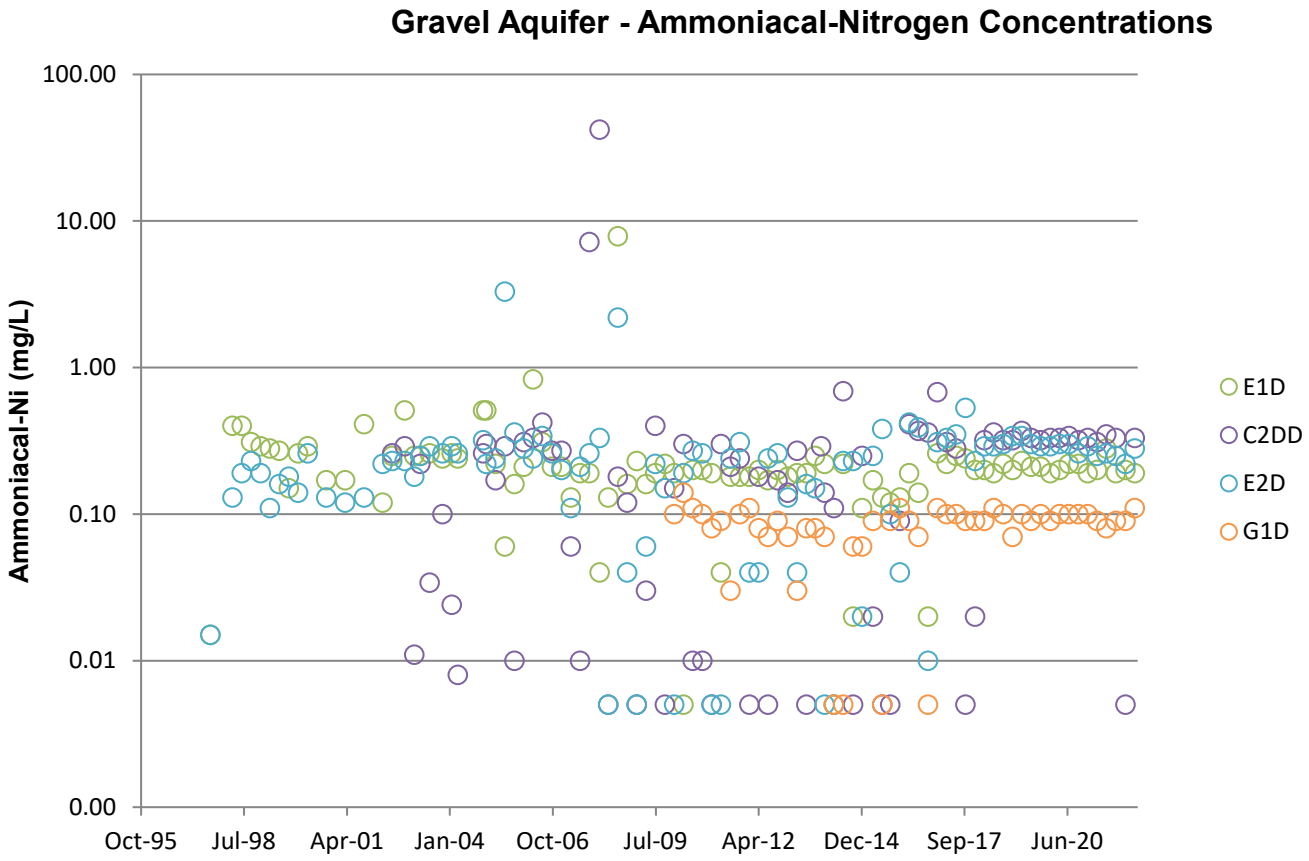

Sand Aquifer Downgrade of New Landfill - Ammoniacal-Nitrogen Concentrations
Ammoniacal-N (mg/L)
10.00
1.00
0.10
0.01
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
G1S
D1
D2

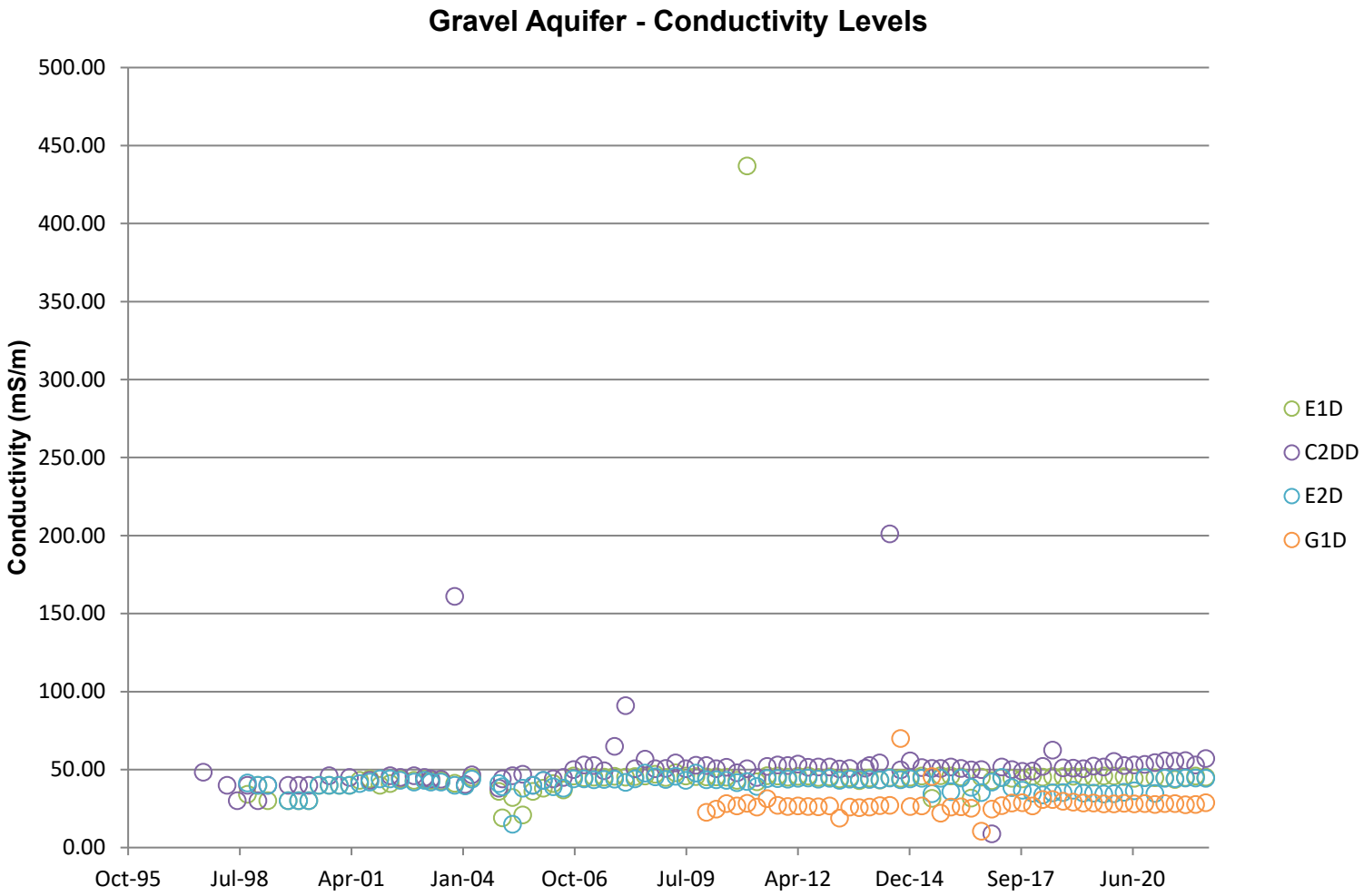

Sand Aquifer Downgrade of New Landfill - Conductivity Levels
Conductivity (mS/m)
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
G1S
D1
D2
D3r (replaced by D3rs)

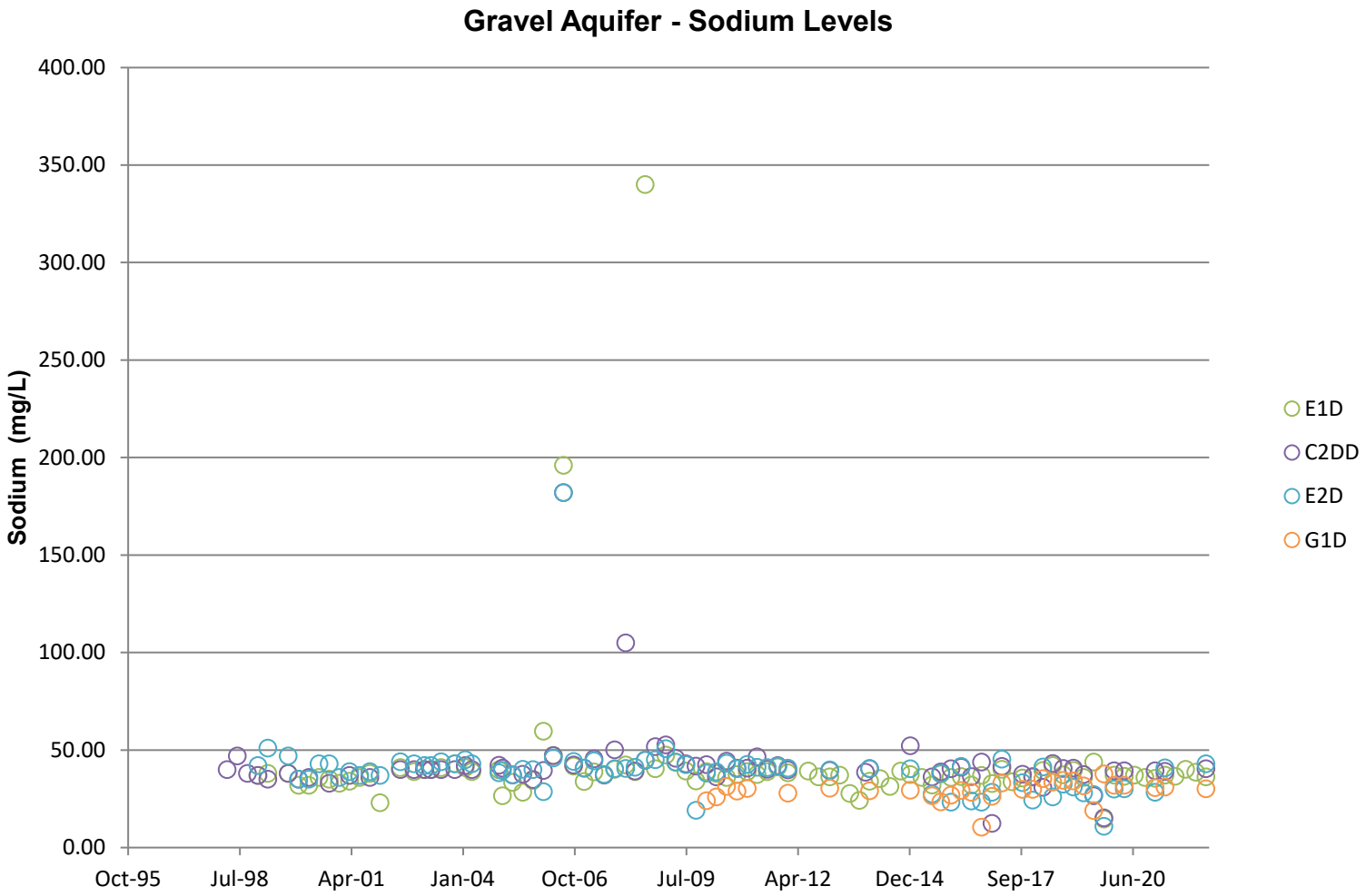

Sand Aquifer Downgrade of New Landfill - Sodium Concentrations
Sodium (mg/L)
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
G1S
D1
D2
D3r (replaced by D3rs)
D4

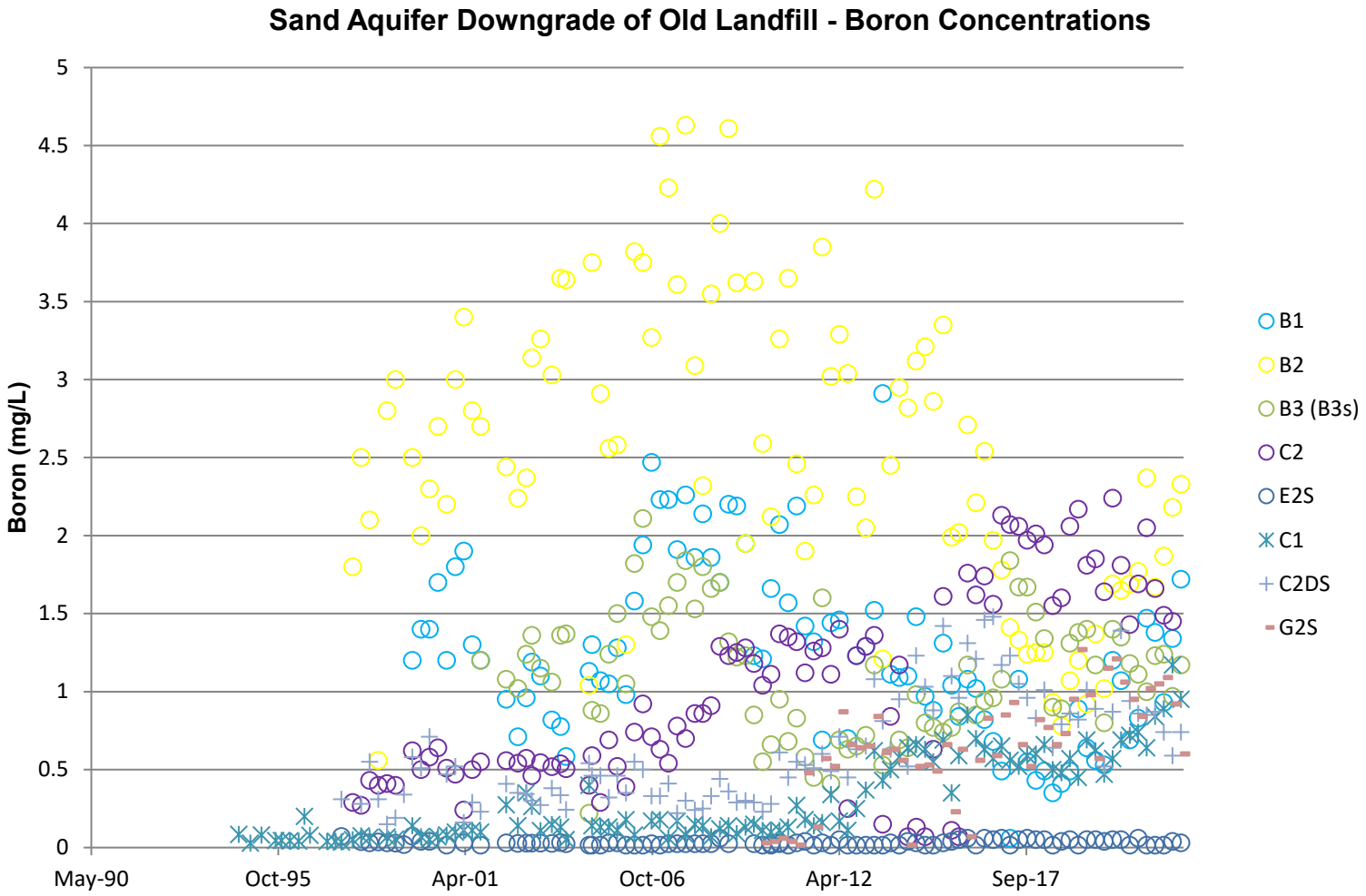

Gravel Aquifer - Boron Concentrations
Boron (mg/L)
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
E1D
C2DD
E2D
G1D

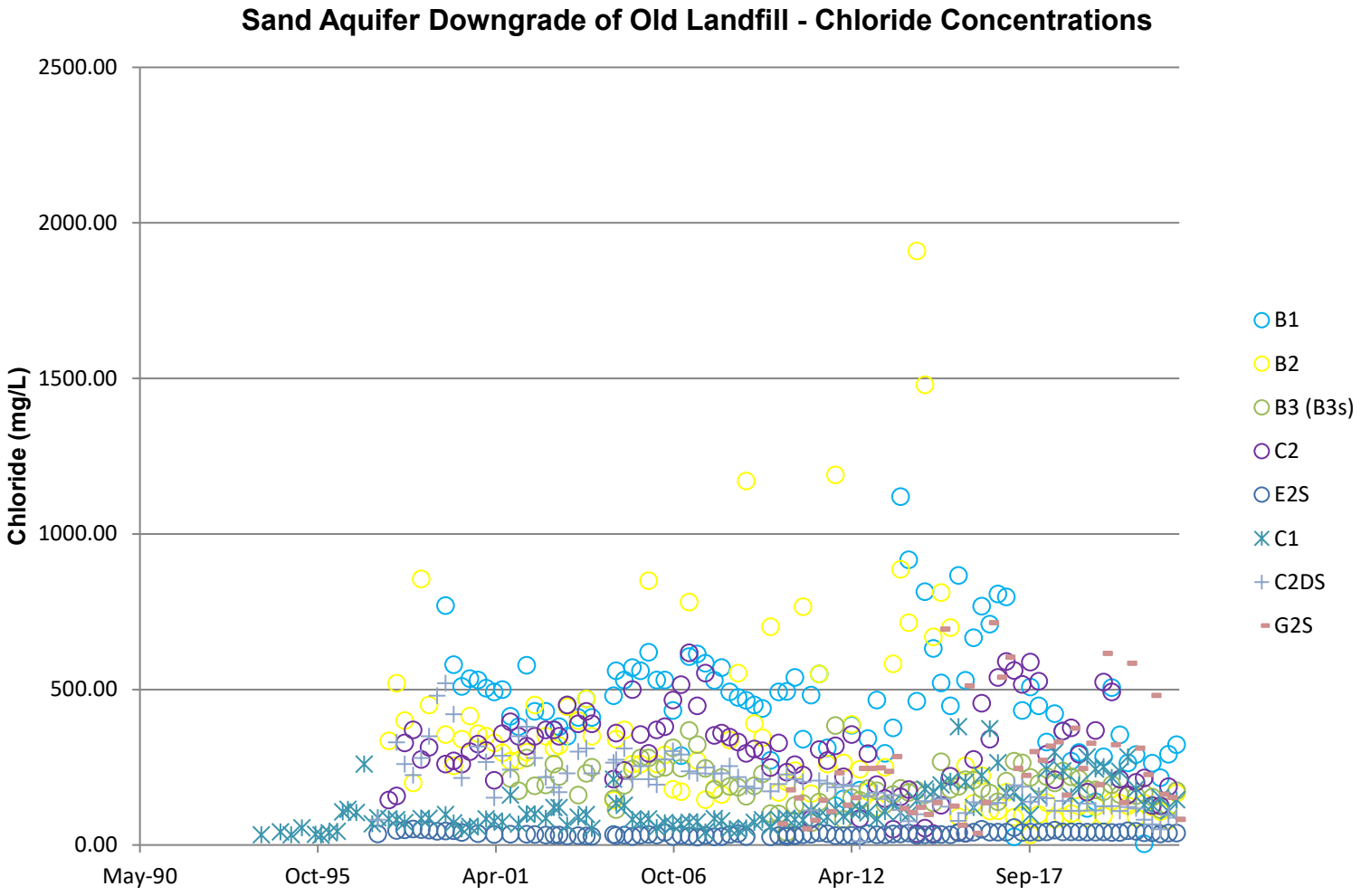

Gravel Aquifer - Chloride Concentrations
Chloride (mg/L)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
E1D
C2DD
E2D
G1D

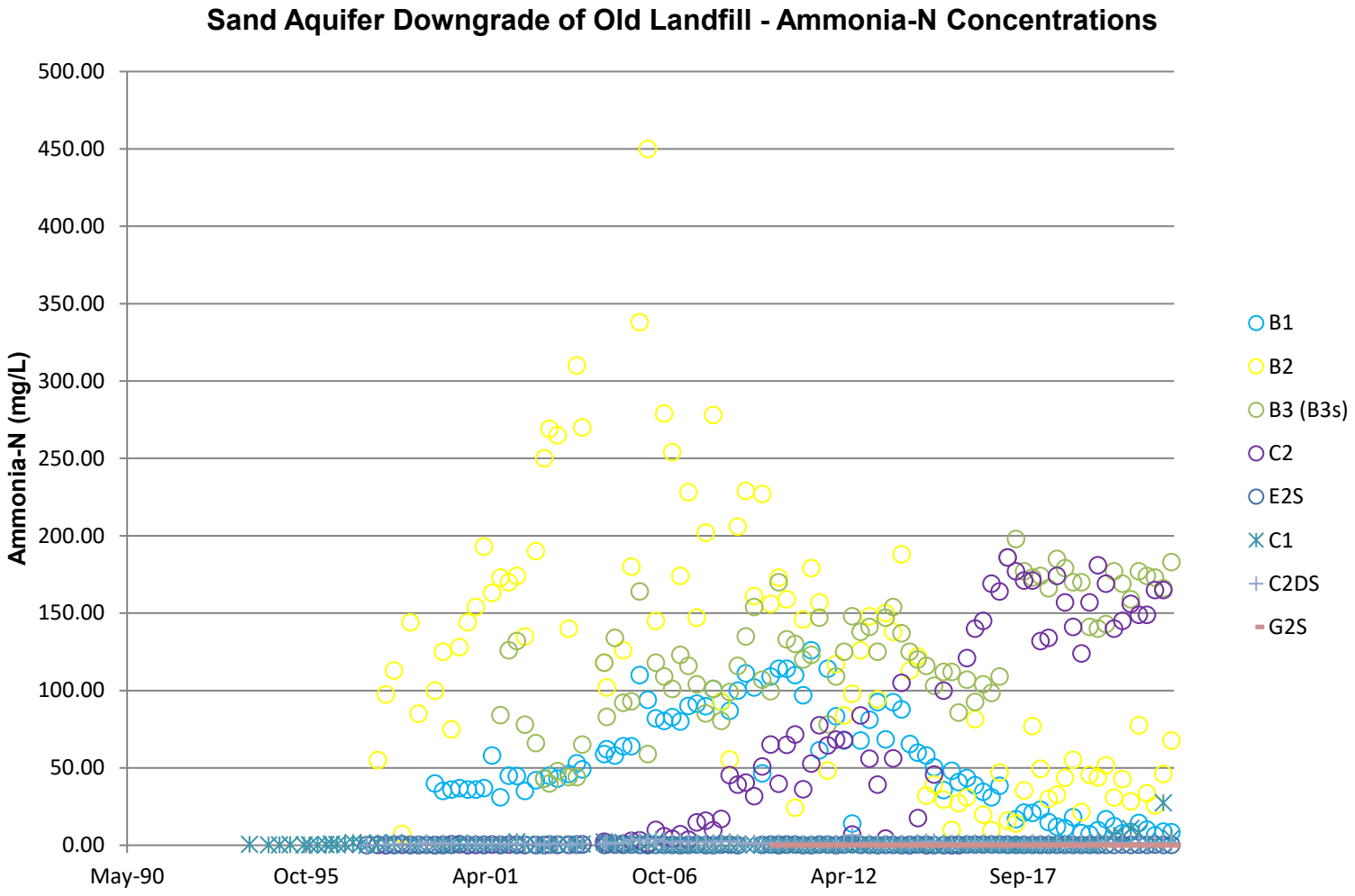

Gravel Aquifer - Ammoniacal-Nitrogen Concentrations
Ammoniacal-Ni (mg/L)
100.00
10.00
1.00
0.10
0.01
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
E1D
C2DD
E2D
G1D

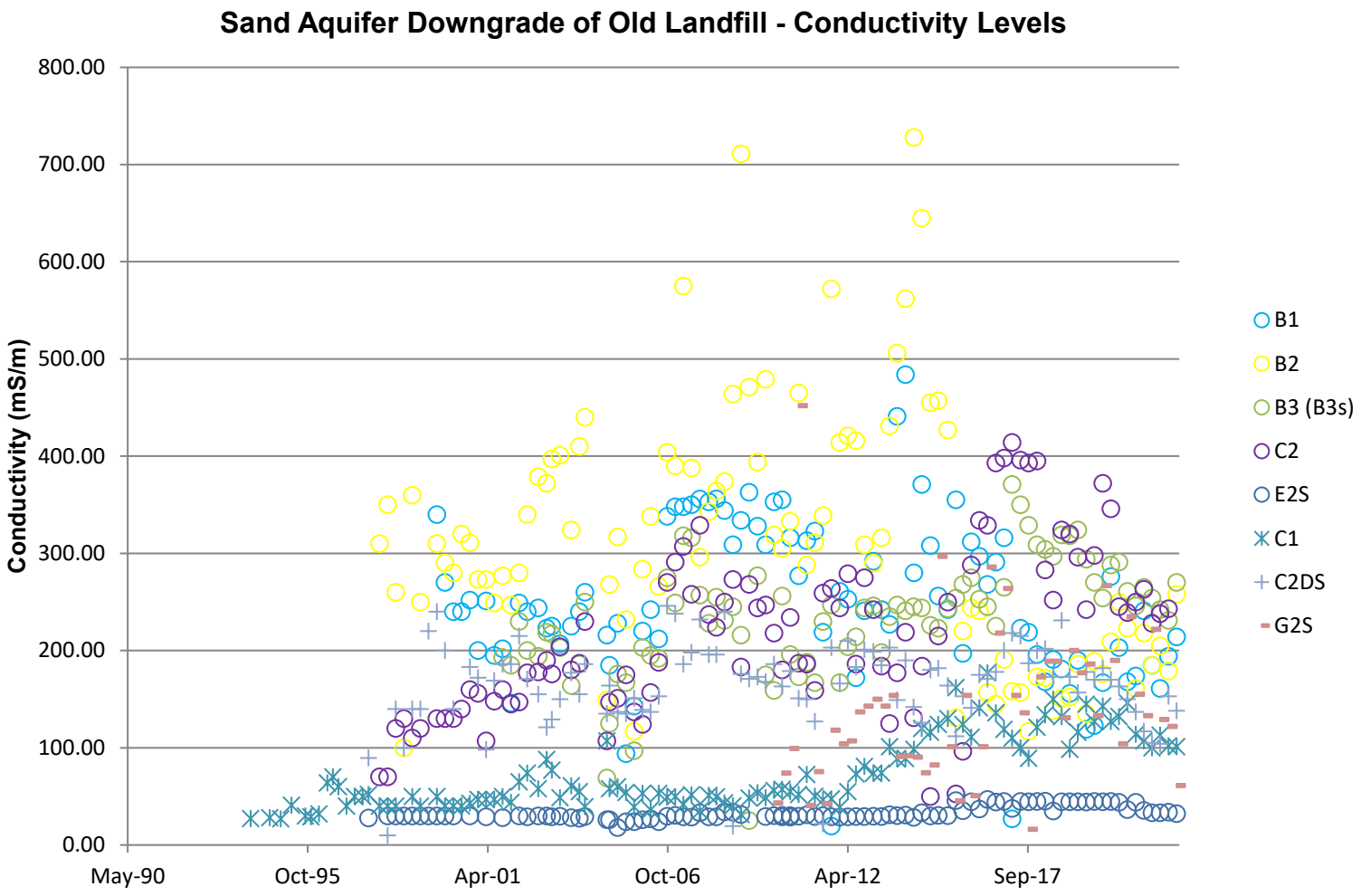

Gravel Aquifer - Conductivity Levels
Conductivity (mS/m)
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
E1D
C2DD
E2D
G1D

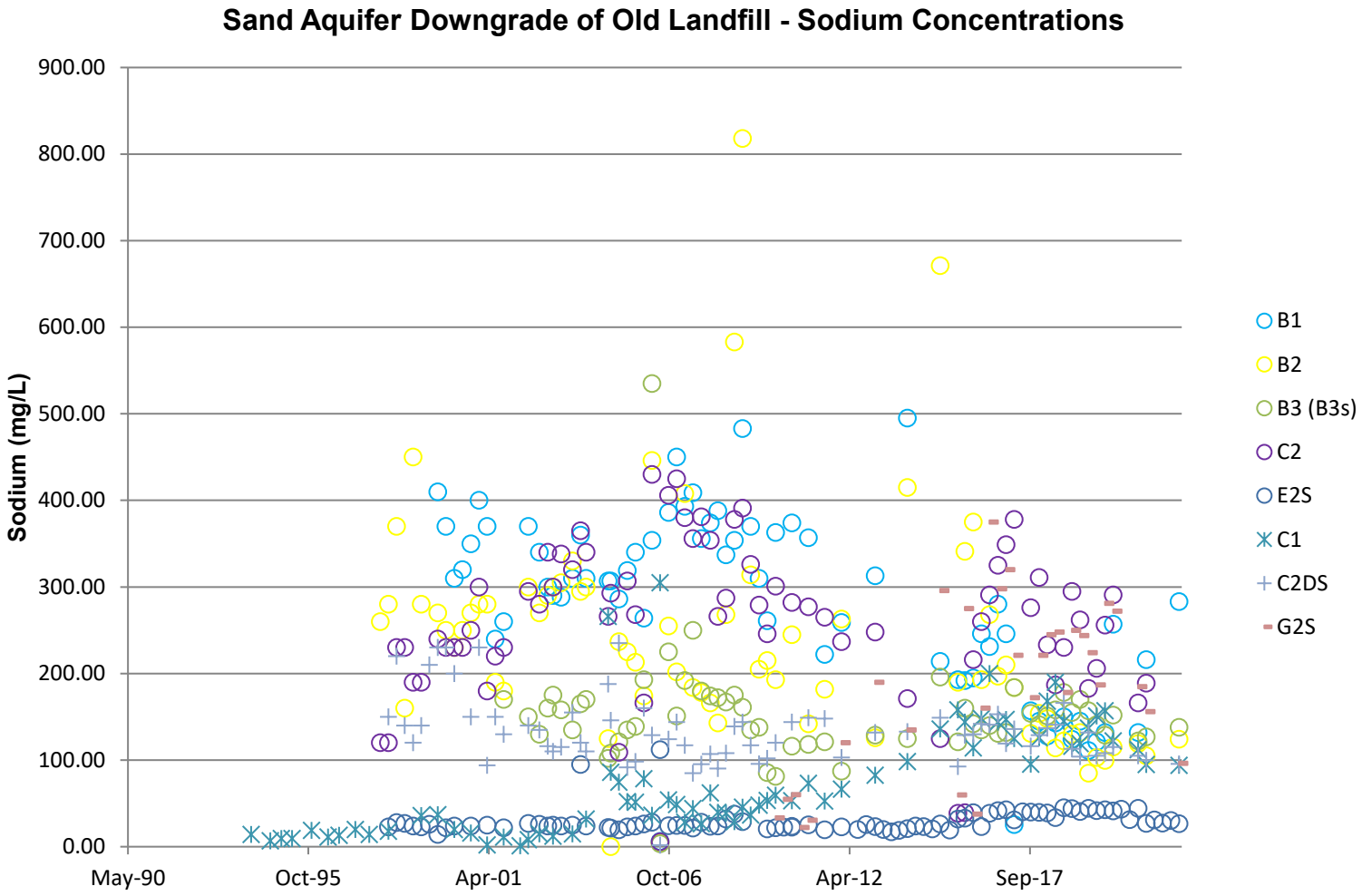

Gravel Aquifer - Sodium Levels
Sodium (mg/L)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
E1D
C2DD
E2D
G1D

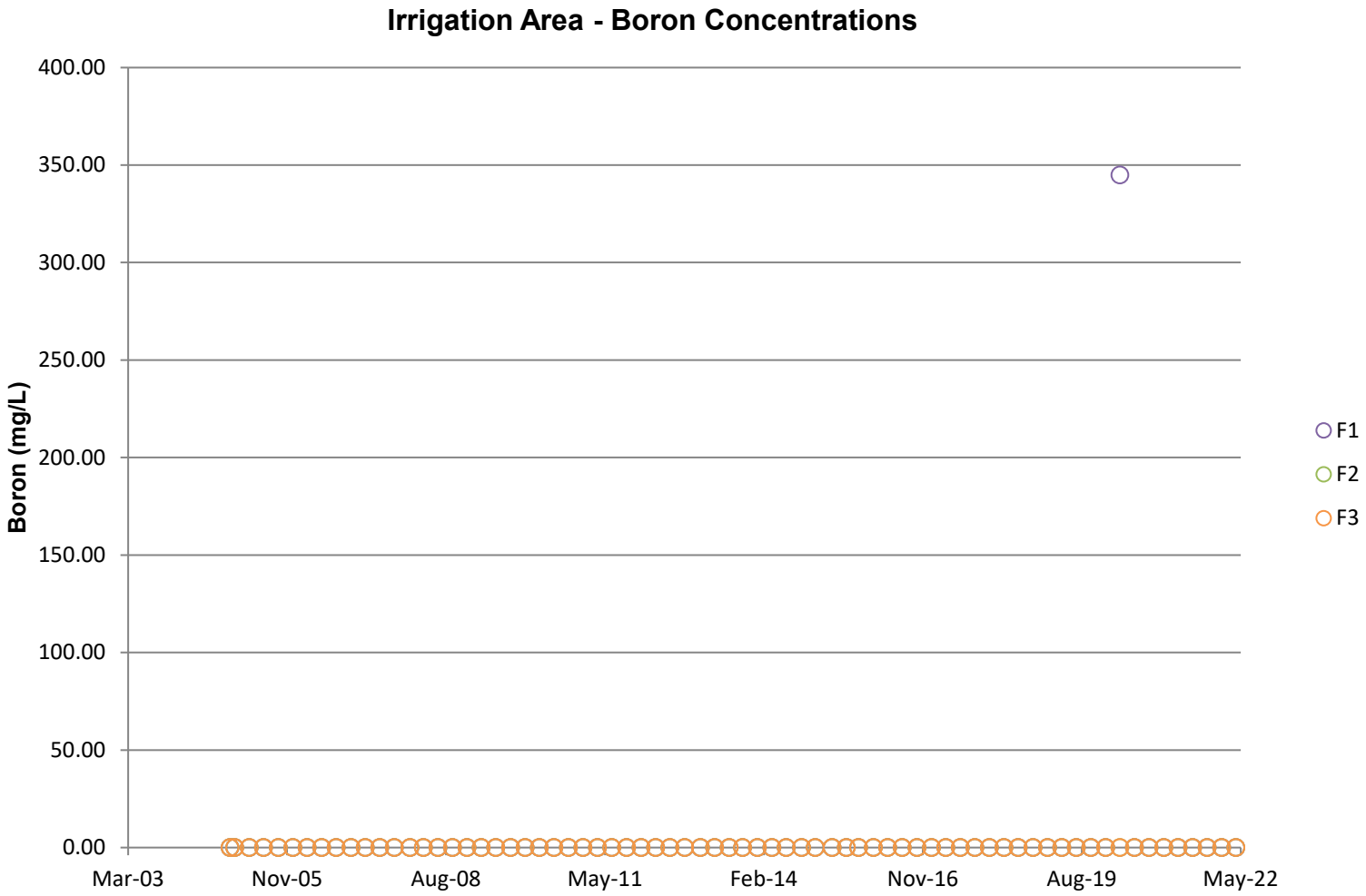

Sand Aquifer Downgrade of Old Landfill - Boron Concentrations
Boron (mg/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

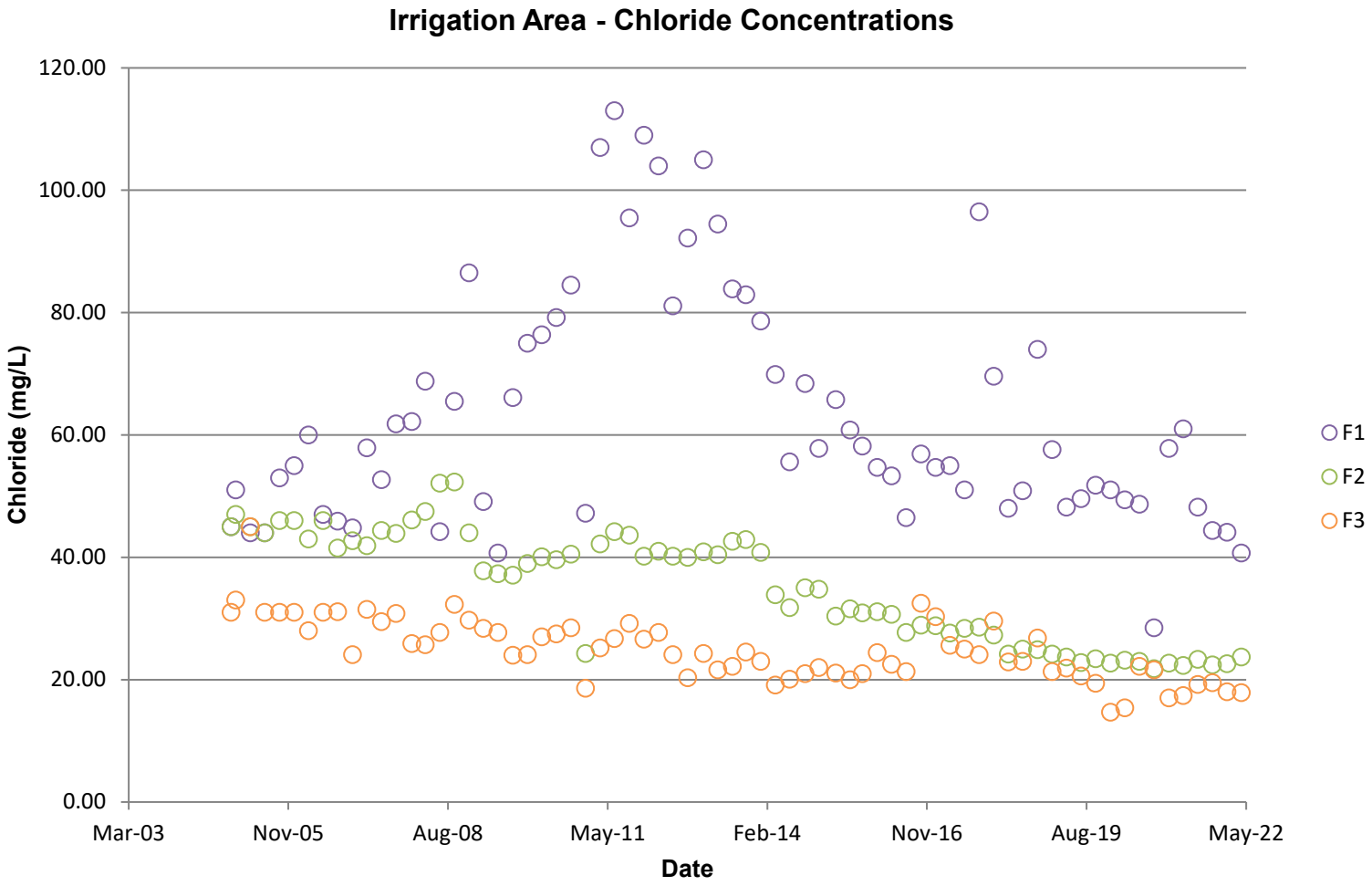

Sand Aquifer Downgrade of Old Landfill - Chloride Concentrations
Chloride (mg/L)
2500.00
2000.00
1500.00
1000.00
500.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

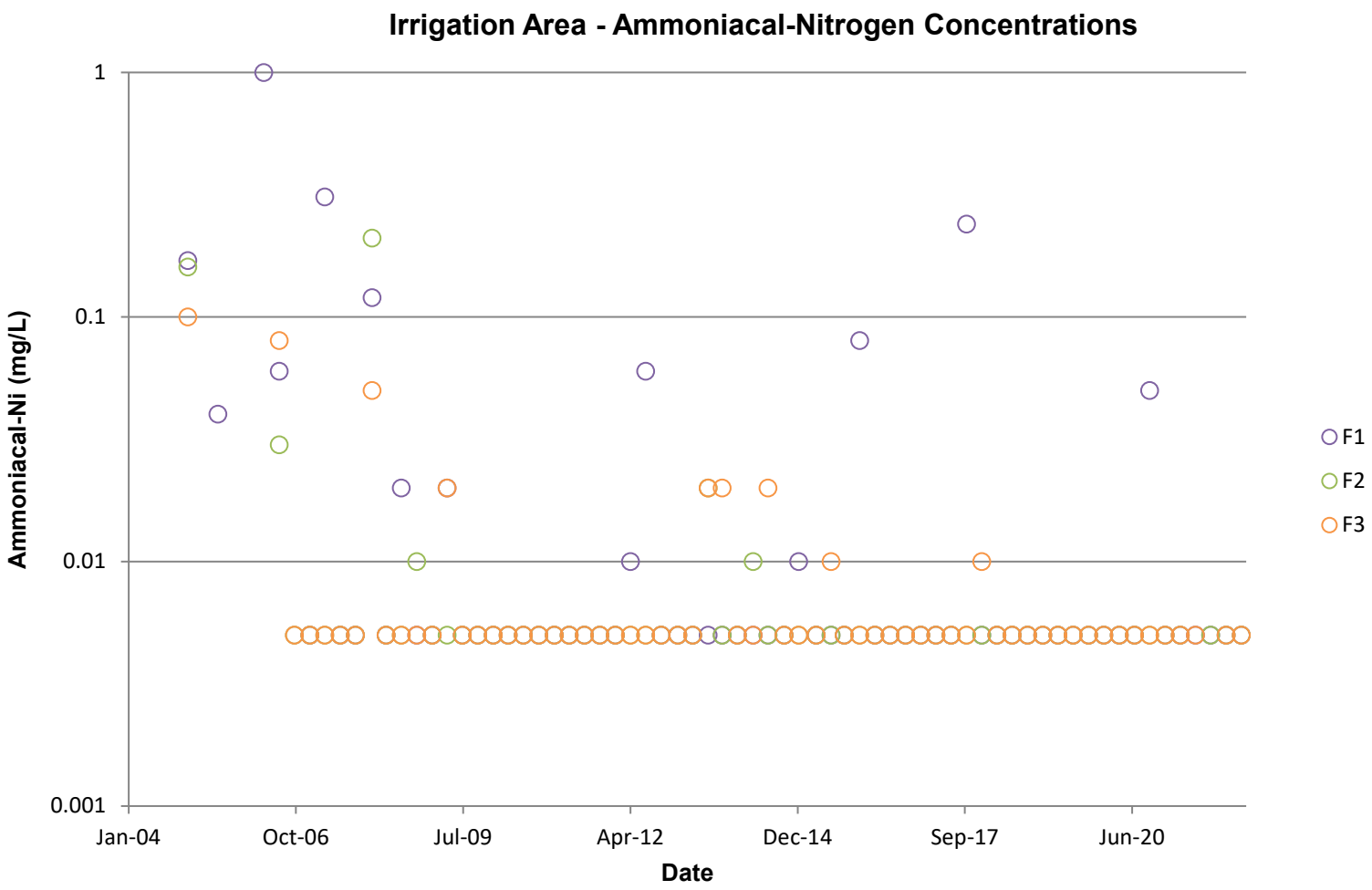

Sand Aquifer Downgrade of Old Landfill - Ammonia-N Concentrations
Ammonia-N (mg/L)
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

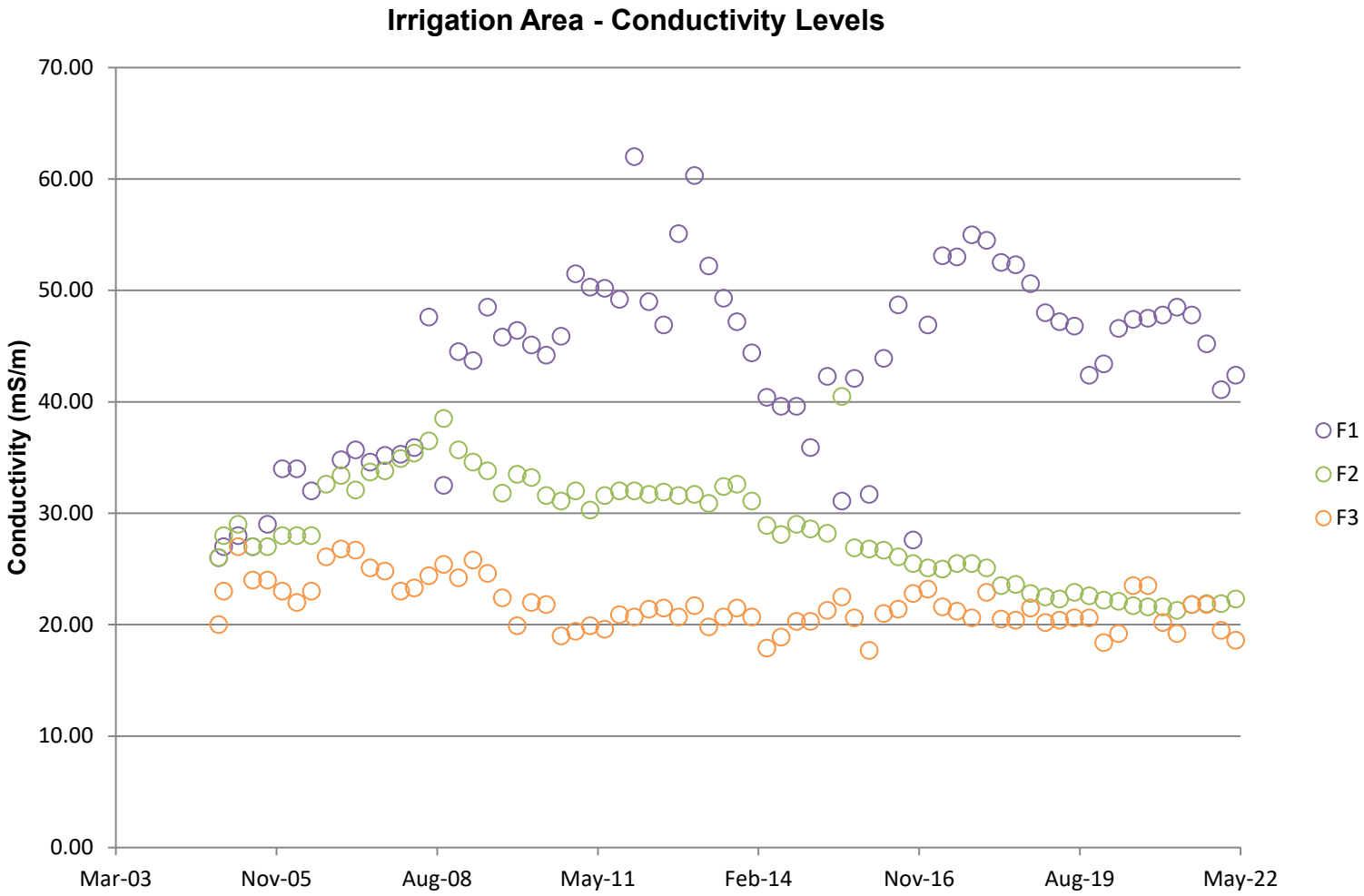

Sand Aquifer Downgrade of Old Landfill - Conductivity Levels
Conductivity (mS/m)
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

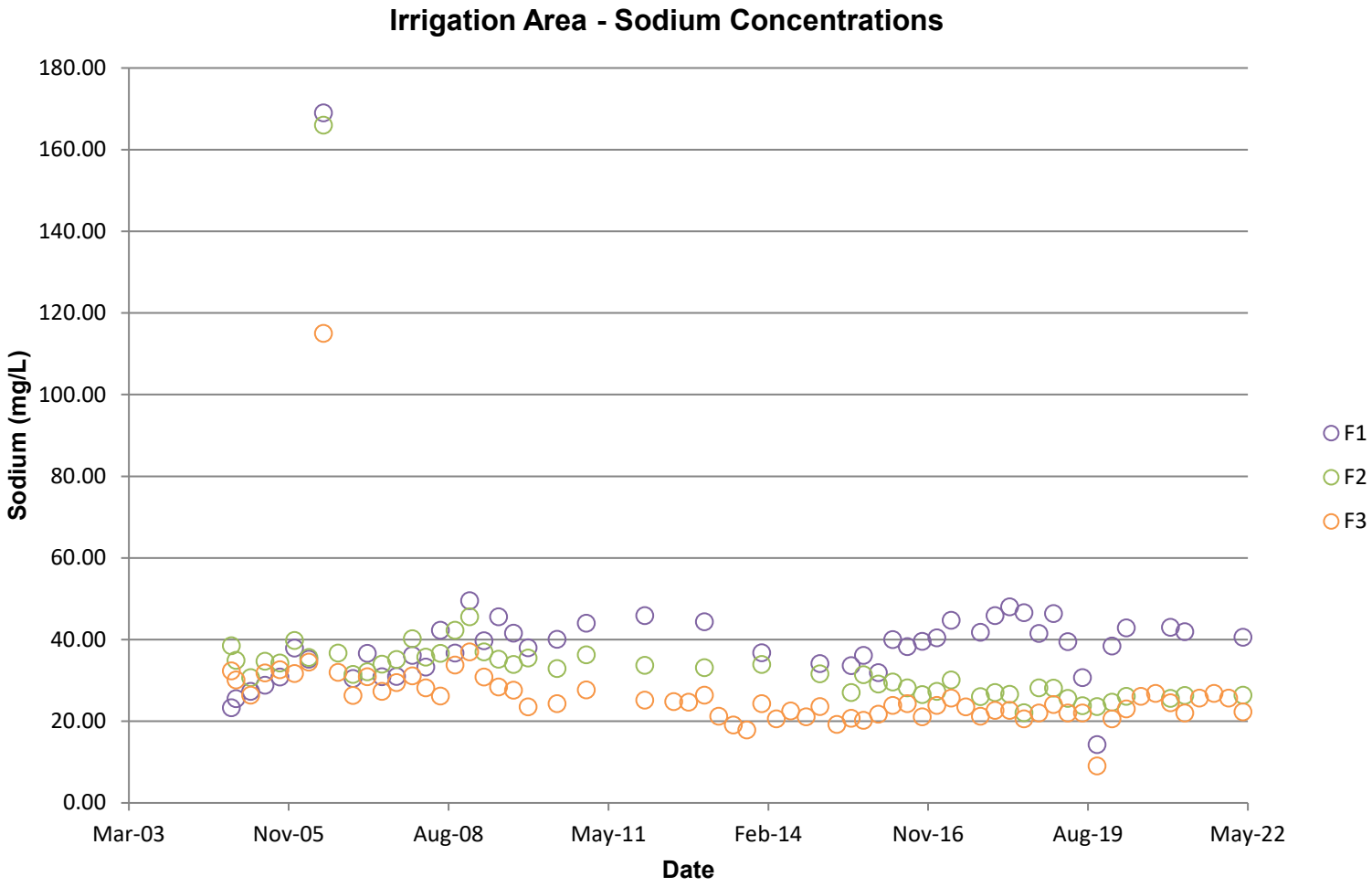

Sand Aquifer Downgrade of Old Landfill - Sodium Concentrations
Sodium (mg/L)
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

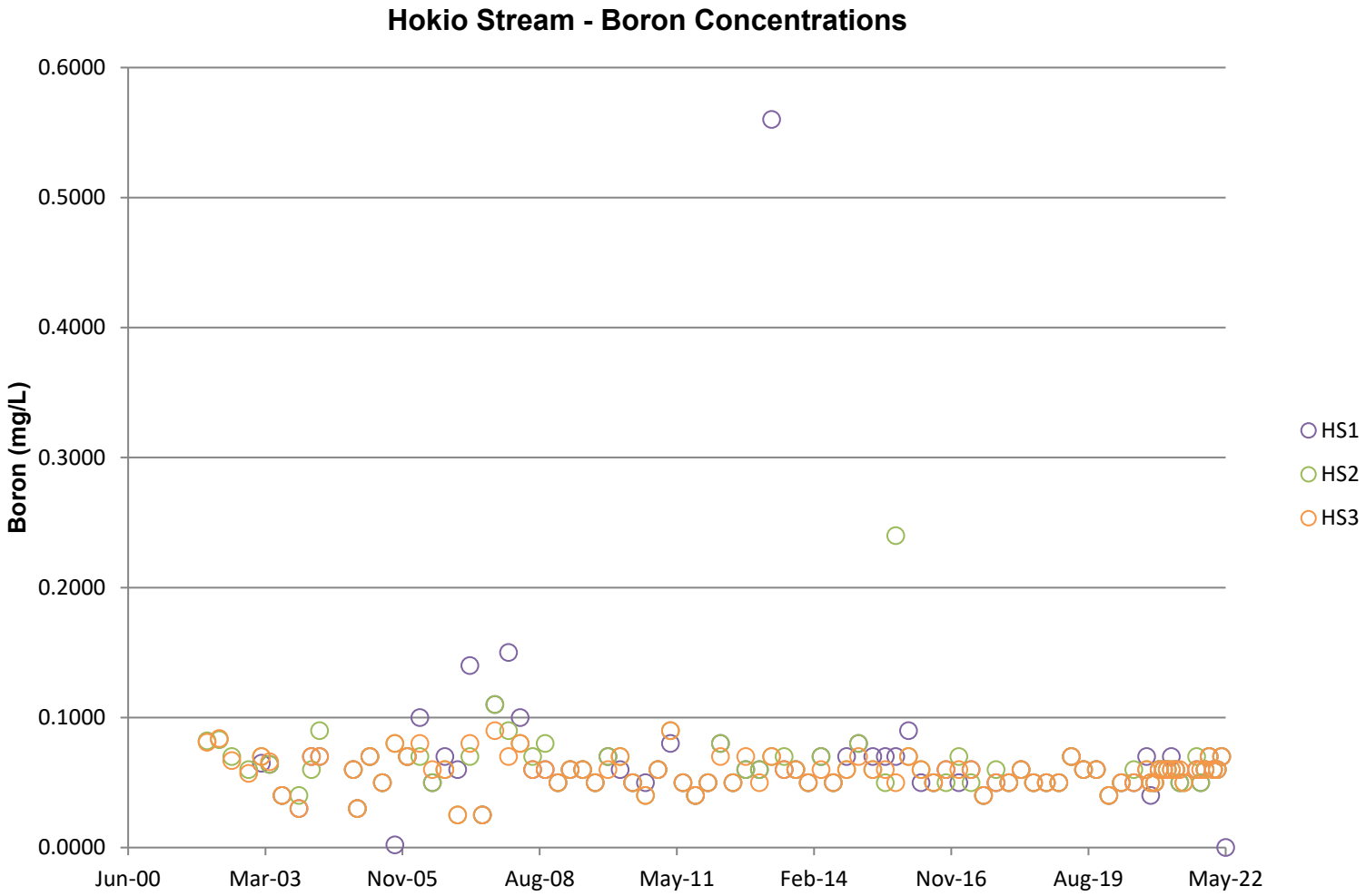

Irrigation Area - Boron Concentrations
Boron (mg/L)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Mar-03
Nov-05
Aug-08
May-11
Feb-14
Nov-16
Aug-19
May-22
F1
F2
F3

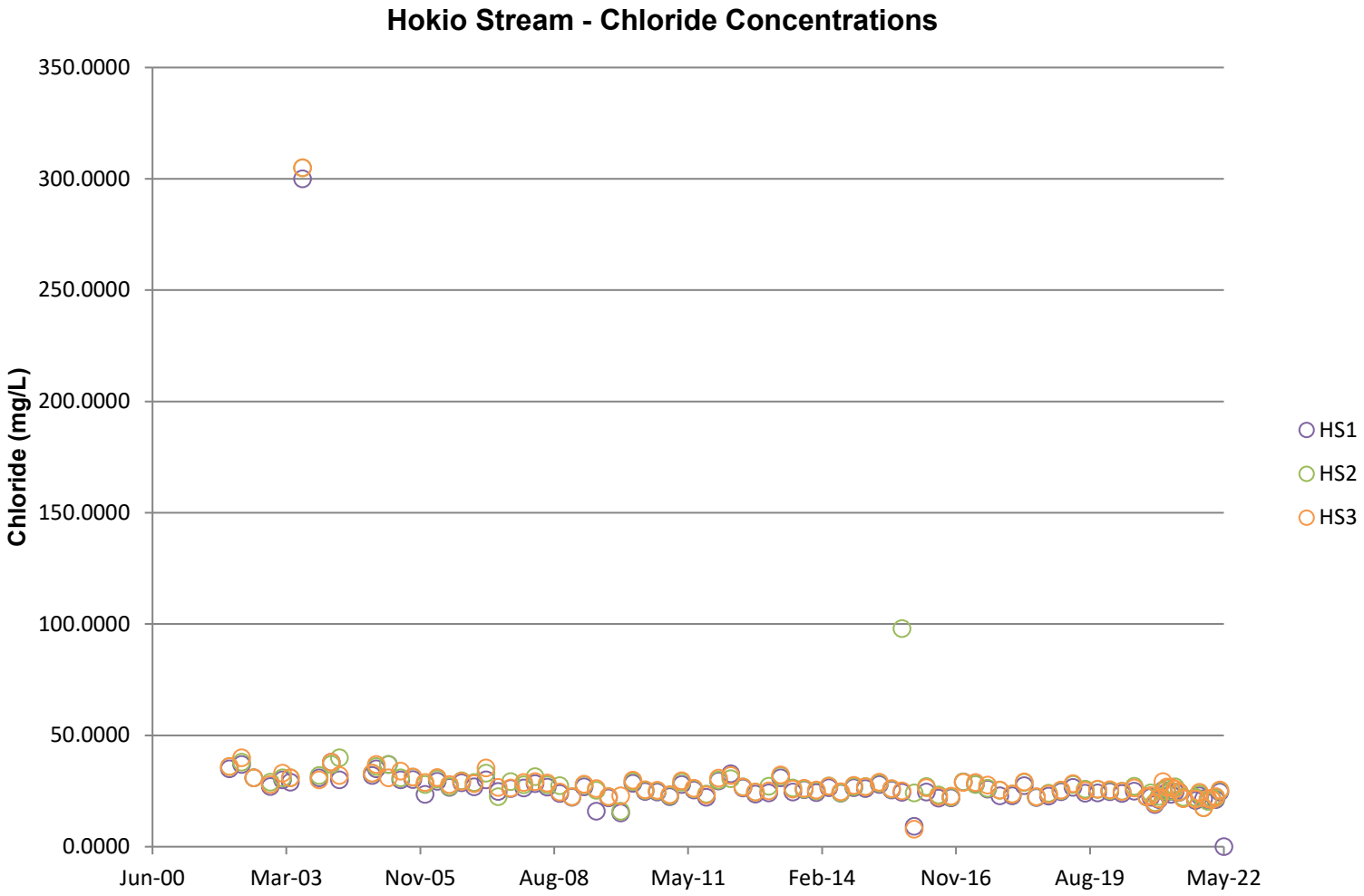

Irrigation Area - Chloride Concentrations
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Chloride (mg/L)
Mar-03
Nov-05
Aug-08
May-11
Feb-14
Nov-16
Aug-19
May-22
Date
F1
F2
F3

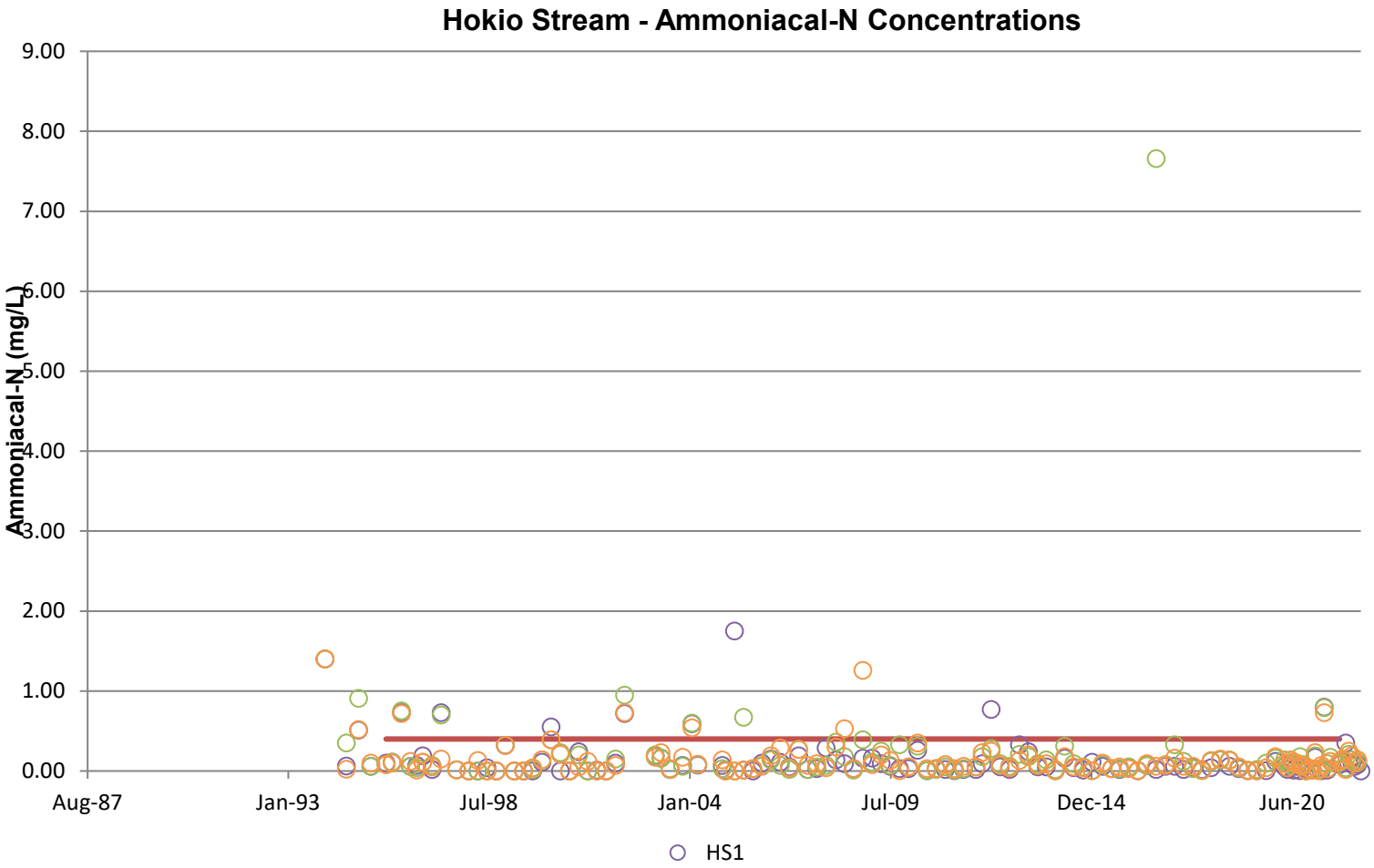

Irrigation Area - Ammoniacal-Nitrogen Concentrations
Ammoniacal-Ni (mg/L)
1
0.1
0.01
0.001
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Date
F1
F2
F3

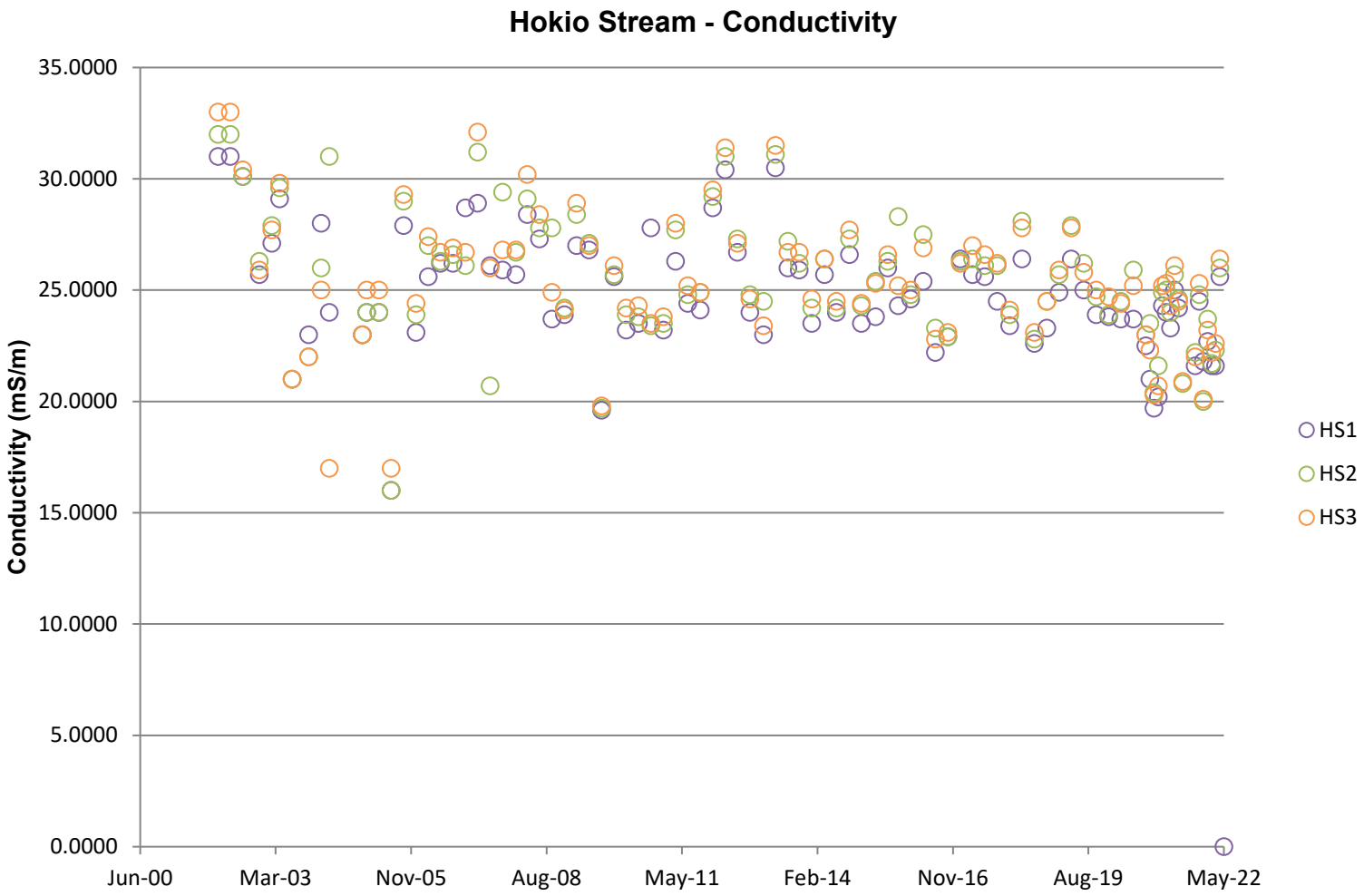

Irrigation Area - Conductivity Levels
Conductivity (mS/m)
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Mar-03
Nov-05
Aug-08
May-11
Feb-14
Nov-16
Aug-19
May-22
F1
F2
F3

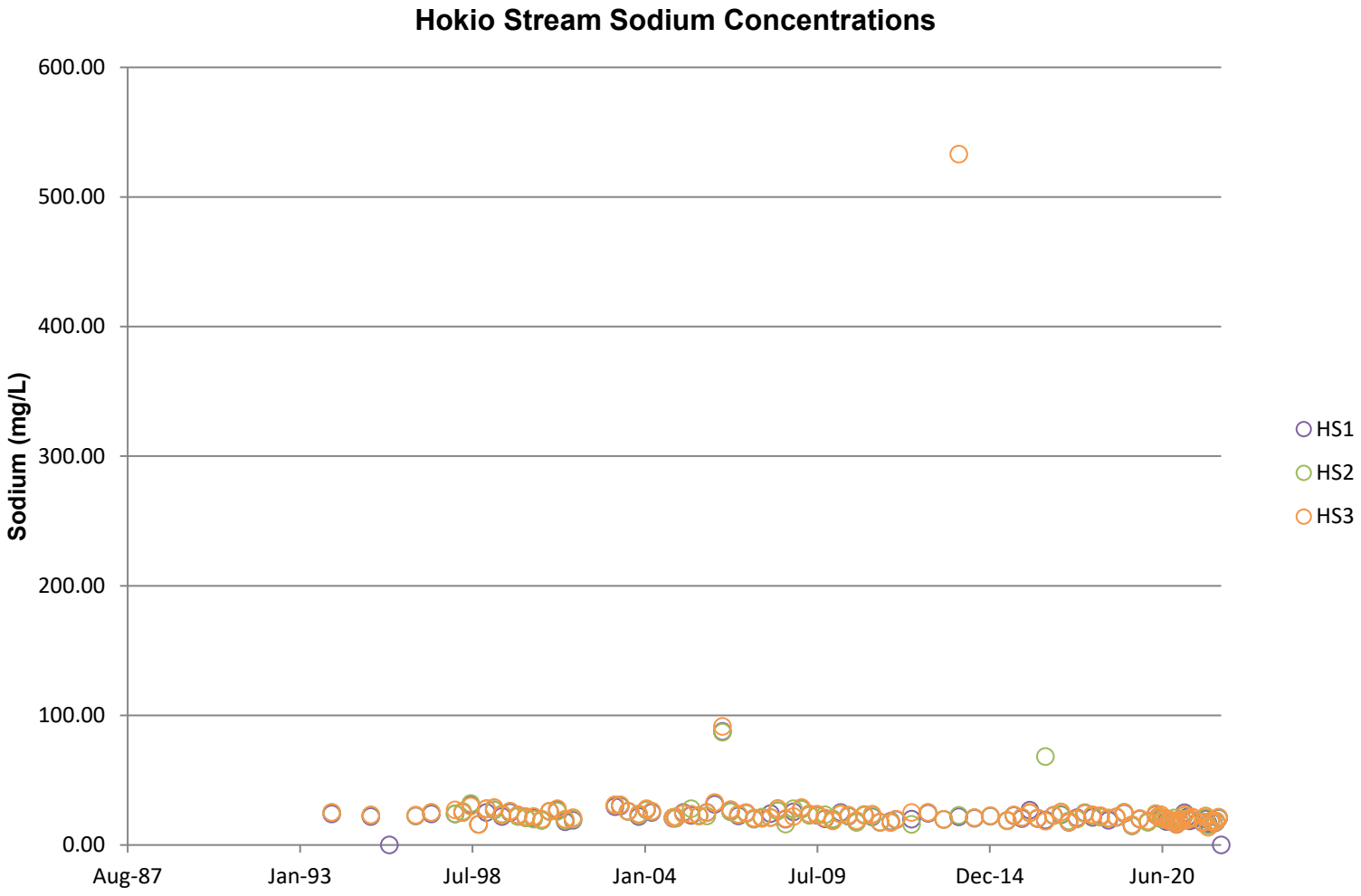

Irrigation Area - Sodium Concentrations
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Sodium (mg/L)
Mar-03
Nov-05
Aug-08
May-11
Feb-14
Nov-16
Aug-19
May-22
Date
F1
F2
F3


Hokio Stream - Boron Concentrations
Boron (mg/L)
0.6000
0.5000
0.4000
0.3000
0.2000
0.1000
0.0000
Jun-00
Mar-03
Nov-05
Aug-08
May-11
Feb-14
Nov-16
Aug-19
May-22
HS1
HS2
HS3


Hokio Stream - Chloride Concentrations
Chloride (mg/L)
350.0000
300.0000
250.0000
200.0000
150.0000
100.0000
50.0000
0.0000
Jun-00
Mar-03
Nov-05
Aug-08
May-11
Feb-14
Nov-16
Aug-19
May-22
HS1
HS2
HS3


Hokio Stream - Ammoniacal-N Concentrations
Ammoniacal-N (mg/L)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Aug-87
Jan-93
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
HS1


Hokio Stream - Conductivity
Conductivity (mS/m)
35.0000
30.0000
25.0000
20.0000
15.0000
10.0000
5.0000
0.0000
Jun-00
Mar-03
Nov-05
Aug-08
May-11
Feb-14
Nov-16
Aug-19
May-22
HS1
HS2
HS3


Hokio Stream Sodium Concentrations
Sodium (mg/L)
600.00
500.00
400.00
300.00
200.00
100.00
0.00
Aug-87
Jan-93
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
HS1
HS2
HS3

Appendix E Landfill Gas Monitoring Results at GW Bores for July 2022

Created	Borehole	Methane (% CH_4)	Carbon Dioxide (% CO_2)	Hydrogen Sulphide (% H_2S)	Oxygen (% O_2)
06-07-22 2:33	Levin Landfill: Levin D6	0	0.04	0	21
06-07-22 13:35	Levin Landfill: Levin G1s	0	0.04	0	21.2
06-07-22 14:00	Levin Landfill: Levin F1	0	0.03	0	20.9
06-07-22 14:12	Levin Landfill: Levin D1	0	0.14	0	20.5
06-07-22 14:40	Levin Landfill: Levin D3rs	0.06	0.11	0	20.9
06-07-22 14:41	Levin Landfill: Levin D2	0.05	0.74	0	20.2
06-07-22 14:45	Levin Landfill: Levin D3rd	0	0.06	0	21
06-07-22 14:55	Levin Landfill: Levin F2	0	0.1	0	20.5
06-07-22 15:00	Levin Landfill: Levin F3	0	0.03	0	21
06-07-22 15:15	Levin Landfill: Levin C1	Water level at surface - no gas sampling could occur.			
06-07-22 15:20	Levin Landfill: Levin G2s	0	1	0	20.5
07-07-22 8:50	Levin Landfill: Levin D5	0.09	0.04	0	20.9
07-07-22 9:20	Levin Landfill: Levin D4	0.14	0	0	20.1
07-07-22 9:27	Levin Landfill: Levin E1s	0.01	0.06	0	20.9
07-07-22 9:30	Levin Landfill: Levin E1d	0	0.05	0	20.9
07-07-22 9:45	Levin Landfill: Levin B1	0.05	0.4	0	20.7
07-07-22 9:55	Levin Landfill: Levin C2	Water level at surface - no gas sampling could occur.			
07-07-22 10:00	Levin Landfill: Levin C2dd	0.13	0.44	0	20.8
07-07-22 10:05	Levin Landfill: Levin C2ds	0.1	0.28	0	20.8
07-07-22 10:15	Levin Landfill: Levin E2d	0.21	0.22	0	19.5
07-07-22 10:15	Levin Landfill: Levin E2d	0.32	0.39	0	20.2
07-07-22 10:20	Levin Landfill: Levin E2s	0.26	0.23	0	20
07-07-22 10:30	Levin Landfill: Levin B3s	Water level at surface - no gas sampling could occur.			
07-07-22 10:45	Levin Landfill: Levin B2	0.32	3.6	0	17.1
07-07-22 11:00	Levin Landfill: Levin Xs1	0.22	0.63	0	21.4
07-07-22 11:21	Levin Landfill: Levin Xs2	0.01	0.23	0	20.8
06-08-22 13:33	Levin Landfill: Levin G1d	0	0.06	0	20.9

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