

LEVIN LANDFILL OCTOBER 2019 QUARTERLY GROUNDWATER, SURFACE WATER AND LEACHATE MONITORING REPORT

PREPARED FOR HOROWHENUA DISTRICT COUNCIL

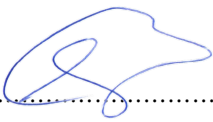


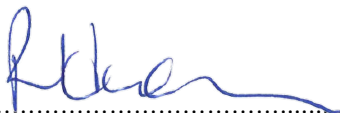
November 2019



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Executive Summary

Horowhenua District Council (HDC) is required to carry out quarterly compliance monitoring for the Levin Landfill as part of Resource Consents DP6009, DP6010, DP6011 and DP102259. This report summarises the findings for the October 2019 quarterly monitoring event, including monitoring results for:

- Background (natural) groundwater condition;
- The landfill leachate pond and effluent;
- Groundwater bores within the new landfill and irrigation area;
- Shallow aquifers, down-gradient of the old landfill;
- Deep aquifer, and
- Hokio Stream.

We have reviewed the results of this monitoring on behalf of HDC.

Monitoring for other aspects of the landfill operation, such as landfill gas, air quality/odour, stormwater and soil, are reported separately as per resource consent requirements.

Samples were collected from 23 groundwater bores, the landfill leachate effluent and seven surface water sites during October 2019 from around the Levin Landfill, and were analysed for parameters as set out in Discharge Permit 6010.

These samples were collected progressively over a two-week period, which does introduce some uncertainty to the interpretation of results. It is recommended that sampling be completed within not more than a one-week period from the collection of the first sample, and that HDC take steps to improve monitoring practices for future events.

The resource consents for the landfill (namely discharge permit 6010) contain compliance limits for the quality of groundwater and surface water, which are based upon the Drinking Water Standards for New Zealand – Maximum Acceptable Values (DWSNZ MAVs) and ANZECC 2000 Livestock Drinking Water (ANZECC LDW) trigger values respectively. The October 2019 results have been assessed against these limits, where they are applicable.

Non-compliant results were recorded at four monitoring locations as follows:

- Exceedance of DWSNZ for manganese (at bore C2DD) in the deep gravel aquifer
- The ANZECC LDW trigger value for faecal coliforms was exceeded at all three monitoring locations within Hokio Stream (HS1, HS2, and HS3).

The October 2019 results were also considered within 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 chloride and iron concentrations in the same bore indicated that groundwater could be impacted by up-gradient activities unrelated to the landfill operations.

Results from a sample of effluent taken from the leachate pond were within the range of data obtained from previous monitoring events and are generally well below that recorded at typical Class 1 landfills in New Zealand.

Horowhenua District Council

Levin Landfill October 2019 Quarterly Groundwater, Surface Water and Leachate Monitoring Report

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1. Introduction

Horowhenua District Council (HDC) commissioned Stantec New Zealand to carry out environmental reporting for the discharge consent monitoring undertaken at the Levin Landfill site. Monitoring is undertaken every three months at 27 locations, as required by the resource consent conditions (namely for discharge permit 6010). There are 23 boreholes penetrating the sand and gravel aquifers; three surface water sampling locations within Hokio Stream and a leachate sampling point as shown in the Site Plan in Appendix A. In addition, HDC has agreed to undertake voluntary surface water monitoring at four locations along the Tatana Property drain.

The Levin Landfill site is comprised of two landfills; one old, closed and unlined landfill and one new, lined and active landfill. The new landfill footprint is being developed in stages. The most recent stage is Stage 3C which was developed in 2017, though landfill operations are now occurring over the top of Stages 1A, 2 and 3C.

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 advised 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 total concentrations. For simplicity, results from monitoring prior to July 2010 (which were tested for total metal and nutrient concentrations) have not been compared to the results from July 2010 onwards.

This report presents the results from the October 2019 quarterly monitoring round which have been compared with the Drinking Water Standards for New Zealand 2008 (DWSNZ), and the Australian and New Zealand Environment and Conservation Council (ANZECC) 2000 Livestock Drinking Water Trigger Values (ANZECC LWD) as per Discharge Consent 6010.

It is noted that a resource consent review process initiated in 2015 for this site has not yet been finalised. To date the process has resulted in revised resource consent conditions, however at the time of preparing this Quarterly Report the revised resource consent conditions had not been approved by the Environment Court and so compliance has been assessed against existing consent conditions.

2. Groundwater and Surface Water Monitoring

2.1 Sample Analysis

Samples were collected by Downer (a contractor to HDC) between 10 and 21 October 2019. Collected samples were couriered overnight and analysed by Eurofins ELS Ltd in Lower Hutt, Wellington, the following day. The length of the monitoring period (11 days to collect all the October 2019 samples) potentially jeopardises the value of the exercise and brings uncertainty to any interpretation of results. However, it is noted that the period over which the samples have been collected has shortened considerably since the July 2019 round which took over 20 days to collect all samples. In addition, all surface water samples were collected on the same day and all groundwater samples were collected over a seven-day period (10 – 17 October). This time period is a lot closer to the recommended collection period (i.e. collecting all samples within seven days) and therefore the results can be interpreted with greater certainty.

The sampling programme for July 2019- April 2022 is summarised in the schedule in Appendix A. From July 2019, faecal coliform 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 faecal coliform counts will be assessed more frequently throughout each year, compared to past monitoring.

Groundwater samples taken from the boreholes; surface water samples from Hokio Stream, and samples of landfill leachate effluent were analysed for the indicator suite of parameters which are outlined in [Table 2-1](#). Surface water samples collected from the Tatana Property drain were analysed based on a specific parameter list agreed to by Horizons Regional Council as detailed in Section 2.7.

Table 2-1: Indicator Parameters

Type	Parameters
Characteristics	pH Electrical Conductivity (EC)
Oxygen demand	Chemical Oxygen Demand (COD)
Nutrients*	Nitrate nitrogen (NO ₃ -N), Ammoniacal-nitrogen (NH ₄ -N)
Metals*	Aluminium, Iron**, Lead, Manganese, Nickel
Other elements	Boron, Chloride, Sodium**
Biological*	Faecal coliforms

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

**Selected bores as per stormwater consent 102559

*Faecal coliforms added from July 2019 onwards (see Appendix A)

2.1.1 Note regarding interpretation of non-detected results

For those chemical constituents which were found to be below laboratory detection limits during the reporting period, the results have been analysed at 50% of the laboratory limit, and a median calculated on this basis. This is standard practice when dealing with chemical concentrations in water. However, the same rule cannot be applied for faecal coliforms in the context of the Levin Landfill.

The laboratory detection limit for faecal coliforms is 4 CFU/100mL. As the resource consent requires that groundwater results for faecal coliforms be compared against the NZDWS (for compliance), which is NIL (i.e. 0 CFU/100mL), we have chosen to indicate where faecal coliforms were not detected, rather than calculating a median as we would for chemical constituents (described above). This method has been applied in all instances where faecal coliforms are assessed for compliance with the NZDWS.

2.2 Background Groundwater Quality

Water quality from the natural **background 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 were used to benchmark the quality of water up-gradient from the landfill site.

Groundwater samples were collected from two background bores situated hydraulically up-gradient from both the new and old landfills to the southeast of the site (bores G1S and G1D, 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 A.

Table 2-2: Background Monitoring Results for October 2019

Determinant	Units	DWSNZ MAV	ANZECC STOCK	G1S	G1D	F3
Water level	mBGL	-	-	14.11	14.635	2.83
pH	-	7 to 8.5*	6 to 9	6.5	7.2	7.0
Conductivity	mS/m	-	-	122	28.0	20.6
COD	mg/L	-	-	43	7.5	7.5
Faecal coliforms	CFU/100ml	NIL	100	ND	ND	ND
Chloride	mg/L	250*	-	276	31.9	19.4
Nitrate-N	mg/L	11.3	90.3	0.05	0.005	1.93
Ammoniacal-N	mg/L	1.17	-	0.05	0.10	0.005

Determinant	Units	DWSNZ MAV	ANZECC STOCK	G1S	G1D	F3
Sodium	mg/L	200*	-	170	37.7	9.08
Aluminium	mg/L	0.1*	5	0.021	<i>0.001</i>	<i>0.001</i>
Boron	mg/L	1.4	5	<i>0.015</i>	<i>0.015</i>	<i>0.015</i>
Iron	mg/L	0.2*	-	7.44	0.19	0.005
Lead	mg/L	0.01	0.1	<i>0.00025</i>	<i>0.00025</i>	<i>0.00025</i>
Manganese	mg/L	0.4	-	0.176	0.0580	<i>0.00025</i>
Nickel	mg/L	0.08	1	0.0007	<i>0.00025</i>	<i>0.00025</i>

Note: *denotes guideline values for aesthetic determinants (G.V.). **Bold** – denotes an exceedance of the relevant DWSNZ guidelines. Underlined – denotes an exceedance of the ANZECC LDW Trigger Values. All '<' values have been reported as half the detection limit for statistical purposes and are expressed in italics. "ND" indicates where faecal coliforms were not detected.

The result in Table 2-2 indicate that all background bores (G1S, G1D and F3) are within the ANZECC guidelines.

There were three exceedances of the DWSNZ limits during the October 2019 monitoring round:

- pH in bore G1S was below the DWSNZ GV
- Chloride concentration in bore G1S was above the DWSNZ GV
- Iron concentration in bore G1S was above the DWSNZ GV

It is noted that bore G1S is a background bore and therefore exceedances of the DWSNZ in this bore do not constitute non-compliance with the consent conditions.

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(r), 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 uninfluenced 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 any leaching from the new landfill. 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. It is unlikely that leachate from the new landfill will significantly affect groundwater quality due to a leachate collection system which is in place in the new landfill, but these bores would give early warning of potential problems.

The results from the October 2019 monitoring round for these bores are presented in [Table 2-3](#). The results have been compared with the ANZECC LDW trigger values as per the consent conditions. The full laboratory report is included in Appendix A.

There were no exceedances of the ANZECC LDW trigger values during the October 2019 monitoring round and so the **results comply with the resource consent conditions**.

Table 2-3: D-Series and EIS Monitoring Bores for October 2019

Determinant	Units	ANZECC STOCK	D1	D2	D3(r)	D4	D5	D6	EIS
Water level	mBGL	-	16.65	21.25	4.695	8.01	9.755	16.22	11.385
pH	-	6 to 9	6.8	6.5	6.8	7.1	7.2	7.0	7.0
Conductivity	mS/m	-	52.3	34.7	22.0	32.7	30.7	31.9	26.9
COD	mg/L	-	7.5	35	7.5	7.5	7.5	7.5	7.5
Faecal coliforms	CFU/100ml	100	ND	ND	ND	ND	ND	ND	ND
Chloride	mg/L	-	36.1	35.2	21.8	53.5	29.5	16.3	30.0
Nitrate-N	mg/L	90.3	11.5	0.05	0.19	0.005	1.15	11.7	0.005
Ammoniacal-N	mg/L	-	0.005	0.47	0.17	0.23	0.005	0.005	0.18
Sodium	mg/L	-	14.2	7.84	8.79	33.7	33.0	9.72	9.45
Aluminium	mg/L	5	0.001	0.004	0.001	0.001	0.001	0.001	0.001
Boron	mg/L	5	0.05	0.05	0.03	0.03	0.015	0.05	0.015
Iron	mg/L	-	0.005	9.04	4.00	0.77	0.05	0.005	4.63
Lead	mg/L	0.1	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0023
Manganese	mg/L	-	0.00025	0.325	0.201	0.175	0.0162	0.00025	0.242
Nickel	mg/L	1	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025

Note: **Bold** – denotes an exceedance of the ANZECC LDW trigger values. All '<' values have been reported as half the detection limit for statistical purposes and are expressed in italics. "ND" indicates where faecal coliforms were not detected.

2.3.2 Deep Gravel Aquifer

Bores E1D, C2DD, E2D and G1D 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.

Results for the October 2019 compliance monitoring round are presented in Table 2-4. The results have been compared with the DWSNZ as per the discharge consent 6010. The full laboratory report is included in Appendix A.

Table 2-4: Monitoring Bores within the Deep Aquifer for October 2019

Determinant	Units	DWSNZ MAV	E1D	C2DD	E2D
Water level	mBGL	-	11.165	2.39	5.58
pH	-	7 to 8.5*	7.5	7.4	7.7
Conductivity	mS/m	-	45.9	51.6	34.4
COD	mg/L	-	7.5	7.5	7.5
Faecal coliforms	CFU/100ml	NIL	ND	ND	ND
Chloride	mg/L	250*	39.0	38.2	45.9
Nitrate-N	mg/L	11.3	0.005	0.005	0.005
Ammonia-N	mg/L	1.17	0.21	0.32	0.29
Sodium	mg/L	200*	14.7	15.3	10.9
Aluminium	mg/L	0.1*	0.001	0.001	0.001
Boron	mg/L	1.4	0.06	0.06	0.015
Iron	mg/L	0.2*	0.04	0.02	0.05
Lead	mg/L	0.01	0.00025	0.00025	0.00025
Manganese	mg/L	0.4	0.258	0.624	0.229
Nickel	mg/L	0.08	0.00025	0.00025	0.00025

Note: * 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. n/r – not required to be tested during this monitoring period. "ND" indicates where faecal coliforms were not detected.

There was **one exceedance of the resource consent conditions** in samples from the deep gravel aquifer during the October 2019 sampling round:

- Manganese concentration in bore C2DD exceeded the DWSNZ MAV.

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 50 m 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 (See Site Plan, Appendix A).

The results from the October 2019 consent monitoring round for these bores are presented in [Table 2-5](#) and have been compared with the ANZECC Livestock Drinking Water Trigger Values as per the discharge consent 6010. The full laboratory report is included in Appendix A.

There were no exceedances of the ANZECC LDW trigger values during the October 2019 monitoring round and so the **results comply with the resource consent conditions**.

Table 2-5: Results from Shallow Boreholes Down-Gradient from the Old Landfill for October 2019

Determinant	Units	ANZECC STOCK	E2S	B1	B2	B3	C1	C2	C2DS	G2S
Water level	mBGL	-	4.635	0.875	1.21	0.135	3.6	0.245	2.12	2.145
pH	-	6 to 9	7.7	7.0	6.6	6.9	6.6	7.0	6.7	7.0
Conductivity	mS/m	-	44.8	123	189	270	127	298	170	133
COD	mg/L	-	7.5	87	78	119	85	113	82	22
Faecal coliforms	CFU/100ml	100	ND	40	28	ND	ND	4	ND	ND
Chloride	mg/L	-	41.0	139	123	177	244	368	111	194
Nitrate-N	mg/L	90.3	0.005	8.45	34.7	0.05	0.005	0.05	0.05	0.005
Ammoniacal-N	mg/L	-	0.26	7.10	45.5	141	0.41	157	1.54	<0.01
Sodium	mg/L	-	41.7	121	103	141	151	206	105	187
Aluminium	mg/L	5	0.001	0.004	0.011	0.003	0.006	0.007	0.001	0.004
Boron	mg/L	5	0.05	0.56	1.37	1.17	0.62	1.85	0.89	0.57
Iron	mg/L	-	0.02	0.01	0.14	0.74	0.78	0.63	4.55	0.12
Lead	mg/L	0.1	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L	-	0.283	5.97	3.14	3.39	0.197	0.0512	2.92	0.0928
Nickel	mg/L	1	0.00025	0.0010	0.0018	0.0085	0.0006	0.0033	0.0015	0.0033

Note: **Bold** – denotes an exceedance of the ANZECC Livestock Drinking Water Trigger Values. 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. "ND" indicates where faecal coliforms were not detected.

2.5 Groundwater Quality Down-Gradient of the Irrigation Area

The F-series boreholes intersect the shallow aquifer down-gradient of the area 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. F2 and F3 boreholes are located in an area that was set aside for leachate irrigation but never used as such. 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 Livestock Drinking Water Trigger Values as per the discharge consent 6010. The full laboratory report is included in Appendix A.

There were no exceedances of the ANZECC LDW trigger values during the October 2019 monitoring round and so the **results comply with the resource consent conditions**.

Table 2-6: Results from the Irrigation Area for October 2019

Determinant	Units	ANZECC STOCK	F1	F2	F3
Water level	mBGL	-	7.92	5.265	2.83
pH	-	6 to 9	6.8	7.0	7.0
Conductivity	mS/m	-	42.4	22.6	20.6
COD	mg/L	-	7.5	7.5	7.5
Faecal coliforms	CFU/100ml	100	ND	ND	ND
Chloride	mg/L	-	51.8	23.4	19.4
Nitrate-N	mg/L	90.3	1.96	0.73	1.93
Ammoniacal-N	mg/L	-	0.005	0.005	0.005
Sodium	mg/L	-	14.3	23.6	9.08
Aluminium	mg/L	5	0.001	0.002	0.001
Boron	mg/L	5	0.03	0.03	0.015
Iron	mg/L	-	0.005	0.005	0.005
Lead	mg/L	0.1	0.00025	0.00025	0.00025
Manganese	mg/L	-	0.0030	0.0017	0.00025
Nickel	mg/L	1	0.00025	0.00025	0.00025

Note: **Bold** – denotes an exceedance of the ANZECC LDW trigger values. 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. "ND" indicates where faecal coliforms were not detected.

2.6 Leachate Effluent Results

Leachate effluent from the landfill is **not subject to any water quality consent conditions**. However, for comparison purposes, typical leachate characteristics for landfills published by the Waste Management Institute New Zealand (*Technical Guidelines for Disposal to Land*, August 2018, WasteMINZ) have been compared against the leachate quality ([Table 2-7](#)). The full laboratory report is included in Appendix A. [Table 2-7](#) shows that characteristics of leachate effluent samples collected in October 2019 were well within the typical ranges to be expected for this type of landfill.

Table 2-7: Results from Leachate Effluent for October 2019

Determinant	Units	Typical Leachate Characteristics*	Leachate
		(range)	Effluent
pH		5.9 - 8.5	7.7
Suspended Solids	mg/l		40
Phenol	mg/L		0.025
VFA	mg/L		12
TOC	mg/L	17.2 - 822	530
Alkalinity	mg CaCO ₃ /L	264 - 6,820	4950
Conductivity	mS/m	308 - 27,900	1210
COD	mg/L	84 - 5,090	2270
BOD	mg/L	12 - 3,867	146
Faecal coliforms	col/100ml	-	96
Chloride	mg/L	45 - 2,584	857
Nitrate-N	mg/L	-	0.05
Sulphate	mg/L	1 - 780	85.5
Ammonia-N	mg/L	3.4 - 1,440	1010
Hardness	mg CaCO ₃ /L		414
Calcium	mg/L	20 - 600***	85.3
Magnesium	mg/L	40 - 350***	48.8
Potassium	mg/L	10 - 2,500**	555
Sodium	mg/L	50 - 4,000**	738
D.R. Phosphorus	mg/L	-	9.04
Aluminium	mg/L	-	0.307
Arsenic	mg/L	0.005 - 1.60**	0.312
Boron	mg/L	0.54 - 20.1	5.34
Cadmium	mg/L	0.0005 - 0.140**	0.0001
Chromium	mg/L	0.005 - 50.4	0.208
Copper	mg/L	0.004 - 1.40	0.0044
Iron	mg/L	1.6 - 220	2.53
Lead	mg/L	0.001 - 0.42	0.0009
Manganese	mg/L	0.3 - 45***	0.852
Nickel	mg/L	0.02 - 2.05**	0.0729
Zinc	mg/L	0.009 - 24.2	0.039

Note:

* 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.

2.7 Tatana Property Drain

A drain is located on the Tatana property (see Site Plan in Appendix A). Four sampling points were selected to represent the top of the drain (SW1), middle of the drain (SW2 and SW3) and lower drain (SW4). Results from the October 2019 sampling round are presented in Table 2-8 and have been compared with the ANZECC LDW trigger values because the water is most reflective of shallow groundwater. **Results from the Tatana Property drain sampling points are presently not subject to any resource consent conditions.**

Table 2-8: Tatana's Drain Results for October 2019

Determinant	Units	ANZECC STOCK	SW1	SW2	SW3	SW4
pH		6 to 9	7.4	7.9	7.8	7.7
Faecal coliforms	CFU/100 ml	100	69	690	250	650
Total Suspended Solids	mg/L	-	59	15	131	11
Conductivity	mS/m	-	253	161	63.3	82.9
COD	mg/L	-	494	142	124	73
Total Kjeldahl Nitrogen	mg/L	-	96.2	38.9	10.0	10.4
BOD5-Total	mg/L	-	14	9	17	36
Chloride	mg/L	-	243	159	72.3	88.1
Nitrite-N	mg/L	-	0.14	0.28	0.03	0.04
Nitrate-N	mg/L	90.3	2.06	5.40	0.26	0.40
Ammoniacal-N	mg/L	-	96.8	36.8	6.4	10.5
Total-N	mg/L	-	98.2	45.3	8.79	11.60
Iron	mg/L	-	0.50	0.37	1.12	0.46
Manganese	mg/L	-	0.806	0.606	0.446	0.518

Note: **Bold** – denotes an exceedance of the ANZECC LDW trigger values. All '<' values have been reported as half the detection limit for statistical purposes and are expressed in italics.

Faecal coliform counts at SW2, SW3 and SW4 **exceeded the ANZECC LDW trigger value** during the October 2019 monitoring round.

2.8 Hokio Stream

Surface water grab samples are obtained from Hokio Stream at sites HS1, HS2 and HS3 (refer to Appendix A) to investigate whether groundwater containing leachate is having an adverse environmental effect on the stream. Site HS1 is 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 Hokio Stream are analysed for indicator parameters every six months (as shown in Appendix B).

Results from the October 2019 sampling round are presented in Table 2-9 and have been compared with the ANZECC LDW trigger values as required by Discharge Permit 6010.

Table 2-9: Hokio Stream Results for October 2019

Determinant	Units	ANZECC STOCK	HS1	HS2	HS3
pH		6 to 9	8.1	7.9	7.8
Suspended Solids	mg/l		36	31	34
Phenol	mg/L		0.025	0.025	0.025
VFA	mg/L		60	30	30
TOC	mg/L		6.9	6.7	6.8
Alkalinity	mg CaCO3/L		49	52	51
Conductivity	mS/m	-	23.3	24.5	24.5
COD	mg/L	-	36	29	27
BOD	mg/L		<3	36	3
Faecal coliforms	col/100ml	100	190	190	200

Determinant	Units	ANZECC STOCK	HS1	HS2	HS3
Chloride	mg/L	-	22.7	24.0	23.7
Nitrate-N	mg/L	90.3	1.43	1.47	1.46
Sulphate	mg/L		21.6	21.4	21.2
Ammonia-N	mg/L	-	0.005	0.10	0.04
Hardness	mg CaCO3/L		60	63	63
Calcium	mg/L		12.9	13.5	13.5
Magnesium	mg/L		6.81	7.04	7.14
Potassium	mg/L		3.32	3.32	3.62
Sodium	mg/L	-	19.9	20.1	20.4
D.R. Phosphorus	mg/L		0.0025	0.0025	0.005
Aluminium	mg/L	5	0.027	0.027	0.034
Arsenic	mg/L		0.0005	0.0005	0.0005
Boron	mg/L	5	0.05	0.05	0.05
Cadmium	mg/L		0.0001	0.0001	0.0001
Chromium	mg/L		0.0005	0.004	0.0005
Copper	mg/L		0.0012	0.0014	0.0017
Iron	mg/L	-	0.068	0.077	0.106
Lead	mg/L	0.1	0.00025	0.00025	0.00025
Manganese	mg/L	-	0.0140	0.0252	0.0279
Nickel	mg/L	1	0.00025	0.00025	0.00025
Zinc	mg/L		0.001	0.001	0.001

Note: **Bold** – denotes an exceedance of the ANZECC LDW trigger values. All '<' values have been reported as half the detection limit for statistical purposes and are expressed in italics.

There were **three exceedances of the resource consent conditions** in samples from the Hokio Stream during the October 2019 sampling round:

- Faecal coliform counts in samples from HS1, HS2 and HS3 exceeded the ANZECC LDW trigger values.

3. Discussion

3.1 Sampling Quality Control and Assurance

It was noted that samples were collected progressively over a 11-day period between 10 October and 21 October 2019. Whilst it is reasonable to understand that the landfill site is a large area and sample collection may require multiple trips to complete, a sampling interval that is too long may prevent realistic comparison between samples. The same was noted in the April and July 2019 report; the timing of sampling collection in October 2019 demonstrates that a concerted effort has been made to improve upon the previous rounds. However, it is still recommended that sampling be completed within not more than a one-week period from the collection of the first sample and that all surface water samples continue to be collected on the same day.

3.2 Background Groundwater Quality

Water quality from the natural background water up-gradient from the landfill site is not subjected to any consenting conditions.

Results since 2010 from the background bores indicate that low pH values are representative of background water quality in the shallow sand aquifer (G1S). The deeper gravel aquifer (G1D) has pH levels that are slightly higher but occasionally dip below the DWSNZ lower guideline of 7.

Chloride concentrations have also fluctuated considerably at the G1S bore and are occasionally above the DWSNZ GV. During the October 2019 sampling round, chloride concentration at G1S was 276 mg/L, higher than the DWSNZ GV of 250 mg/L but within the historical result range recorded at this bore.

Iron concentrations have fluctuated considerably at both the G1S and G1D bores since monitoring began and is occasionally above the DWSNZ GV. During the October 2019 sampling round, iron concentrations at G1S exceeded the DWSNZ GV of 0.2mg/L but was within the historical result ranges recorded at this bore. While chloride in bore G1D is usually also elevated above the DWSNZ GV, during this monitoring round the concentration recorded was just below this GV. Elevated iron concentrations in groundwater is likely to be related to hydrogeological conditions found at the site and is common in groundwater in this area.

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. In particular background bore G1S consistently records elevated concentrations of a range of parameters and therefore may not be suitable to use for reference background water quality. The suitability of G1S as a background bore will be further assessed prior to issue of the next annual compliance report (for 2019/2020).

3.3 Shallow Aquifer Groundwater Quality

3.3.1 Hydraulically Up-gradient from the Old landfill

Sampling results from the October 2019 monitoring round show that water quality from the shallow monitoring bores hydraulically up-gradient from the old landfill complies with the discharge consent conditions

Previous quarterly and annual reports noted that nitrate nitrogen has been consistently elevated in bores D1 and D6 when compared to background (G1S) and bore D4 as shown in [Figure 3-1](#). The concentration of nitrate nitrogen appeared to be steadily increasing until around October 2018 when the concentration began to fall. This recent decreasing trend has persisted throughout the 2019 quarterly monitoring rounds and is again reflected in these latest monitoring results.

Bores D1 and D6 are located down gradient of the new landfill, with bore D1 located hydraulically up-gradient of the leachate effluent pond and bore D6 located down gradient of the leachate pond. Other leachate indicators such as boron, chloride and ammoniacal nitrogen are all consistent with background concentrations and the historic record.

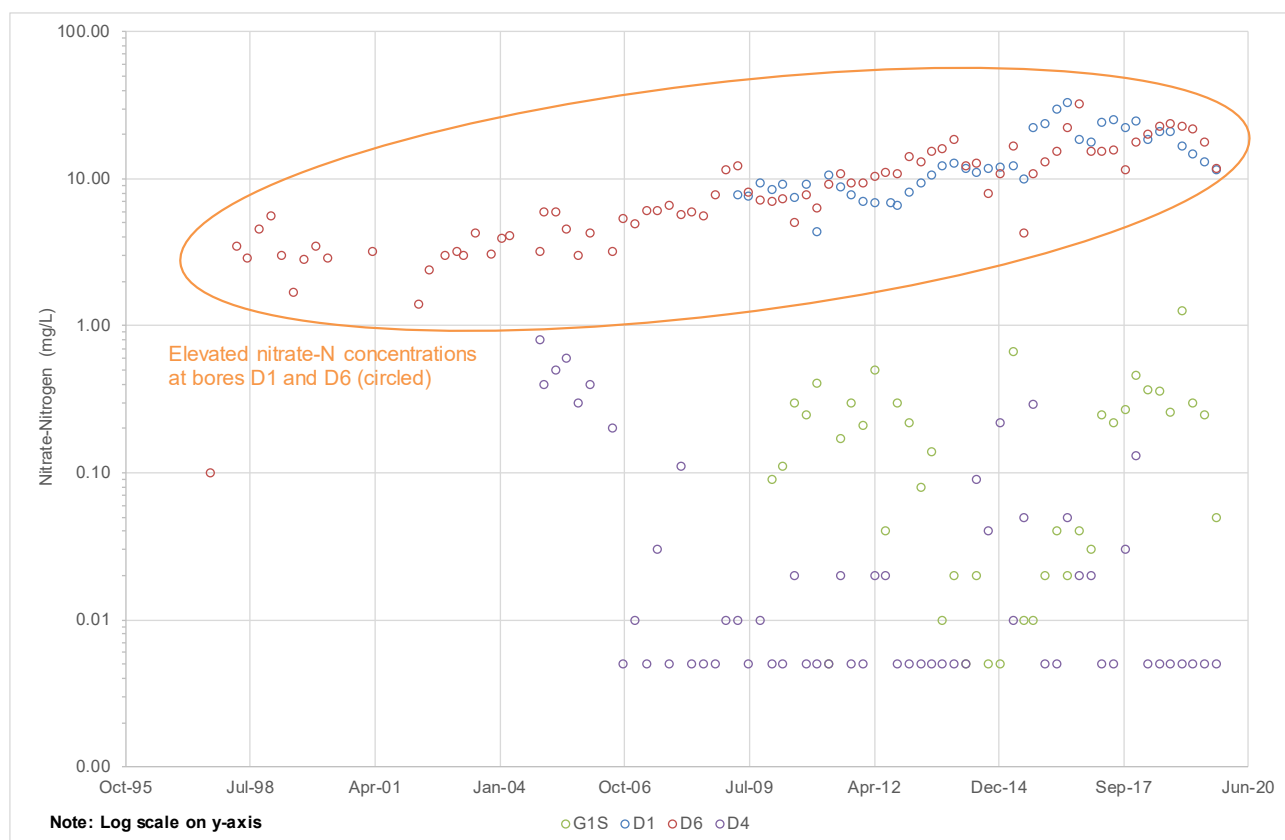


Figure 3-1: Nitrate Nitrogen Concentration in the D-Series Bores

In previous quarterly reports, it was recommended that further investigations be carried out to identify the possible cause (or causes) of the elevated levels of nitrate nitrogen in bores D1 and D6.

Such investigations should include regular monitoring of groundwater levels to be undertaken in all the bores monitored for the 2019-2020 monitoring period so that groundwater flow and the depth of the unsaturated zone can be assessed. This will enable more conclusions to be drawn as to the source of the elevated nitrate nitrogen and conductivity values.

3.3.2 Irrigation area

Sampling results from all shallow bores located hydraulically down-gradient of the irrigation area¹ (F series bores) is consistent with historical results and complies with the discharge consent conditions.

Historical trends of leachate indicators chloride, boron and ammoniacal nitrogen in the F-series bores are generally stable and did not show any indication of an increasing trend.

3.3.3 Hydraulically Down-gradient from the Old landfill

During the October 2019 sampling round there were no exceedances of the resource consent conditions in samples from the shallow bores.

Bores C1 and G2S are located down gradient of the old landfill to the east. These bores have consistently recorded low concentrations of ammoniacal nitrogen, with G2S often recording concentrations below detection limit. These bores are likely to be located beyond the eastern edge of the leachate plume.

Bores B1, B2, B3 and C2 all appear to be located and screened within the leachate plume and have significantly elevated concentrations of ammoniacal nitrogen. Historic results for all four bores are plotted

¹ Irrigation of leachate within this area ceased in October 2008.

in Figure 3-2 below. It is noted that the concentration of ammoniacal nitrogen in bore C2 has been increasing since 2009, while the concentration in B1 has fallen. It is possible that the leachate plume has shifted resulting in the different spatial pattern from five years ago. The regular monitoring of the groundwater levels in the bores over the 2019-2020 monitoring period will allow further conclusions to be drawn in the next annual report.

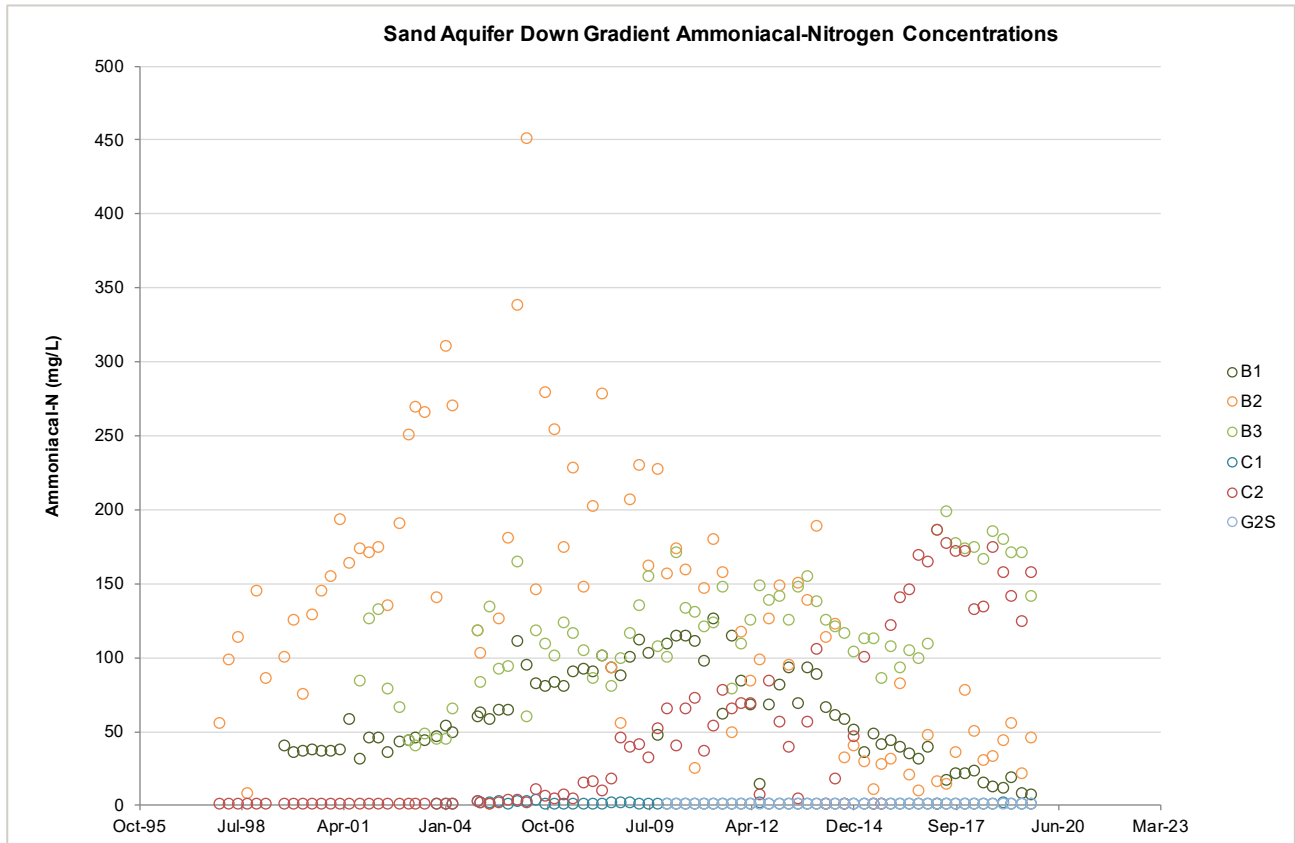


Figure 3-2: Shallow Bores Screened in the Leachate Plume

Other key leachate indicators, boron, conductivity and chloride are also all elevated within the bores that are located and screened in the leachate plume as would be expected.

The leachate plume appears to have a confined radius northward and is not extending to the north-west and the north-east. The leachate plume width was estimated to be 300-500m in 2014.

3.4 Deep Aquifer Groundwater Quality

The concentration of manganese exceeded the DWSNZ MAV at C2DD within the deep gravel aquifer, in October 2019. However, it is noted that the manganese concentration at C2DD (0.624mg/L) was consistent with historical results and representative of background groundwater quality in the area.

3.5 Leachate Effluent

Monitoring results from the leachate effluent samples are not required to meet either the ANZECC or DWSNZ standards. Results from the October 2019 monitoring round were all within the typical leachate composition range for Class 1 landfills published in the WasteMINZ 2018 Technical Guidelines for Disposal to Land.

3.6 Tatana Property Drain

Monitoring results from the Tatana's Property drain samples are not required to meet either the ANZECC LDW trigger values or DWSNZ MAVs.

As requested by HDC, analysis for faecal coliforms was added to the Comprehensive and Indicator Parameter Lists from the July 2019 monitoring period onwards. During this October 2019 monitoring period, faecal coliform counts at SW2, SW3 and SW4 within the Tatana Property drain exceeded the ANZECC LDW trigger values.

3.7 Hokio Stream

The consented limit for faecal coliforms in Hokio Stream (the ANZECC LDW trigger value) **was exceeded** at all three sampling locations (HS1, HS2 and HS3) during the October 2019 sampling event. This is consistent with the historic record and it is noted that the concentration between the upstream and downstream locations are comparable. This trend suggests that the exceedances observed may be related to activity upstream of the landfill. However, for greater certainty in interpreting this trend, the number of monitoring events where surface water samples are collected all on the same day needs to be increased (i.e. ensuring that samples are collected on the same day for every quarterly event). This will improve the quality and reliability of the dataset and provide greater confidence for any trends observed.

Current observations indicate that leachate from the landfill is not having a significant adverse environmental effect on Hokio Stream.

3.8 Consent Compliance

Discharge permit 6010 states that quarterly and annual monitoring results should 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) should comply with DWSNZ. Should any parameters be more than these guidelines, 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 landfill leachate, consult with the Regional Council to determine if further investigation or remedial measures are required.

Deeper gravel aquifer

There **was one exceedance** of the resource consent conditions in samples from the deep gravel aquifer during the October 2019 sampling round:

- Manganese concentration in bore C2DD exceeded the DWSNZ MAV.

Hokio stream

There were **three exceedances** of the resource consent conditions during the October 2019 sampling round monitoring the Hokio Stream:

- Faecal coliform levels in HS1, HS2 and HS3 exceeded the ANZECC LDW trigger value.

At this time these exceedances cannot be clearly attributed to landfill leachate discharges. However, the potential influence of landfill leachate on groundwater and surface water quality will be further explored in the annual report.

4. Conclusions

Current monitoring results suggests that the background groundwater is being impacted by local ground conditions and/or activities up-gradient of the landfill.

During the October 2019 monitoring period there were four exceedances of the resource consent conditions:

The deep-water bore C2DD located immediately down-gradient hydraulically of the old unlined landfill showed a manganese concentration marginally above the DWSNZ MAV. The concentration of manganese at this bore is consistent with historical results and is representative of ground water quality in the area.

Additionally, there were three exceedances from surface monitoring at the Hokio Stream; faecal coliform upstream of the old landfill (HS1), mid-stream (HS2) and downstream (HS3) of the old landfill were all above the ANZECC LDW trigger values. Continued elevation of faecal coliform counts above the ANZECC LDW trigger values may be related to activities upstream of the landfill.

Appendices



Appendix A Site Plans

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

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A REV

FOR INFORMATION

REVISIONS

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DATE

PROF REGISTRATION:

SURVEYED

DESIGNED

DRAWN

CAD REVIEW

APPROVED

Client:

MWH

N/A

Brent James

Brent James

Phil Landmark

08.2019

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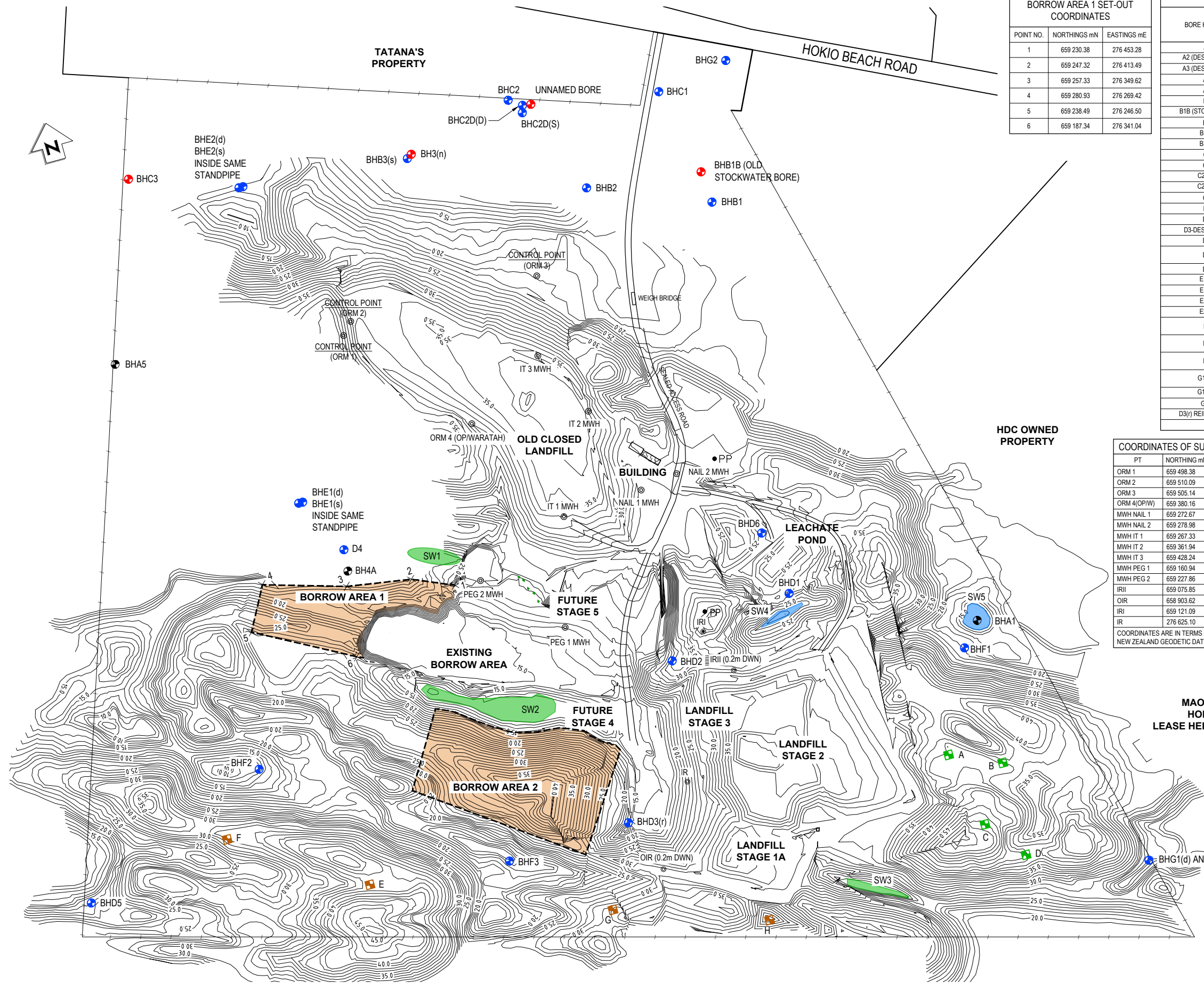
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BORROW AREA 1 SET-OUT COORDINATES		
POINT NO.	NORTHINGS mN	EASTINGS mE
1	659 230.38	276 453.28
2	659 247.32	276 413.49
3	659 257.33	276 349.62
4	659 280.93	276 269.42
5	659 238.49	276 246.50
6	659 187.34	276 341.04

BORE LOCATIONS AND DETAILS					
BORE HOLE NO	NORTHING mN	EASTING mE	R.L. (m)	DEPTH OF WELL (m)	PIEZOMETE R DIAMETER (mm)
A1	659 060.15	276 944.89	12.95		
A2 (DESTROYED)					
A3 (DESTROYED)					
A4	659 271.67	276 354.72	10.10		
A5	659 530.47	276 185.91	9.62		
B1	659 561.81	276 797.35	9.04	4.3	40
B1B (STOCK BORE)	659 530.08	276 799.91	9.28	10	
B2	659 576.32	276 683.50	9.42	3.5	50
B3(s)	659 651.19	276 519.52	7.76	2.83	50
B3(n)	659 654.26	276 524.38	7.49	2.33	32
C1	659 649.64	276 777.83	7.47	3.60	50
C2	659 680.80	276 631.22	7.50	2.81	32
C2D(s)	659 671.19	276 641.63	10.13	12.88	32
C2D(d)	659 671.19	276 641.63	10.11	18.85	32
C3	659 704.29	276 246.89	7.22	2.8	32
D1	659 134.97	276 771.65	27.46	23.69	50
D2	659 101.02	276 642.06	32.12	29.46	50
D3-DESTROYED					
D4	659 293.20	276 356.60	20.50	17.0	
D5	659 020.80	276 022.40	17.8	18	
D6	659 200.31	276 761.08	26.41	16.07	50
E1(d)	659 349.54	276 329.48	20.91	37.80	32
E1(s)	659 349.54	276 329.48	20.91	20.05	32
E2(s)	659 667.30	276 354.69	13.15	15.24	32
E2(d)	659 667.30	276 354.69	13.15	28.66	32
F1	659 037.10	276 925.50	18.90	15.0	50
F2	659 105.00	276 218.00	13.50	10.2	50
F3	658 951.7	276 434.0	16.70	10.5	50
G1(s) ⁴	658 786	277 046	24	15	50
G1(d) ⁴	658 786	277 046	24	31.5	50
G2 ⁴	659 673	276 835	8	4	50
D3(r) REINSTATED ⁴	658 953	276 552	18	10	50

COORDINATES ARE IN TERMS OF NEW ZEALAND GEODETIC DATUM 1949: WANGANUI CIRCUIT

COORDINATES OF SURVEY CONTROL MARKS			
PT	NORTHING mN	EASTING mE	R.L.
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(OPW)	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

NOTES:

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

LEGEND

- 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

NOT FOR CONSTRUCTION

HOROWHENUA DISTRICT COUNCIL
LEVIN LANDFILL

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

Status Stamp

FOR INFORMATION ONLY

Date Stamp

26.08.19

Scales

1:2000 (A1) 1:4000 (A3)

Drawing No.

310101088-19-001-G001

Rev.

A



Hokio Stream ("HS") and Tatana's Property Drain ("SW") Monitoring Locations

Appendix B Sampling Schedule

LEVIN LANDFILL - SUMMARY OF SURFACE AND GROUNDWATER MONITORING REQUIREMENTS (July 2019 - April 2022).

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

			Table A (Condition 3, DP 6010)					Table B (Condition 3, DP 6010)																				Table C (Condition 3, DP 6010)									
Reports Due		Sampling Month	Deep Aquifer Bores					Shallow Aquifer Bores																Irrigation Bores				Hokio Stream ⁽⁴⁾				Tatana Drain	Leachate Pond ⁽⁵⁾				
Annual	Quarterly		C2dd	E1d	E2d	G1d	Xd1 ⁽¹⁾	C1	C2	C2ds	D4	B1	B2	B3s	E1s	E2s	D1 ⁽²⁾	D2 ⁽²⁾	D3r ⁽²⁾	D6 ⁽²⁾	G1s	G2s	Xs1 ⁽¹⁾	Xs2 ⁽¹⁾	D5 ⁽³⁾	F1 ⁽³⁾	F2 ⁽³⁾	F3 ⁽³⁾	HS1	HS1A	HS2	HS3		TD1			
Sep-19	Aug-19	Jul-19	I	I + SW	I	I	C + A	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C + A	C + A	I	I	I	I + SW	Monthly Comprehensive for 2 Years	Monthly Comprehensive for 2 Years	Monthly Comprehensive for 2 Years	Monthly Comprehensive for 2 Years	I	Monthly Comprehensive for 2 Years			
	Nov-19	Oct-19	I	I + SW	I	I	C + A	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C + A	C + A	I	I	I	I + SW					C			A	
	Feb-20	Jan-20	I	I + SW	I	I	C + A	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C + A	C + A	I	I	I	I + SW					I				
	May-20	Apr-20	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		
Sep-20	Aug-20	Jul-20	I	I + SW	I	I	I	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C + A	C + A	I	I	I	I + SW					I				
	Nov-20	Oct-20	I	I + SW	I	I	I	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C + A	C + A	I	I	I	I + SW					C			A	
	Feb-21	Jan-21	I	I + SW	I	I	I	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C + A	C + A	I	I	I	I + SW					I				
	May-21	Apr-21	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		
Sep-21	Aug-21	Jul-21	I	I + SW	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	Discontinue after 2 years	I	I	I	I	I	I		
	Nov-21	Oct-21	I	I + SW	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-22	Jan-22	I	I + SW	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	I		
	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		C	C	C	C	C + A			

Measure groundwater level and sample all bores for CH₄, CO₂ and O₂ each time that groundwater is sampled (Condition 4a of DP 6011)

Notes:

- (1) Bores to be developed by Consent Holder
- (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
- C Comprehensive list (see below)
- I Indicator list (see below)
- A Annual 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 significant 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

Downer EDI Levin - Landfill
P O Box 642
LEVIN 5540
Attention: Bruce Marshall

Analytical Report

Report Number: 19/40576
Issue: 1
05 November 2019

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-01	Levin Landfill quarterly SW1		21/10/2019 00:00	21/10/2019 14:18	0
Notes: 139301-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.4		22/10/2019	Marylou Cabral KTP	
0002 Suspended Solids - Total	59	g/m ³	21/10/2019	Gordon McArthur KTP	
0055 Conductivity at 25°C	253	mS/m	22/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	494	g/m ³	23/10/2019	Gordon McArthur KTP	
0083 Total Kjeldahl Nitrogen	96.2	g/m ³	21/10/2019	Gordon McArthur KTP	
0085 BOD5 - Total	14	g/m ³	21/10/2019	Gordon McArthur KTP	
0602 Chloride	243	g/m ³	29/10/2019	Amit Kumar KTP	
0603 Nitrite - Nitrogen	0.14	g/m ³	29/10/2019	Amit Kumar KTP	
0605 Nitrate - Nitrogen	2.06	g/m ³	29/10/2019	Amit Kumar KTP	
0719 Ammonia Nitrogen	96.8	g/m ³	23/10/2019	Divina Lagazon KTP	
2127 Total Nitrogen	98.2	g/m ³	23/10/2019	Divina Lagazon KTP	
6717 Iron - Dissolved	0.50	g/m ³	24/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.806	g/m ³	24/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	69	cfu/100ml	22/10/2019	Juana Tamayo KTP	
P1859 Sample Filtration	Completed		21/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-02	Levin Landfill quarterly SW5		21/10/2019 00:00	21/10/2019 14:18	0
Notes: 139305-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.8		22/10/2019	Marylou Cabral KTP	
0002 Suspended Solids - Total	11	g/m ³	21/10/2019	Gordon McArthur KTP	
0055 Conductivity at 25°C	85.1	mS/m	22/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	88	g/m ³	23/10/2019	Gordon McArthur KTP	
0083 Total Kjeldahl Nitrogen	10.2	g/m ³	21/10/2019	Gordon McArthur KTP	
0085 BOD5 - Total	< 6	g/m ³	21/10/2019	Gordon McArthur KTP	
0602 Chloride	91.1	g/m ³	24/10/2019	Amit Kumar KTP	
0603 Nitrite - Nitrogen	0.02	g/m ³	24/10/2019	Amit Kumar KTP	
0605 Nitrate - Nitrogen	0.24	g/m ³	24/10/2019	Amit Kumar KTP	
0719 Ammonia Nitrogen	10.1	g/m ³	23/10/2019	Divina Lagazon KTP	
2127 Total Nitrogen	11.3	g/m ³	23/10/2019	Divina Lagazon KTP	
6717 Iron - Dissolved	0.26	g/m ³	24/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.876	g/m ³	24/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	630	cfu/100ml	22/10/2019	Juana Tamayo KTP	
P1859 Sample Filtration	Completed		22/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-03	Levin Landfill quarterly SW4		21/10/2019 00:00	21/10/2019 14:18	0
Notes: 139304-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.7		22/10/2019	Marylou Cabral KTP	
0002 Suspended Solids - Total	11	g/m ³	21/10/2019	Gordon McArthur KTP	
0055 Conductivity at 25°C	82.9	mS/m	22/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	73	g/m ³	23/10/2019	Gordon McArthur KTP	
0083 Total Kjeldahl Nitrogen	10.4	g/m ³	21/10/2019	Gordon McArthur KTP	
0085 BOD5 - Total	< 6	g/m ³	21/10/2019	Gordon McArthur KTP	
0602 Chloride	88.1	g/m ³	24/10/2019	Amit Kumar KTP	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-03	Levin Landfill quarterly SW4		21/10/2019 00:00	21/10/2019 14:18	0
Notes: 139304-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0603 Nitrite - Nitrogen	0.04	g/m ³	24/10/2019	Amit Kumar KTP	
0605 Nitrate - Nitrogen	0.40	g/m ³	24/10/2019	Amit Kumar KTP	
0719 Ammonia Nitrogen	10.5	g/m ³	23/10/2019	Divina Lagazon KTP	
2127 Total Nitrogen	11.6	g/m ³	23/10/2019	Divina Lagazon KTP	
6717 Iron - Dissolved	0.46	g/m ³	24/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.518	g/m ³	24/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	650	cfu/100ml	22/10/2019	Juana Tamayo KTP	
P1859 Sample Filtration	Completed		21/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-04	Levin Landfill quarterly SW3		21/10/2019 00:00	21/10/2019 14:18	0
Notes: 139303-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.8		22/10/2019	Marylou Cabral KTP	
0002 Suspended Solids - Total	131	g/m ³	21/10/2019	Gordon McArthur KTP	
0055 Conductivity at 25°C	63.3	mS/m	24/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	124	g/m ³	23/10/2019	Gordon McArthur KTP	
0083 Total Kjeldahl Nitrogen	10.0	g/m ³	21/10/2019	Gordon McArthur KTP	
0085 BOD5 - Total	17	g/m ³	21/10/2019	Gordon McArthur KTP	
0602 Chloride	72.3	g/m ³	24/10/2019	Amit Kumar KTP	
0603 Nitrite - Nitrogen	0.03	g/m ³	24/10/2019	Amit Kumar KTP	
0605 Nitrate - Nitrogen	0.26	g/m ³	24/10/2019	Amit Kumar KTP	
0719 Ammonia Nitrogen	6.4	g/m ³	23/10/2019	Divina Lagazon KTP	
2127 Total Nitrogen	8.79	g/m ³	23/10/2019	Divina Lagazon KTP	
6717 Iron - Dissolved	1.12	g/m ³	24/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.446	g/m ³	24/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	250	cfu/100ml	22/10/2019	Juana Tamayo KTP	
P1859 Sample Filtration	Completed		21/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-05	Levin Landfill quarterly SW2		21/10/2019 00:00	21/10/2019 14:18	0
Notes: 139302-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.9		22/10/2019	Marylou Cabral KTP	
0002 Suspended Solids - Total	15	g/m ³	21/10/2019	Gordon McArthur KTP	
0055 Conductivity at 25°C	161	mS/m	22/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	142	g/m ³	23/10/2019	Gordon McArthur KTP	
0083 Total Kjeldahl Nitrogen	38.9	g/m ³	21/10/2019	Gordon McArthur KTP	
0085 BOD5 - Total	9	g/m ³	21/10/2019	Gordon McArthur KTP	
0602 Chloride	159	g/m ³	24/10/2019	Amit Kumar KTP	
0603 Nitrite - Nitrogen	0.28	g/m ³	24/10/2019	Amit Kumar KTP	
0605 Nitrate - Nitrogen	5.40	g/m ³	29/10/2019	Amit Kumar KTP	
0719 Ammonia Nitrogen	36.8	g/m ³	23/10/2019	Divina Lagazon KTP	
2127 Total Nitrogen	45.3	g/m ³	23/10/2019	Divina Lagazon KTP	
6717 Iron - Dissolved	0.37	g/m ³	24/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.606	g/m ³	24/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	690	cfu/100ml	22/10/2019	Juana Tamayo KTP	
P1859 Sample Filtration	Completed		21/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-06	Levin HS1		21/10/2019 00:00	22/10/2019 09:36	0
Notes: 139299-0 Levin Landfill Sample					
Test	Result	Units	Test Date	Signatory	
0001 pH	8.1		22/10/2019	Marylou Cabral KTP	
0002 Suspended Solids - Total	36	g/m ³	22/10/2019	Marylou Cabral KTP	



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South Dunedin 9012
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Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-06	Levin HS1		21/10/2019 00:00	22/10/2019 09:36	0
Notes: 139299-0 Levin Landfill Sample					
Test	Result	Units	Test Date	Signatory	
0040 Total (NP) Organic Carbon	6.9	g/m ³	02/11/2019	Tracy Morrison KTP	
0052 Alkalinity - Total	49	g CaCO ₃ /m ³	22/10/2019	Marylou Cabral KTP	
0055 Conductivity at 25°C	23.3	mS/m	22/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	36	g/m ³	24/10/2019	Gordon McArthur KTP	
0085 BOD5 - Total	< 6	g/m ³	22/10/2019	Gordon McArthur KTP	
0602 Chloride	22.7	g/m ³	24/10/2019	Amit Kumar KTP	
0605 Nitrate - Nitrogen	1.43	g/m ³	24/10/2019	Amit Kumar KTP	
0607 Sulphate	21.6	g/m ³	24/10/2019	Amit Kumar KTP	
0760 Ammonia Nitrogen	< 0.01	g/m ³	24/10/2019	Divina Lagazon KTP	
1642 Total Hardness	60	g CaCO ₃ /m ³	24/10/2019	Shanel Kumar KTP	
1810 Calcium - Dissolved	12.9	g/m ³	24/10/2019	Shanel Kumar KTP	
1819 Iron - Dissolved	0.068	g/m ³	24/10/2019	Shanel Kumar KTP	
1822 Magnesium - Dissolved	6.81	g/m ³	24/10/2019	Shanel Kumar KTP	
1834 Sodium - Dissolved	19.9	g/m ³	24/10/2019	Shanel Kumar KTP	
2088 Dissolved Reactive Phosphorus	< 0.005	g/m ³	24/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.027	g/m ³	24/10/2019	Shanel Kumar KTP	
6703 Arsenic - Dissolved	< 0.001	g/m ³	24/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.05	g/m ³	24/10/2019	Shanel Kumar KTP	
6708 Cadmium - Dissolved	< 0.0002	g/m ³	24/10/2019	Shanel Kumar KTP	
6711 Chromium - Dissolved	< 0.001	g/m ³	24/10/2019	Shanel Kumar KTP	
6713 Copper - Dissolved	0.0012	g/m ³	24/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	24/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.0140	g/m ³	24/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m ³	24/10/2019	Shanel Kumar KTP	
6726 Potassium - Dissolved	3.32	g/m ³	24/10/2019	Shanel Kumar KTP	
6738 Zinc - Dissolved	< 0.002	g/m ³	24/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	190	cfu/100ml	22/10/2019	Juana Tamayo KTP	
MO-5001 Volatile Fatty Acids	60 *	g/m ³		Prashilla Singh Transcribed by	
MO-5002 Total Halogenated Phenolics	< 0.05	g/m ³		Prashilla Singh Transcribed by	
P1859 Sample Filtration	Completed		22/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-07	Levin HS2		21/10/2019 00:00	22/10/2019 09:36	0
Notes: 139298-0 Levin Landfill Sample					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.9		22/10/2019	Marylou Cabral KTP	
0002 Suspended Solids - Total	31	g/m ³	22/10/2019	Marylou Cabral KTP	
0040 Total (NP) Organic Carbon	6.7	g/m ³	02/11/2019	Tracy Morrison KTP	
0052 Alkalinity - Total	52	g CaCO ₃ /m ³	22/10/2019	Marylou Cabral KTP	
0055 Conductivity at 25°C	24.5	mS/m	22/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	29	g/m ³	24/10/2019	Gordon McArthur KTP	
0085 BOD5 - Total	< 6	g/m ³	22/10/2019	Gordon McArthur KTP	
0602 Chloride	24.0	g/m ³	24/10/2019	Amit Kumar KTP	
0605 Nitrate - Nitrogen	1.47	g/m ³	24/10/2019	Amit Kumar KTP	
0607 Sulphate	21.4	g/m ³	24/10/2019	Amit Kumar KTP	
0760 Ammonia Nitrogen	0.10	g/m ³	24/10/2019	Divina Lagazon KTP	
1642 Total Hardness	63	g CaCO ₃ /m ³	24/10/2019	Shanel Kumar KTP	
1810 Calcium - Dissolved	13.5	g/m ³	24/10/2019	Shanel Kumar KTP	
1819 Iron - Dissolved	0.077	g/m ³	24/10/2019	Shanel Kumar KTP	
1822 Magnesium - Dissolved	7.04	g/m ³	24/10/2019	Shanel Kumar KTP	
1834 Sodium - Dissolved	20.1	g/m ³	24/10/2019	Shanel Kumar KTP	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-07	Levin HS2		21/10/2019 00:00	22/10/2019 09:36	0
Notes: 139298-0 Levin Landfill Sample					
Test	Result	Units	Test Date	Signatory	
2088 Dissolved Reactive Phosphorus	< 0.005	g/m ³	24/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.027	g/m ³	24/10/2019	Shanel Kumar KTP	
6703 Arsenic - Dissolved	< 0.001	g/m ³	24/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.05	g/m ³	24/10/2019	Shanel Kumar KTP	
6708 Cadmium - Dissolved	< 0.0002	g/m ³	24/10/2019	Shanel Kumar KTP	
6711 Chromium - Dissolved	0.004	g/m ³	24/10/2019	Shanel Kumar KTP	
6713 Copper - Dissolved	0.0014	g/m ³	24/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	24/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.0252	g/m ³	24/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m ³	24/10/2019	Shanel Kumar KTP	
6726 Potassium - Dissolved	3.32	g/m ³	24/10/2019	Shanel Kumar KTP	
6738 Zinc - Dissolved	< 0.002	g/m ³	24/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	190	cfu/100ml	22/10/2019	Juana Tamayo KTP	
MO-5001 Volatile Fatty Acids	30	g/m ³		Prashilla Singh Transcribed	
				by	
MO-5002 Total Halogenated Phenolics	< 0.05	g/m ³		Prashilla Singh Transcribed	
				by	
P1859 Sample Filtration	Completed		22/10/2019	Ruth Ashton	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-08	Levin HS3		21/10/2019 00:00	22/10/2019 09:36	0
Notes: 139297-0 Levin Landfill Sample					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.8		22/10/2019	Marylou Cabral KTP	
0002 Suspended Solids - Total	34	g/m ³	22/10/2019	Marylou Cabral KTP	
0040 Total (NP) Organic Carbon	6.8	g/m ³	02/11/2019	Tracy Morrison KTP	
0052 Alkalinity - Total	51	g CaCO ₃ /m ³	22/10/2019	Marylou Cabral KTP	
0055 Conductivity at 25°C	24.5	mS/m	22/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	27	g/m ³	24/10/2019	Gordon McArthur KTP	
0085 BOD5 - Total	< 6	g/m ³	22/10/2019	Gordon McArthur KTP	
0602 Chloride	23.7	g/m ³	24/10/2019	Amit Kumar KTP	
0605 Nitrate - Nitrogen	1.46	g/m ³	24/10/2019	Amit Kumar KTP	
0607 Sulphate	21.2	g/m ³	24/10/2019	Amit Kumar KTP	
0760 Ammonia Nitrogen	0.04	g/m ³	24/10/2019	Divina Lagazon KTP	
1642 Total Hardness	63	g CaCO ₃ /m ³	24/10/2019	Shanel Kumar KTP	
1810 Calcium - Dissolved	13.5	g/m ³	24/10/2019	Shanel Kumar KTP	
1819 Iron - Dissolved	0.106	g/m ³	24/10/2019	Shanel Kumar KTP	
1822 Magnesium - Dissolved	7.14	g/m ³	24/10/2019	Shanel Kumar KTP	
1834 Sodium - Dissolved	20.4	g/m ³	24/10/2019	Shanel Kumar KTP	
2088 Dissolved Reactive Phosphorus	0.005	g/m ³	24/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.034	g/m ³	24/10/2019	Shanel Kumar KTP	
6703 Arsenic - Dissolved	< 0.001	g/m ³	24/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.05	g/m ³	24/10/2019	Shanel Kumar KTP	
6708 Cadmium - Dissolved	< 0.0002	g/m ³	24/10/2019	Shanel Kumar KTP	
6711 Chromium - Dissolved	< 0.001	g/m ³	24/10/2019	Shanel Kumar KTP	
6713 Copper - Dissolved	0.0017	g/m ³	24/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	24/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.0279	g/m ³	24/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m ³	24/10/2019	Shanel Kumar KTP	
6726 Potassium - Dissolved	3.62	g/m ³	24/10/2019	Shanel Kumar KTP	
6738 Zinc - Dissolved	< 0.002	g/m ³	24/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	200	cfu/100ml	22/10/2019	Juana Tamayo KTP	
MO-5001 Volatile Fatty Acids	30	g/m ³		Prashilla Singh Transcribed	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-08	Levin HS3		21/10/2019 00:00	22/10/2019 09:36	0
Notes: 139297-0 Levin Landfill Sample					
Test	Result	Units	Test Date	Signatory	
MO-5002 Total Halogenated Phenolics	< 0.05	g/m ³		by Prashilla Singh Transcribed	
P1859 Sample Filtration	Completed		22/10/2019	Ruth Ashton .	
Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-09	Levin G2s		10/10/2019 00:00	11/10/2019 10:12	0
Notes: 139294-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.0		11/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	133	mS/m	11/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	22	g/m ³	11/10/2019	Gordon McArthur KTP	
0602 Chloride	194	g/m ³	14/10/2019	Divina Lagazon KTP	
0605 Nitrate - Nitrogen	< 0.01	g/m ³	14/10/2019	Divina Lagazon KTP	
0760 Ammonia Nitrogen	< 0.01	g/m ³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.004	g/m ³	14/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.57	g/m ³	14/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.12	g/m ³	14/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	14/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.0928	g/m ³	14/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	0.0033	g/m ³	14/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	187	g/m ³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	11/10/2019	Yuemei Yu KTP	
P1859 Sample Filtration	Completed		12/10/2019	Stephen Hutton .	
Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-10	Levin G1D		10/10/2019 00:00	11/10/2019 10:12	0
Notes: 139293-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.2		11/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	28.0	mS/m	11/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	< 15	g/m ³	11/10/2019	Gordon McArthur KTP	
0602 Chloride	31.9	g/m ³	14/10/2019	Divina Lagazon KTP	
0605 Nitrate - Nitrogen	< 0.01	g/m ³	14/10/2019	Divina Lagazon KTP	
0760 Ammonia Nitrogen	0.10	g/m ³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m ³	14/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	< 0.03	g/m ³	14/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.19	g/m ³	14/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	14/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.0580	g/m ³	14/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m ³	14/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	37.7	g/m ³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	11/10/2019	Yuemei Yu KTP	
P1859 Sample Filtration	Completed		12/10/2019	Stephen Hutton .	
Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-11	Levin G1S		10/10/2019 00:00	11/10/2019 10:12	0
Notes: 139292-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	6.5		11/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	122	mS/m	11/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	43	g/m ³	11/10/2019	Gordon McArthur KTP	
0602 Chloride	276	g/m ³	14/10/2019	Divina Lagazon KTP	
0605 Nitrate - Nitrogen	< 0.10	g/m ³	14/10/2019	Divina Lagazon KTP	
0760 Ammonia Nitrogen	0.05	g/m ³	17/10/2019	Divina Lagazon KTP	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-11	Levin G1S		10/10/2019 00:00	11/10/2019 10:12	0
Notes: 139292-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
6701 Aluminium - Dissolved	0.021	g/m ³	14/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	< 0.03	g/m ³	14/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	7.44	g/m ³	14/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	14/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.176	g/m ³	14/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	0.0007	g/m ³	14/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	170	g/m ³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	11/10/2019	Yuemei Yu KTP	
P1859 Sample Filtration	Completed		12/10/2019	Stephen Hutton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-12	Levin F3		14/10/2019 00:00	15/10/2019 09:31	0
Notes: 139291-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.0		15/10/2019	Marylou Cabral KTP	
0055 Conductivity at 25°C	20.6	mS/m	15/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	< 15	g/m ³	15/10/2019	Gordon McArthur KTP	
0602 Chloride	19.4	g/m ³	17/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	1.93	g/m ³	17/10/2019	Shanel Kumar KTP	
0760 Ammonia Nitrogen	< 0.01	g/m ³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m ³	17/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	< 0.03	g/m ³	17/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	< 0.01	g/m ³	17/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	9.08	g/m ³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	15/10/2019	Yuemei Yu KTP	
P1859 Sample Filtration	Completed		15/10/2019	Paige Falconer .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-13	Levin F2		14/10/2019 00:00	14/10/2019 15:31	0
Notes: 139290-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.0		15/10/2019	Marylou Cabral KTP	
0055 Conductivity at 25°C	22.6	mS/m	15/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	< 15	g/m ³	15/10/2019	Gordon McArthur KTP	
0602 Chloride	23.4	g/m ³	14/10/2019	Divina Lagazon KTP	
0605 Nitrate - Nitrogen	0.73	g/m ³	14/10/2019	Divina Lagazon KTP	
0760 Ammonia Nitrogen	< 0.01	g/m ³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.002	g/m ³	15/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.03	g/m ³	15/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	< 0.01	g/m ³	15/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	15/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.0017	g/m ³	15/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m ³	15/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	23.6	g/m ³	15/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	14/10/2019	Maria Norris KTP	
P1859 Sample Filtration	Completed		15/10/2019	Paige Falconer .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-14	Levin F1		14/10/2019 00:00	15/10/2019 09:31	0
Notes: 139289-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	6.8		15/10/2019	Marylou Cabral KTP	



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Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-14	Levin F1		14/10/2019 00:00	15/10/2019 09:31	0
Notes: 139289-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0055 Conductivity at 25°C	42.4	mS/m	15/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	< 15	g/m³	15/10/2019	Gordon McArthur KTP	
0602 Chloride	51.8	g/m³	17/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	1.96	g/m³	17/10/2019	Shanel Kumar KTP	
0760 Ammonia Nitrogen	< 0.01	g/m³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m³	17/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.03	g/m³	17/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	< 0.01	g/m³	17/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m³	17/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.0030	g/m³	17/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m³	17/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	14.3	g/m³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	15/10/2019	Yuemei Yu KTP	
P1859 Sample Filtration	Completed		15/10/2019	Paige Falconer .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-15	Levin E2s		16/10/2019 00:00	16/10/2019 14:50	0
Notes: 139288-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.7		16/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	44.8	mS/m	16/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	< 15	g/m³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	41.0	g/m³	17/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	< 0.01	g/m³	22/10/2019	Amit Kumar KTP	
0760 Ammonia Nitrogen	0.26	g/m³	25/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m³	21/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.05	g/m³	21/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.02	g/m³	21/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m³	21/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.283	g/m³	21/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m³	21/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	41.7	g/m³	22/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	16/10/2019	Maria Norris KTP	
P1859 Sample Filtration	Completed		17/10/2019	Paige Falconer .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-16	Levin E2d		15/10/2019 00:00	15/10/2019 15:06	0
Notes: 139287-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.7		16/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	34.4	mS/m	16/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	< 15	g/m³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	45.9	g/m³	16/10/2019	Divina Lagazon KTP	
0605 Nitrate - Nitrogen	< 0.01	g/m³	16/10/2019	Divina Lagazon KTP	
0760 Ammonia Nitrogen	0.29	g/m³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m³	17/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	< 0.03	g/m³	17/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.05	g/m³	17/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m³	17/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.229	g/m³	17/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m³	17/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	10.9	g/m³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	15/10/2019	Maria Norris KTP	
P1859 Sample Filtration	Completed		16/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-17	Levin E1s		15/10/2019 00:00	16/10/2019 08:47	0
Notes: 139286-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.0		16/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	26.9	mS/m	16/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	< 15	g/m³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	30.0	g/m³	16/10/2019	Divina Lagazon KTP	
0605 Nitrate - Nitrogen	< 0.01	g/m³	16/10/2019	Divina Lagazon KTP	
0760 Ammonia Nitrogen	0.18	g/m³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m³	17/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	< 0.03	g/m³	17/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	4.63	g/m³	17/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	0.0023	g/m³	17/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.242	g/m³	17/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m³	17/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	9.45	g/m³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	16/10/2019	Juana Tamayo KTP	
P1859 Sample Filtration	Completed		16/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-18	Levin E1d		14/10/2019 00:00	15/10/2019 09:31	0
Notes: 139285-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.5		15/10/2019	Marylou Cabral KTP	
0055 Conductivity at 25°C	45.9	mS/m	15/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	< 15	g/m³	15/10/2019	Gordon McArthur KTP	
0602 Chloride	39.0	g/m³	16/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	< 0.01	g/m³	17/10/2019	Shanel Kumar KTP	
0760 Ammonia Nitrogen	0.21	g/m³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m³	17/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.06	g/m³	17/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.04	g/m³	17/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m³	17/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.258	g/m³	17/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m³	17/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	14.7	g/m³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	15/10/2019	Yuemai Yu KTP	
P1859 Sample Filtration	Completed		15/10/2019	Paige Falconer .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-19	Levin D6		15/10/2019 00:00	15/10/2019 15:06	0
Notes: 139284-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.0		16/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	31.9	mS/m	16/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	< 15	g/m³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	16.3	g/m³	16/10/2019	Divina Lagazon KTP	
0605 Nitrate - Nitrogen	11.7	g/m³	16/10/2019	Divina Lagazon KTP	
0760 Ammonia Nitrogen	< 0.01	g/m³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m³	17/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.05	g/m³	17/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	< 0.01	g/m³	17/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m³	17/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	< 0.0005	g/m³	17/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m³	17/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	9.72	g/m³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	15/10/2019	Maria Norris KTP	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-19	Levin D6		15/10/2019 00:00	15/10/2019 15:06	0
Notes: 139284-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
P1859 Sample Filtration	Completed		16/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-20	Levin D5		10/10/2019 00:00	11/10/2019 10:12	0
Notes: 139283-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.2		11/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	30.7	mS/m	11/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	< 15	g/m³	11/10/2019	Gordon McArthur KTP	
0602 Chloride	29.5	g/m³	14/10/2019	Divina Lagazon KTP	
0605 Nitrate - Nitrogen	1.15	g/m³	14/10/2019	Divina Lagazon KTP	
0760 Ammonia Nitrogen	< 0.01	g/m³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m³	14/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	< 0.03	g/m³	14/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.05	g/m³	14/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m³	14/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.0162	g/m³	14/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m³	14/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	33.0	g/m³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	11/10/2019	Yuemei Yu KTP	
P1859 Sample Filtration	Completed		12/10/2019	Stephen Hutton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-21	Levin D4		17/10/2019 00:00	17/10/2019 14:31	0
Notes: 139282-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.1		18/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	32.7	mS/m	18/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	< 15	g/m³	18/10/2019	Gordon McArthur KTP	
0602 Chloride	53.5	g/m³	17/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	< 0.01	g/m³	17/10/2019	Shanel Kumar KTP	
0760 Ammonia Nitrogen	0.23	g/m³	25/10/2019	Divina Lagazon KTP	
1819 Iron - Dissolved	0.858	g/m³	22/10/2019	Shanel Kumar KTP	
1834 Sodium - Dissolved	29.6	g/m³	22/10/2019	Shanel Kumar KTP	
6701 Aluminium - Dissolved	< 0.002	g/m³	21/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.03	g/m³	21/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.77	g/m³	21/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m³	21/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.175	g/m³	21/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m³	21/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	33.7	g/m³	22/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	17/10/2019	Sunita Raju KTP	
P1859 Sample Filtration	Completed		18/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-22	Levin D3r		15/10/2019 00:00	16/10/2019 08:47	0
Notes: 139281-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	6.8		16/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	22.0	mS/m	16/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	< 15	g/m³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	21.8	g/m³	16/10/2019	Divina Lagazon KTP	
0605 Nitrate - Nitrogen	0.19	g/m³	16/10/2019	Divina Lagazon KTP	
0760 Ammonia Nitrogen	0.17	g/m³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m³	17/10/2019	Shanel Kumar KTP	



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Dunedin
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Phone: (03) 972-7963

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-22	Levin D3r		15/10/2019 00:00	16/10/2019 08:47	0
Notes: 139281-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
6707 Boron - Dissolved	0.03	g/m ³	17/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	4.00	g/m ³	17/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.201	g/m ³	17/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	8.79	g/m ³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	16/10/2019	Juana Tamayo KTP	
P1859 Sample Filtration	Completed		16/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-23	Levin D2		15/10/2019 00:00	16/10/2019 08:47	0
Notes: 139280-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	6.5		16/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	34.7	mS/m	16/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	35	g/m ³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	35.2	g/m ³	16/10/2019	Divina Lagazon KTP	
0605 Nitrate - Nitrogen	< 0.10	g/m ³	16/10/2019	Divina Lagazon KTP	
0760 Ammonia Nitrogen	0.47	g/m ³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.004	g/m ³	17/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.05	g/m ³	17/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	9.04	g/m ³	17/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.325	g/m ³	17/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	7.84	g/m ³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	16/10/2019	Juana Tamayo KTP	
P1859 Sample Filtration	Completed		16/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-24	Levin D1		15/10/2019 00:00	16/10/2019 08:47	0
Notes: 139279-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	6.8		16/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	52.3	mS/m	16/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	< 15	g/m ³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	36.1	g/m ³	16/10/2019	Divina Lagazon KTP	
0605 Nitrate - Nitrogen	11.5	g/m ³	16/10/2019	Divina Lagazon KTP	
0760 Ammonia Nitrogen	< 0.01	g/m ³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m ³	17/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.05	g/m ³	17/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	< 0.01	g/m ³	17/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	14.2	g/m ³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	16/10/2019	Juana Tamayo KTP	
P1859 Sample Filtration	Completed		16/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-25	Levin C2ds		16/10/2019 00:00	17/10/2019 09:53	0
Notes: 139278-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	6.7		17/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	170	mS/m	17/10/2019	Jennifer Mont KTP	



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Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-25	Levin C2ds		16/10/2019 00:00	17/10/2019 09:53	0
Notes: 139278-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0081 Chemical Oxygen Demand	82	g/m ³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	111	g/m ³	17/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	< 0.10	g/m ³	22/10/2019	Amit Kumar KTP	
0760 Ammonia Nitrogen	1.54	g/m ³	24/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m ³	21/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.89	g/m ³	21/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	4.55	g/m ³	21/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	21/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	2.92	g/m ³	22/10/2019	Sharon van Soest KTP	
6724 Nickel - Dissolved	0.0015	g/m ³	21/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	105	g/m ³	22/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	17/10/2019	Sunita Raju KTP	
P1859 Sample Filtration	Completed		17/10/2019	Paige Falconer .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-26	Levin C2dd		14/10/2019 00:00	15/10/2019 09:31	0
Notes: 139277-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.4		15/10/2019	Marylou Cabral KTP	
0055 Conductivity at 25°C	51.6	mS/m	15/10/2019	Marylou Cabral KTP	
0081 Chemical Oxygen Demand	< 15	g/m ³	15/10/2019	Gordon McArthur KTP	
0602 Chloride	38.2	g/m ³	16/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	< 0.01	g/m ³	17/10/2019	Shanel Kumar KTP	
0760 Ammonia Nitrogen	0.32	g/m ³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	< 0.002	g/m ³	17/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.06	g/m ³	17/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.02	g/m ³	17/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.624	g/m ³	17/10/2019	Sharon van Soest KTP	
6724 Nickel - Dissolved	< 0.0005	g/m ³	17/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	15.3	g/m ³	17/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	15/10/2019	Yuemei Yu KTP	
P1859 Sample Filtration	Completed		15/10/2019	Paige Falconer .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-27	Levin C2		16/10/2019 00:00	17/10/2019 09:53	0
Notes: 139276-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.0		17/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	298	mS/m	17/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	113	g/m ³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	368	g/m ³	22/10/2019	Amit Kumar KTP	
0605 Nitrate - Nitrogen	< 0.10	g/m ³	22/10/2019	Amit Kumar KTP	
0760 Ammonia Nitrogen	157	g/m ³	24/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.007	g/m ³	21/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	1.85	g/m ³	24/10/2019	Tracy Morrison KTP	
6717 Iron - Dissolved	0.63	g/m ³	21/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	21/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.0512	g/m ³	21/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	0.0033	g/m ³	21/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	206	g/m ³	22/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	4	cfu/100ml	17/10/2019	Sunita Raju KTP	
P1859 Sample Filtration	Completed		17/10/2019	Paige Falconer .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-28	Levin C1		16/10/2019 00:00	17/10/2019 09:53	0
Notes: 139275-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	6.6		17/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	127	mS/m	17/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	85	g/m ³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	244	g/m ³	17/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	< 0.01	g/m ³	24/10/2019	Amit Kumar KTP	
0760 Ammonia Nitrogen	0.41	g/m ³	21/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.006	g/m ³	21/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.62	g/m ³	21/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.78	g/m ³	21/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	21/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.197	g/m ³	21/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	0.0006	g/m ³	21/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	151	g/m ³	22/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	17/10/2019	Sunita Raju KTP	
P1859 Sample Filtration	Completed		17/10/2019	Paige Falconer .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-29	Levin B3s		16/10/2019 00:00	17/10/2019 09:53	0
Notes: 139274-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	6.9		17/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	270	mS/m	17/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	119	g/m ³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	177	g/m ³	17/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	< 0.10	g/m ³	22/10/2019	Amit Kumar KTP	
0760 Ammonia Nitrogen	141	g/m ³	24/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.003	g/m ³	21/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	1.17	g/m ³	21/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.74	g/m ³	21/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	21/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	3.39	g/m ³	22/10/2019	Sharon van Soest KTP	
6724 Nickel - Dissolved	0.0085	g/m ³	21/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	141	g/m ³	22/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	< 4	cfu/100ml	17/10/2019	Sunita Raju KTP	
P1859 Sample Filtration	Completed		17/10/2019	Paige Falconer .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-30	Levin B2		16/10/2019 00:00	17/10/2019 09:53	0
Notes: 139273-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	6.6		17/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	189	mS/m	17/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	78	g/m ³	17/10/2019	Gordon McArthur KTP	
0602 Chloride	123	g/m ³	17/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	34.7	g/m ³	22/10/2019	Amit Kumar KTP	
0760 Ammonia Nitrogen	45.5	g/m ³	24/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.011	g/m ³	21/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	1.37	g/m ³	21/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.14	g/m ³	21/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m ³	21/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	3.14	g/m ³	22/10/2019	Sharon van Soest KTP	
6724 Nickel - Dissolved	0.0018	g/m ³	21/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	103	g/m ³	22/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	28	cfu/100ml	17/10/2019	Sunita Raju KTP	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-30	Levin B2		16/10/2019 00:00	17/10/2019 09:53	0
Notes: 139273-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
P1859 Sample Filtration	Completed		17/10/2019	Paige Falconer .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-31	Levin B1		17/10/2019 00:00	17/10/2019 14:31	0
Notes: 139261-0 Levin Landfill					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.0		18/10/2019	Jennifer Mont KTP	
0055 Conductivity at 25°C	123	mS/m	18/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	87	g/m³	18/10/2019	Gordon McArthur KTP	
0602 Chloride	139	g/m³	17/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	8.45	g/m³	22/10/2019	Amit Kumar KTP	
0760 Ammonia Nitrogen	7.10	g/m³	25/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.004	g/m³	21/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	0.56	g/m³	21/10/2019	Shanel Kumar KTP	
6717 Iron - Dissolved	0.01	g/m³	21/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	< 0.0005	g/m³	21/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	5.97	g/m³	22/10/2019	Sharon van Soest KTP	
6724 Nickel - Dissolved	0.0010	g/m³	21/10/2019	Shanel Kumar KTP	
6731 Sodium - Dissolved	121	g/m³	22/10/2019	Shanel Kumar KTP	
M0102 Faecal Coliforms	40	cfu/100ml	17/10/2019	Sunita Raju KTP	
P1859 Sample Filtration	Completed		18/10/2019	Ruth Ashton .	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-32	Levin Leachate Pond		10/10/2019 00:00	10/10/2019 14:49	0
Notes: 139316-0 Levin Landfill Sample					
Test	Result	Units	Test Date	Signatory	
0001 pH	7.7		10/10/2019	Jennifer Mont KTP	
0002 Suspended Solids - Total	40	g/m³	11/10/2019	Gordon McArthur KTP	
0040 Total (NP) Organic Carbon	530	g/m³	31/10/2019	Tracy Morrison KTP	
0052 Alkalinity - Total	4,950	g CaCO3/m³	11/10/2019	Gordon McArthur KTP	
0055 Conductivity at 25°C	1,210	mS/m	10/10/2019	Jennifer Mont KTP	
0081 Chemical Oxygen Demand	2,270	g/m³	11/10/2019	Gordon McArthur KTP	
0085 BOD5 - Total	146	g/m³	16/10/2019	Gordon McArthur KTP	
0602 Chloride	857	g/m³	14/10/2019	Shanel Kumar KTP	
0605 Nitrate - Nitrogen	< 0.10	g/m³	14/10/2019	Shanel Kumar KTP	
0607 Sulphate	85.5	g/m³	14/10/2019	Shanel Kumar KTP	
0760 Ammonia Nitrogen	1,010	g/m³	17/10/2019	Divina Lagazon KTP	
1642 Total Hardness	414	g CaCO3/m³	16/10/2019	Richard Zhao KTP	
1810 Calcium - Dissolved	85.3	g/m³	16/10/2019	Richard Zhao KTP	
1819 Iron - Dissolved	2.53	g/m³	16/10/2019	Richard Zhao KTP	
1822 Magnesium - Dissolved	48.8	g/m³	16/10/2019	Richard Zhao KTP	
1834 Sodium - Dissolved	738	g/m³	16/10/2019	Richard Zhao KTP	
2088 Dissolved Reactive Phosphorus	9.04	g/m³	17/10/2019	Divina Lagazon KTP	
6701 Aluminium - Dissolved	0.307	g/m³	14/10/2019	Shanel Kumar KTP	
6703 Arsenic - Dissolved	0.312	g/m³	14/10/2019	Shanel Kumar KTP	
6707 Boron - Dissolved	5.34	g/m³	14/10/2019	Shanel Kumar KTP	
6708 Cadmium - Dissolved	< 0.0002	g/m³	14/10/2019	Shanel Kumar KTP	
6711 Chromium - Dissolved	0.208	g/m³	14/10/2019	Shanel Kumar KTP	
6713 Copper - Dissolved	0.0044	g/m³	14/10/2019	Shanel Kumar KTP	
6718 Lead - Dissolved	0.0009	g/m³	14/10/2019	Shanel Kumar KTP	
6721 Manganese - Dissolved	0.852	g/m³	14/10/2019	Shanel Kumar KTP	
6724 Nickel - Dissolved	0.0729	g/m³	14/10/2019	Shanel Kumar KTP	
6726 Potassium - Dissolved	555	g/m³	17/10/2019	Shanel Kumar KTP	
6738 Zinc - Dissolved	0.039	g/m³	14/10/2019	Shanel Kumar KTP	

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
19/40576-32	Levin Leachate Pond		10/10/2019 00:00	10/10/2019 14:49	0
Notes: 139316-0 Levin Landfill Sample					
Test	Result	Units	Test Date	Signatory	
M0102 Faecal Coliforms	96	cfu/100ml	11/10/2019	Yuemei Yu KTP	
MO-5001 Volatile Fatty Acids	12 *	g/m³		Sunita Raju Transcribed by	
MO-5002 Total Halogenated Phenolics	< 0.05	g/m³		Sunita Raju Transcribed by	
P1859 Sample Filtration	Completed		11/10/2019	Ruth Ashton .	

Comments:

* Not an accredited test.

Sampled by customer using ELS approved containers.

Test Methodology:

Test	Methodology	Detection Limit
pH	Dedicated pH meter following APHA Online Edition Method 4500 H.	0.1
Suspended Solids - Total	APHA Online Edition Method 2540 D	3 g/m³
Total (NP) Organic Carbon	Total Non-Purgeable Organic Carbon using TOC analyser. APHA Online Edition 5310 B.	0.1 g/m³
Alkalinity - Total	APHA Online Edition Method 2320 B	1 g CaCO3/m³
Conductivity at 25°C	APHA Online Edition Method 2510 B.	0.1 mS/m
Chemical Oxygen Demand	APHA Online Edition Method 5220 D.	15 g/m³
Total Kjeldahl Nitrogen	APHA Online Edition 4500-N(org) B	0.8 g/m³
BOD5 - Total	APHA Online Edition Method 5210 B.	1 g/m³
Chloride	Ion Chromatography following APHA 4110B.	0.02 g/m³
Nitrite - Nitrogen	Ion Chromatography following APHA 4110B.	0.01 g/m³
Nitrate - Nitrogen	Ion Chromatography following APHA 4110B.	0.01 g/m³
Sulphate	Ion Chromatography following APHA 4110B.	0.02 g/m³
Ammonia Nitrogen	Discrete Analyser. In House method based on ISBN 0117516139.	0.01 g/m³
Ammonia Nitrogen	Flow Injection Autoanalyser following APHA Online Edition Method 4500 NH3-H.	0.01 g/m³
Total Hardness	ICP-OES following APHA Online Edition Method 3120 B (modified).	1 g CaCO3/m³
Calcium - Dissolved	ICP-OES following APHA Online Edition Method 3120 B (modified).	0.01 g/m³
Iron - Dissolved	ICP-OES following APHA Online Edition Method 3120 B (modified).	0.005 g/m³
Magnesium - Dissolved	ICP-OES following APHA Online Edition Method 3120 B (modified).	0.01 g/m³
Sodium - Dissolved	ICP-OES following APHA Online Edition Method 3120 B (modified).	0.02 g/m³
Dissolved Reactive Phosphorus	Flow Injection Autoanalyser following APHA Online Edition Method 4500-P G.	0.005 g/m³
Total Nitrogen	Flow Injection Autoanalyser following APHA Online Edition Method 4500-NO3 I. Persulphate digestion follows APHA Online Edition 4500-N C.	0.05 g/m³
Aluminium - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.002 g/m³
Arsenic - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.001 g/m³
Boron - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.03 g/m³
Cadmium - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.0002 g/m³
Chromium - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.001 g/m³
Copper - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.0005 g/m³
Iron - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.01 g/m³
Lead - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.0005 g/m³
Manganese - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.0005 g/m³
Nickel - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.0005 g/m³
Potassium - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified)	0.01 g/m³
Sodium - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified)	0.01 g/m³
Zinc - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.002 g/m³
Faecal Coliforms	APHA 9222D:Online Edition	1 cfu/100ml
Volatile Fatty Acids	Performed by Eurofins Melbourne following APHA 22nd Edition Method 5560C. Results are reported as acetic acid	5 g/m³

Test	Methodology	Detection Limit
	equivalent.	
Total Halogenated Phenolics	Analyses at Eurofins Melbourne following Method USEPA 8270 Phenols.	0.01 g/m ³
Sample Filtration	Sample filtered through 0.45 micron filter following APHA Online Edition Method 3030B.	n/a

Unless otherwise stated, all tests are performed in Wellington.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results.

"<" means that no analyte was found in the sample at the level of detection shown. Detection limits are based on a clean matrix and may vary according to individual sample.

g/m³ is the equivalent to mg/L and ppm.

Samples will be retained for a period of time, in suitable conditions appropriate to the analyses requested.



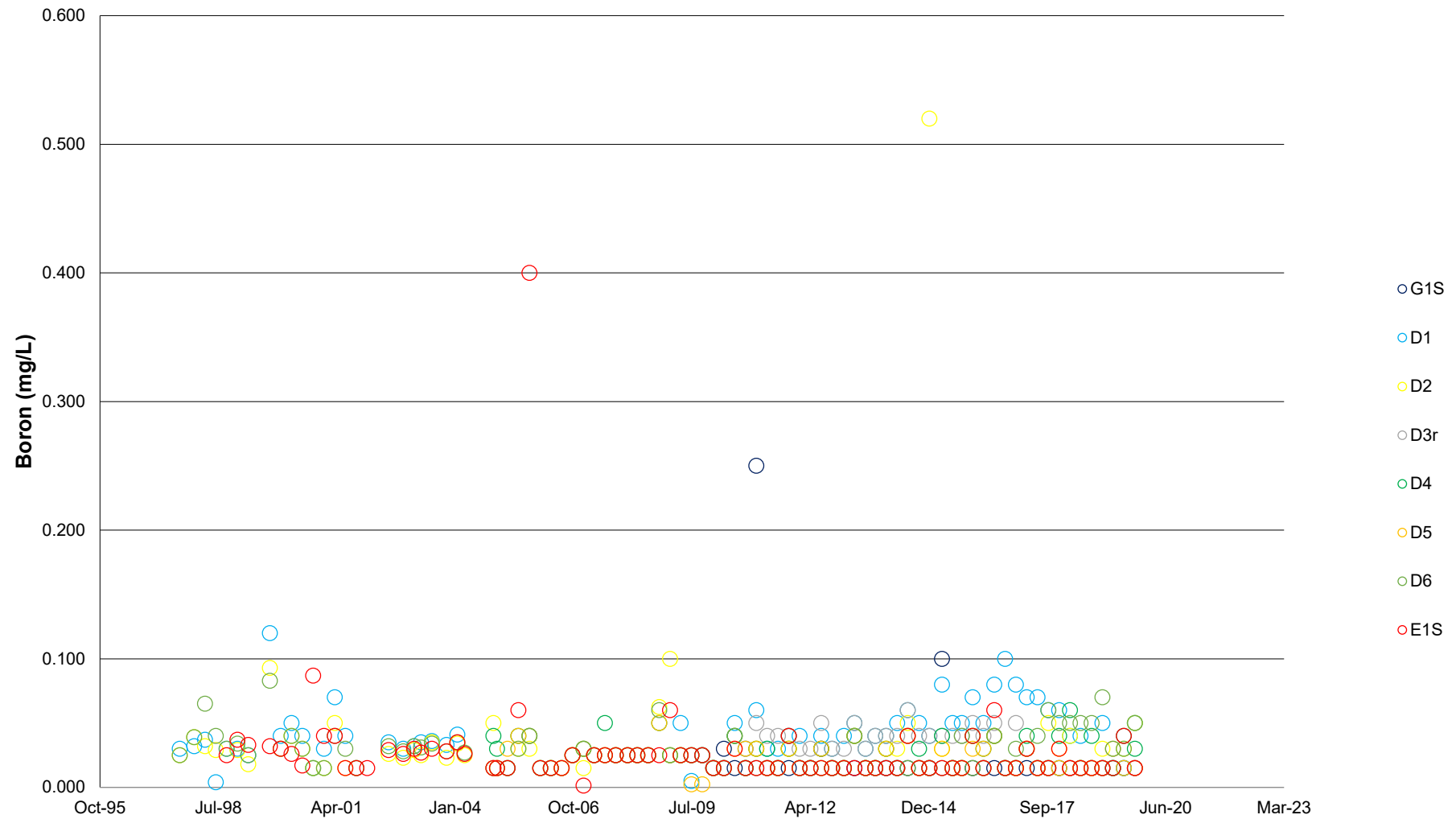
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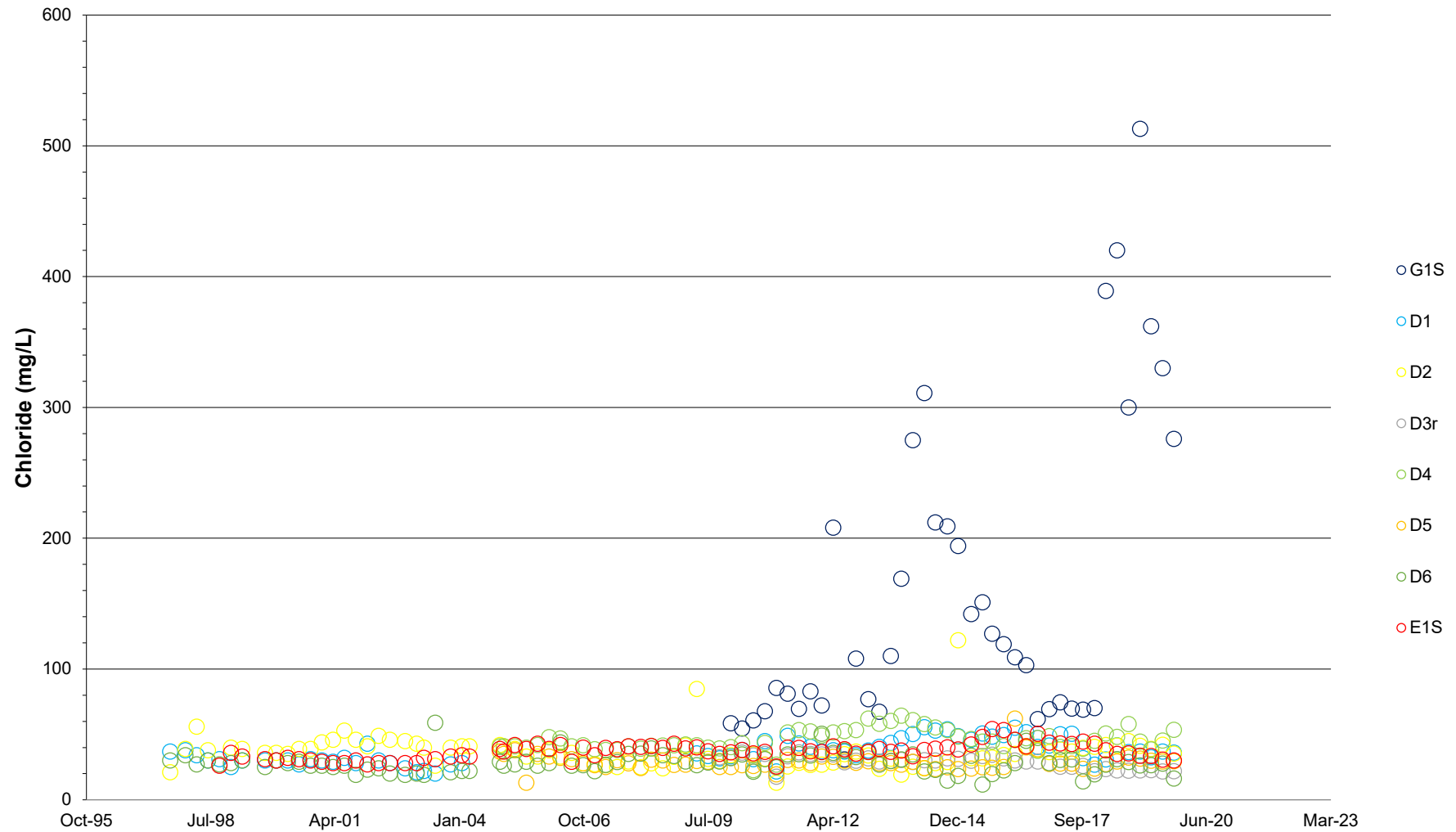
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Appendix D Historical Result Graphs

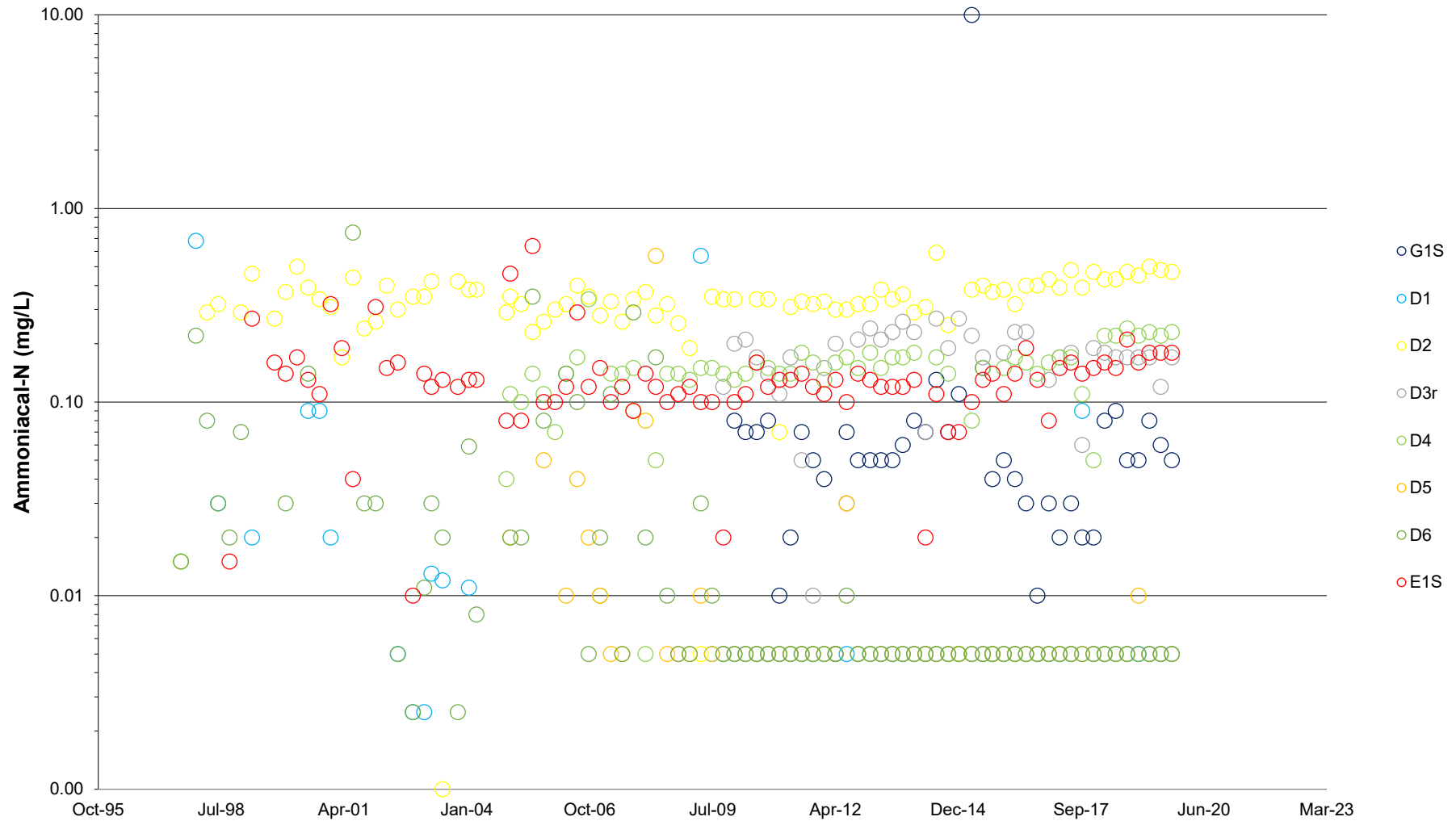
Sand Aquifer Boron Concentrations



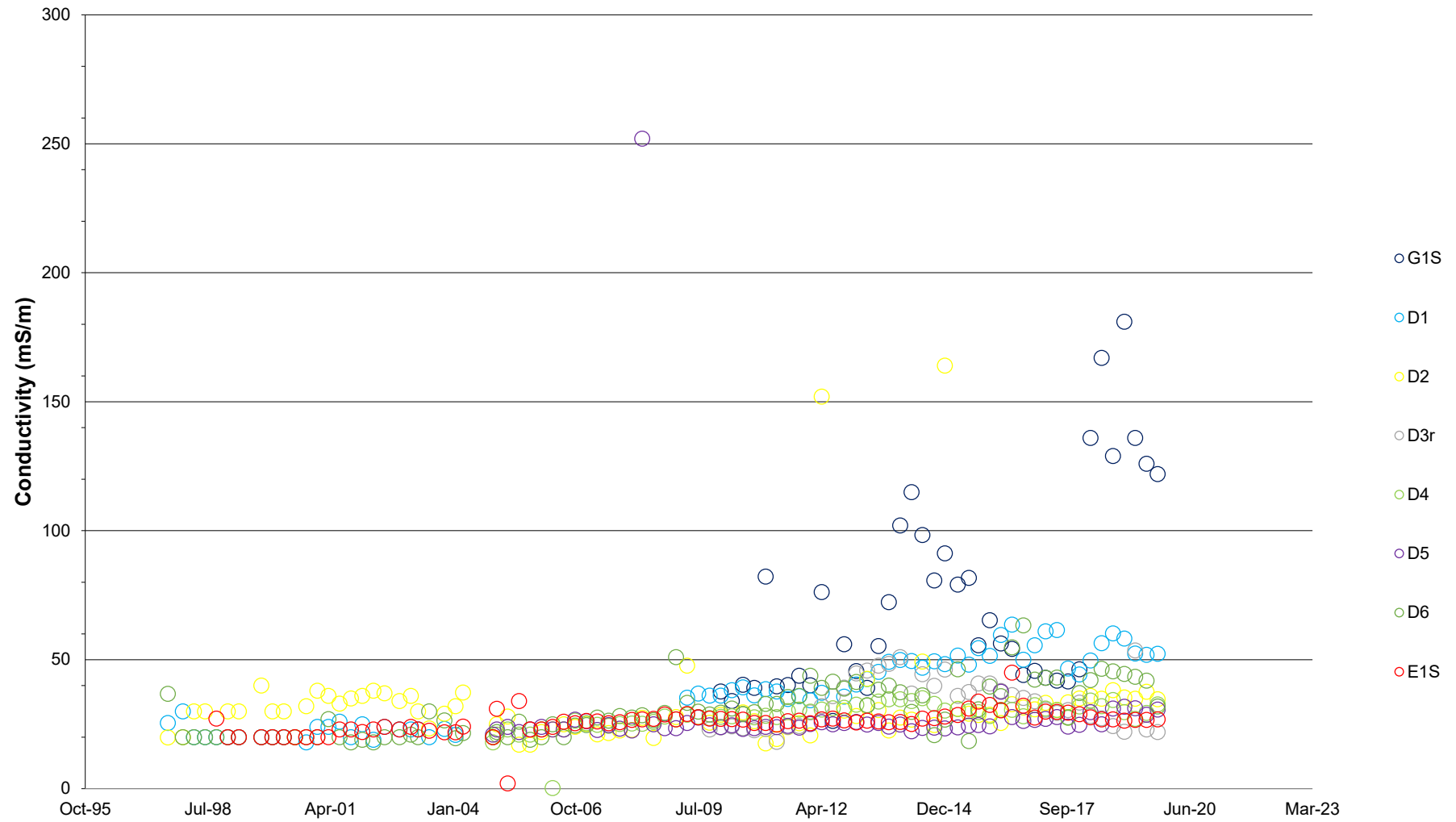
Sand Aquifer Chloride Concentrations



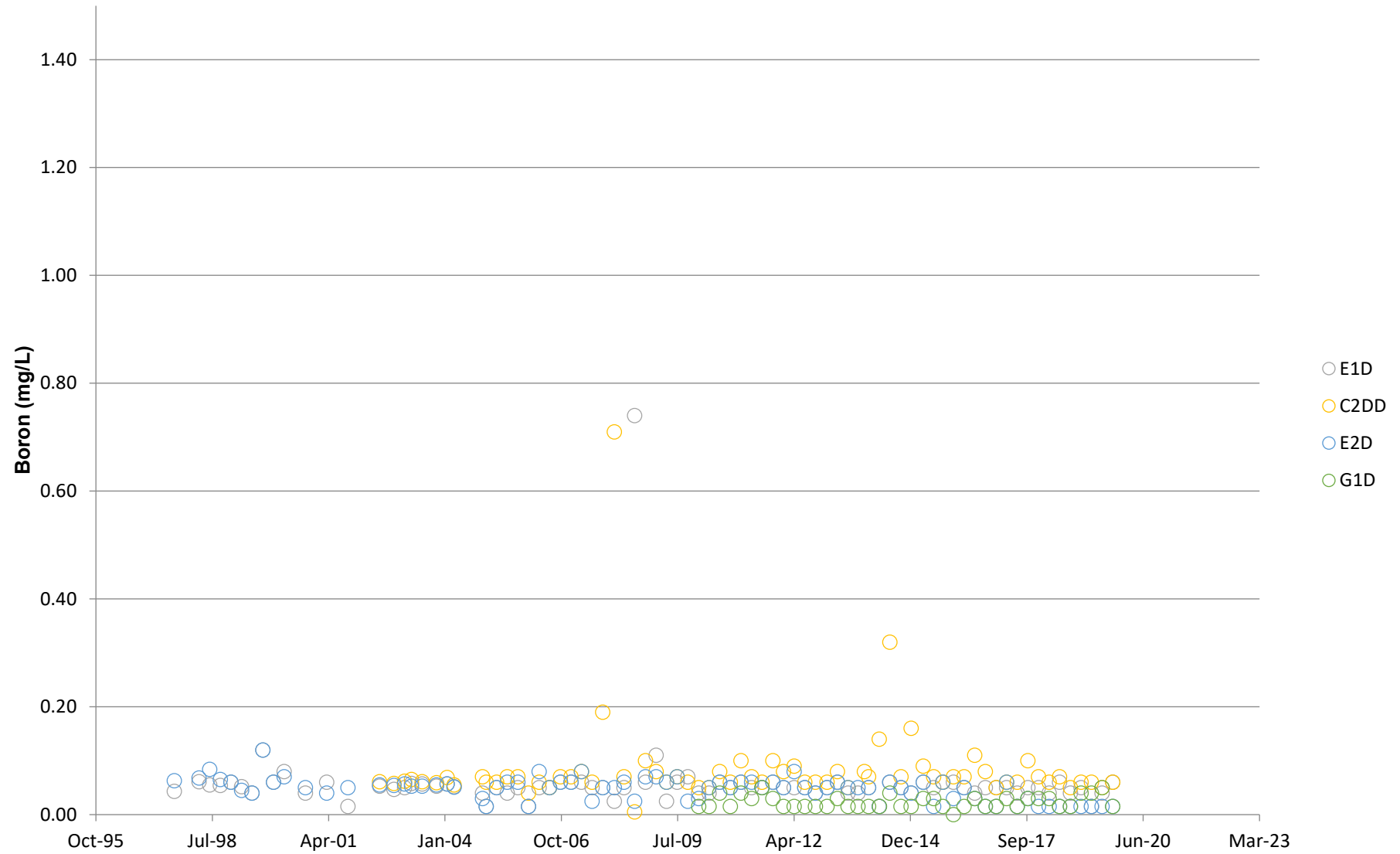
Sand Aquifer Ammoniacal-Nitrogen Concentrations



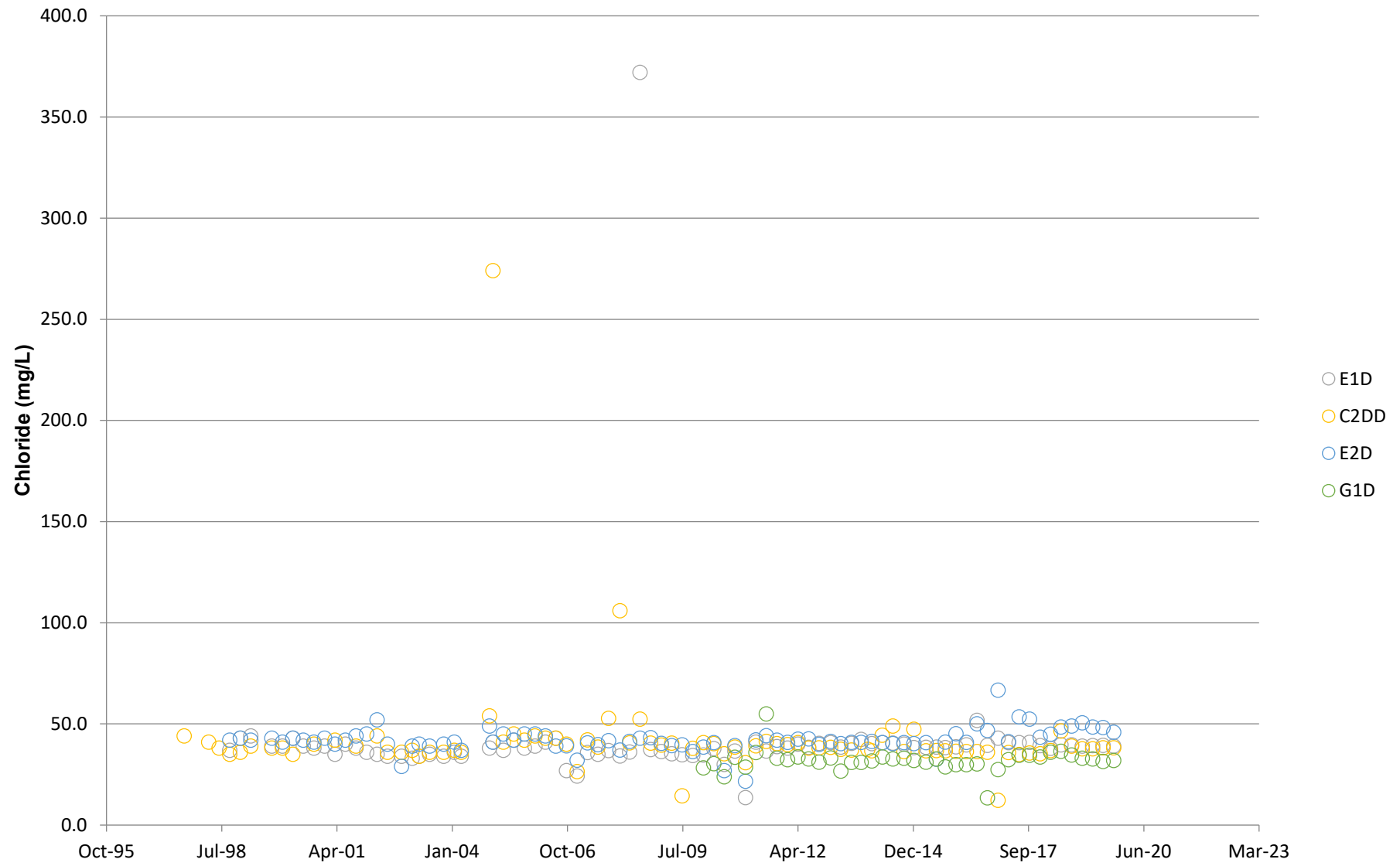
Sand Aquifer Conductivity Levels



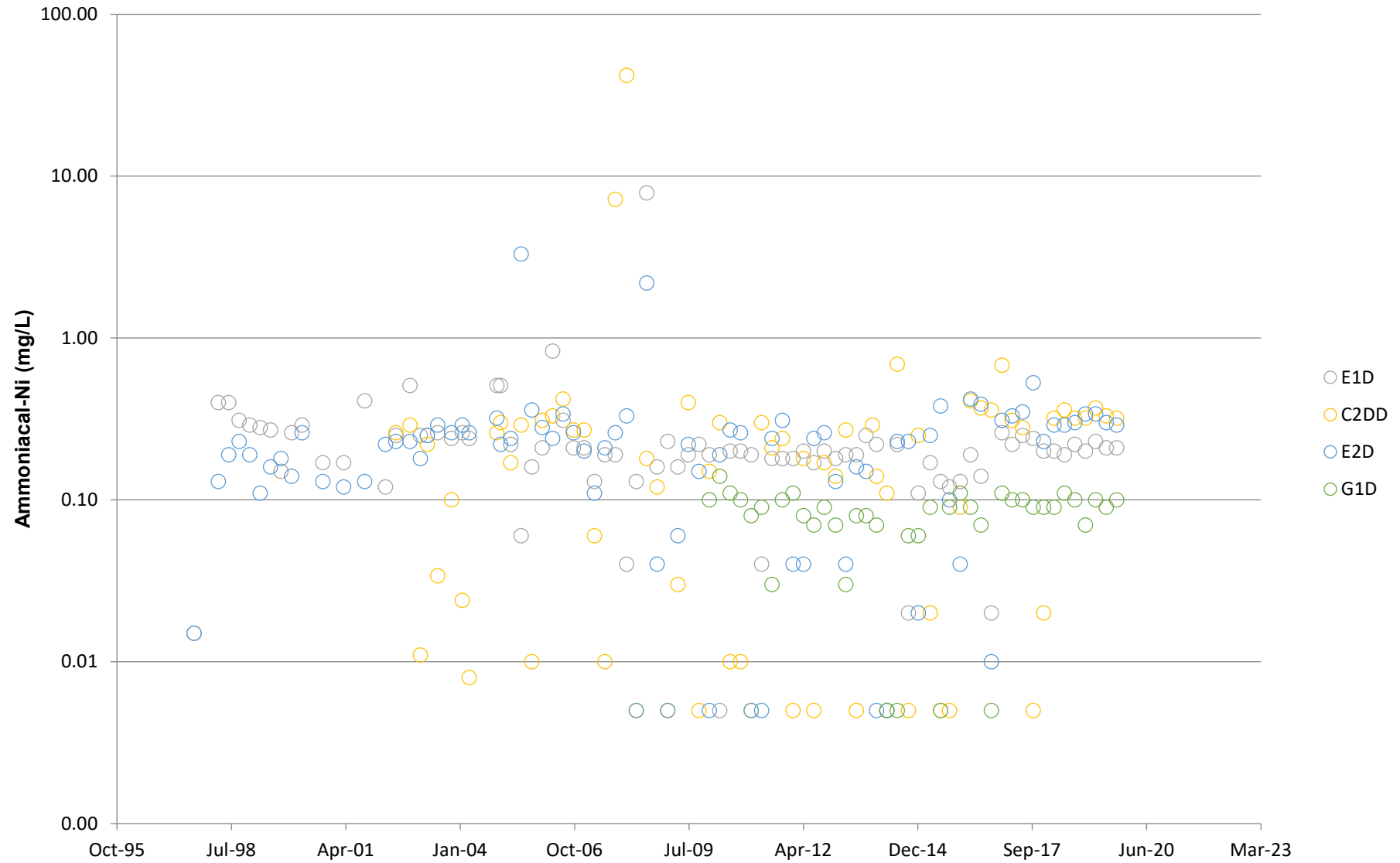
Gravel Aquifer Boron Concentrations



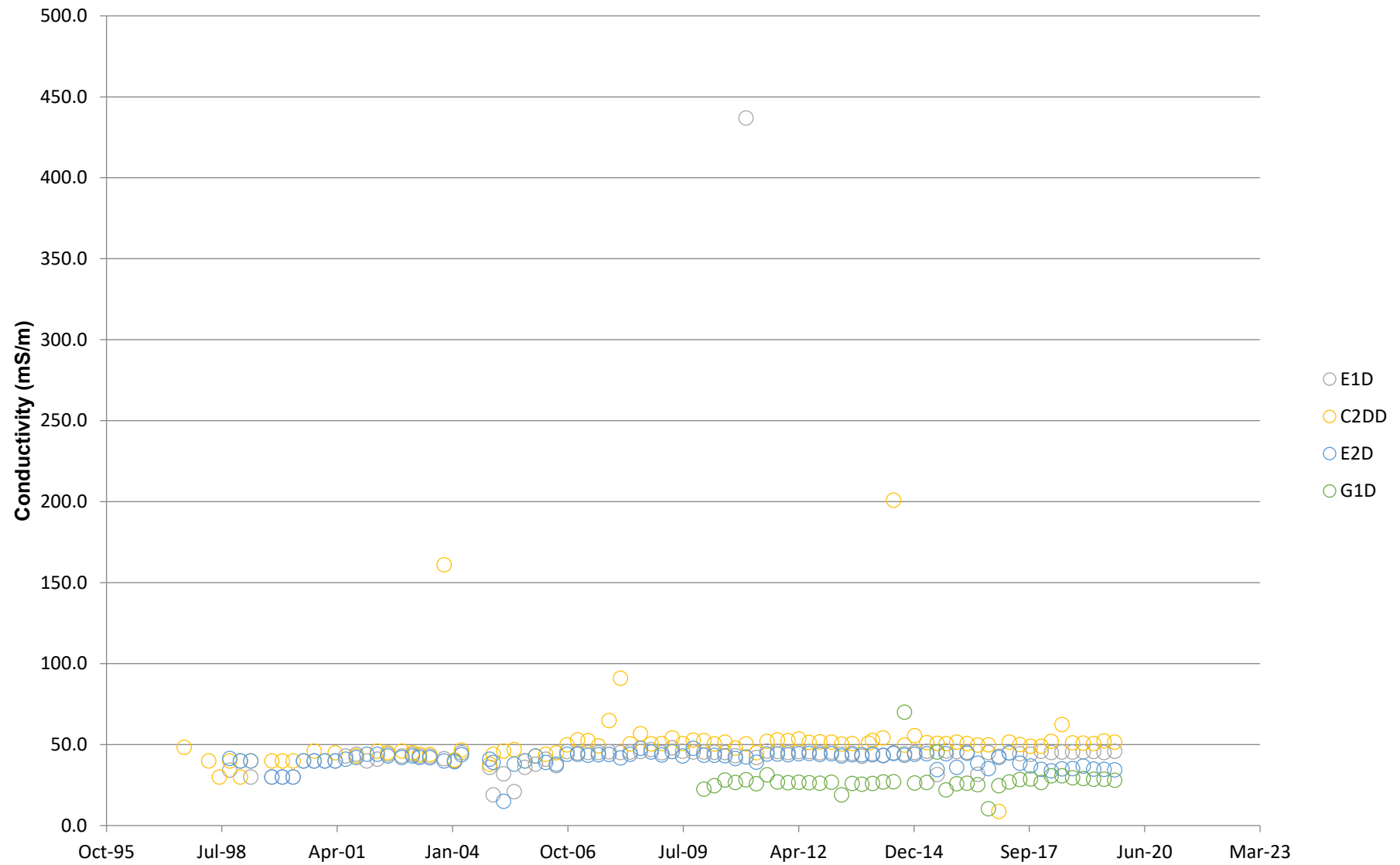
Gravel Aquifer Chloride Concentrations



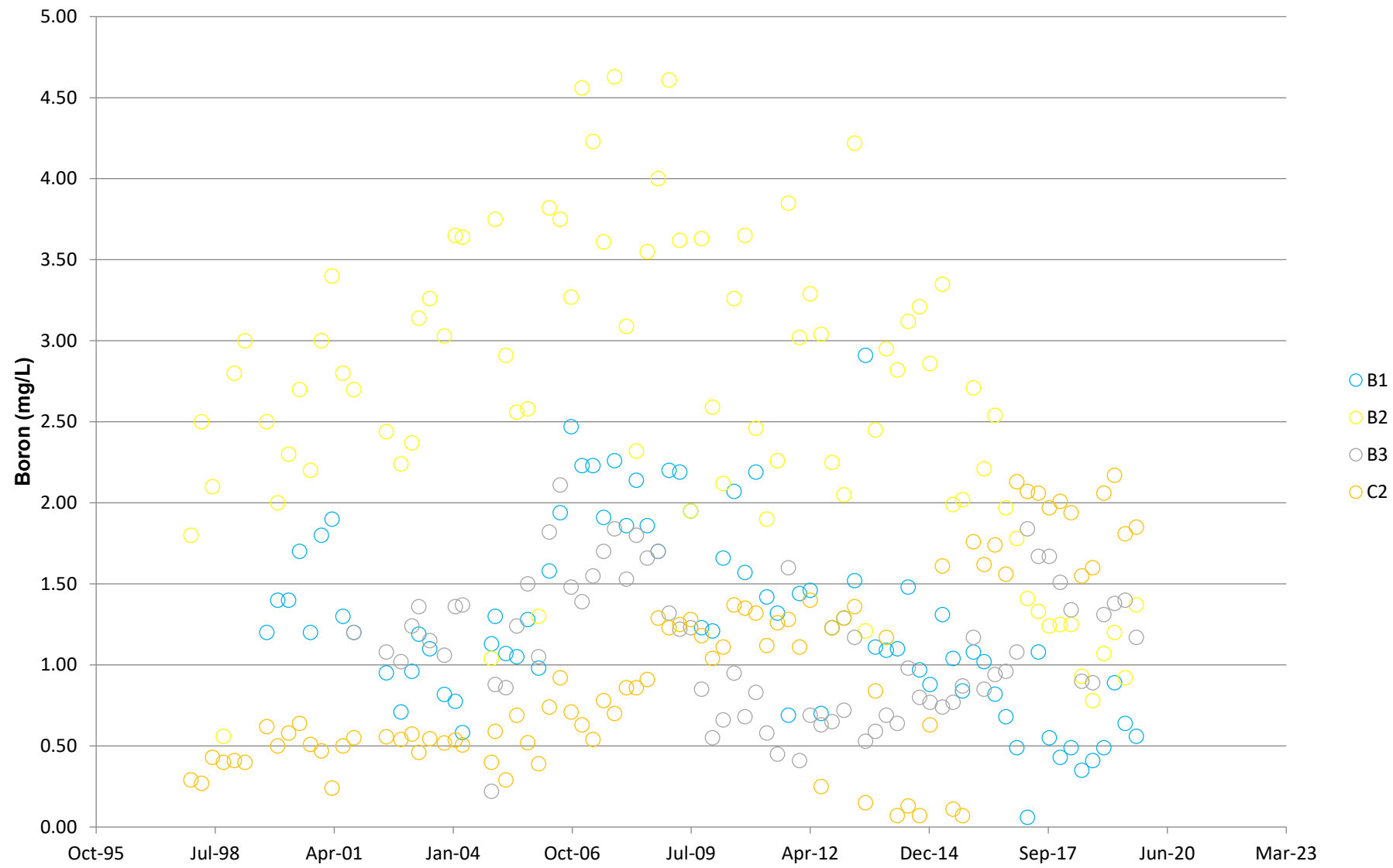
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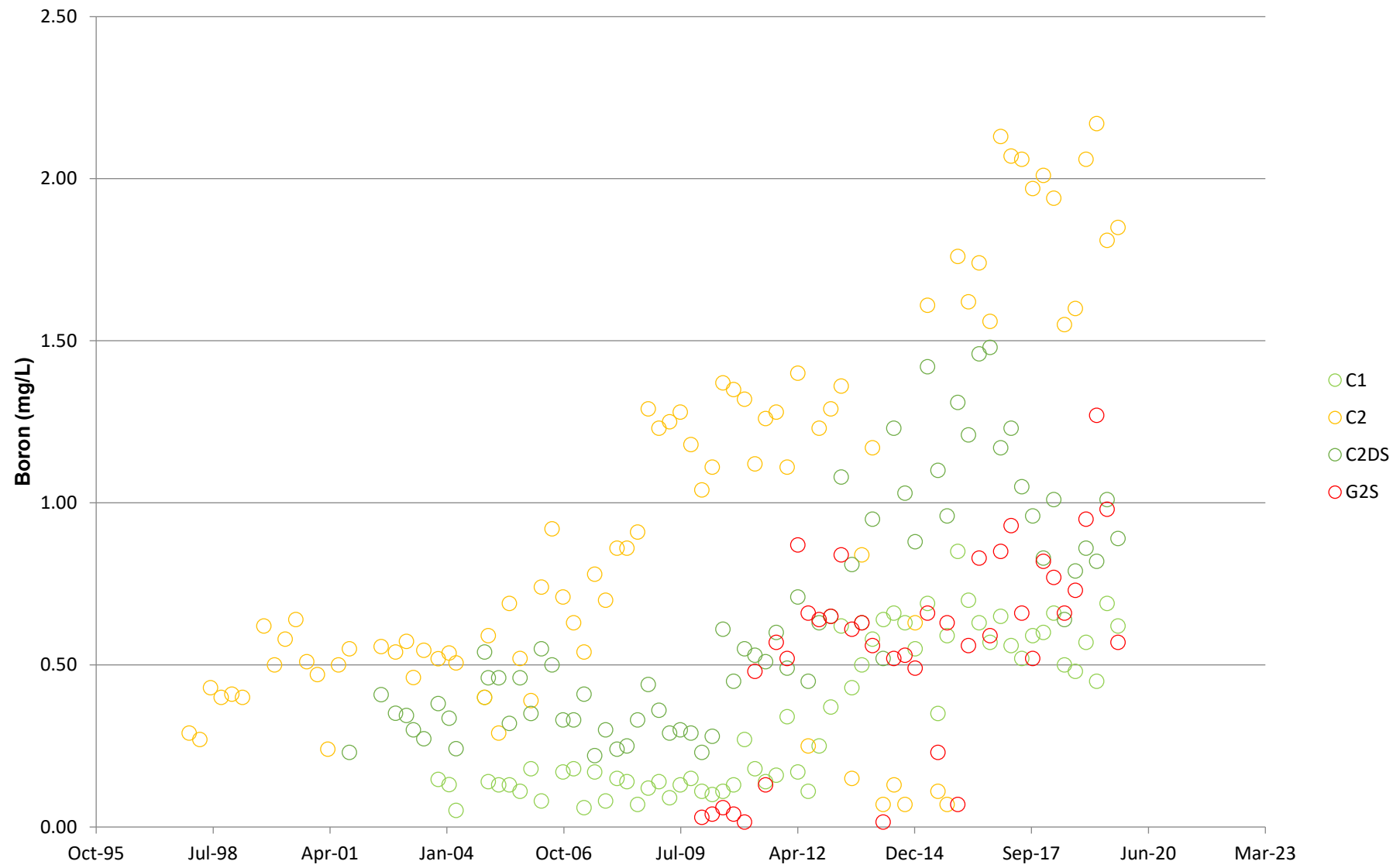
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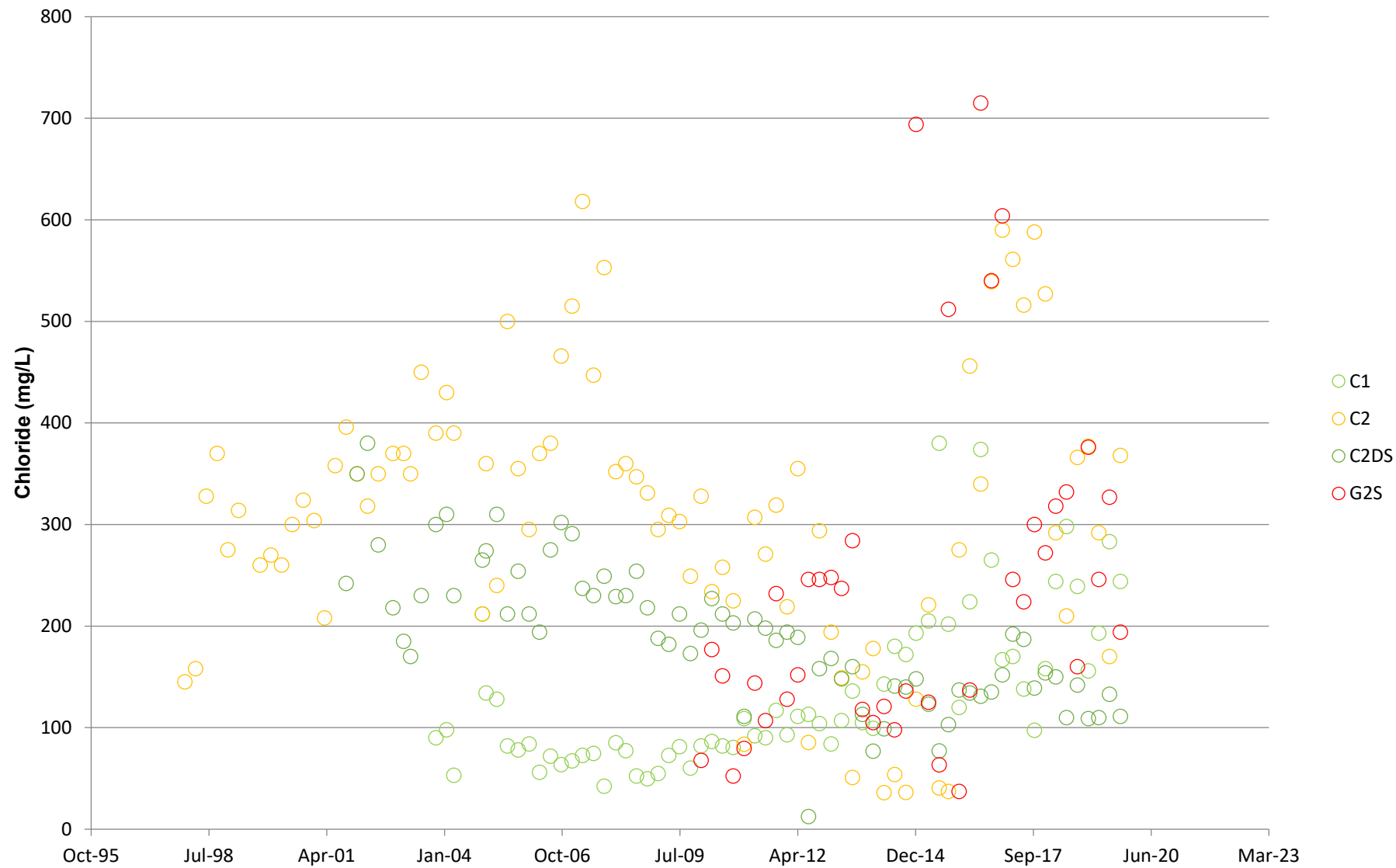
Sand Aquifer Down Gradient Boron Concentrations



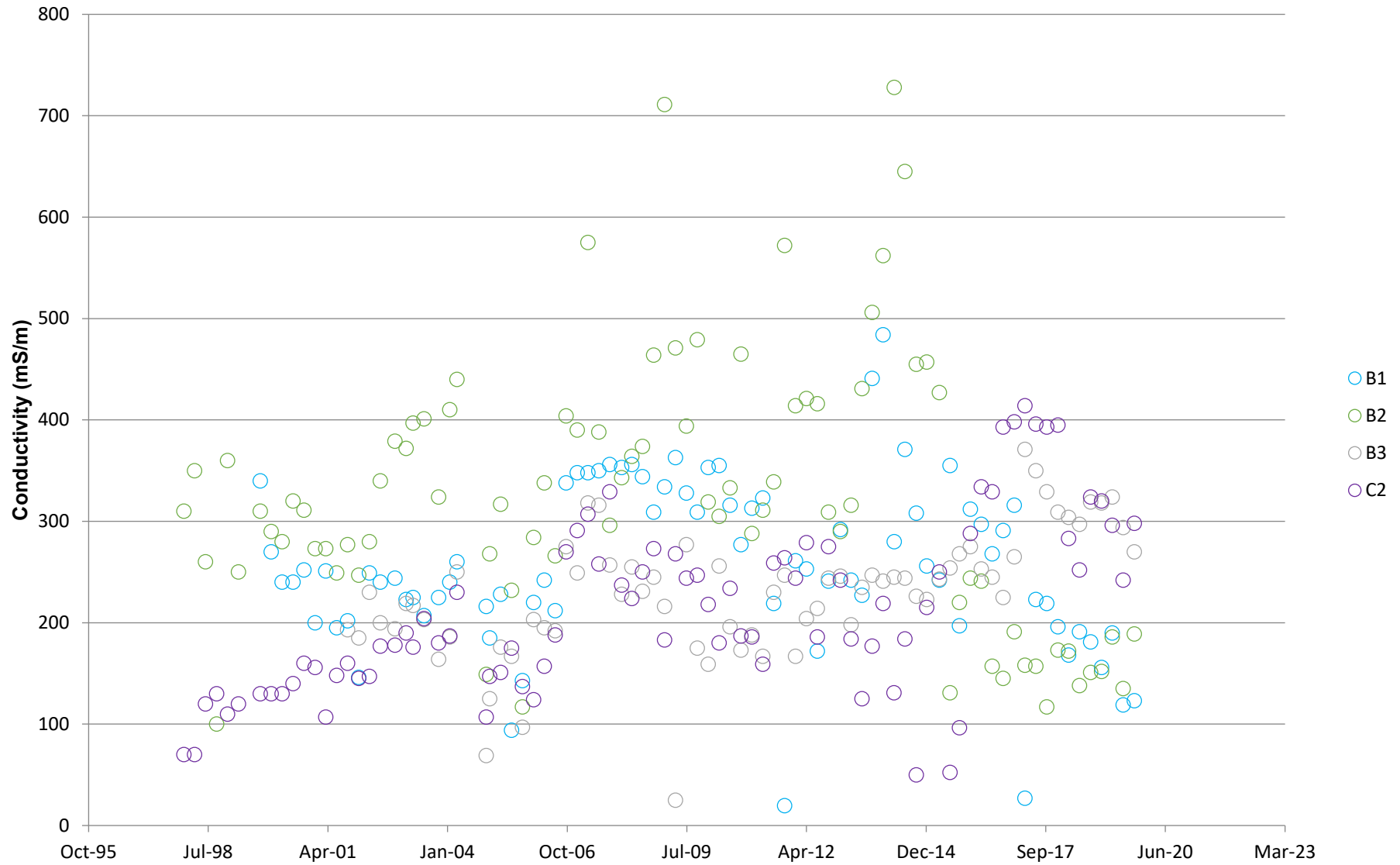
Sand Aquifer Down Gradient Boron Concentrations



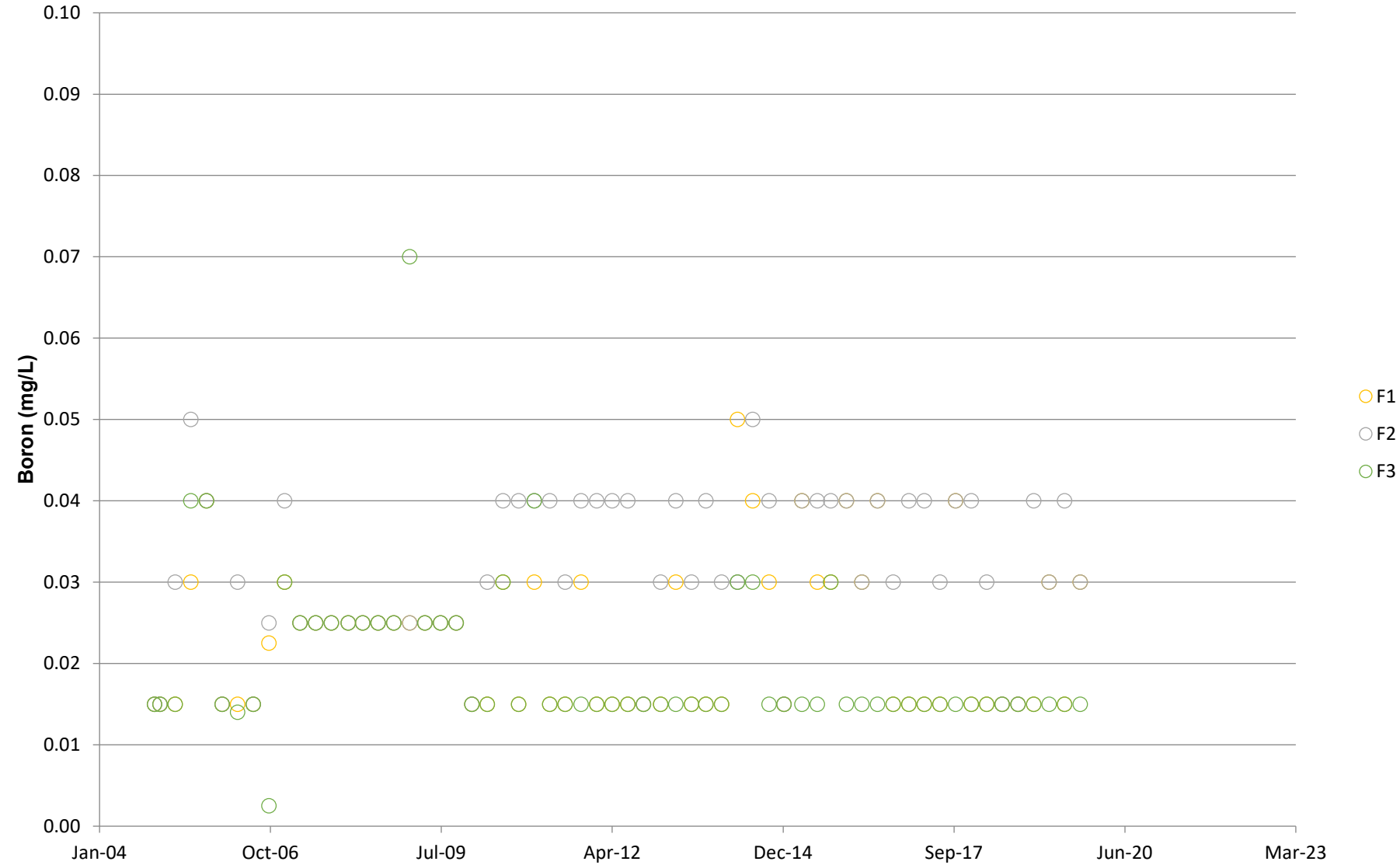
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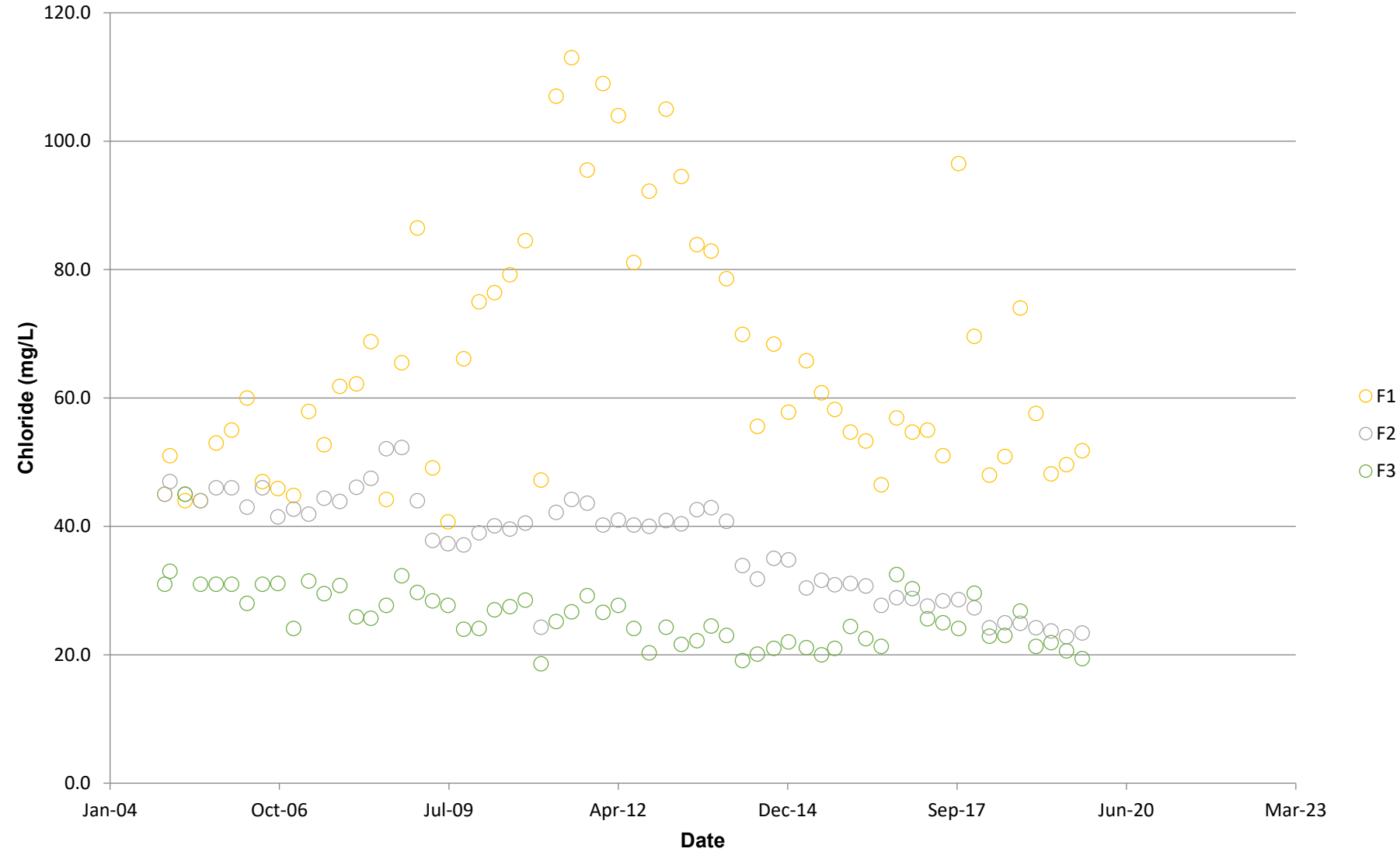
Sand Aquifer Down Gradient Conductivity Levels



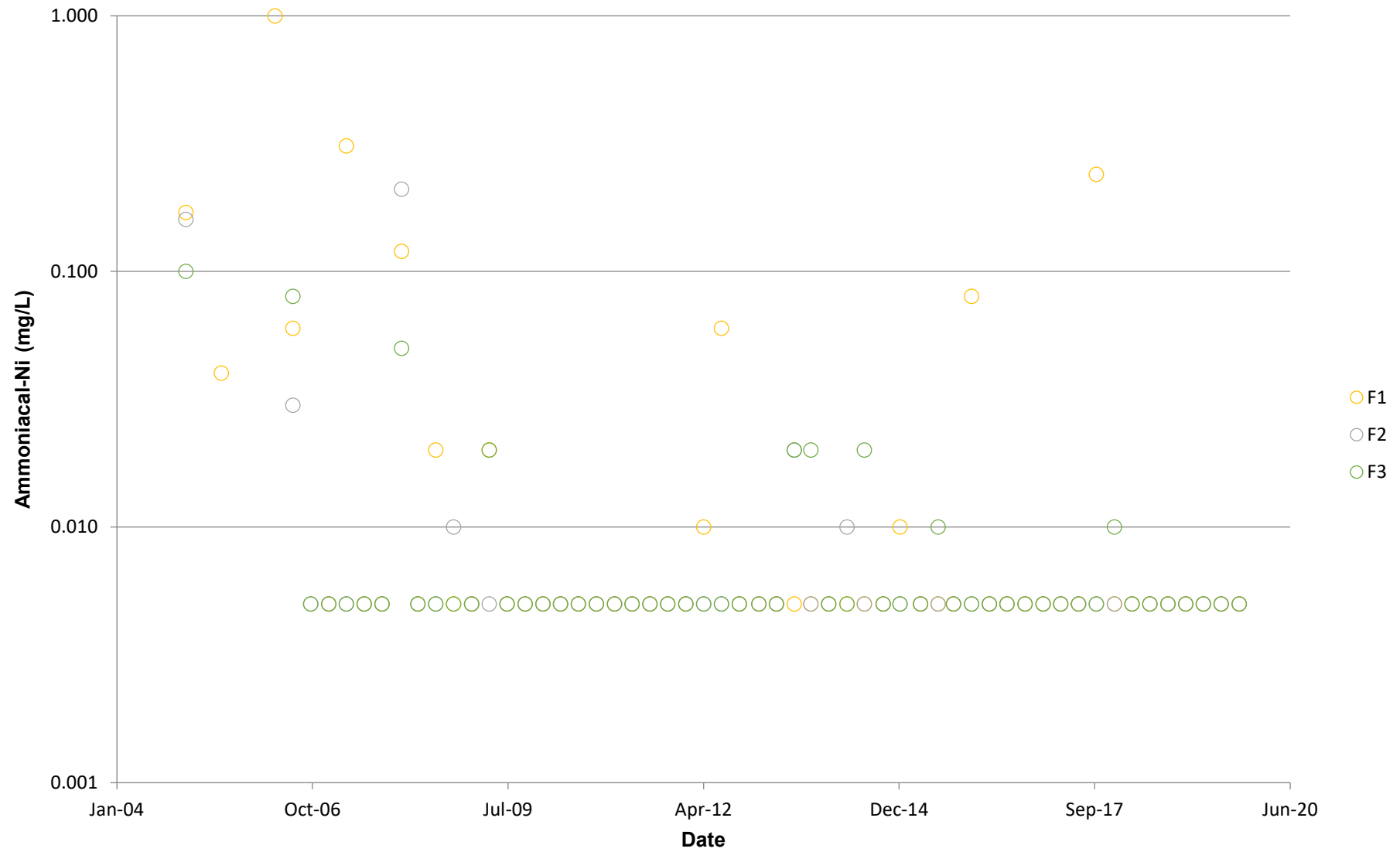
Irrigation Area Boron Concentrations



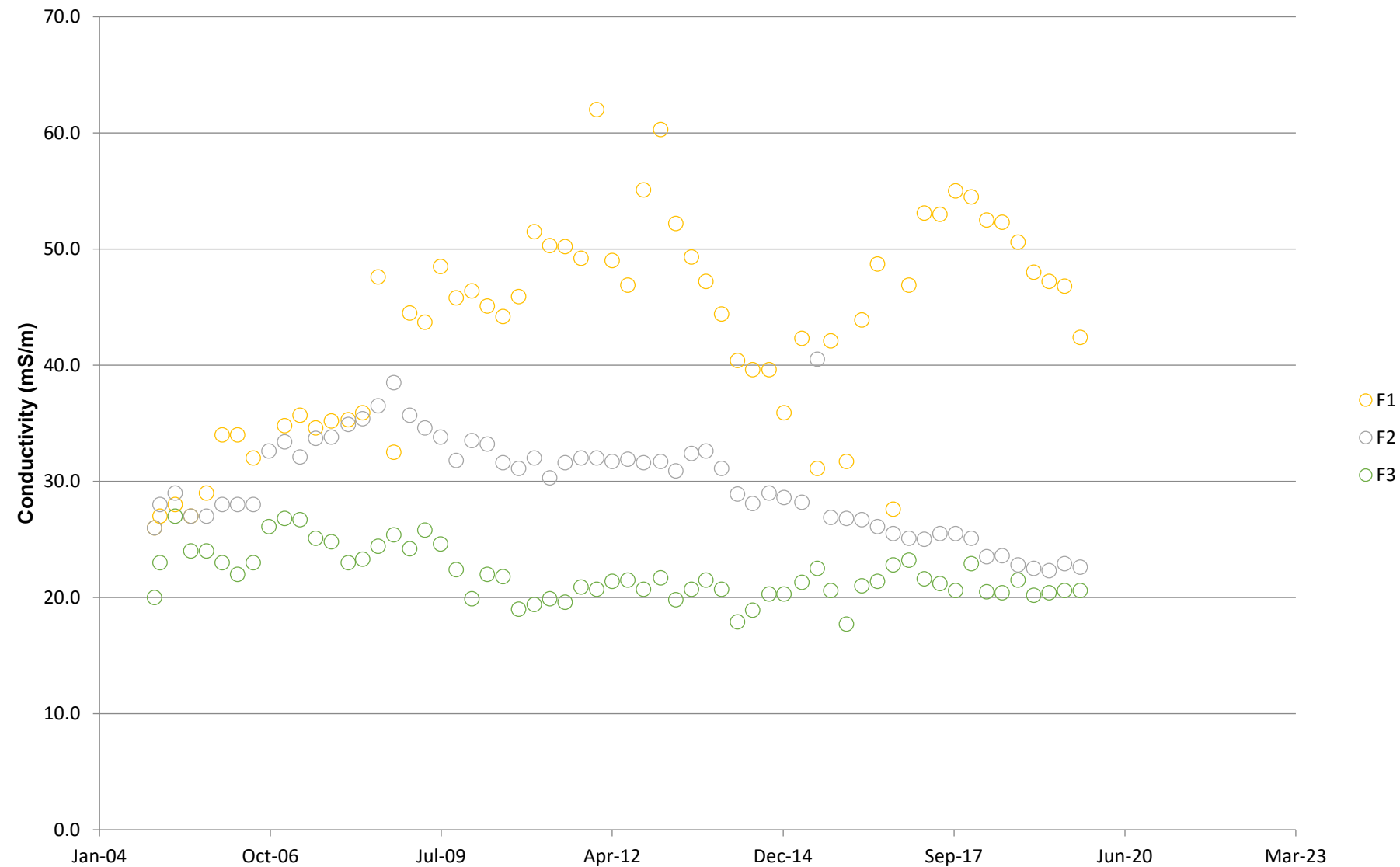
Irrigation Area Chloride Concentrations



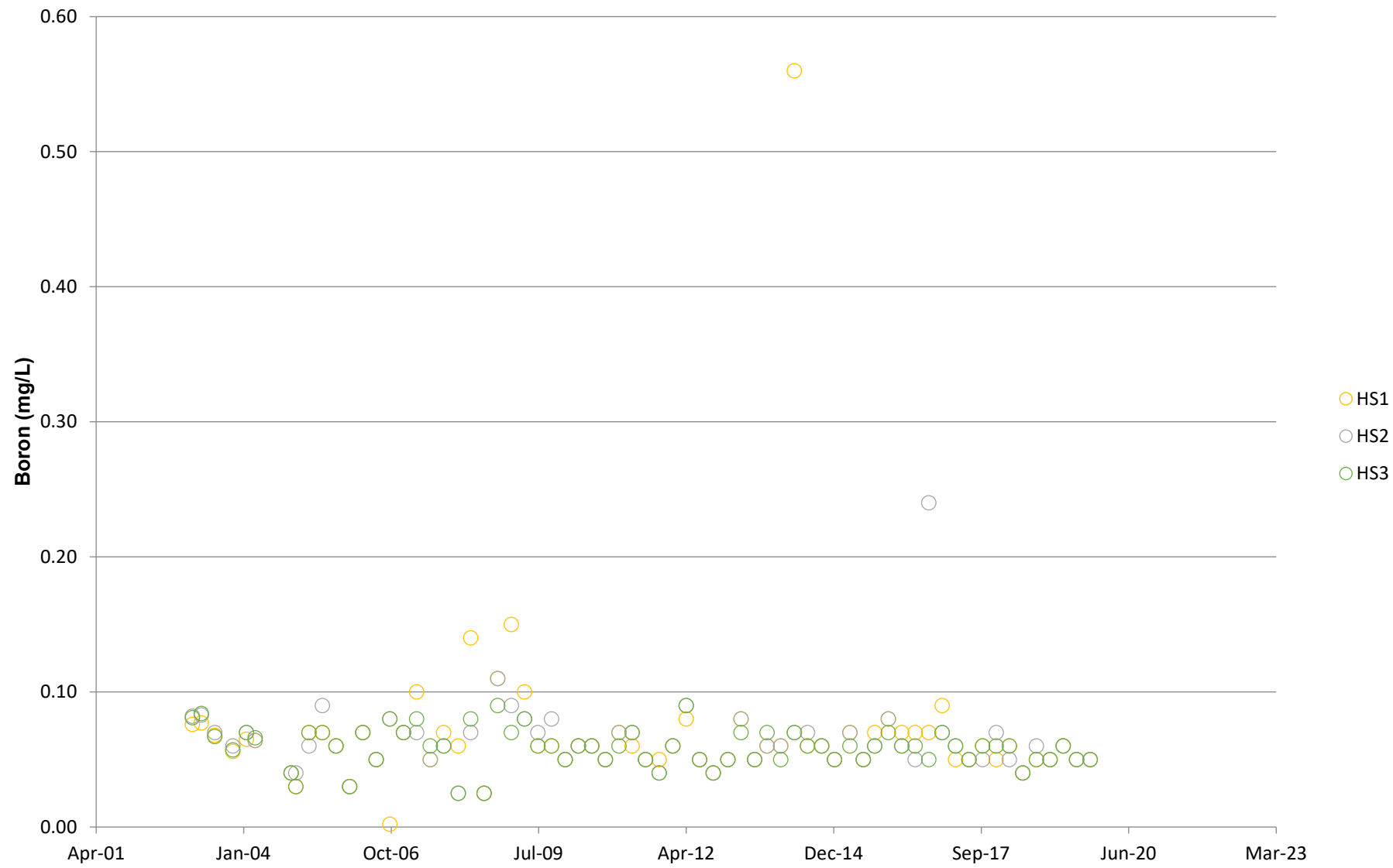
Irrigation Area Ammoniacal-Nitrogen Concentrations



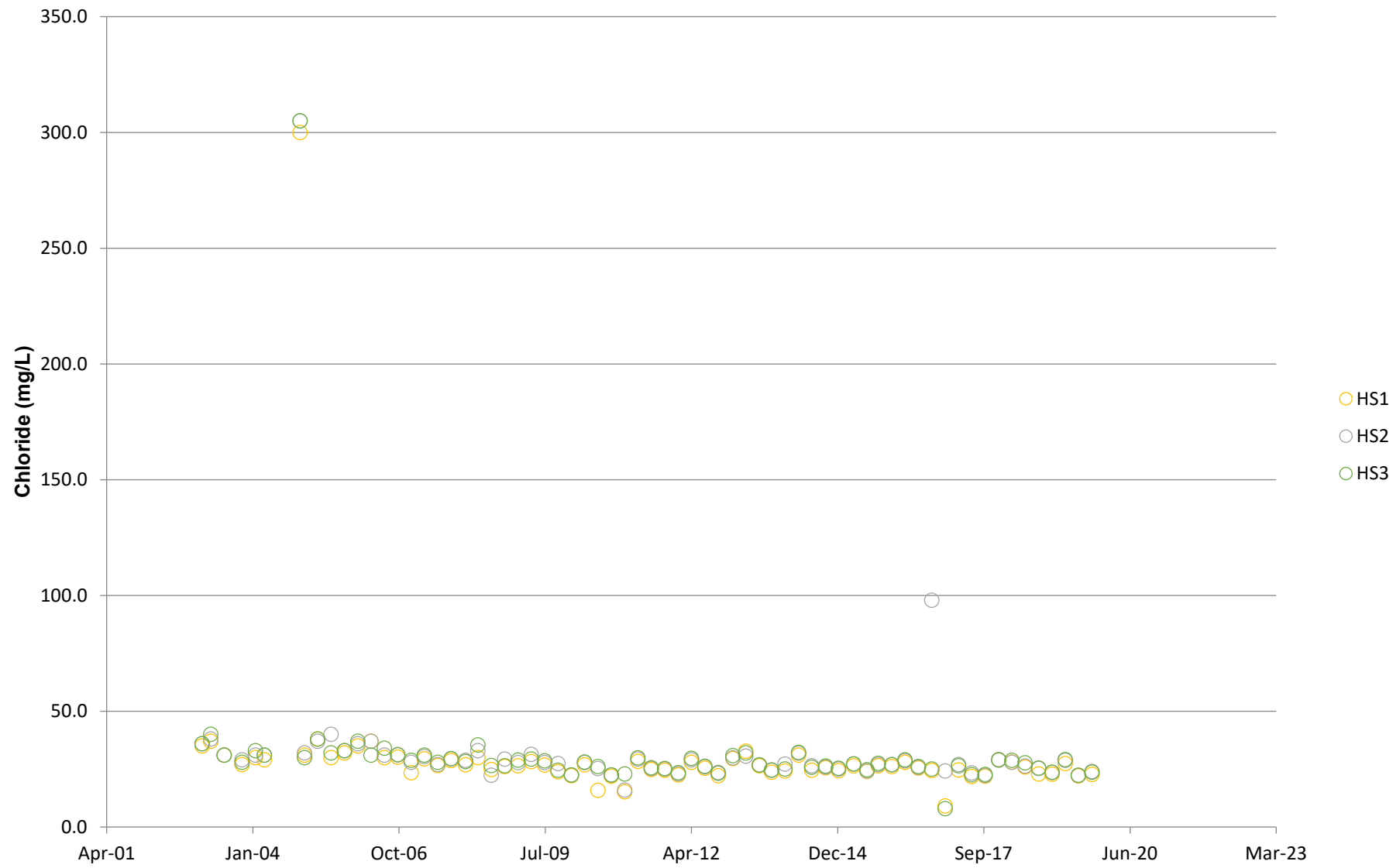
Irrigation Area Conductivity Levels



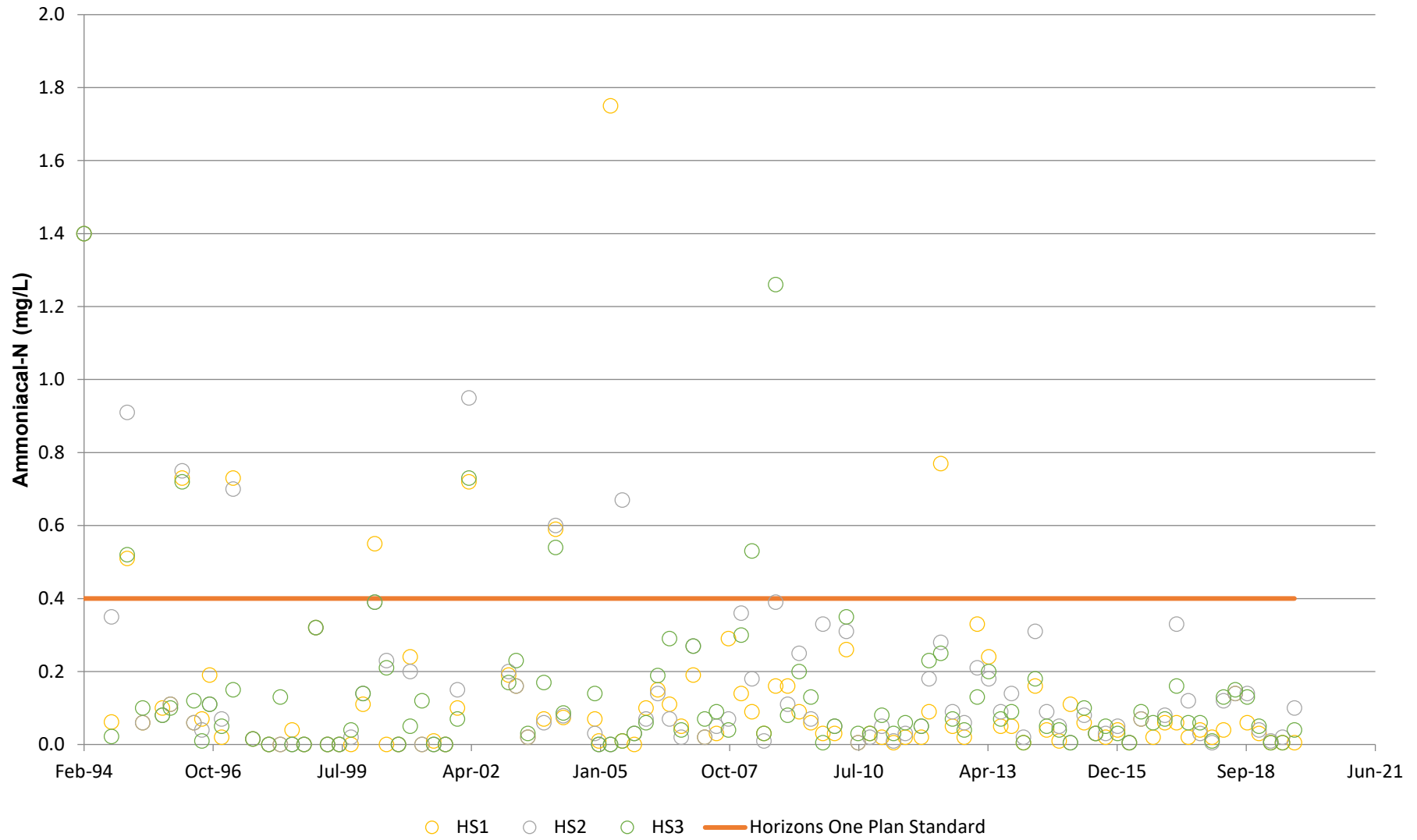
Hokio Stream Boron Concentrations



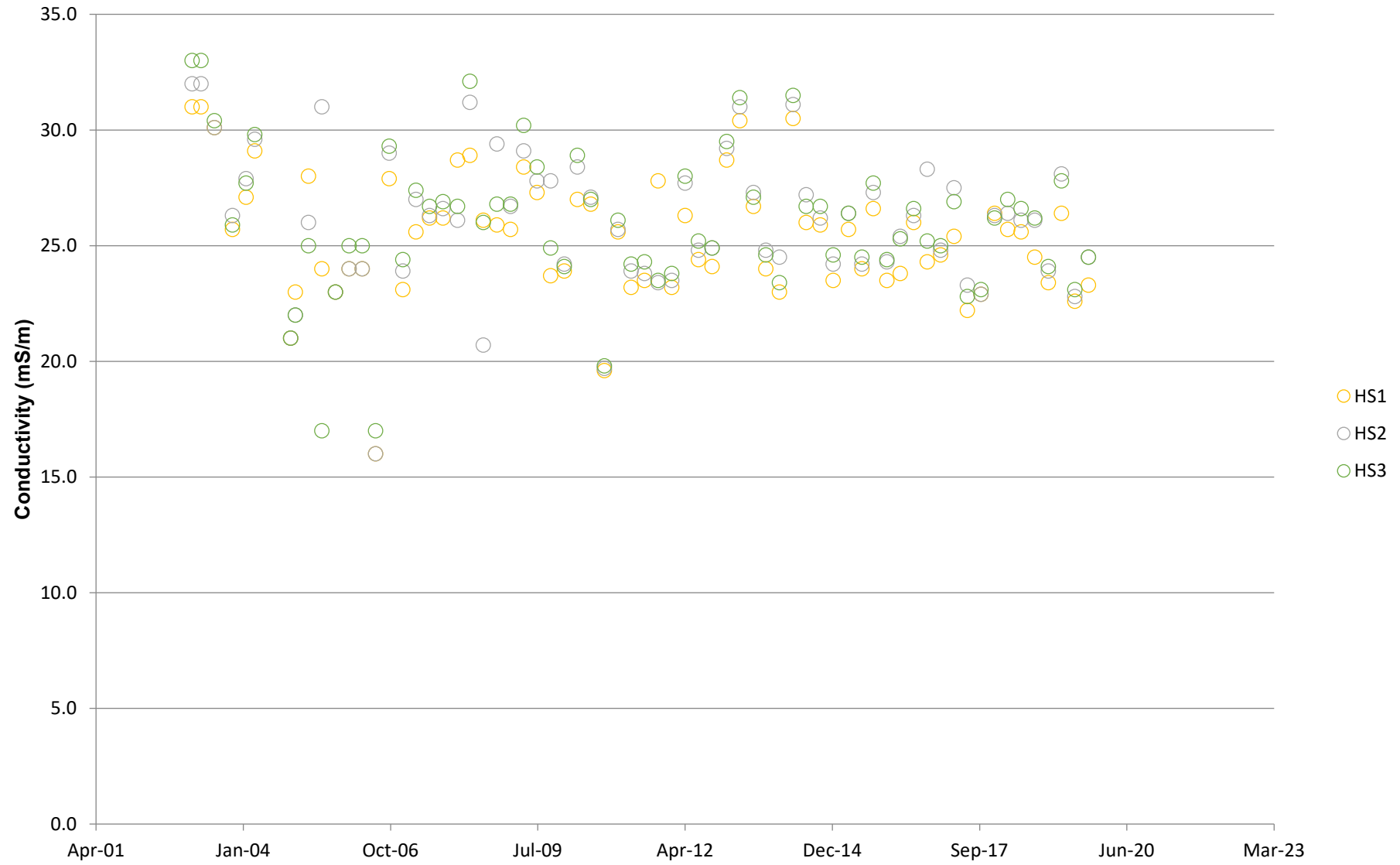
Hokio Stream Chloride Concentrations



Hokio Stream Ammoniacal-N Concentrations



Hokio Stream Conductivity



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